CORONAVIRUS DISEASE (COVID-19): THE MENTAL HEALTH, RESILIENCE, AND COMMUNICATION RESOURCES FOR THE SHORT- AND LONG-TERM CHALLENGES FACED BY HEALTHCARE WORKERS

EDITED BY: Andrew E. P. Mitchell, Chris Keyworth, Eduardo Salas, Federica Galli and Elena Vegni

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Topic Editors:
Andrew E. P. Mitchell, University of Chester, United Kingdom
Chris Keyworth, University of Leeds, United Kingdom
Eduardo Salas, Rice University, United States
Federica Galli, Sapienza University of Rome, Italy
Elena Vegni, University of Milan, Italy

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Editorial: Coronavirus Disease (COVID-19): The Mental Health, Resilience, and Communication Resources for the Short- and Long-term Challenges Faced by Healthcare Workers

Andrew E. P. Mitchell[1]*, *Federica Galli*[2], *Chris Keyworth*[3], *Elena Vegni*[4] and *Eduardo Salas*[5]

[1] Faculty of Health and Social Care, University of Chester, Chester, United Kingdom, [2] Department of Dynamic and Clinical Psychology, Sapienza University of Rome, Rome, Italy, [3] School of Psychology, University of Leeds, Leeds, United Kingdom, [4] Department of Health Sciences, University of Milan, Milan, Italy, [5] Department of Psychology, Rice University, Houston, TX, United States

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Edited and reviewed by:
Severi Luoto,
The University of Auckland,
New Zealand

***Correspondence:**
Andrew E. P. Mitchell
a.mitchell@chester.ac.uk

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Editorial on the Research Topic

Coronavirus Disease (COVID-19): The Mental Health, Resilience, and Communication Resources for the Short- and Long-Term Challenges Faced by Healthcare Workers

During the early phases of the COVID-19 pandemic, the world initially focused on measures to suppress COVID-19 transmission and protect their populations by developing vaccines and drug treatments for the most vulnerable and a host of social actions, including implementing social distancing, working from home, travel restrictions, lockdowns, and face coverings. Nearly 2 years after the initial outbreak, at the time of writing this editorial, and through research conducted as part of this Research Topic, it is clear that the mental health impacts of COVID-19 on healthcare workers (HCW) are significant. There is an urgent need to understand and address these impacts (Greenberg et al., 2020). This is particularly true given the World Health Organisation has outlined a series of mental health and psychosocial considerations aimed explicitly at HCWs (World Health Organisation, 2020). The present Research Topic on Coronavirus Disease (COVID-19) and HCWs has added to the scientific knowledge in several main areas, including barriers and enablers to healthcare delivery, understanding HCWs' mental health and well-being, resilience, coordination and communication within the workforce, and specific interventions to promote mental health and well-being. The Research Topic yielded 42 articles with contributions from 240 authors. The articles within this Research Topic were published between the third quarter of 2020 and 2021. The majority of studies were conducted in Europe ($n = 26$), with most conducted in Italy ($n = 13$), the United Kingdom ($n = 3$), and Spain ($n = 3$). There was also one study from each of Norway, Denmark, Romania, Turkey, Portugal, Austria and Switzerland. Asia included China ($n = 6$), India ($n = 3$), one study in Pakistan and Vietnam, one study conducted in Brazil, and four studies in the United States of America.

The heterogeneity of the studies in terms of location and populations further contributes to the Research Topic. The study designs can be dichotomised, with the majority of studies ($n = 29$) being cross-sectional. Most were questionnaire studies in which a population is surveyed at one point in time to describe characteristics. Other studies ($n = 5$) were broadly qualitative and used interviews or focus groups. There were systematic reviews ($n = 5$), mostly narrative reviews and one example involving meta-analysis (Dong et al.). There was one randomised control trial reported within the Research Topic (Procaccia et al.). Finally, there was a mixed-method (Putrino et al.) and an opinion/commentary paper (Chapman et al.). There was a range of analysis techniques in the qualitative papers. The most frequent method was to conduct interviews, with most using thematic and less frequently involving content analysis. Data analysis within the quantitative papers used descriptive and dispersion analysis, analysis of variance, regression analysis and factor analysis to report the results. The submissions assessed various mental health outcomes, including anxiety and mood disorders, post-traumatic stress disorder, obsessive-compulsive disorder, and sleep disturbance.

The different studies collected in the Research Topic may be described according to four lines of research. Firstly, a part of the studies addressed the enablers and barriers in healthcare delivery, both person-specific variables and resources to deliver healthcare. Moreno-Jiménez et al. utilised the Job Demands-Resources model (JD-R; Bakker and Demerouti, 2017) and reported that high job demands by HCWs during the COVID-19 pandemic were related to a lack of appropriate resources, such as protective equipment in the healthcare environment. The limited supply or lack of Personal Protective Equipment (PPE) was related to adverse outcomes, including increased workload and fear of contagion. The authors suggested that increased resources such as PPE could reduce fear of contagion and emotional consequences. It has been found that COVID-19 can affect team performance at four stressor levels: individual, team, organization, and work-life (Tannenbaum et al., 2021). Working in healthcare settings during a pandemic has the potential risk to cause high levels of stress because of exposure to a range of potentially stressful situations.

Some specific stressors for HCWs have included the interpersonal aspects of practise, clinical environment, keeping up to date with current knowledge and dealing with patient concerns (Mitchell, 2020a). A study by Del Piccolo et al. focused on individual, interpersonal and organisational resources to reduce stress. The authors suggested that the essential aspects are the promotion of acceptance of negative emotions and resilience to stressors at the individual level. At the interpersonal level, peer support and daily sharing of experiences helped. At the organisational level, the findings suggested that access to COVID-19-specific resources, such as PPE, enabled Italian obstetrics staff to undertake their work safely whilst reducing distress. Healthcare workers' health and welfare are important resources and potential barriers. Individual well-being was described in two papers (Raza et al.; Testoni et al.) by investigating the lived experiences of health workers during the COVID-19 pandemic. Both studies utilised qualitative interviews in different countries and found that frontline workers experienced the highest personal distress when confronted with COVID-19.

The second aspect of the Research Topic focused on articles investigating HCWs' mental health and well-being during the first 18 months of the COVID-19 pandemic. Galli et al. (2020) reported the likely risk of developing a psychiatric disorder for healthcare workers during the pandemic. An article by Chatterjee et al. found that 79.3% of the HCWs had moderate to severe levels of perceived stress, and 47.9% had insomnia during the early phase of the pandemic in India. Huo et al. studied the determinates of burnout of HCWs during the COVID-19 pandemic in China. The authors indicated that 36.5% of workers experienced burnout. The findings highlighted personal and work-related factors were associated with burnout, such as being less experienced HCW and younger. Another study in the United States by Pearman et al. found that healthcare workers were at an increased risk of experiencing mental health issues such as depression and anxiety compared to a matched general population sample during the pandemic. Furthermore, the authors indicated that HCWs, on average, had a symptom profile to reach a clinical diagnosis of depression. Pfefferbaum and North (2020) reported that HCWs are at risk due to job-specific attributes, i.e., exposure to disease and concerns about transmitting the infection. Early and mid-term consequences on HCWs' physical, behavioural, and mental health were focused on by Khanji et al. by developing a study protocol (CoPE-HCP) to compare HCWs and the general public. The authors hoped to improve the delivery and design of support systems for HCWs and the public.

A third aspect relates to articles addressing resilience and communication themes. This aspect attracted research investigating the adherence and understanding of clinical guidelines and the impact of the pandemic on levels of emotional distress and resilience of HCWs. Outside of this Research Topic, Keyworth et al. (2021) investigated adherence to Government guidelines in the general population and reported that the psychosocial effects could undermine long-term adherence. Riguzzi and Gashi examined the psychosocial lessons learnt during the first wave of COVID-19 and adherence to guidelines in HCWs in Switzerland. The authors found a high level of emotional distress, with 70% of the HCWs reporting emotional distress in the first pandemic wave. Fifty-two percent of HCWs felt worried about passing the virus on to their family or friends. In contrast, 18% of HCWs felt worried about the same happening to themselves. The findings also suggest an overestimation of the effectiveness of standard hygiene procedures, with 36% falsely believing standard hygiene measures would keep themselves and others safe. Lenzo et al. focused on the relationship between emotion regulation and its effect on depression and anxiety. The authors found that perceiving stressor context cues was inversely associated with depression and anxiety. This finding suggests the possibility of using psychological theories to support psychological interventions to help mitigate the psychological consequence of depression and anxiety. The authors did not name a specific intervention but named a broad range of third-wave cognitive and behavioural techniques such as

mindfulness-based interventions to decrease compassion fatigue and resilience amongst HCWs (Zhang et al.). The relationships between mindfulness and resilience have been studied by Mitchell (2020b), finding that acceptance and attention within mindfulness was important for HCWs' resilience.

The last main grouping of articles focused on specific interventions to promote mental health. Callus et al. completed a rapid review to identify the most effective stress reduction techniques for healthcare workers managing infected patients with coronavirus (SARS, MERS, and COVID-19). The authors identified several studies focusing on interventions to support HCWs. Still, most did not test user satisfaction or conduct a follow-up, which suggests a need for further research into stress reduction interventions to safeguard HCWs' mental health. This area of research is needed to protect staff from fatigue and burnout during high levels of acknowledged exposure to stressors during the pandemic (Leo et al., 2021). Callus et al. reported on a digital package in which user satisfaction was measured (Blake et al., 2020). The evaluation of the online support package indicated a high user satisfaction for content, usability and utility amongst HCWs in the United Kingdom. In another study, Putrino et al. showed that after a single 15-min experience in a multisensory experience recharge room, healthcare workers showed a 59.6% reduction in self-reported stress levels and rated the experience positively at 99.3%.

Studies have also looked at service-level implementation by teams in response to COVID-19. A study by Cao di San Marco et al. (2020) reported implementing a clinical psychology service and detailed two types of psychological support, decompression rooms and small-group sessions, as beneficial. A similar service-level provision was reported by You et al. focussed on hotline counselling service, which was set up following the initial COVID-19 outbreak to provide HCWs with psychological support. The authors devised a psychological hotline scale to assess skills and reported a good level of reliability and validity. The scale was designed to screen and evaluate the competencies of counsellors providing hotline support. Aristizabal et al. reported on heart rate variability biofeedback to support HCWs at times of stress and anxiety. The authors highlighted that diaphragmatic breathing exercises could positively reduce stress and anxiety. Procaccia et al. investigated the benefits of expressive writing compared to neutral writing on HCWs' psychological adjustment during the COVID-19 pandemic after three writing sessions. The findings suggest a positive benefit in psychological adjustment to several psychological outcomes.

CONCLUSION

In summary, this Research Topic has gathered articles from around the world and focused on HCWs and the best evidence to support their mental health and well-being during the pandemic. The studies report from the meso-level of organisations to the micro-level of individual behaviour and cognitions. These articles have contributed to the understanding of the needs of the HCWs to deliver health in the most effective and safe ways for the patients whilst protecting themselves as an invaluable resource.

This Research Topic has published studies addressing a range of topics relevant to understanding mental health, resilience, coordination and communication within the workforce, and specific interventions to promote mental health for HCWs during the COVID-19 pandemic. Coronavirus is likely to be a challenge for the foreseeable future regarding understanding its sequelae for the HCWs themselves. Future consideration of well-being and mental health is needed amongst frontline workers. There is a need to understand how to prevent distress and provide interventions to support healthcare workers during such periods. This Research Topic is a valuable source for future work in the area. Hopefully, this Research Topic will motivate more research on this important worldwide topic.

AUTHOR CONTRIBUTIONS

AM wrote the initial draft. FG, CK, EV, and ES critically reviewed and provided valuable feedback on the final version of the manuscript. All authors approved the submitted version.

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BRIEF RESEARCH REPORT
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Mental Health Challenges of United States Healthcare Professionals During COVID-19

Ann Pearman[1], MacKenzie L. Hughes[1], Emily L. Smith[2] and Shevaun D. Neupert[2]*

[1] School of Psychology, Georgia Institute of Technology, Atlanta, GA, United States, [2] Department of Psychology, North Carolina State University, Raleigh, NC, United States

As COVID-19 continues to impact global society, healthcare professionals (HCPs) are at risk for a number of negative well-being outcomes due to their role as care providers. The objective of this study was to better understand the current psychological impact of COVID-19 on HCPs in the United States This study used an online survey tool to collect demographic data and measures of well-being of adults age 18 and older living in the United States between March 20, 2020 and May 14, 2020. Measures included anxiety and stress related to COVID-19, depressive symptoms, current general anxiety, health questions, tiredness, control beliefs, proactive coping, and past and future appraisals of COVID-related stress. The sample included 90 HCPs and 90 age-matched controls (M_{age} = 34.72 years, *SD* = 9.84, range = 23 – 67) from 35 states of the United States. A multivariate analysis of variance was performed, using education as a covariate, to identify group differences in the mental and physical health measures. HCPs reported higher levels of depressive symptoms, past and future appraisal of COVID-related stress, concern about their health, tiredness, current general anxiety, and constraint, in addition to lower levels of proactive coping compared to those who were not HCPs ($p < 0.001$, $\eta^2 = 0.28$). Within the context of this pandemic, HCPs were at increased risk for a number of negative well-being outcomes. Potential targets, such as adaptive coping training, for intervention are discussed.

Keywords: health care professionals, pandemic (COVID-19), stress and coping, depression, anxiety

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Andrew E. P. Mitchell, University of Chester, United Kingdom

Reviewed by:
Stefano Eleuteri, Sapienza University of Rome, Italy
Reina Granados, University of Granada, Spain
Lennart Reifels, The University of Melbourne, Australia

****Correspondence:***
Ann Pearman
ann.pearman@psych.gatech.edu

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INTRODUCTION

On May 14, 2020, the United States had 1,340,098 confirmed COVID-19 cases with 80,695 deaths (World Health Organization, 2020) and was considered the epicenter of the pandemic. Although social distancing and quarantine guidelines have slowed the pandemic's spread, the recent relaxing of guidelines suggests continued challenges to the healthcare systems and healthcare professionals (HCPs). Indeed, there are calls for COVID-19 to be considered as a new occupational hazard for H around the globe (Godderis et al., 2020). Not only are many HCPs more likely to be exposed to and, therefore, contract COVID-19, but providing care during a pandemic can place tremendous pressure on HCPs caring for very sick and dying patients, helping the families of the sick, and dealing with the frustrations of healthcare systems, all while trying to take care of their own families and loved ones (Maunder et al., 2003; Bai et al., 2004).

Studies out of China have examined the experiences of HCPs during the height of their COVID-19 outbreak. In a sample of 1,563 medical staff workers in China working during the COVID-19 pandemic, 73.4% reported stress-related symptoms, 50.7% reported symptoms of depression, 44.7% reported anxiety, and 36.1% reported experiencing insomnia (Liu et al., 2020). Lai et al. (2020) found evidence for higher rates of anxiety, depression, and distress among HCPs in Wuhan compared to HCPs in other regions in China. Other studies examined the need for and impact of services offered to healthcare workers, such as adjusting shifts to allow time for rest (Chen et al., 2020; Kang et al., 2020).

While there have been several well-written opinion pieces and commentaries regarding the well-being of healthcare workers in the United States during this pandemic (Godderis et al., 2020; Gold, 2020; Greenberg et al., 2020), we are aware of only one descriptive study with data from New York City (Shechter et al., 2020) that did not include a control group. There have been several meta-analyses and reviews of the impact of this pandemic on HCPs internationally (Chew et al., 2020; Pappa et al., 2020; Rajkumar, 2020), but no studies from the United States were available to be included in these studies. Previous studies have shown that the mental health challenges HCPs face during pandemics often impact their ability to continue to be part of the frontlines working to help treat and care for patients and their own families (Maunder et al., 2006; Shechter et al., 2020). Further, enduring psychological effects could negatively impact their ability to provide patient care in the future as well as impacting their quality of life (Goulia et al., 2010). A crucial mission for researchers during this time is enhancing our understanding of the experiences of HCPs in order to plan for interventions and care both in the short-term (now) and in the long-term (over the next couple of years). The current study is designed to examine several critical outcomes such as depressive symptoms, anxiety (current general anxiety as well as anxiety about developing COVID-19), COVID-related stress, and health in HCPs during the early months of the COVID-19 pandemic across the entire United States. In addition, we also examine potentially beneficial indicators of resilience such as control beliefs and proactive coping.

Psychiatric morbidity in the forms of depression and/or anxiety not only is troubling in its own right, but is also highly correlated with burnout, higher rates of chronic diseases, reduced quality of life, and suicide (Kumar, 2016). During the severe acute respiratory syndrome (SARS) pandemic in Goulia et al. (2010) found that the pressure of the work environment combined with fears about the disease itself created negative outcomes in the form of anxiety and depression that had profound impacts on the well-being of healthcare workers during that time. Additionally, follow-up studies revealed that the emotional distress from the pandemic was often long-lasting (Maunder et al., 2006). For instance, one to 2 years after the SARS outbreak, Maunder et al. (2006) found that SARS healthcare workers reported higher levels of burnout and distress, had increased smoking and alcohol consumption, were more likely to have reduced patient contact, and worked fewer hours compared to healthcare workers who did not treat SARS. The SARS outbreak was much more contained than the current worldwide pandemic which has even greater potential to have both ongoing and lasting consequences on society as a whole and HCPs in particular.

Identifying opportunities for resilience will be especially critical to combat the negative consequences. Control beliefs represent the subjective perceptions that one can influence what happens in one's life and include beliefs or expectations about the extent to which one's actions can bring about desired outcomes (Agrigoroaei and Lachman, 2010). Lachman and Firth (2004) distinguished two main sources of control: one's own efficacy (internal control, competence, or personal mastery), and the responsiveness of the environment or other people (external control, contingency, or perceived constraints) (Bandura, 1977). The two control beliefs included in the present study are mastery and constraint. Mastery is often described in terms of one's judgments about his or her ability to achieve a goal, while perceived constraints refers to the extent to which people believe factors exist which interfere with goal attainment (Lachman and Weaver, 1998b). Pearlin and Schooler (1978) suggested that personal mastery is an important psychological resource that mitigates the effects of stress and strain, and it is also associated with reduced reactivity to work-related stressors (Neupert et al., 2007). When faced with stressful situations, a strong sense of control has also been linked to low levels of self-reported perceived stress (Cameron et al., 1991) and lower risk of depression (Yates et al., 1999).

Aspinwall and Taylor (1997) characterized proactive coping as a series of steps one takes to preemptively modify or avoid stressful events. Those who have higher levels of proactive coping compared to those with lower levels of proactive coping have more meaning in life (Miao et al., 2017), fewer symptoms of PTSD (Vernon et al., 2009), and higher levels of quality of life (Cruz et al., 2018). Proactive coping is also associated with lower levels of depression, fewer declines in functional disability in aging, and larger systems of social support (Greenglass et al., 2006; Bokszczanin, 2012). When stressors do occur, those with higher levels of proactive coping are able to maintain their emotional functioning better than those with lower levels of proactive coping (Polk et al., 2020). Within the context of the COVID-19 pandemic, individuals who are at high risk of exposure to the virus, HCPs, could particularly benefit from engaging in proactive coping strategies in an effort to prevent exposure to future stressors. Indeed, we know from our past work that older adults, who are vulnerable to the effects of the virus, had lower levels of stress when they were high in proactive coping (Pearman et al., 2020).

This study is designed to examine the experiences of HCPs in the United States during this pandemic. Data collection took place between March 20 and May 14, 2020, a timeframe when the United States experienced a spike in new coronavirus cases, which limited the availability of important medical resources including appropriate personal protective equipment, and put tremendous strain on the nation's HCPs. The sample is derived from a larger online study focused on individuals' psychological and behavioral responses to COVID-19 (Pearman et al., 2020). In the current study, we specifically examine the following variables: stress related to COVID-19, anxiety about developing COVID-19, depressive symptoms, current

general anxiety, past and future appraisals of stress related to COVID-19, perceived health and health-related concern, tiredness, control beliefs (mastery and constraint), and proactive coping in a sample of HCPs and age-matched controls. We hypothesized that HCPs would show significantly more challenges on our measures of stress, mental and physical health issues, control, and coping.

METHODS

Participants

Amazon Mechanical Turk (mturk.com) was used to recruit participants for a larger study on the impact of COVID-19. MTurk is an international online crowdsourcing panel administered by Amazon and used here for collecting data. Potential participants responded to the description: *The purpose of this study is to examine how people living across the United States are reacting to the current COVID-19 pandemic. Select the link below to complete the 30-min survey*. Participant requirements for the current study were as follows: 18 years of age or older, living in the United States, native English-speakers and free from a dementia diagnosis. Once recruited and consented (see section "Procedure"), the participants completed the survey through the Qualtrics platform which is an online survey tool. The sample for the larger study consisted of 1,000 participants. Participants answered "Yes" or "No" to the question, "Are you a HCP?" Participants for the current study included all participants who answered "Yes" to this question as well as age-matched controls drawn from the same dataset. Because of concerns regarding age differences in our health indicators, we age-matched the controls. The final sample included 90 HCPs and 90 age-matched controls (M_{age} = 34.72 years, SD = 9.84, range = 23–67) from 35 states across the United States. Sample characteristics, including type of HCP, are reported in **Table 1**.

Procedure

Informed consent was obtained online; participants who wished to participate in the study indicated electronically that they read and understood the study procedures. After indicating interest, participants were provided a Qualtrics survey link on MTurk between March 20, 2020 and May 14, 2020, which was the time period that encompassed the majority of stay-at-home orders as well as many peaks in hospitalizations and death from COVID-19 in the United States. Human intelligence tasks (HITS) were released approximately every 3 days on MTurk to promote continued enrollment and survey completion throughout the 6 weeks of data collection. Participants were compensated $3.00 for completing the 30-min survey. The study was approved by the Georgia Institute of Technology Institutional Review Board.

Measures

Demographics

Participants indicated their year of birth, gender, their education from a checklist (e.g., GED, Associates), and their race. HCPs were also asked to report the specific profession within the healthcare field from a checklist (see **Table 1**).

COVID-19 Anxiety

Participants indicated their level of anxiety related to contracting coronavirus by answering the question, "How anxious are you about developing (COVID-19)?" on a 1 (*not at all anxious*) to 5 (*very anxious*) scale.

COVID-19 Stress

On a 1 (*not at all*) to 5 (*extremely*) scale, participants indicated their level of stress by answering the question, "How stressed are you about the COVID-19 outbreak?"

Depressive Symptoms

Participants completed the 15-item Geriatric Depression Scale Short Form (GDS) (Yesavage, 1988). The GDS is a self-report screening tool that examines depressive symptoms. Reflecting over the past week, participants respond "Yes" or "No" to

TABLE 1 | Sample characteristics by group (in valid percentages).

Variables	Healthcare professionals (n = 90) (%)	Matched sample (n = 90) (%)
Gender:		
Men	54.4	54.4
Women	45.6	45.6
Degree:		
GED	0	1.1
High school graduate	0	4.4
Elementary/middle school	1.1	0
Two year college, vocational school, associate's degree	1.1	6.7
Some college but no degree	6.7	12.2
Bachelor's degree (e.g., BA, BS, BFA)	56.7	57.8
Some graduate school but no degree	1.1	1.1
Master's degree (e.g., MA, MS, MPH)	27.8	12.2
Ph.D., EdD, MD, DDS, JD, other professional degree	5.6	4.4
Race:		
Asian	5.6	4.4
Black or African American	15.6	12.2
Native Hawaiian	2.2	0
White	75.6	81.1
More than one race	0	2.2
I do not wish to answer	1.1	0
Healthcare occupation:		
Nurse	13.3	
Physician	36.7	
Occupational therapy	2.2	
Physical therapy	4.4	
Technician	24.4	
Nursing assistant	4.4	
Other	11.1	
Not specified	3.3	

Other Healthcare Occupations include n = 1 Administration, n = 1 Facility Manager, n = 1 Legal Operations, n = 1 Counselor, n = 1 Exercise Physiologist, n = 1 Health Insurance, n = 1 Medical Student, n = 2 Optometry, n = 1 Registered Dental Hygienist.

each item. An example item includes, "Do you feel that your situation is helpless?" The scale has been shown to have good diagnostic sensitivity and specificity for adults across the adult lifespan (Guerin et al., 2018). The scale was not used for diagnostic purposes in this study, but higher scores indicate greater depressive symptoms ($\alpha = 0.81$).

Current Anxiety

Ten state anxiety items from the State-Trait Anxiety Inventory (Spielberger et al., 1983) were rated on a four-point scale ranging from 1 (*not at all*) to 4 (*very much so*). Participants indicated how they were feeling in the current moment. Example items include "I am tense" and "I feel frightened." Five items were reverse coded. A mean was calculated across the 10 items with higher scores indicating more state anxiety ($\alpha = 0.88$).

Health

Participants self-rated their health on a five-point scale ranging from 1 (*poor*) to 5 (*excellent*) by answering the question, "How would you rate your overall health?" In addition, participants rated their health concern on a 1 (*no concern*) to 5 (*very serious concern*) scale, responding to the question, "How much concern/distress do you feel about your health at this time?" Both items were included in analyses as one focuses on current health status while the other focuses more specifically on how concerned the individual is about their health.

Tiredness

On a five-point scale ranging from 1 (*not at all tired*) to 5 (*very tired*), participants were asked "In general, how tired are you right now?"

Control Beliefs

Control beliefs were measured using the mastery (four items, $\alpha = 0.84$) and constraint (eight items, $\alpha = 0.95$) scales from the Sense of Control Scales from the Midlife Development Inventory (Lachman and Weaver, 1998a). On a 1 (*strongly disagree*) to 7 (*strongly agree*) scale, participants rated their agreement with statements such as "What happens in my life is often beyond my control" (constraint) and "I can do just about anything I really set my mind to" (mastery).

Proactive Coping

The Proactive Coping Scale (Aspinwall et al., 2005) includes six items rated on a five-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). An example item includes, "I prepare for adverse events." One item was reverse coded. Higher scores indicate more proactive coping ($\alpha = 0.71$).

Stress Appraisals

On a four-point scale ranging from 1 (*not at all*) to 4 (*a lot*), participants rated the extent to which COVID-19 affected different areas of their lives in the past 24 h (past appraisal, $\alpha = 0.84$) as well as the extent to which they expected COVID-19 to affect their lives in the next 24 h (future appraisal, $\alpha = 0.87$). Example items include, "Your physical health or safety?" and "Your plans for the future?" (Lazarus, 2006). Items were scored so that higher scores indicate COVID-19 having a greater impact on one's life.

Statistical Analysis

All data analyses were performed using SPSS version 26 (IBM Corp.). The significance level was set at $\alpha = 0.05$ and all tests were two-tailed. A MANOVA was conducted with education (degree) as a covariate and HCP (0 = *no*, 1 = *yes*) as the independent variable and COVID-19 stress and anxiety, depressive symptoms, current anxiety, self-reported health, health concern, tiredness, mastery, constraint, proactive coping and appraisal (past and future) as continuous dependent variables. Because healthcare positions commonly require postsecondary education, education was included as a covariate to account for group differences. Significant multivariate tests were followed up with tests of between-subjects effects for each dependent variable individually.

RESULTS

There were no significant differences between HCPs and the control group on gender [χ^2 (1, $N = 180$) = 0.00, $p = 1.00$] or race [χ^2 (5, $N = 180$) = 5.65, $p = 0.34$]. As expected, there were significant differences on education [χ^2 (8, $N = 180$) = 16.61, $p = 0.03$] such that HCPs had more education than non-HCPs. Results from the MANOVA (**Table 2**) controlling for education show that HCPs reported significantly higher levels of depressive symptoms, current anxiety, concern about their health, tiredness, constraint, and past and future appraisal of COVID-related stress, but lower levels of proactive coping compared to non-HCPs (Pillai's Trace = 0.28, $F(12,160) = 5.29$, $p < 0.001$, $\eta^2 = 0.28$). Of note, there were also no significant group differences on COVID-related stress or on the specific anxiety of developing COVID-19.

TABLE 2 | MANOVA results with means and standard deviations by group.

	Healthcare Professional (*n* = 85)		Matched Sample (*n* = 89)			
Variables	**Mean**	***SD***	**Mean**	***SD***	***P***	η^2
COVID-19 anxiety	3.25	1.46	3.20	1.48	0.74	0.001
COVID-19 stress	3.52	1.12	3.22	1.24	0.22	0.01
Depressive symptoms	6.49	3.23	4.58	3.75	0.001	0.06
Current anxiety	2.32	0.54	2.01	0.77	0.003	0.05
Self-rated health	3.92	0.93	3.75	1.00	0.38	0.004
Health concern	3.40	1.25	2.53	1.16	<0.001	0.11
Tiredness	2.93	1.29	1.85	0.96	<0.001	0.18
Mastery	5.11	1.01	5.28	1.17	0.27	0.01
Constraint	4.64	1.36	3.28	1.50	<0.001	0.16
Proactive coping	3.62	0.58	4.08	0.63	<0.001	0.12
Appraisal (past 24 h)	2.61	0.63	2.22	0.74	0.002	0.05
Appraisal (next 24 h)	2.60	0.66	2.20	0.81	0.002	0.05

η^2 = partial eta squared. Multivariate Test Results: Pillai's Trace = 0.28, $F(12,160) = 5.29$, $p < 0.001$, $\eta^2 = 0.28$, observed power = 1.00.

DISCUSSION

This study is a timely look into the experiences of HCPs across the United States during the COVID-19 pandemic. Using an age-matched comparison group, the HCPs were significantly more depressed and generally anxious than the non-HCPs during the first months of the pandemic. In line with Shechter et al. (2020) who documented high rates of lack of control and sleep disturbances within HCPs in New York City, our results show that HCPs across the United States had significantly higher rates of lack of control and tiredness compared to controls. Additionally, the HCP group on average fell into the clinically depressed range on the GDS (Guerin et al., 2018). While some of the other findings (e.g., fatigue) may represent the nature of professional differences sometimes seen between HCPs and other professions in non-pandemic times (Dyrbye et al., 2014), meeting the criteria for depressive disorder should not. We believe that the heightened level of depressive symptoms in HCPs may be due to not just occupational differences but occupational differences during a pandemic. Clearly, this is of concern not just for understanding and, perhaps, helping the current situation but also to look ahead to the potential lasting influence of this experience (see Maunder et al., 2006; Lee et al., 2007). It is well-understood that the long-term consequences of depression and anxiety can create enduring negative impacts (Sareen et al., 2005; Musliner et al., 2016). Finding ways to intervene and support HCPs, such as cognitive behavioral therapy or support groups, will be an important goal to healthcare systems and workplaces now and in the future.

In addition to increased general anxiety and depressive symptoms, HCPs were more tired and more concerned about their health than the age-matched controls. There are many possible reasons for the health concerns of HCPs during this pandemic (Centers for Disease Control, 2020). To start, HCPs are more likely to be exposed to COVID-19 which increases HCP's health risk. Other health risks include long work hours and mental and physical exhaustion (Shanafelt et al., 2020; The Lancet, 2020). It is not surprising therefore that the HCPs also have higher perceived constraints and are more tired. The real experiences in healthcare settings during the pandemic may present HCPs with what seem like insurmountable pressure when it comes to finding ways to accomplish their goals both in terms of maintaining their own health and well-being. Helping HCPs find ways to differentiate between immovable constraints, such as personal protective equipment deficits, and possible malleable constraints, such as feeling as though there is no opportunity to engage in self-care, may be a possible avenue for buoying the well-being of HCPs (De Raedt and Hooley, 2016).

Along these same lines, the HCPs showed lower proactive coping and fewer resources to dedicate to adaptive coping behaviors. We know from past work that proactive coping (Polk et al., 2020) and control beliefs (Neupert et al., 2007) are key ingredients for resilient stress responses, representing potential targets for intervention. For instance, Stauder et al. (2017, 2018) found that using coping skills training with employees from work-environments that were stressful, but unchanging, helped reduce stress and improve well-being.

Although statistically equivalent on COVID-19-related stress and anxiety, the HCPs in the current study scored significantly higher on both current and future stress appraisal when compared to controls. In their real-time study of work stress in nurses, Johnston et al. (2016) showed that appraisals of stress were more predictive of psychological and physiological reactivity than the actual tasks being performed. In addition, the perceived reward for the work actually helped reduce stress. Given the high levels of stress appraisal both current and future in our sample, it may be beneficial during this time of crisis to help HCPs recognize and focus on the reward of their work as a means of managing negative stress appraisals.

We acknowledge several limitations in this study. The observational design limits our ability to make causal conclusions. Future longitudinal studies should examine the long-term impact of this pandemic on the mental health of HCPs. We also do not know the extent to which the HCPs in the sample are serving on the frontlines of the pandemic. However, given that the HCPs showed significant differences on most of our measures of interest, it is likely that our effects actually underestimate the experiences of frontline workers. In addition, Smereka and Szarpak (2020) note that COVID-19 is an ongoing challenge for all HCPs, not just the frontline workers. Another potential limitation is that the professions of the control group nor the hours worked by either group were collected so we are unable to make finer distinctions between the experiences of HCP and the others. We do know, however, that the two groups are statistically equivalent in their stress and anxiety related to the pandemic, so we are reasonably confident that the differences that we do see in our study are associated with healthcare profession status. We encourage future work that seeks to further explore potential differences between professions, but note that our results suggest that all HCPs are at risk for decreased well-being, perceived control, and coping resources during the COVID-19 pandemic. Finally, our sample was not random or nationally representative and was restricted to those living in the United States, the current epicenter of the pandemic. HCPs' experiences during the COVID-19 pandemic could differ for those living and working in countries outside of the United States.

In conclusion, our results suggest that COVID-19 may function as an occupational hazard for HCPs (Godderis et al., 2020) because we found evidence of higher levels of anxiety and depressive symptoms, more tiredness and concern for their health, and more severe stress appraisals of COVID-19, along with lower levels of perceived control and coping compared to age-matched controls. Across a wide array of indicators, HCPs appear to be at increased risk for mental health challenges. In addition, given that previous studies during other pandemics have shown lasting impacts of service during this time, including reduced workforce participation and increased traumatic symptomatology, this is a critical issue to address. We encourage efforts to intervene that can provide relief now and in the future.

DATA AVAILABILITY STATEMENT

The dataset presented in this article is not readily available because data sharing options were not included in consent documents. Requests to access the datasets should be directed to AP, ann.pearman@psych.gatech.edu.

ETHICS STATEMENT

This study involved human participants was reviewed and approved by Georgia Institute of Technology Office Research Integrity Assurance – Institutional Review Board (Protocol # H20141). Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements for exempt studies.

AUTHOR CONTRIBUTIONS

AP designed the study and funded it out of her internal funds and a grant both from Georgia Tech, as well as manuscript writing. MH managed the online portion of the project and the data, wrote the methods, helped to prepare the references, and helped with primary prose. ES helped with data analyses, created the tables, helped to prepare the references, and helped with primary prose. SN helped with study design, primary data analyses, as well as manuscript writing. All authors contributed to the article and approved the submitted version.

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Coping With COVID-19: Emergency Stress, Secondary Trauma and Self-Efficacy in Healthcare and Emergency Workers in Italy

*Monia Vagni, Tiziana Maiorano, Valeria Giostra and Daniela Pajardi**

Department of Humanities, University of Urbino, Urbino, Italy

Coping with the coronavirus disease (COVID-19) is a significant risk factor for the psychological distress of health workers. Hence, this study explores the relationship between coping strategies used by healthcare and emergency workers in Italy to manage the stress factors related to the COVID-19 emergency, which may result in the risk of developing secondary trauma. We study differences between healthcare (n = 121) and emergency workers (n = 89) in terms of their coping strategies, emergency stress, and secondary trauma, as well as the relationships of these differences to demographic variables and other stress factors (Instructions and Equipment). For this purpose, we collected data from participants through the following questionnaires online: *Secondary Traumatic Stress Scale – Italian Version*, *The Coping Self-Efficacy Scale – Short Form*, an original questionnaire on stressors, and the *Emergency Stress Questionnaire* (to assess organizational–relational, physical, decisional inefficacy, emotional, cognitive, and COVID-19 stress). We performed a *t*-test, correlational analysis, and hierarchical regression. The analyses reveal that compared with the emergency worker group, the health worker group has greater levels of emergency stress and arousal and is more willing to use problem-focused coping. Healthcare workers involved in the treatment of COVID-19 are exposed to a large degree of stress and could experience secondary trauma; hence, it is essential to plan prevention strategies for future pandemic situations. Moreover, individual efficacy in stopping negative emotions and thoughts could be a protective strategy against stress and secondary trauma.

Keywords: COVID-19, stress, secondary trauma, healthcare workers, self-efficacy, coping

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***Correspondence:**
Daniela Pajardi
daniela.pajardi@uniurb.it

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INTRODUCTION

The coronavirus disease (COVID-19), or the acute respiratory disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), began spreading in China at the end of 2019 and, to date, represents an international health emergency without precedents in terms of its health, economic, and organizational effects on people's lives (World Health Organization, 2020). After China, Italy was the first country to be affected by this epidemic, with the first deaths on February 20, 2020, and a rapid increase in the spread of infection and mortality. COVID-19 was first detected in Northern Italy, and it then spread, although at different rates of incidence, to the

other regions. It was immediately evident that healthcare and emergency workers were at great risk of contagion and that protection and intervention protocols needed to be introduced in the absence of adequate points of reference because of the exceptional nature of the epidemic, the rate of spread of the infection, the seriousness of patients' health condition, and the mortality index. The extreme conditions in which health workers have had to work, especially in the most affected regions in Northern Italy, are indicated by the following data from the Italian National Institute of Health (2020): over 150 doctors died and 25,000 other health workers were infected within the general context of the population of 30,000 deaths and 220,000 infections in a span of 11 weeks. It was also clear that the medical staff would experience serious psychological repercussions because of the working conditions as well as the difficulty of having scientific points of reference on care and intervention procedures. To this must be added the increase in workload, the extension of working hours and, for health workers, the frequent exposure to the suffering and death of their patients. Therefore, healthcare and emergency workers were subjected to serious psychological as well as physical stress. Hence, the aim of this study, which was also the aim of a previous study (Vagni et al., 2020), is to focus on the similarities and the differences in the stress management of two professional groups—healthcare and emergency workers—during the acute phase of the pandemic. Both groups have had to deal with COVID patients as frontline responders and have been exposed to the related risks of infection and psychological consequences, which, to date, have not been examined in detail through a comparative analysis.

As regards the stress that they experience, the literature clearly explains that healthcare and emergency workers who intervene in emergency situations are exposed to the risk of developing dysfunctional reactions that can be identified at different levels—physical and/or physiological (e.g., psychosomatic disorders, sleep/wake cycle alterations, and sense of tiredness); emotional (e.g., irritability, nervousness, agitation, anger, low self-esteem, and guilt); cognitive (e.g., distractibility, sense of ineffectiveness, and negative anticipation of events); and relational (e.g., increase in conflicts within emergency teams and/or with their organization/institution, and social withdrawal)—and may also develop reactions from secondary trauma (Del Missier et al., 2008; Sbattella, 2009; Argentero and Setti, 2011; Fraccaroli and Balducci, 2011; Bellelli and Di Schiena, 2012; Walton et al., 2020). Faced with stressful events regarding which they lack previous experience and specific, necessary knowledge, and which cause tension owing to the need for rapid decision timings and a sense of responsibility, emergency workers may experience a sense of decision ineffectiveness. In fact, emergency situations are characterized by high levels of decisional and operational uncertainty with associated regret and guilt (Del Missier et al., 2008).

Several studies have highlighted that insufficient instructions and a lack of personal protective equipment (PPE) are important predictors of stress for healthcare and emergency workers in large-scale emergencies (Oh et al., 2017; Du et al., 2020; El-Hage et al., 2020; Walton et al., 2020). Oh et al. (2017) highlighted that nurses involved in managing the Middle East respiratory syndrome (MERS) experienced lower levels of stress when the levels of goods supply and hospital training were higher. Some studies have highlighted that frontline healthcare workers had lower secondary traumatization scores than non-frontline health workers and the general public in contrast to the findings of previous research on the SARS outbreak in the same area in Singapore (Chan and Huak, 2004). According to Barleycorn (2019) and Tan et al. (2020), these results may be due to the dedicated training and psychological support given to healthcare workers after the SARS outbreak and demonstrate the validity of policy strategies for prevention of stress in the psychological health field.

An analysis of 14 studies published from January to March 2020 aimed at investigating the stress experience of healthcare workers in facing COVID-19 shows that health workers experienced symptoms of depression and anxiety related to this stressful experience. Moreover, the severity of their symptoms was influenced by their age, gender, role, specialization, type of activity performed, and exposure to patients with COVID-19; however, prevention, resilience, and social support interventions mediated their response to stress (Bohlken et al., 2020). In a review of the literature, Spoorthy (2020) underlined that sociodemographic variables, such as age, gender, profession, and workplace, and psychological variables, such as poor social support and self-efficacy, affect the stress level experienced by health workers. In addition, COVID-19 emerged as an independent stress risk factor. Xiao et al. (2020) found that social support plays a role in reducing the anxiety levels in medical staff and increases their sense of self-efficacy.

According to Walton et al. (2020), the specific stressors that health workers face in the COVID-19 emergency are related to the organizational context. The challenges for medical staff include not only an increased workload but also a fear of infection, the need to work with new protocols that change frequently, and the use of PPE. In uncontrollable situations such as a pandemic, when specific action protocols are absent and limited resources are available, health workers must make individual decisions with a heavy burden of responsibility that may be contrary to their moral principles. For example, in the case of COVID-19, they may have to choose which patients to save because only a few places are available in intensive care. In this regard, Cai et al. (2020) showed that for a sample of 534 healthcare professionals who worked closely with COVID-19 patients in Hubei, the most stressful factors were the lack of protocols for the treatment of COVID-19, the scarcity of PPE, the exhausting work shifts, their concern about the risk of infection, and their exposure to the death and suffering of their patients. They also found that the support of superiors proved to be one of the most important motivational factors for medical staff, and the presence of clear guidelines and effective safety protocols were protective factors against the development of stress, in particular, for females. Further, Walton et al. (2020) identified the organizational stressors as the changes in work shifts, the prevalence of night shifts, an excessive workload, staff roles, autonomy, the lack of support from superiors, and the absence of adequate information and clear instructions. On the basis of these stressors, they estimated that 10% of the medical staff working

on the front line of this pandemic are at risk of developing post-traumatic stress disorder (PTSD). In addition, limited resources, longer shifts, decreased hours of rest, and the occupational risks associated with COVID-19 exposure have increased the physical and mental fatigue, stress, anxiety, and burnout of these staff members (Sasangohar et al., 2020).

The loss of a social support network, which can be an important resilience factor, is another risk factor (Ozbay et al., 2007). In the COVID-19 emergency, healthcare and emergency workers have often experienced a separation from their affective links, either because of the restrictions on social contacts imposed by the lockdown or the fear of spreading the infection to their family members. To this must be added that although, at first, health workers received unanimous encouragement from the population, later, they also experienced demonstrations of stigma and isolation. Some studies have shown that being able to resort to their own social support network is a significant protective factor for health workers dealing with this emergency (Cai et al., 2020).

As Favretto (2005) stated, when individuals experience situations that go beyond their coping strategies, their vulnerability to, and risk of developing, psychopathological reactions increases. Studies conducted during previous epidemics, such as the SARS, MERS, and Ebola epidemics, converge in detecting how healthcare and emergency workers may experience extremely high levels of stress and even develop secondary traumatic stress or vicarious trauma. This trauma is defined as an experience of symptoms similar to those found in people with PTSD, such as in emergency nurses working with traumatized patients (Beck, 2011). Figley (1995) defined it as a form of stress that derives from the feelings of empathy experienced when helping traumatized people. The symptoms may include intrusive recurring thoughts, disturbed sleep, fatigue, physical symptoms, hyperarousal, increased stress response, anxiety, depression, and feeling emotional (Adriaenssens et al., 2012). Wolf et al. (2016) described how nurses may feel "overwhelmed," and this condition becomes a source of moral distress that triggers feelings of powerlessness, guilt, fear, anger, and frustration.

The sense of frustration and impotence felt by nurses when they are unable to treat and save a patient has been highlighted as a risk factor for secondary traumatic stress in several studies (Missouridou, 2017). Avoidance and emotional numbing can become tools for self-protection from intrusive symptoms that exceed the personal tolerance level (Coetzee and Klopper, 2010; Mealer and Jones, 2013). Their frustration obviously intensifies on a patient's death. The onset of PTSD in the health workers involved in treating MERS was also detected after the acute phase of the emergency was over, highlighting a risk not only in the immediate period but also in the medium-term period (Lee et al., 2018).

In reference to COVID-19, updated studies conducted on Chinese health workers have already highlighted the strong impact of the epidemic on the psychological health of doctors and nurses. Some studies have found that healthcare workers have high levels of anxiety, depression, insomnia, and distress (Lai et al., 2020; Li et al., 2020; Zhu et al., 2020). In particular, female professionals with more than 10 years of experience and previous psychiatric pathology present more risk factors of developing the symptoms of stress, anxiety, and depression (Lai et al., 2020; Zhu et al., 2020). Huang J. Z. et al. (2020) studied stress levels during the COVID-19 emergency in a sample of medical staff. They found that females showed higher levels of anxiety and PTSD than males did and that the levels were higher for nurses than for doctors. Moreover, Li et al. (2020) found that nurses had developed higher levels of vicarious trauma than those of the general population and that nurses who did not work closely with COVID-19 patients showed a more severe symptomatology, both physical and psychological, compared with their colleagues working on the frontline emergency services. In Italy, a study conducted on healthcare workers found that doctors and nurses developed high levels of stress and anxiety, greater than those developed by the general population, and that healthcare workers operating in the North, the area of Italy most affected by the virus, showed a more severe symptomatology (Simione and Gnagnarella, 2020). This study also confirmed that females tend to have a greater perception of the risk of infection, which increases their risk of developing the symptoms of anxiety and distress.

Because of their long, intense exposure to various stressors, it is important to note the nature of the coping strategies used by these healthcare and emergency workers in these situations and their effectiveness in terms of reducing and effectively coping with stress. Indeed, the effective management of stress levels in the acute/emergency phase could reduce the risk of developing long-term PTSD or other pathologies, such as anxiety and depression (Fullerton et al., 2004; Slottje et al., 2005; Argentero and Setti, 2011; Sakuma et al., 2015; Birinci and Erden, 2016; Li et al., 2017). Coping may be defined as a series of cognitive and behavioral efforts to manage specific internal or external issues that test or exceed individual resources (Lazarus and Folkman, 1984). A distinction can be made between problem-focused and emotion-focused coping strategies. The former is aimed at modifying and solving the stressful situation through active interventions. By contrast, emotion-focused coping is aimed at managing the emotions connected to the stressful event and regulating affective reactions, such as anxiety and the tension of response to stress, for example, by trying to avoid the threat (denial) or re-evaluating it (reappraisal).

The choice of coping strategies is influenced by the individual's cognitive evaluation of the event, termed secondary evaluation, which involves estimating the resources available and the most effective strategies to deal with the situation (Lazarus and Folkman, 1984). A key element of this assessment is the extent to which the individual can maintain control over the outcome of the situation. The literature indicates that individuals apply dysfunctional coping when they face an uncontrollable event by responding primarily with a coping strategy focused on the problem, and conversely, when they face a controllable situation, they respond with coping strategies focused on emotions (Strentz and Auerbach, 1988; Vitaliano et al., 1990). A coping strategy may be defined as adaptive when the controllability of the stressful event corresponds with the choice of coping strategy: in this case, the subject will experience fewer symptoms related to stress (Park et al., 2001).

The strategies used to cope with trauma may differ among individuals, but they can also vary according to the profession and the features of the traumatic event (Nydegger et al., 2011). Individuals differ in their choice of coping strategies (Connor-Smith and Flachsbart, 2007), and factors related to the situation can also have a decisive influence on such choice (Brown et al., 2002). A few studies have considered the ways in which gender influences the perception of stress in emergency situations and the choice of coping strategy. These studies highlight that females tend to perceive events as more negative and uncontrollable and to resort more to coping strategies focused on emotions and avoidance, whereas males tend to resort more to applying problem-focused coping and to inhibiting emotions (Matud, 2004; Matud et al., 2015; Matud and Garcia, 2019).

The literature on the relationship between coping strategies and the stress levels of emergency workers has shown that the use of coping strategies focused on the problem usually tends to correlate with lower stress levels, both in healthcare workers (Watson et al., 2008; Howlett et al., 2015) and in other emergency workers, such as firefighters (Brown et al., 2002). However, a coping strategy frequently used by emergency workers is that of avoidance and minimization, and this strategy is associated with higher levels of stress (Brown et al., 2002; Chang et al., 2003; Kerai et al., 2017; Witt et al., 2018; Theleritis et al., 2020). Loo et al. (2016) found that in a group of emergency workers, avoidance as well as coping strategies focused on emotions were associated with the development of post-traumatic symptomatology. Rodríguez-Rey et al. (2019) revealed that among health workers working in a pediatric emergency department, approximately 30% of the variance in PTSD was explained by the frequent use of coping strategies focused on emotions and the infrequent use of those focused on the problem. In addition, Kucmin et al. (2018), who considered a sample of 440 paramedics, highlighted that the risk of developing PTSD symptoms was predicted by the use of coping strategies focused on emotions.

However, the literature does not offer unanimous results. Chamberlin and Green (2010) found that in a group of firefighters, all coping strategies actually correlated with high levels of stress: the authors explained this finding by suggesting that it is not the individual coping strategies that are maladaptive in themselves, but that greater effort is needed to adjust in stressful situations. By contrast, Young et al. (2014) indicated that firefighters use problem-focused coping strategies more often at the beginning of the operation and emotion-focused coping strategies more commonly in the phase of breakdown and fatigue. However, after the incident, they use both strategies (Young et al., 2014). A meta-analysis by Shin et al. (2014) highlighted that different coping strategies have different effects on work burnout: in particular, emotional stress and depersonalization are associated with the use of emotion-focused coping strategies, whereas professional ineffectiveness is associated with the use of problem-focused strategies.

Further, a few studies have investigated the coping strategies that emergency workers can use during health emergencies similar to COVID-19. Maunder et al. (2006) revealed that healthcare professionals who tended to apply dysfunctional coping strategies, based on avoidance, hostile comparison, or self-blame, tended to develop higher stress levels. Wong et al. (2005) highlighted that during the SARS epidemic, doctors and nurses tended to use different coping strategies. The doctors tended to turn more to action planning, but this strategy did not affect their stress level. Instead, their stress level was positively correlated with their use of coping strategies based on emotional outlets. By contrast, the nursing staff tended to resort more to behavioral disengagement and distraction strategies, which, however, correlated with higher levels of stress among them.

In this regard, during the MERS epidemic, hospital staff tended to adopt coping strategies related to the use of PPE and the adoption of all prevention measures, as well as social support, whereas the coping strategy that they adopted the least was that based on an emotional outlet (Khalid et al., 2016). A recent study on healthcare workers in Hubei, China, during the COVID-19 epidemic (Cai et al., 2020), yielded similar results: to reduce stress, the medical staff tended to rely on active coping strategies, such as using security protocols, practicing social isolation measures, and seeking support from family and friends, but they did not find it necessary to discuss their emotions with a professional. Huang L. et al. (2020) found that a sample of nurses working during the COVID-19 emergency presented greater emotional reactions and turned more to problem-focused coping compared with university nursing students. Emergency workers must have sufficient self-efficacy in terms of their coping skills to be able to manage and cope with stress levels. Self-efficacy in coping appears to be an effective protective factor in relation to stress levels and maladaptive responses (Chesney et al., 2006). Self-efficacy to cope with traumatic events has been effective in reducing the risk of developing PTSD (Bosmans et al., 2015).

MATERIALS AND METHODS

Objectives

The main objective of this study is to identify the coping strategies activated by healthcare and emergency workers to deal with stress factors related to the COVID-19 emergency that may be associated with the risk of developing vicarious or secondary trauma. Few studies have considered both groups simultaneously when analyzing the strategies they have adopted to manage stress during the COVID-19 emergency. Hence, in this study, we are interested in detecting the similarities and differences in the approaches they adopted to manage their stress during the acute phase of the current pandemic According to Walton et al. (2020), the main acute stress reactions of emergency workers to emergency medical situations are emotional, cognitive, physical, and social reactions. Therefore, these factors were included in the questionnaire used in the present study. Moreover, reactions linked to stress factors for difficulties due to ineffective decision-making and dealing with stress were also considered (Chesney et al., 2006). In addition, fears regarding contracting the virus and infecting their own families because of COVID-19 were specifically considered (Du et al., 2020; Huang J. Z. et al., 2020; Ornell et al., 2020; Walton et al., 2020).

Based on results found in the literature, the specific objectives of this study are as follows:

(1) To examine the relationships between coping strategies, emergency stress, and secondary trauma in healthcare and emergency workers.
(2) To identify significant differences in stress factors, coping strategies, and secondary trauma between two groups—health workers and emergency workers.
(3) To analyze the predictive power of coping strategies on the various levels of stress.
(4) To analyze the predictive power of stress factors on the levels of arousal and intrusion of secondary trauma.
(5) To analyze the predictive power of coping strategies on the levels of arousal and intrusion of secondary trauma.

Method

Participants

Participants were selected on a voluntary basis through a trasversal sampling in order to take a picture of the situation caused by the pandemic emergency. We used an internet platform to conduct the study and approached the participants using social media, dedicated mailing lists, and forums. Participants from all Italian regions completed the questionnaire online. The sample consists of 210 participants—90 males (42.9%) and 120 females (57.1%)—whose average age was 42.53 years (SD = 10.97; min 22 – max 67). Further, 52.9% of the sample were married, 10.6% were separated, and the remaining 36.5% were single. We selected various professional figures who had directly worked in various sectors during the COVID-19 emergency and who could be divided into two main groups. The first, the "Health Group," consists of 121 participants (57.6%) who were healthcare workers: 57 doctors (50%), 47 nurses (37.3%), 9 psychologists (7.14%), and seven healthcare assistants (5.56%). Their average age was 42.13 years (SD = 11.35), and their average years of active professional service was 14.60 (SD = 11.56). The second, the "Emergency Group," consists of 89 participants (42.4%): 48 emergency workers (53.9%), 21 firefighters (23.6%), and 20 Civil Protection staff (22.5%), whose average age was 45.43 years (SD = 10.19) and average years of service was 14.41 (SD = 11.89). There was an age difference between the two groups ($t = -2.170$; $p < 0.05$), and the distribution of the gender variable differed between the two groups, with 41 males and 80 females in the Health Group and 49 males and 40 females in the Emergency Group (χ^2 9.38; $p < 0.01$). The study involved participants from the entire national territory, and their workplace could be divided as follows: 38, 36, and 26% were from North, Central, and South Italy, respectively. Further, 59% of the sample worked directly with COVID-19 patients and 24.8% worked in specific COVID-19 departments. Among the healthcare workers, 73% had worked in direct contact with COVID-19 patients, whereas among the emergency workers, only 33% had assisted these patients (χ^2 36.251; $p < 0.01$). In the present study, we included two variables, lack of necessary instructions and lack of PPE, in accordance with the findings in the literature on their impact on the stress reactions of healthcare and emergency workers during the COVID-19 pandemic. Among the participants, 62 and 45% of healthcare and emergency workers, respectively, did not have sufficient instructions to intervene (χ^2 2.441; p n.s.), and 57 and 52% of healthcare and emergency workers, respectively, lacked adequate PPE when working (χ^2 2.857; p n.s.).

Procedure

This study used an online questionnaire and was conducted during the lockdown period owing to the COVID-19 pandemic. The questionnaire had three parts: one each to collect online informed consent and baseline sociodemographic information, and one with an online series of questionnaires, as described in the next section. Participants' anonymity was maintained in collecting the data. The institutional Ethics Committee approved all the procedures.

Materials

We administered a series of questionnaires to evaluate the psychological stress and coping style of each participant. We included the following questionnaires.

Secondary Traumatic Stress Scale – Italian Version (STSS-I; Setti and Argentero, 2012)

This instrument's 15 items enable verification of the presence of two symptoms of vicarious trauma, Intrusion and Arousal, and their relative frequency. The STSS was built on the basis of the conceptualization expressed in the DSM-5 (American Psychiatric Association, 2013) regarding the characteristic PTSD symptoms. In detail, the Arousal items describe situations characterized by anxiety, confusion, physical and psychological complaints, and agitation. Intrusion refers to the re-experiencing of the traumatic event—even if not directly suffered—through internal images and memories. Instructions for the STSS-I indicated that respondents should specify how frequently an item was true for them in the previous 4 weeks. The statements are evaluated on a 5-point scale (1 = never; 5 = very often) that provides scores for Intrusion (example items: "I thought about my work with victims when I didn't intend to"; "Reminders of my work with clients upset me") and Arousal (example items: "I had trouble concentrating"; "I was easily annoyed"; "I expected something bad to happen"; "I felt jumpy"). The reliability coefficients of the instrument are 0.87 and 0.81 for Arousal and Intrusion, respectively.

The Coping Self-Efficacy Scale – Short Form (CSES-SF; Chesney et al., 2006)

This is a 13-item measure of perceived self-efficacy for coping with challenges and threats. This measure focuses on the changes in individuals' confidence in their ability to cope effectively, based on the self-efficacy theory (Bandura, 1997; Chesney et al., 2006). Participants were asked, "When things aren't going well for you, or when you're having problems, how confident or certain are you that you can do the following." Then, they were asked to rate on an 11-point scale the extent to which they believed they could perform important behaviors for adaptive coping. The instrument yields three subscale scores: "problem-focused coping" (α = 0.91), "stop unpleasant emotions and thoughts" (α = 0.91), and "support" (α = 0.80). Anchor points on the scale

are 0 ("cannot do at all"), 5 ("moderately certain can do"), and 10 ("certain can do").

An Original Questionnaire on Stressful Factors

We constructed an ad hoc 7-item questionnaire that included Yes/No questions to detect stress factors identified by the literature, such as the availability of suitable equipment and the receipt of clear instructions during the COVID-19 coping experience. In this study, we present the results related to two of these items: "Instructions," which refers to having received the necessary instructions to intervene, and "Equipment," which refers to having PPE. Predictions of these factors have also been made in other studies (Du et al., 2020; Walton et al., 2020). In light of the relevance and specificity of the lack of clear information or instructions and adequate PPE in the management of COVID-19 in the Italian context, as well as the findings in other studies, we decided to focus attention on these two risk factors.

Emergency Stress Questionnaire (ESQ; Vagni et al., 2020)

Our analysis of the literature revealed that in situations in which they have to cope with a pandemic, several factors may affect the stress of medical staff and emergency healthcare workers and that COVID-19 represents an independent specific stressor (Spoorthy, 2020). These stress factors have been identified as frequently affecting healthcare and emergency workers in emergency situations and leading to physical, emotional, cognitive, decision-making, relational, and organizational stress (Del Missier et al., 2008; Sbattella, 2009; Argentero and Setti, 2011; Fraccaroli and Balducci, 2011; Bellelli and Di Schiena, 2012; Du et al., 2020; Walton et al., 2020). Focusing on the specificity of the COVID-19 epidemic, items have been constructed regarding the fears of contracting the infection and of infecting colleagues or family members (Walton et al., 2020), since COVID-19 represents a factor of independent stress (Spoorthy, 2020) that has great impact (Huang J. Z. et al., 2020). Consequently, we constructed the ESQ consisting of 33 items assessed on a 5-point Likert scale, with scores ranging from 0 (not at all) to 4 (very much), grouped into six scales. The participants were asked to indicate how often they experienced certain emotions and thoughts while performing intervention and emergency activities during the COVID-19 pandemic.

The scales correspond to the factors identified and confirmed by factorial analysis through an analysis of the main components with orthogonal rotation of factors (varimax). The number of factors to be extracted was initially verified through the unit's largest eigenvalue criterion and, subsequently, by the scree test. The ESQ is based on six scales:

(1) Organizational–Relational Stress: measures the stress levels related to the organizational context, relationships with colleagues, and social support (consisting of eight items: 7, 10, 13, 14, 15, 16, 19, and 23);
(2) Physical Stress: composed of five items describing symptoms of physical fatigue (11, 12, 18, 20, and 32);
(3) Inefficacy Decisional Stress: consists of five items that analyze decision-making aspects and the possibility to act, which are related to the level of self-efficacy (22, 25, 27, 28, and 29);
(4) Emotional Stress: comprises six items that indicate the participant's emotional reactions (1, 2, 3, 4, 6, and 26);
(5) Cognitive Stress: consists of four items on the cognitive aspects of stress (5, 17, 21, and 24);
(6) COVID-19 Stress: comprises five items regarding worries related to the COVID-19 emergency (8, 9, 30, 31, and 33).

The ESQ demonstrated good internal consistency ($\alpha = 0.93$) overall and for each individual scale: Organizational–Relational Stress ($\alpha = 0.71$), Physical Stress ($\alpha = 0.82$), Inefficacy Decisional Stress ($\alpha = 0.80$), Emotional Stress ($\alpha = 0.86$), Cognitive stress ($\alpha = 0.72$), and COVID-19 Stress ($\alpha = 0.80$).

Statistical Strategy Explanation

First, we performed Pearson's correlation analyses to identify the associations between the variables for the two groups that we considered in this study. Subsequently, we checked for significant differences between the two groups as their stress levels, coping strategies, and secondary trauma. We used hierarchical linear regression models to verify the predictive effect of the risk factors (lack of adequate information and PPE) on the different stress levels (in step 1). Then, we verified the protective effect of the coping strategies (in step 2). The models were controlled for age, gender, and group. Lastly, we used hierarchical regression models to verify the predictive effect of stress factors on the components of secondary trauma. The models were controlled for age, gender, and group.

RESULTS

First, we conducted correlational analyses and comparisons of averages on the reference sample. **Table 1** shows the correlations between the scales of the ESQ and the other instruments.

Preliminary comparisons were made through the Student's *t*-test between the Health Group and the Emergency Group in relation to the ESQ, CSES-SF, and STSS-I scores. **Table 2** shows the comparison between the two groups.

As shown in **Table 2**, significant differences emerged between the two groups in relation to their Stress and Arousal levels. The results indicate higher levels of both for the Health Group, and that emergency workers turn more to the Stop Unpleasant Emotions and Thoughts strategy. Further, we performed comparisons with reference to the gender variable to detect differences in the levels of stress factors, coping strategies, and secondary trauma. Females reported significantly higher Physical Stress than males did (Females: $M = 10.90$; $SD = 4.83$; Males: $M = 7.30$; $SD = 4.57$; $t = 5.47$; $p < 0.001$), as well as Emotional Stress (Females: $M = 13.30$; $SD = 3.68$; Males: $M = 11.64$; $SD = 3.80$; $t = 3.18$; $p < 0.01$) and COVID-19 Stress (Females: $M = 14.93$; $SD = 3.68$; Males: $M = 13.58$; $SD = 4.22$; $t = 2.48$; $p < 0.05$). No gender difference emerged in coping strategies and secondary trauma. Within the Health Group, there were significant differences regarding Inefficacy Decisional Stress ($F = 3.68$; $p < 0.05$; Doctor

TABLE 1 | Intercorrelations of STSS-I, ESQ, and CSES-SF for Health (above diagonal), and Emergency (below diagonal) Groups (n = 210).

	STSS-I		ESQ						CSES-SF		
	Arousal	Intrusion	Organizational _relational stress	Physical stress	Inefficacy decisional stress	Emotional stress	Cognitive stress	COVID-19 stress	Focused problem	Stop emotion_ thought	Support
STSS-I											
Arousal		0.491***	0.196*	−0.176*	0.119	−0.022	0.259**	0.179*	0.127	0.044	−0.136
Intrusion	0.463***		0.136	−0.065	0.240*	−0.040	0.190*	0.197*	−0.017	−0.064	−0.140
ESQ											
Organizational_ relational stress	0.264**	0.066		0.299**	0.253**	0.315**	0.346***	0.569***	−0.258**	−0.227*	−0.192*
Physical stress	0.013	−0.160*	430***		0.183*	0.476***	0.406***	0.328**	−0.448***	−0.324**	−0.399***
Inefficacy decisional stress	0.170*	0.098	495***	0.251**		0.246*	0.322**	0.391***	−0.003	−0.110	0.036
Emotional stress	0.221*	0.021	483***	0.405***	0.365***		0.481***	0.398***	−0.384***	−0.398***	−0.158
Cognitive stress	0.366***	0.205*	513***	267**	0.391***	0.386***		0.418***	−0.279**	−0.292**	−0.166
COVID-19 stress	0.218**	−0.051	277**	452***	0.303***	0.464***	0.277**		−0.231*	−0.278**	−0.219*
CSES-SF											
Focused problem	−0.037	−0.157*	−0.122	−0.183*	−0.006	−0.139	−0.127	−0.016		0.487***	0.364***
Stop emotion_ thought	−0.325***	−0.292**	−0.346***	−0.194*	−0.120	−0.256**	−0.334***	−0.095	0.451***		0.419***
Support	−0.176*	−0.159*	−0.145	−0.145	0.096	−0.108	−0.084	0.005	0.270**	0.435***	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$; STSS-I, Secondary Traumatic Stress Scale - Italian Version; ESQ, Emergency Stress Questionnaire; CSE-SDF, The Coping Self-Efficacy Scale – Short Form.*

M = 14.51; SD = 2.89; Psychologist M = 11.11; SD = 2.15; average difference = 3.40; $p < 0.05$); and COVID-19 Stress (F = 3.57, $p < 0.05$; Nurse M = 16.19; SD = 3.47; Doctor M = 14.30; SD = 3.61; difference = 1.89, $p < 0.05$). Within the Emergency Group, there were no differences in levels of stress and secondary trauma or coping strategies. Moreover, we found similar correlations between the two groups for the Stop Unpleasant Emotions and Thoughts strategy and the stress factors, whereas for the other two coping strategies, we found a different association, particularly for the Emergency Group. However, the t-test comparisons highlight differences only at the level of the Stop Unpleasant Emotions and Thoughts strategy. Given the findings of the preliminary analyses, we considered it necessary to include the age, gender, and group variables to test the predictiveness of the coping strategies on the participants' stress levels.

TABLE 2 | Differences in STSS-I, ESQ, and CSES-SF between Health and Emergency Groups (n = 210).

	Health group	Emergency group		
	Mean (*SD*)	Mean (*SD*)	*t*-value	Cohen's *d*
ESQ				
Organizational_ relational stress	22.69 (4.43)	19.43 (3.62)	5.69***	0.81
Physical stress	10.29 (3.13)	8.09 (4.60)	3.19**	0.45
Inefficacy decision	14.45 (3.13)	12.79 (3.05)	3.84***	0.54
Emotional stress	14.17 (3.48)	10.45 (3.16)	7.95***	1.12
Cognitive stress	8.88 (2.89)	6.08 (2.53)	7.30***	1.03
COVID-19 stress	15.54 (3.67)	12.74 (4.17)	5.37***	0.71
CSES-SF				
Focused problem	36.69 (6.76)	37.65 (6.57)	−1.04	0.14
Stop emotion_ thought	32.50 (10.59)	36.40 (9.00)	−2.81**	0.40
Support	21.25 (5.88)	21.09 (6.54)	0.183	0.03
STSS-I				
Arousal	26.33 (4.97)	23.30 (5.51)	4.15***	0.58
Intrusion	15.38 (5.22)	14.55 (5.32)	1.23	0.16

**$p < 0.01$, ***$p < 0.001$; STSS-I, Secondary Traumatic Stress Scale - Italian Version; ESQ, Emergency Stress Questionnaire; CSE-SF, The Coping Self-Efficacy Scale – Short Form.*

To test the predictive effect of the coping strategies on various levels of stress, hierarchical regression was conducted. Considering the Age and Gender differences within the groups, we included these variables in all models together with the Group variable (Health vs. Emergency) and the "Instructions" and "Equipment" variables. The models generated by assuming the ESQ scales as dependent variables are shown in **Table 3**. Regarding the coping strategies, we observed an important effect of the Stop Unpleasant Emotions and Thoughts Coping strategy on all the stress scales, except for Physical Stress where the effect of the Focused Problem Coping strategy is recorded.

As shown in **Table 1**, significant negative associations between stressors and secondary trauma were found for both groups. The hierarchical regression models of stress scales were analyzed for the Arousal and Intrusion levels of secondary trauma. The models included the Age, Gender, Health/Emergency Group variables, and the ESQ scales. The results are shown in **Table 4**.

TABLE 3 | Hierarchical regressions on ESQ scales (n = 210).

	Organizational_ relational stress		Physical stress		Inefficacy decision stress		Emotional stress		Cognitive stress		COVID-19 stress	
	B	**Exp (*B*)**	***B***	**Exp (*B*)**	***B***	**Exp (*B*)**	***B***	**Exp (*B*)**	***B***	**Exp (*B*)**	***B***	**Exp (*B*)**
Model 1												
Age	−0.042	−0.104	−0.072	−0.157*	−0.023	−0.081	−0.062	−0.177**	−0.027	−0.096	0.001	0.002
Gender[1]	0.407	0.046	3.521	0.347***	−0.892	−0.138*	1.105	0.144*	0.272	0.044	0.871	0.109
Health/emergency group	−2.001	−0.225***	−0.672	−0.066	−1.389	−0.215**	−2.884	−0.375***	−2.164	−0.349***	−2.399	−0.300***
Instructions[2]	3.382	0.375***	1.623	0.158*	1.092	0.167*	1.150	0.147*	1.563	0.249**	0.464	0.057
Equipment[3]	0.756	0.086	1.283	0.127	1.200	0.188*	1.094	0.143*	0.454	0.074	1.587	0.200**
	R^2 = 0.313		R^2 0.225		R^2 0.185		R^2 0.333		R^2 0.293		R^2 0.186	
	F = 18.560***		F = 11.855***		F = 9.258***		F = 20.352		F = 16.892***		F = 9.330***	
Model 2												
Age	−0.020	−0.051	−0.047	−0.102	−0.010	−0.046	−0.041	−0.117*	−0.009	−0.032	0.015	0.042
Gender[1]	0.260	0.029	3.254	0.320***	−0.804	−0.125	0.940	0.122*	0.158	0.026	0.756	0.095
Health/emergency group	−1.750	−0.197**	−0.586	−0.058	−1.127	−0.175*	−2.705	−0.351***	−1.960	−0.316***	−2.268	−0.283***
Instructions[2]	3.133	0.348***	1.244	0.121	1.241	0.190*	0.898	0.115	1.379	0.220**	0.279	0.034
Equipment[3]	0.834	0.095	1.316	0.131	1.340	0.209**	1.157	0.152*	0.527	0.086	1.628	0.205**
Focused problem	0.040	0.008	−0.125	−0.166*	0.028	0.059	−0.040	−0.070	−0.009	−0.020	−0.017	−0.028
Stop emotion_ thought	−0.108	0.055	0.054	−0.109	−0.061	−0.192*	−0.080	−0.211**	−0.083	−0.274***	−0.061	−0.154*
Support	−0.108	0.055	0.032	0.039	0.105	0.202**	0.040	0.064	0.044	0.088	0.022	0.034
	R^2 0.359		R^2 0.270		R^2 0.226		R^2 0.379		R^2 0.352		R^2 0.208	
	F = 14.041***		F = 9.273***		F = 7.352***		F = 15.346***		F = 13.634***		F = 6.596***	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$; [1]Gender (1 = male; 2 = female); [2]Instructions (1 = yes; 2 = no); [3]Equipment (1 = yes; 2 = no); CSES-SF Scales, Focused Problem; Stop Emotion_Thought; Support.*

The same regression models were generated by including coping strategies as predictors and were analyzed by Age, Gender, and Health/Emergency Group. Compared with Arousal, the Health/Emergency Group and Stop Unpleasant Emotions and Thoughts are predictive (R^2 0.138; F = 5.343; $p < 0.001$; Beta −0.264***; Beta −0.207*, respectively). Compared with Intrusion, only the Stop Unpleasant Emotions and Thoughts variable (R^2 0.065; F = 2.347; $p < 0.05$; Beta −0.182*) assumes significance.

TABLE 4 | Hierarchical regressions on Arousal and Intrusion (n = 210).

	Arousal		Intrusion	
	Exp (*B*)	***B***	**Exp (*B*)**	***B***
Model 1				
Age	0.034	0.070	0.004	0.008
Gender[1]	0.026	0.002	−1.193	−0.113
Health/emergency group	−3.126	−0.287***	−1.096	−0.103
	R^2 0.082		R^2 0.018	
	F = 6.062**		F = 1.270 n.s.	
Model 2				
Age	0.034	0.069	−0.002	−0.004
Gender[1]	0.736	0.067	−0.264	−0.025
Health/emergency group	−0.911	−0.084	0.044	0.004
Organizational_ relational stress	0.205	−0.165*	0.052	0.043
Physical stress	−0.303	−0.283***	−0.225	−0.216*
Inefficacy decisional stress	0.020	0.012	0.189	0.115
Emotional stress	−0.018	−0.012	−0.120	−0.087
Cognitive stress	0.564	0.316***	0.067	0.050
COVID-19 stress	0.196	0.144	0.427	0.249***
	R^2 0.247		R^2 0.102	
	F = 7.216***		F = 2.534**	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$; [1]Gender (1 = male; 2 = female).*

DISCUSSION

The results of this study show that healthcare and emergency workers both experienced high stressors during the COVID-19 epidemic, exposing them to the risk of developing secondary trauma (Dominguez-Gomez and Rutledge, 2009; Argentero and Setti, 2011; Adriaenssens et al., 2012; Duffy et al., 2015; Aisling et al., 2016; Morrison and Joy, 2016; Wolf et al., 2016; Roden-Foreman et al., 2017; Lai et al., 2020; Li et al., 2020; Zhu et al., 2020). We found significant differences between the two groups regarding their reactions and their levels of organizational, physical, and relational stress, their sense of decision-making, and their emotional and cognitive ineffectiveness. Compared with emergency workers, healthcare workers had higher stress levels, leading them to perceive more serious tensions and difficulties in teamwork, physical fatigue, somatic illnesses, irritability, and difficulty in maintaining control over the situation, in taking decisions, and in predicting the consequences of their actions. Higher levels of stress have been reported related to the fears of contracting COVID-19 and of infecting family members. In line with other studies, we found that the COVID-19 emergency

led health workers, in particular, to perceive specific stress factors that affected the organizational area, with consequences in terms of tension in teamwork and a sense of ineffectiveness since they had to intervene without sufficient tools and resources. They also experienced deep emotional reactions of anger, powerlessness, and frustration with inevitable cognitive stress, in terms of increased arousal levels. Many of the healthcare workers also developed physical stress, due not only to the lack of sleep but also to the possible forms of somatization of the psycho-emotional tension they perceived (Sasangohar et al., 2020; Walton et al., 2020).

The differences recorded between the two groups in stress levels may be explained by taking into account, for example, the fact that the Emergency Group perceived their intervention with a greater sense of continuity in their usual procedures compared with the Health Group. The former performed their usual activities on the organizational, cognitive, and procedural levels, although with greater levels of safety and self-protection and a greater frequency of interventions. Conversely, the Health Group had to reorganize aspects such as departments, teams, and shifts to cope with the emergency, which thus involved making radical changes. In addition, the Health Group helplessly witnessed a large number of deaths of their patients and had to make decisions in conflict with their moral sense and in situations of insecurity and unpredictability regarding the consequences of their actions (Cai et al., 2020; Walton et al., 2020). However, in terms of physical stress, there was no predictive effect of the group, which indicates that the Health and Emergency Groups were both exposed to very similar physical stressors.

It is important to consider the significant impact of the gender variable. According to other studies, females developed a greater reaction of physical and emotional stress and the sense of decision-making ineffectiveness than did males (Lai et al., 2020; Zhu et al., 2020). In fact, females apparently tend to perceive events as more negative and uncontrollable, and thus suffer higher levels of stress. Further, females tend to resort to coping strategies focused on emotions, which tend to be less effective in emergency situations (Matud, 2004; Matud et al., 2015; Matud and Garcia, 2019). However, in the present study, these gender differences did not have an impact in terms of psychopathological or specific maladaptive consequences, and coping strategies. In fact, females and males perceived a similar sense of efficacy/ineffectiveness in dealing with stressful situations and had similar scores on the secondary trauma scale. The results shown in **Table 3** also indicate that predictive impact is also assumed by the lack of adequate instructions and knowledge about the emergency and the lack of necessary PPE. In particular, for the Health Group, the lack of necessary instructions on how to conduct quick interventions affected almost all stressors, leading to tensions or conflicts within the team, difficulty in making decisions, irritability, anger, and frustration.

Above all, the lack of PPE affected the sense of making the right decisions, the emotional sphere and, most importantly, the fear of contracting the virus or of transmitting it to their families. These results converge with those of other studies that have highlighted that the lack of adequate and specific information and of equipment for healthcare staff in dealing with COVID-19 affected their self-efficacy and the factors protecting them from stress, thus increasing their fear of contracting an infectious disease and causing them greater emotional, decisional, and physical stress. Conversely, the professionals who were provided with the necessary knowledge and equipment were more resilient during the emergency response (Du et al., 2020; Huang J. Z. et al., 2020; Ornell et al., 2020; Walton et al., 2020). The lack of specific equipment and instruments in emergency situations along with the risk of infection increases the feeling of poor control, leading to cognitive and emotional stress and a sense of ineffectiveness (Placentino and Scarcella, 2001; Walton et al., 2020). Higher levels of stress were found in the Health Group than in the Emergency Group because of the absence of PPE, the risk of infection from the virus, and the lack of necessary instructions or prompt information (Cai et al., 2020). The incidence of these variables is contained and limited by the use of coping strategies.

The coping strategy that assumes a predictive effect, reducing stress levels, is to block those negative or unpleasant emotions and thoughts associated with the risk of developing secondary trauma. In fact, the use of the Stop Unpleasant Emotions and Thoughts strategy reduces the Arousal and Intrusion levels of the secondary trauma. The effectiveness of this strategy in reducing the Arousal levels appeared to be greater in the Health Group. As Fraccaroli and Balducci (2011) suggested, in situations of high emergency stress, healthcare workers and emergency workers may have a deficit in the cognitive process of emotions, thus failing to identify their emotional reactions, which tends to be associated with maladaptive behaviors. The lack of a complete recognition of one's unpleasant emotions, which tends to be denied and dismissed as a coping strategy, would explain the greater predictive impact of cognitive stress and physical stress on post-traumatic arousal compared with emotional stress.

Further, the results of this study highlight that the Stop Unpleasant Emotions and Thoughts strategy has an inhibitory and therefore effective and highly significant impact on the stress levels and the components of secondary trauma, unlike the problem-focused and social support strategies. The literature points out that the avoidant matrix coping strategies tend to present themselves when healthcare and emergency workers experience a condition of fatigue and exhaustion, and this would explain the presence of the greater acute stress responses in healthcare workers (Maunder et al., 2006; Young et al., 2014).

The results of this study show that the problem-focused coping strategy (the strategy most frequently used in the Health Group in line with the finding of Huang L. et al., 2020) in this emergency situation did not appear to demonstrate protective efficacy. This is likely to be because the workers were dealing with an emergency that was not yet fully understood and the therapeutic and treatment procedures were not fully known. Moreover, the supply of PPE was scarce, especially in the first few weeks of the COVID-19 emergency in Italy, in all hospitals (e.g., a lack of respirators and insufficient number of resuscitation beds), which meant that the level of protective efficacy of this strategy may have been lower than the stress levels.

In other words, emergency workers, although task-oriented, were faced with a problem that was not fully understood, and in the absence of PPE, perceived poor self-efficacy in terms of trust and belief in their ability to organize and make effective decisions. The strategy that ensured optimal levels of self-efficacy was the one that allowed negative thoughts and emotions associated with the epidemic to be removed from consciousness, which was also found to have a protective function against the risk of developing traumatic symptoms.

The government lockdown and the consequent restriction of visits outside the working environment limited the use of coping strategies involving social support, family, and friends, implying a greater use of emotional and cognitive avoidance methods to deal with anguished thoughts, intrusive memories, and the constant vision of corpses or the seriously ill. In this regard, the Health Group appears to have developed a greater secondary trauma arousal than the Emergency Group. By contrast, the latter appears to have developed more aspects of intrusiveness related to secondary or vicarious trauma than the Health Group (see **Table 2**).

Since they were interviewed during the COVID-19 emergency, the healthcare and emergency workers who participated in the present study do not appear to have developed a complete secondary trauma. This may explain the prediction of the stress factors on arousal and not on intrusion. In other words, these individuals were interviewed while the emergency was still in the acute phase and before a structuring of answers in a psychopathological sense could be performed. Therefore, performing a follow-up study would be interesting. PTSD can take several months to fully emerge, and its stabilization can depend on the individual's internal as well as external factors.

Because they blocked negative emotions and unpleasant memories, the healthcare and emergency workers' arousal appears to be mainly due to, at least in the full phase during the epidemiological emergency, the factors of a cognitive matrix, linked with the difficulty of focusing on and identifying the most appropriate intervention strategies, leading them to experience regret, disappointment, and both physical and relational tension. The health workers apparently blocked the emotional aspects related to pain, impotence, and guilt, which allowed them to continue their work. In an emergency phase that is still active, and a few weeks after the start of the pandemic, it is possible to detect high arousal and a lower level of intrusiveness of stressful or traumatic events. This condition may be more likely if the blocking of negative emotions and intrusive thoughts linked to one's personal experience intervenes as a coping strategy. Low perceptions of self-efficacy regarding coping has been found to be a predictor of PTSD in other studies (Benight and Harper, 2002; Bosmans et al., 2015).

In emergency situations, high stress can cause emergency workers to experience impotence, breathlessness, cognitive difficulties, and difficulties in decision-making and managing emotional reactions along with a prevalence of feelings of anger, as recorded in this study. If the lack of adequate knowledge and of PPE are added to these factors, even professional experts may perceive a loss of self-efficacy in coping and, simultaneously, experience an inability to orient their skills more effectively, thus developing maladaptive responses.

Limitations

This study has several limitations. The first is the limited sample size. The second is that our study involved participants in the very midst of the COVID-19 emergency, which means that the level of stress in healthcare workers may have been more severe and acute. Moreover, the long-term psychological implications for the healthcare and emergency population should be investigated for the presence of a full secondary trauma. Therefore, a large-sized longitudinal study is called for to further explore the pathogenesis of vicarious traumatization. The third is that participants were not selected based on whether they had existing psychological problems. In proposing the hypothesis of this study, we anticipated that we would be able to discover the relationships between coping strategies, emergency-related stress, and secondary trauma in healthcare and emergency workers and commenced our investigation by assuming that the impact of stress can provoke psychological consequences in emergency situations. In future work, this assumption could be tested to verify whether an emergency situation has a different impact on workers who have already experienced psychological problems.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Comitato Etico per la Sperimentazione Umana – CESU of the University of Urbino. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MV, TM, VG, and DP: conceptualization, writing – original draft preparation, and writing – review and editing. MV, TM, and VG: methodology and investigation. MV and TM: formal analysis and data curation. TM and VG: visualization. MV, TM, and DP: project administration. All authors contributed to the article and approved the submitted version.

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Being a Psychotherapist in Times of the Novel Coronavirus Disease: Stress-Level, Job Anxiety, and Fear of Coronavirus Disease Infection in More Than 1,500 Psychotherapists in Austria

Thomas Probst[1†], Elke Humer[1†], Peter Stippl[2] and Christoph Pieh[1]*

[1]Department for Psychotherapy and Biopsychosocial Health, Danube University Krems, Krems, Austria,
[2]Austrian Federal Association for Psychotherapy, Vienna, Austria

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***Correspondence:**
Thomas Probst
thomas.probst@donau-uni.ac.at

†These authors share first authorship

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This study investigated stress-level, degree of job-related anxiety, and fear of coronavirus disease (COVID-19) infection in psychotherapists in the early weeks of the COVID-19 lockdown in Austria. One thousand five hundred and forty-seven psychotherapists participated in an online survey, assessing stress [Perceived Stress Scale-10 (PSS-10)], work-related worries and fears of existence [Job Anxiety Scale (JAS)], fear of COVID-19 infection during face-to-face psychotherapy, and adherence to five protective measures against COVID-19 infection during face-to-face psychotherapy. Stress-levels were higher than in a representative sample ($p < 0.001$). When psychotherapy was the sole income, stress-level ($p = 0.020$) and job anxiety ($p < 0.001$) were higher. Experiences with teletherapy, the psychotherapy format used during COVID-19, as well as reductions in number of patients treated during COVID-19, had no effect on stress-level or job anxiety. Psychotherapists still conducting face-to-face psychotherapy during COVID-19 reported less fear of infection compared to those conducting no face-to-face psychotherapy ($p < 0.001$), whereby the fear of infection was further reduced when they were more able to adhere to protective measures against COVID-19 ($p < 0.01$). Mental hygiene is important for psychotherapists to manage stress and job-related anxiety during COVID-19, especially in those whose income relies on psychotherapy.

Keywords: psychotherapists, stress, anxiety, fear of infection, coronavirus disease

INTRODUCTION

Previous research suggested that emotional stressors and existential stressors due to financial concerns range among the major stressors' psychotherapists are exposed to (Petrowski et al., 2014; Puig et al., 2014). The novel coronavirus disease (COVID-19) and the measures necessary to fight it (i.e., quarantine, isolation, and social distancing; see Nussbaumer-Streit et al., 2020) are new stressors, which can increase and even cause public mental health problems (Brooks et al., 2020; Hossain et al., 2020; Sharma et al., 2020). Mental health care is, therefore, essential during and after COVID-19 (Fiorillo and Gorwood, 2020; Pfefferbaum and North, 2020; Xiang et al., 2020). Psychotherapists are specifically qualified to provide mental health care. Yet, they might face

problems in dealing with the impact of COVID-19 on their life and professional activity (Pfefferbaum and North, 2020). For example, sessions are usually provided in personal contact (face-to-face), which has to be reduced now and most likely in the near future as well. Although providing psychotherapy *via* telephone or internet (teletherapy) is possible (Whaibeh et al., 2020; Wright and Caudill, 2020), many state that face-to-face contact is an essential part of the therapy (Connolly et al., 2020). Thus, the required reduction of face-to-face contacts might lead to a reduced number of patients (Humer et al., 2020; Probst et al., 2020) as some reservations against teletherapy have been shown in psychotherapists (Schuster et al., 2018) and the general population (Apolinário-Hagen et al., 2018). This situation might reinforce distress and job anxiety in psychotherapists, especially in those not used to provide teletherapy. Moreover, psychotherapists still providing psychotherapy face-to-face during COVID-19 might be especially stressed because of fear of becoming infected with COVID-19. Consequences of these examples might be increased mental burden of psychotherapists, and this distress may negatively impact process and outcome of psychotherapy (Salyers et al., 2017; La Verdière et al., 2018). The issue of preventing psychotherapists' burnout is a central concern in this context. Research suggests that helpers who experience increased psychological distress are unable to respond optimally or to use their core skills (West and Shanafelt, 2007; Kitchingman et al., 2017).

Thus, exploring stress-level, job anxiety, and fear of COVID-19 infection in psychotherapists is essential to know if psychotherapists need to increase their mental hygiene during COVID-19. To the best of our knowledge whether and to what degree psychotherapists experience stress, job-related anxiety, and fear of infection in situations of exposing public health emergency, such as during the COVID-19 outbreak, have not been studied previously. Therefore, the current study aimed to investigate the stress-level, degree of job-related worries and fears of existence, as well as fear of COVID-19 infection in psychotherapists in the early weeks of the COVID-19 outbreak in Austria. Throughout the present study, job anxiety refers to generalized job-related worrying, as well as worrying about job security and the future.

In Austria, the first COVID-19 infections were reported on 25th of February 2020. To combat the rapid spread of the virus, a lockdown became obligatory on 16th of March 2020 (Bundesgesetzblatt für die Republik Österreich, 2020a,b,c). In general, entering public places was strictly prohibited. People were only permitted to leave their homes if they had a good reason for doing so, such as to meet necessary basic needs of daily life or to fulfill work responsibilities. In these exceptions, a minimum safe distance of 1 m (3 feet) had to be maintained between people. Certain areas in Austria were under quarantine at the time of the study and had even stronger restrictions.

In the present study, the following research questions (RQs) were addressed.

- RQ 1: How are stress-level, job-related worries and fears of existence, and fear of COVID-19 infection in psychotherapists in the early weeks of the COVID-19 outbreak? We hypothesized higher stress-level, as well as job-related worries and fears of existence than pre-pandemic scores from representative samples.
- RQ 2: Do stress-level as well as job-related worries and fears of existence differ between different groups of psychotherapists in the early weeks of the COVID-19 outbreak?
- RQ 2a: Are there differences between psychotherapists reporting that the psychotherapeutic work is their sole source of income and psychotherapists with other sources of income besides psychotherapy? We hypothesized that stress-level as well as job-related worries and fears of existence are higher if psychotherapy is the sole source of income.
- RQ 2b: Are there differences between psychotherapists who did not use teletherapy before the COVID-19 situation and psychotherapists who already used teletherapy before COVID-19? This RQ tested the hypotheses if psychotherapists used to teletherapy experience less stress-level as well as less job-related worries and fears of existence.
- RQ 2c: Are there differences between psychotherapists treating only face-to-face, treating face-to-face as well as *via* teletherapy, treating only *via* teletherapy, and psychotherapists not treating patients at all in the early weeks of the COVID-19 lockdown? We had no specific hypothesis here.
- RQ 2d: Are there differences between psychotherapists with more reductions (COVID-19 vs. months before) of total patients treated on average per week and psychotherapists with fewer reductions (COVID-19 vs. months before) of total patients treated on average per week? This RQ addressed the hypothesis whether more reductions of patients are associated with more stress-level as well as more job-related worries and fears of existence.
- RQ 3: Does fear of becoming infected with COVID-19 during face-to-face psychotherapy differ between different groups of psychotherapists?
- RQ 3a: Are there differences between psychotherapists treating patients face-to-face and psychotherapists not treating patients face-to-face? This RQ tested the hypothesis if psychotherapists still treating face-to-face have higher fear of COVID-19 infection.
- RQ 3b: For those psychotherapists treating patients face-to-face during COVID-19, does their ability to adhere to the protective measures against COVID-19 affect their fear of COVID-19 infection? This last RQ tested the hypothesis if psychotherapists being more able to adhere to the protective measures against COVID-19 have less fear of COVID-19 infection during face-to-face psychotherapy than psychotherapists being less able to adhere to the protective measures.

MATERIALS AND METHODS

Study Design

In the current study, eligible participants included all licensed Austrian psychotherapists. In Austria, psychotherapy is an independent profession regulated by the Austrian law since 1990 (Psychotherapy Act, 361st Federal Act of June 7, 1990 on the Exercise of Psychotherapy). In brief, candidates have to complete a professional training comprising two stages (a general training followed by a specialist training) to qualify

as a psychotherapist. All licensed psychotherapists in Austria are registered in the list of psychotherapists of the Austrian Federal Ministry of Social Affairs, Health, Care and Consumer Protection. In the current study, all psychotherapists who provided a valid e-mail address in this list (~6,000 psychotherapists of more than 9,000 licensed psychotherapists) were contacted by the first author in cooperation with the Austrian Federal Association for Psychotherapy (ÖBVP). Psychotherapists received a link to an online survey, which was open from 24th of March until 1st of April 2020. To start the survey, participants had to agree to the data protection declaration (electronic informed consent). No incentives were provided, and participation was voluntary. The survey followed the principles outlined in the Declaration of Helsinki, and the ethics committee of the Danube University Krems (Austria) approved the study.

Measures

The Perceived Stress Scale with 10 items (PSS-10; Cohen et al., 1983) was used to measure the psychotherapists' stress-level on a five-point response scale (0 = "never" and 4 = "very often"). The questions in this scale ask about feelings and thoughts during the last month, such as "How often have you been upset because of something that happened unexpectedly," or "How often have you felt nervous and stressed." The positively worded items of the PSS-10 (4, 5, 7, and 8) were reverse scored. The total score of the PSS-10 was obtained by summing up the items, so that higher scores indicate higher stress-level. In previous studies, Cronbach's alpha of the PSS-10 was evaluated at >0.70, and test-retest reliability was >0.70 (see review by Lee, 2012). In our sample, Cronbach's alpha was 0.83.

Job anxiety was measured with the 10 items of the "worrying and fear of existence" dimension of the Job Anxiety Scale (JAS; Linden et al., 2008). This dimension consists of the subscales "worrying" and "fears of existence" and has shown good internal consistency (Cronbach's alpha: 0.88). The instruction was adapted, so that participants were asked to rate the statements in relation to the psychotherapeutic work in the current situation around COVID-19. Psychotherapists rated 10 statements that described situations, thoughts, and feelings which one can have experienced in connection with the workplace on a five-point response scale (0 = "strongly disagree" and 4 = "totally agree"). The "worrying" scale describes generalized worrying about minor matters concerning the workplace and the work itself, comprising of five items such as "Colleagues or family have already told me that I should not always worry that much about work." The "fears of existence" scale focuses on worries about job security and the future, consisting of five questions like "A loss of my workplace is/would be existentially threatening." The score for the worrying and fears of existence dimension was obtained by averaging the 10 items, with higher scores indicating more job-related worries and fears of existence. Values above the cut-off point of two points indicate high job-related worries and fears of existence (Muschalla et al., 2013). Cronbach's alpha was 0.76 in our sample.

Psychotherapists were asked about their number of patients treated on average per week in the COVID-19 lockdown as well as (retrospectively) in the months before. These numbers were given for face-to-face psychotherapies, for psychotherapy *via* telephone, and for psychotherapy *via* internet. For psychotherapists not treating during/before COVID-19, these numbers were set to 0. Using these numbers, reductions of total (face-to-face, telephone, and internet) number of patients treated on average per week during COVID-19 vs. in the months before were calculated (number in the months before COVID-19 was subtracted from the number during COVID-19, i.e., during COVID-19 – before COVID-19, so that more negative values indicate more reductions). As reported in another paper (Probst et al., 2020), the reductions of patients treated on average per week was statistically significant [M = 3.92 (SD = 11.04), $p < 0.001$].

Psychotherapists were asked whether psychotherapy is their sole source of income or whether they have additional sources of income.

Psychotherapists were asked to rate their fear to become infected with COVID-19 during psychotherapy in which they are face-to-face with patients on a sliding scale ranging from 0 ("not at all") to 100 ("extreme").

Psychotherapists treating patients face-to-face during the COVID-19 lockdown rated for each of the five protective measures against COVID-19 how well they can adhere to the protective measure during face-to-face psychotherapy on a four-point response scale (1 = "cannot adhere to the measure at all" and 4 = "can completely adhere to the measure"). The following five protective measures were suggested by the government (Austrian Federal Ministry of Social Affairs, Health, Care and Consumer Protection, 2020): (1) wash your hands frequently! Regularly and thoroughly wash your hands with soap or clean them with a disinfectant. (2) Maintain social distancing! Maintain at least 1 m (3 feet) distance between yourself and all other persons who are coughing or sneezing. (3) Do not touch eyes, nose, and mouth! Hands can pick up viruses and transfer the virus to your face! (4) Practice respiratory hygiene! Cover your mouth and nose with your bent elbow or tissue when you cough or sneeze and dispose of the used tissue immediately. (5) If signs and symptoms occur, do not leave your home and contact health care professionals or emergency services by phone.

Statistical Analyses

Statistical analyses were performed with SPSS25 (IBM Analytics).

Descriptive statistics were calculated to characterize participants and address RQ 1. The comparison of the PSS-10 with a norm sample was conducted using a t-test. For the job-related worries and fears of existence dimension of the JAS, we compared the average score against the cut-off of two points indicating high job-related worries and fears of existence.

To address RQ 2a,b and RQ 3a, independent t-tests were used to compare two groups of psychotherapists in each RQ. For RQ 2c, univariate ANOVAs were performed to investigate four groups of psychotherapists.

To address RQ 2d and RQ 3b, Pearson's correlation analysis was performed.

We report effect sizes using Hedge's g with 95% CIs. All statistical tests for significance were conducted two-tailed with an alpha level of 0.05.

RESULTS

Participant Characteristics

In total, 1,547 psychotherapists participated. Their mean age was 51.67 (SD = 9.69) years, and 75.7% of them were female. A comparison of the distribution of their psychotherapeutic orientations with the distribution of therapeutic orientations in the official Austrian list of psychotherapists (March 2020) showed that the humanistic orientation was overrepresented in the survey (% in the study sample vs. % in the Austrian list of psychotherapists): psychodynamic 20.9 vs. 25.9%, humanistic 46.3 vs. 37.8%, systemic 22.0 vs. 24.3%, and behavioral 9.8 vs. 12.0% (not specified for 1% of the survey sample). The average year in profession (indicated as the time since psychotherapists were registered in the Austrian list of psychotherapists in March 2020) was 11.19 (SD = 9.20) years. Of the participating psychotherapist, 781 (50.5%) were treating only adults, 14 (0.9%) only children and adolescents, and 752 (48.6%) adults as well as children and adolescents. In total, 1,234 psychotherapists (79.8%) were self-employed practitioners, 32 (2.1%) were regularly employed, and 281 (18.2%) worked self-employed as well as regularly employed.

Results for RQ 1

The average stress-level of the participating psychotherapists on the PSS-10 was M = 13.27 (SD = 5.85). Compared to the stress-level of employed persons in a representative German sample (M = 12.32, SD = 6.30; Klein et al., 2016), the stress-level of the psychotherapists was higher, $p < 0.001$, but the effect size was very small, Hedge's g = 0.16, 95% CI = 0.08, 0.23.

On average, psychotherapists scored M = 0.71 (SD = 0.50) on the "worrying and fears of existence" dimension of the JAS, thus scoring below 2.0, the threshold differentiating between low and high job-related anxiety in a nonclinical employees sample (Muschalla et al., 2013).

The average fear to become infected with COVID-19 during face-to-face psychotherapy was M = 37.51 (SD = 28.34).

Results for RQ 2a

Compared to psychotherapists with additional sources of income (n = 707), psychotherapists whose income relied solely on psychotherapy (n = 840) reported significantly higher stress-levels, $T(1{,}530.60) = 2.333$, $p = 0.020$, Hedge's g = 0.12, 95% CI = 0.02, 0.22, and higher job-related worrying and fears of existence, $T(1{,}543.25) = 7.07$, $p < 0.001$, Hedge's g = 0.36, 95% CI = 0.26, 0.46. Means and SDs are shown in **Table 1**.

Results for RQ 2b

Compared to psychotherapists who already used telephone or internet for psychotherapy in the months before COVID-19 (n = 316), psychotherapists who did not use telephone or internet for psychotherapy in the months before COVID-19 (n = 1,231) reported no differences regarding perceived stress, $T(1{,}545) = 1.246$, $p = 0.213$, Hedge's g = 0.079, 95% CI = −0.05, 0.20, and job-related worrying and fears of existence, $T(1{,}545) = 0.397$, $p = 0.692$, Hedge's g = 0.024, 95% CI = −0.10, 0.15. **Table 2** shows the means and SDs.

Results for RQ 2c

Between psychotherapists treating only face-to-face (n = 31), face-to-face as well as *via* teletherapy (telephone or internet, n = 618), only *via* teletherapy (telephone or internet, n = 793), or not at all (n = 105) in the early weeks of the COVID-19 lockdown, stress-levels, $F(3, 1{,}543) = 1.462$, $p = 0.223$, and job-related worries and fears of existence, $F(3, 1{,}543) = 0.304$, $p = 0.823$, did not differ. Of the 105 psychotherapists treating not at all 71 reported that they treated patients in the months before COVID-19, whereas 34 reported that they did not. Means and SDs are shown in **Table 3**.

Results for RQ 2d

Psychotherapists with more reductions in the total (face-to-face + telephone + internet) number of patients treated on average per week in COVID-19 as compared to the months before experienced comparable stress-level, $r = -0.006$, $p = 0.818$, as well as comparable job-related worries and fears of existence, $r = -0.011$, $p = 0.660$, as psychotherapists with less reductions in the total number of patients treated on average per week.

Results for RQ 3a

Psychotherapists who conducted no face-to-face psychotherapy in the early weeks of the COVID-19 lockdown (n = 898) reported higher fear of infection (M = 43.48, SD = 29.65) compared to the 649 psychotherapists who still conducted face-to-face psychotherapy during the COVID-19 lockdown (M = 29.26, SD = 24.13), $T(1{,}523.39) = 10.383$, $p < 0.001$, Hedge's g = 0.52, 95% CI = 0.42, 0.62.

Results for RQ 3b

Table 4 shows the means and SDs regarding how well psychotherapists could adhere to the five protective measures against COVID-19 during face-to-face psychotherapy in the early weeks of the COVID-19 lockdown. In addition, the correlation coefficients for associations between the psychotherapists' ability to adhere to the protective measures and fear of COVID-19 infection during face-to-face psychotherapy are given in **Table 4**.

The correlation coefficients between ability to adhere to the protective measures and fear of COVID-19 infection were all negative and statistically significant (all values of $p < 0.01$). This means that psychotherapists treating face-to-face during the COVID-19 lockdown had significantly less fear of COVID-19 infection when they were more able to adhere to the protective measures against COVID-19.

TABLE 1 | Comparison of perceived stress and job-related worrying and fears of existence in relation to income sources of psychotherapists.

Outcome	Additional income sources (n = 707)		Psychotherapy as sole income (n = 840)		T	p	Hedge's g
	M	SD	M	SD			
Perceived stress	12.89	5.60	13.58	6.04	2.333	0.020	0.12
Job-related worrying and fears of existence	0.612	0.458	0.788	0.526	7.070	<0.001	0.36

Perceived Stress was measured with the 10-items version of the Perceived Stress Scale (PSS-10; Cohen et al., 1983). Job-related worrying and fears of existence were measured with the 10 items "worrying and fears of existence" dimension of the Job Anxiety Scale (JAS; Linden et al., 2008). Mean parameter values for each of the analyses are shown for the psychotherapists with psychotherapy as sole income (n = 840) and the psychotherapists with additional sources of income (n = 707), as well as the results of the two-tailed t-tests (assuming unequal variance) comparing the parameter estimates between the two groups of psychotherapists.

TABLE 2 | Comparison of perceived stress and jobs-related worrying and fears of existence in relation to experience with teletherapy (telephone or internet) in the months before COVID-19.

Outcome	Teletherapy before COVID-19 (n = 316)		No teletherapy before COVID-19 (n = 1,231)		T	p	Hedge's g
	M	SD	M	SD			
Perceived stress	12.90	5.90	13.36	5.83	1.246	0.213	0.079
Job-related worrying and fears of existence	0.698	0.521	0.710	0.499	0.397	0.692	0.024

Perceived Stress was measured with the 10-items version of the PSS-10 (Cohen et al., 1983). Job-related worrying and fears of existence were measured with the 10 items "worrying and fears of existence" dimension of the JAS (Linden et al., 2008). Mean parameter values for each of the analyses are shown for the psychotherapists who already used teletherapy (telephone or internet) in the months before COVID-19 (n = 316) and the psychotherapists who did not use telephone or internet for psychotherapy in the months before COVID-19 (n = 1,231), as well as the results of the two-tailed t-tests (assuming equal variance) comparing the parameter estimates between the two groups of psychotherapists.

TABLE 3 | Comparison of perceived stress and job-related worrying and fears of existence in relation to the practice of psychotherapy (only in face-to-face, face-to-face and *via* teletherapy, only *via* teletherapy, and not at all) in the early weeks of the COVID-19 lockdown.

Outcome and group	M	SD	$F(3,1,543)$	p
Perceived stress			1.462	0.223
Psychotherapy only face-to-face	13.16	5.92		
Psychotherapy face-to-face and *via* teletherapy	13.13	5.91		
Psychotherapy only *via* teletherapy	13.23	5.80		
No Psychotherapy at all	14.41	5.76		
Job-related worrying and fears of existence			0.304	0.823
Psychotherapy only face-to-face	0.694	0.555		
Psychotherapy face-to-face and *via* teletherapy	0.718	0.497		
Psychotherapy only *via* teletherapy	0.704	0.516		
No Psychotherapy at all	0.671	0.435		

Perceived Stress was measured with the 10-items version of the PSS-10 (Cohen et al., 1983). Job-related worrying and fears of existence were measured with the 10 items "worrying and fears of existence" dimension of the JAS (Linden et al., 2008). Mean parameter values for each of the analyses are shown for the psychotherapists who treated only face-to-face (n = 31), face-to-face and via teletherapy (telephone or internet; n = 618), only via teletherapy (telephone or internet; n = 793), or not at all (n = 105) in the early weeks of the COVID-19 lockdown.

DISCUSSION

This survey explored stress-level, job-related worries and fears of existence, and fear of COVID-19 infection during face-to-face psychotherapy in psychotherapists in Austria. Stress-level was higher than scores of a German-speaking norm sample. Job-related worries and fears of existence were below the cut-off that defines high job-related anxiety. These results confirm the hypothesis that stress-level was elevated, but reject the one that job-related worries and fears of existence were high.

Stress-level and job-related worries and fears of existence were significantly higher in psychotherapists who had no other sources of income besides psychotherapy. This confirms our hypothesis. Since mental well-being of psychotherapists represents a key determinant of their ability to deliver high-quality psychological health care (Salyers et al., 2017; La Verdière et al., 2018), this illustrates the need to reduce existential stressors due to economic uncertainty, especially for psychotherapists whose income relies solely on psychotherapy. Besides professional policy, stress-management interventions for health care professionals might

TABLE 4 | Ability to adhere to the protective measures against COVID-19 as proposed by the Austrian government during face-to-face psychotherapy in the early weeks of the COVID-19 lockdown and correlations with fear of COVID-19 infection.

Protective measure against COVID-19	*M*(SD)	Correlation (*r*) with fear of COVID-19 infection
Wash your hands frequently! Regularly and thoroughly wash your hands with soap or clean them with a disinfectant	3.89(0.43)	–0.20**
Maintain social distancing! Maintain at least 1 m (3 feet) distance between yourself and all other persons who are coughing or sneezing	3.81(0.53)	–0.21**
Do not touch eyes, nose and mouth! Hands can pick up viruses and transfer the virus to your face!	3.24(0.82)	–0.13**
Practice respiratory hygiene! Cover your mouth and nose with your bent elbow or tissue when you cough or sneeze and dispose of the used tissue immediately.	3.82(0.52)	–0.22**
If signs and symptoms occur, do not leave your home and contact health care professionals or emergency services by phone.	3.88(0.47)	–0.12**

*Fear to become infected with COVID-19 during face-to-face psychotherapy was rated on a sliding scale ranging from 0 ("not at all") to 100 ("extreme"). Ability to adhere to the five protective measures against COVID-19 during face-to-face psychotherapy was rated on a four-point response scale (1 = "cannot adhere to the measure at all" and 4 = "can completely adhere to the measure"). Results refer to the n = 649 psychotherapists treating face-to-face during the COVID-19 lockdown in Austria; r, Pearson's correlation coefficient. **$p < 0.01$ two-tailed.*

be further options for psychotherapists who derive all their income from psychotherapy (Ruotsalainen et al., 2015).

Stress-level and job-related worries and fears of existence were not lower for psychotherapists who practiced psychotherapy *via* telephone or internet already before COVID-19. This result contrasts with our hypothesis assuming that those psychotherapists already used to teletherapy experience less stress-level, as well as job-related worries and fears of existence during COVID-19. Maybe switching to telephone or internet to provide psychotherapy was easy for those psychotherapists who did not use these formats for psychotherapy before COVID-19. It has also been reported that in the context of the forced transition toward teletherapy because of the COVID-19 pandemic, the majority of 145 surveyed psychotherapists from North America and Europe developed a positive attitude toward teletherapy (Békés and Aafjes-van Doorn, 2020). Therefore, it is possible that psychotherapists without previous teletherapy experience felt more at ease using teletherapy after they gained first experiences. Also previous studies showed that therapists reported that they were pleasantly surprised by the functionality and ease of use of videoconferencing upon using teletherapy (Connolly et al., 2020). The context of this forced transition to teletherapy because of the COVID-19 pandemic might have further increased the psychotherapists' motivation to use remote psychotherapy in order to be able to continue the sessions with all or most of their patients.

Stress-levels as well as job-related worries and fears of existence did not differ between psychotherapists treating only face-to-face, face-to-face as well as *via* teletherapy, only *via* teletherapy, or not at all. One explanation why psychotherapists treating not at all during COVID-19 did not differ from the other groups regarding stress and job anxiety might be that they did not depend financially on psychotherapy. Indeed, about one-third (34 out of 105) of the psychotherapists providing no psychotherapy at all during COVID-19 did not treat patients in the months before COVID-19, either. Thus, they could afford to quit practicing during the lockdown without additional stress and job-related worries. However, one has also to consider that both groups of psychotherapists were rather small (n = 31 psychotherapists practicing only face-to-face and n = 105 psychotherapists practicing not at all), which limits the overall significance of the current findings.

Details on the number of patients treated with respect to treatment format have been published recently (Probst et al., 2020). In brief, the total number of patients treated on average per week decreased from M = 14.04 (SD = 11.32) in the months before the COVID-19 lockdown to M = 10.12 (SD = 9.05) in the early weeks of the COVID-19 lockdown ($p < 0.001$). Reductions in total number of patients treated on average per week in COVID-19 as compared to the months before affected neither stress-level nor job-related worries and fears of existence. This result is in contrast to our hypothesis that more reductions in patients treated are associated with more stress-levels as well as more job-related worries. One explanation for this could be that, in the early weeks of the COVID-19 lockdown, psychotherapists were hoping that the lockdown will soon be over and that they will be able to treat their usual number of patients by face-to-face psychotherapy soon again. The longer the lockdown, the higher the correlations (between reduced number of patients on the one side and stress-level or job-related worries or fears of existence on the other side) might be.

Psychotherapists still practicing face-to-face during the COVID-19 lockdown had lower fear of COVID-19 infection during face-to-face psychotherapy than psychotherapists not practicing face-to-face during COVID-19. This result rejects our hypothesis that fear of COVID-19 infection during face-to-face psychotherapy is higher in psychotherapists still treating patients face-to-face during COVID-19. An explanation for this result might be that fear of COVID-19 infection might be a reason for some psychotherapists to stop treating face-to-face. Furthermore, it might be that those psychotherapists who have limited practice space, stopped treating face-to-face as they would not have been able to keep an appropriate safety distance. This is further supported by the negative correlation between the adherence to the protective measure of social distancing and the fear of COVID-19 infection in psychotherapists treating face-to-face during the lockdown. Similarly, also the ability to

adhere to the other four protective measures against COVID-19 of the Austrian government was associated with lower fear of COVID-19 infection for psychotherapists treating face-to-face.

It should be kept in mind that most effect sizes for the significant results were small. The results refer to the early weeks of the COVID-19 situation in Austria (first COVID-19 infections were reported on 25th of February 2020, measures of the government became obligatory on 16th of March 2020, and the survey was open from 24th of March to 1st of April 2020). Stress-levels and job-related anxiety might change dynamically either positively or negatively depending on the durations and intensity of the restrictions.

There are a number of limitations in this study. The major limitation is the cross-sectional design, so that we cannot say whether the psychotherapists' stress-level or job-related worries and fears of existence changed during COVID-19 as compared to the time before. A further limitation is that the fear to become infected was operationalized by a single item measure. Meanwhile, a validated scale to assess the fear of COVID-19 became available (Ahorsu et al., 2020), which should be considered in future studies. In addition, only psychotherapists' self-ratings on number of patients treated on average per week could be analyzed and not health insurance data. Due to the cross-sectional design, there might be a recall bias regarding the number of patients treated on average per week in the months before COVID-19. Moreover, stress-level was operationalized only with self-reports and not complemented by more objectively quantifiable physiological measurements, such as cortisol analyses (Dickerson and Kemeny, 2004). Such analyses are not easily possible in online surveys, and lab studies would be necessary. Another shortcoming is the online conduction of the survey, which might have caused some respondent bias, such as higher psychotherapists' participation with higher preference for new technologies, which might have contributed to the finding that experience with teletherapy did not affect stress-level and job-related anxiety. Carrying out the survey online may also have introduced some selection bias toward fewer elder psychotherapists' participation (Bethlehem, 2010). Although the sample largely reassembled the psychodynamic, behavioral, and systemic population of Austrian therapists (deviation range from −5.0 to −2.2% units), therapists with a humanistic orientation were overrepresented (deviation range of 8.5% units), which further limits the generalizability of the findings to the population of Austria's psychotherapists. Since the study was conducted in Austria, results may only be applicable to countries with similar mental health care systems (for example, psychotherapy – but not counseling – *via* internet is rejected by the official Internet guideline for psychotherapists in Austria at the time of the study; however, health insurances started to cover the costs for psychotherapy *via* telephone or internet during COVID-19) and comparisons with countries, which already implemented e-health solutions in routine psychotherapy would be interesting.

CONCLUSION

Overall, psychotherapists need to meet the challenges inherent in balancing stressors, especially in situations of increased mental, emotional, and economic challenges, such as during COVID-19, to ensure optimal psychotherapeutic services. This study suggests that mental hygiene is important for psychotherapists to manage stress and job-related anxiety during COVID-19. The finding that mainly being financially dependent on psychotherapy was associated with higher stress-level and job anxiety is important in regard to professional policy. This might also have an effect on therapeutic process, as increased mental burden of psychotherapists and distress may negatively affect process and outcome of psychotherapy. Therefore, results suggest that especially psychotherapists whose income relies on psychotherapy need to increase their mental hygiene during COVID-19.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

TP, PS, and CP: conceptualization. TP: methodology, formal analysis, investigation, and data curation. TP and EH: writing – original draft preparation. CP and PS: writing – review and editing. All authors have read and agreed to the published version of the manuscript.

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BRIEF RESEARCH REPORT
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Stressors and Resources for Healthcare Professionals During the Covid-19 Pandemic: Lesson Learned From Italy

Serena Barello[1,2,3], Lorenzo Palamenghi[1,2,4] and Guendalina Graffigna[1,2,4]*

[1] EngageMinds HUB - Consumer, Food & Health Engagement Research Center, Università Cattolica del Sacro Cuore, Milan, Italy, [2] Department of Psychology, Università Cattolica del Sacro Cuore, Milan, Italy, [3] Faculty of Psychology, Università Cattolica del Sacro Cuore, Milan, Italy, [4] Faculty of Agriculture, Food and Environmental Sciences, Università Cattolica del Sacro Cuore, Piacenza, Italy

The COVID-19 pandemic is exerting a high pressure on healthcare systems all over the world. Italy, in particular, being one of the first Western countries to be struck by the contagion, has seen the number of recovered -and deceased- patients increase alarmingly, thus increasing the workload and the demands for healthcare professionals. This situation has the potential to put several healthcare operators at risk of developing high levels of work-related distress and burnout due to the exposure to emotionally difficult situations, uncertainty, and personal risk. A sample of 532 Italian physicians, nurses, and other professionals answered an online survey addressing their levels of burnout (through the Maslach Burnout Inventory) and frequency of experienced psycho-somatic symptoms, along with some *ad hoc* items regarding job demands. Results show that levels of burnout and experienced symptoms are correlated with the increased demands due to the COVID-19 pandemic, while finding a meaning in one's own work is correlated with personal gratification. Urgent measures to address concerns regarding the wellbeing of health workers are a necessary key point of the response to the current pandemic.

Keywords: burnout, distress, healthcare professionals, COVID-19, job demands

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Eleftherios Spartalis, National and Kapodistrian University of Athens, Greece
Tiziana Nania, IRCCS Policlinico San Donato, Italy
Vincenza Capone, University of Naples Federico II, Italy

****Correspondence:***
Lorenzo Palamenghi
lorenzo.palamenghi@unicatt.it

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INTRODUCTION

The COVID-19 pandemic has disrupted healthcare systems worldwide, unlike anything else in the last few decades: during the emergency, operating rooms have been transformed into ICUs, healthcare professionals of many different backgrounds have been drafted into emergency work, and many of them have contracted the disease as well.

This scenario has been experienced internationally, although some countries such as Italy were particularly overwhelmed (Armocida et al., 2020; Nacoti et al., 2020). Since Feb 21, 2020, when the first case of COVID-19 was recorded in Italy, the National Healthcare Service, which offers universal access to health care, has faced increasing pressure, with 231,732 total assessed cases of COVID-19 and 33,142 deaths as of May 28th, 2020 (Ministero della Salute, 2020). In the most affected regions, the National Healthcare Service almost collapsed, as mechanical ventilators, oxygen, and personal protective equipment were not available for everyone. And as with any event of this magnitude, COVID-19 will not just cause many victims, but will also take its toll in terms of the psychological burden that those who survive will have to bear (Holmes et al., 2020).

This "emotional surge" has the potential to burden the medical workforce for as long as the public health crisis lasts (Downar and Seccareccia, 2010). Healthcare professionals found themselves working at the front line of the COVID-19 outbreak response and as such are exposed to several risks for their own occupational safety and psycho-physical health (Lima et al., 2020). Indeed, they experienced unprecedented psychological and physical symptoms of grief in response to patients' suffering and death (Li et al., 2020; Barello et al., 2020a). They have been exposed to traumatic events and situations that could lead to significant distress and moral suffering (Delfrate et al., 2018; Barello and Guendalina, 2020; Radbruch et al., 2020; Barello et al., 2020b), such as difficult triage decisions regarding the allocation of limited resources to the patients that they are personally taking care of Selman et al. (2020). All of these potentially traumatic experiences have occurred under extreme pressures, including the fear of spreading the virus to loved ones, possible separation from family, mental and physical exhaustion, and limited access to personal protective equipment and medical supplies. Although not all healthcare workers are going to develop mental health problems, no one is invulnerable or immune, and some healthcare staff will struggle, possibly for an extended time, as they face unprecedented and unexpected scenarios.

A pandemic causes and amplifies suffering through physical illness, death, stresses, and anxieties that the entire healthcare workforce is currently facing across multiple countries (Adams and Walls, 2020). Therefore, the response to this pandemic should be based on key attributes such as supporting complex decision-making and managing medical uncertainty (Williamson et al., 2020); however, this implies that the current emergency may actually challenge the medical culture, its implicit assumptions, and the basic underpinnings of daily work.

According to this premises, there is an urgent need to mitigate the psycho-social impact of the COVID-19 pandemic on healthcare workers to address broader aspects of wellbeing among them. Hence, recognizing the sources of work-related stress is required for healthcare organizations to develop targeted approaches and to address concerns and provide specific support to their health care workforce.

Understanding the stressors that COVID-19 is placing on Italian clinicians, their perceptions about job demands and job resources, and their impact on physical and mental health can assist in recognizing what is needed to return to a point of wellness during and after such emergencies.

Therefore, this study was aimed to (1) describe the levels of burnout of a sample of Italian healthcare workers involved in the management of the COVID-19 pandemic and to (2) explore the relationship between professionals' burnout and psychosomatic symptoms with perceived job demands and job resources.

METHODS

A group of 744 Italian healthcare professionals was asked to answer a survey regarding their burnout levels and their experience at work during the COVID-19 outbreak. Of these, 532 provided complete answers between the 4th and the 27th of April, 2020. **Table 1** shows sample characteristics.

The survey included the Maslach Burnout Inventory (Maslach et al., 1996), a 22 items questionnaire, considered the gold standard for burnout assessment, which provides 3 different indexes of burnout of healthcare operators (Emotional Exhaustion, Depersonalization, and Personal Gratification). The survey also included a series of questions regarding the perceived job demands and resources (in particular: professional risks, emotional demands, uncertainty, work-family balance, and meaning of work). Finally, our survey comprised a checklist of psycho-somatic symptoms that could have been experienced by healthcare professionals under heavy workloads and distress: participants were asked to report the frequency of these symptoms in the last 4 weeks on a 6-point scale from "never" to "usually." The answers were then averaged to calculate an index of "psycho-somatic distress." All participants provided written informed consent and the study was approved by the Catholic University Ethical Commission (approval number 2020–04).

RESULTS

Our results show that, in our sample of Italian healthcare professionals, levels of burnout were high: according to the Italian cut-off criteria for healthcare workers (Sirigatti and Stefanile, 1993), 41% showed high levels of Emotional Exhaustion, and 27% high levels of Depersonalization, while only 57% were really gaining high levels of gratification from their own work. Generally speaking, the COVID-19 pandemic was demanding a high toll from Italian healthcare professionals: 91.8% of the sample agreed with the statement that "the COVID-19 emergency puts me more frequently in touch with other people's suffering," while 70.6% agreed with the statement "My job is putting me at serious risk."

A series of Spearman's correlations was run to assess the association between burnout levels, psycho-somatic distress, and job demands to better understand the factors underlying these high levels of burnout and distress. **Table 2** shows correlation indexes.

In particular, health professionals' perceived levels of professional risk, emotional demands, uncertainty of the clinical situation, and conflict between work and family were correlated with the experience of burnout and, in particular, with emotional exhaustion. They were also correlated with the frequency of psycho-somatic symptoms, while they did not seem correlated with personal gratification.

On the other hand, the ability to feel that one's own work has a meaning and to be inspired by the work was negatively correlated with both emotional exhaustion and depersonalization, while positively correlated with personal gratification.

DISCUSSION

The current COVID-19 pandemic is not only having a direct impact on citizens and economy but also, and particularly, on

TABLE 1 | Personal and professional sample characteristics.

Personal characteristics		
Gender	***n***	**%**
Male	133	25.0
Female	399	75.0
Age		
Min	22	
Max	77	
Average (SD)	41 (11)	
Marital status	***n***	**%**
Married/living together	312	58.6
Single	181	34.0
Divorced/separated	33	6.2
Widow(er)	3	0.6
Other	3	0.6

Professional characteristics		
Length of work experience		
Min	<1	
Max	53	
Average (SD)	16 (12)	
Occupational role	***n***	**%**
Nurse	327	61.5
Physician	106	19.9
Other professionals	99	18.6
Main work setting	***n***	**%**
Hospital unit	372	69.9
Ambulatory	13	2.4
Private study	13	2.4
Rehabilitation Centre	7	1.3
Other	127	23.9
The hospital/organization you are currently working at, is in. . .?	***n***	**%**
Lombardia/Piemonte/Veneto/Emilia Romagna (most hit regions)	417	78.4
Elsewhere	115	21.6

Personal experience with COVID-19		
Have you been tested for COVID-19?	***n***	**%**
No	361	67.9
Yes	168	31.6
I'd rather not answer	3	0.6
Have you been quarantined?	***n***	**%**
No	488	91.7
Yes	39	7.3
I'd rather not answer	5	0.9
One of your familiars has been found positive to COVID-19?	***n***	**%**
No	496	93.2
Yes	29	5.5
I'd rather not answer	7	1.3

Professional experience with COVID-19		
Do you work in an hospital with COVID-19 patients?	***n***	**%**
No	156	29.3
Yes	349	65.6
Have you been personally assisting a COVID-19 patient?	***n***	**%**
No	183	34.4
Yes	349	65.6
During your interaction with COVID-19 patients, were you wearing adequate PPEs (Personal Protective Equipment)? (*n* = 349)	***n***	**%**
No	30	8.6
Yes	307	88.0
I'd rather not answer	12	3.4

the healthcare system and professionals' health in Italy. As the National Healthcare System was trying to keep up with the growing number of cases, healthcare professionals were asked to comply with increasingly difficult-to-face challenges, higher job demands and increased workload, which eventually interfered with their private life and work-family balance. Moreover, emotional demands increased as well, as healthcare professionals found themselves more frequently facing other people's sufferings, complicated decisions, and uncertain situations on top of severe risks for their own health. Our findings show

TABLE 2 | Spearman's correlations between professional demands and indexes of burnout/distress[a].

	Emotional exhaustion	Depersonalization	Personal gratification	Psycho-somatic distress
Professional risks				
My job is putting me at serious risk	0.360 ($p < 0.001$)	0.172 ($p < 0.001$)		0.358 ($p < 0.001$)
The health risk caused by my job is unacceptable	0.332 ($p < 0.001$)	0.160 ($p < 0.001$)		0.303 ($p < 0.001$)
Emotional demands				
The COVID-19 emergency makes me take difficult decisions at work	0.244 ($p < 0.001$)			0.233 ($p < 0.001$)
I often feel like I need to hide my emotions at work	0.292 ($p < 0.001$)	0.096 ($p = 0.027$)		0.420 ($p < 0.001$)
At work I usually do things I don't want to	0.364 ($p < 0.001$)	0.228 ($p < 0.001$)	−0.143 ($p = 0.001$)	0.299 ($p < 0.001$)
The COVID-19 emergency puts me more frequently in touch with other people's suffering	0.139 ($p = 0.001$)		0.096 ($p = 0.28$)	0.231 ($p < 0.001$)
Uncertainty				
I have difficulty at tolerating the unpredictability of the COVID-19 emergency	0.284 ($p < 0.001$)	0.108 ($p = 0.013$)		0.341 ($p < 0.001$)
I cannot tolerate the uncertainty of curing COVID-19 patients	0.302 ($p < 0.001$)	0.110 ($p = 0.013$)		0.368 ($p < 0.001$)
Work-family balance				
My private life is being affected by the energies I'm spending at work	0.396 ($p < 0.001$)	0.146 ($p = 0.001$)		0.336 ($p < 0.001$)
Since the COVID-19 emergency has begun, I cannot pass enough time with my family	0.260 ($p < 0.001$)	0.125 ($p = 0.004$)		0.277 ($p < 0.001$)
Meaning of work				
At work, I can fully express myself	−0.344 ($p < 0.001$)	−0.330 ($p < 0.001$)	0.429 ($p < 0.001$)	−0.117 ($p < 0.001$)
My job is inspiring	−0.316 ($p < 0.001$)	−0.280 ($p < 0.001$)	0.435 ($p < 0.001$)	−0.123 ($p = 0.005$)

[a]*Non-significant correlations ($p > 0.05$) have not been reported.*

that the perception of these increased demands is indeed associated with the levels of burnout we observed in our sample (in particular, with emotional exhaustion) and with the frequency of experienced symptoms that could be indices of psycho-somatic distress.

This is coherent with scientific literature exploring the levels of burnout and distress among healthcare professionals that, even in their "routine" experience, are requested to face complicated decisions, heavy emotional loads and other people's suffering with a high frequency. Indeed, physicians, nurses, and other non-specialists in this field are known to experience high levels of burnout and distress due to the very high demands that their job requests (Harrison et al., 2017; Rizo-Baeza et al., 2018).

In this situation, the capacity of the professionals to find a meaning in their work, and to be inspired by it, seems to act as an important resource and a protective factor, as higher levels are associated with less emotional exhaustion and depersonalization and with higher personal gratification at work. Thus, according to previous studies on this topic (West et al., 2018), while reducing workloads, providing adequate protective equipment and psychological support are crucial strategies to reduce the current levels of burnout, finding a way to support and enhance work motivation could be essential in preventing or limiting burnout and other distress-related health outcomes.

Therefore, we suggest that strategies to support healthcare professionals, such as peer-to-peer counseling, self-monitoring and pacing, working in teams, and organizational supervision to support professionals' motivation at work and mitigate the impact of continued exposure to death and dying, emotional exhaustion, desperation, and suffering should be urgently deployed across health systems worldwide. To enable clinicians to maintain personal well-being and resilience throughout the pandemic, healthcare organizations should aim to monitor both clinician sources of stress and to sustain their personal work motivation and work engagement. These efforts are warranted to proactively address concerns related to the wellbeing of clinicians and their families. Alleviation of healthcare professionals' suffering needs to be a key part of the strategic response to the COVID-19 pandemic.

This study has a few limitations, in particular regarding generalizability, as the sample is not statistically representative of the Italian population of healthcare workers. Moreover, future

cross-cultural studies should study the psychological impact of COVID-19 on healthcare workers in other countries and cultures for comparison.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Catholic University Ethical Commission. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SB and GG equally contributed to the research conceptualization and methodology. SB and LP cured draft writing and manuscript preparation. LP cured data and carried out formal analyses. GG supervised the work. All authors approved the final manuscript.

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BRIEF RESEARCH REPORT
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2020s Heroes Are Not Fearless: The Impact of the COVID-19 Pandemic on Wellbeing and Emotions of Italian Health Care Workers During Italy Phase 1

Giulia Marton[1,2†], Laura Vergani[1,2†], Ketti Mazzocco[1,2], Marina Chiara Garassino[3] and Gabriella Pravettoni[1,2]*

[1] Applied Research Division for Cognitive and Psychological Science, IEO, European Institute of Oncology IRCCS, Milan, Italy, [2] Department of Oncology and Hemato-Oncology, University of Milan, Milan, Italy, [3] Thoracic Oncology Unit, Division of Medical Oncology, Foundation IRCCS–Italian National Cancer Institute, Milan, Italy

Objective: The study aimed to investigate the mental health and emotional reaction of physicians working during phase 1 of the COVID-19 pandemic in Italy.

Methods: A total of 458 Italian Health Care Workers (HCWs) working during phases 1 of the COVID-19 outbreak were voluntarily enlisted in the study and recruited with the snowball technique through an online survey. We examined our variables with the General Health Questionnaire – 12 and with Visual Analog Scales.

Results: The sample has a high level of psychological distress 21.26 (SD = 4.46), the emotional reaction was characterized by high level of fear for family members and cohabitants (M = 77.67, SD = 27.16) and patients (M = 67.16, SD = 27.71). Perceived control, fear for patients, and for family members and cohabitants, feeling alone and anger all contribute to a decreased mental health in Italian physicians (R^2 = 0.285, $p < 0.001$).

Conclusion: Italian HCWs' mental health and emotional reaction have to be considered to prevent high risk of burnout and post-traumatic stress disorder (PTSD). It becomes pivotal in the next months to implement a tailored psychological intervention to take care of HCWs and to prevent costly consequences for them, patients, and the healthcare system.

Keywords: health care workers, COVID-19, emotional reaction, health care workers wellbeing, distress

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***Correspondence:**
Giulia Marton
giulia.marton@ieo.it

†These authors share first authorship

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INTRODUCTION

On the 11th of March 2020, the World Health Organization characterized COVID-19 as a pandemic. In Italy the situation was already very serious and, as one of the first States to be affected by this outbreak, the spread of the disease was at its peak, with the national lockdown imposed on the 9th of March. Only on the 18th of May phase 1 ended, with the restrictive measure of lockdown loosen and the healthcare system registering a break from the emergency. COVID-19 spreads rapidly and can cause severe symptoms, giving a lot of pressure to the National Health

System (Shanafelt et al., 2020). Health care workers' (HCW) workload was very demanding, affected also by suspension of days of leave and rest. Moreover, the strict contact with infected patients and the risk of being infected themselves increase the physical and psychological difficulties that HCWs have to face: the fear is not limited to the possibility to get the virus, but also to the possibility to take it home and infect their families and other people as proven during other pandemics in the past (Maunder et al., 2006). At the beginning of July 2020, more than 1800 HCWs have died because of the COVID-19 (MEDSCAPE, 2020). Also, the limited number of beds in the intensive care units and the dramatically increased number of patients needing intubation, imposed HCWs the responsibility to choose which patients to cure (Rosenbaum, 2020). Such a dilemma accumulated with the aforementioned factors of psychological distress. Studies conducted in past comparable situations showed that the stressful situation, the workload, and the high responsibility affect the psychological wellbeing of HCWs, with acute and chronic consequences (Bai et al., 2004; Chen et al., 2005; Maunder et al., 2006; Khalid et al., 2016; Lai et al., 2020; Li et al., 2020; Zhu et al., 2020). Post traumatic stress, insomnia, depressive, and anxiety symptoms are often reported by HCWs during pandemic and epidemic situations (Preti et al., 2020). During the SARS epidemic, quarantine was associated with emotional distress in HCWs as well as feelings of fear to contract the disease, worry for the family and isolation, the stress in the workspace and stigma of possibly being contagious (Bai et al., 2004; Maunder et al., 2006). Under these conditions, working in a hospital that treated SARS patients led to high burnout levels, psychological distress and post-traumatic stress disorder (PTSD) (Chen et al., 2005). During the MERS-CoV outbreak in 2014, HCWs experienced fear for personal safety and fear for their colleagues and families (Khalid et al., 2016). In China, the first country to be affected by COVID-19, HCWs working with COVID-19 patients reported various symptoms of psychological distress, like anxiety, insomnia and depression (Huang and Zhao, 2020; Lai et al., 2020; Zhu et al., 2020). A preliminary study on trauma during the COVID-19 pandemic (Li et al., 2020) suggested that HCW may experience vicarious traumatization due to the frequent experience of seeing patients dying without having their loved-ones near them.

But what are the main factors that affect the psychological distress of HCWs during COVID-19 pandemic? The aim of this study was to explore the mental health and emotional reactions of Italian HCW involved in phase 1 of the COVID-19 pandemic. Based on previous studies conducted during similar events, we hypothesized a decreased mental health and emotional distress affecting Italian HCW during phase 1 of the COVID-19 pandemic.

METHODS

For this observational study, we recruited a sample of 458 HCW working during the first phases of the COVID-19 Italian outbreak, through HCWs mailing lists, social media and snowball recruitment. For the considered population, a minimum sample of 400 respondents allows having a certainty measure with a confidence level of 95% and a confidence interval of 5% (Hill, 1998). Recruitment started on the 24th of March until the 13th of May and focused on phase 1 of the COVID-19 Italian emergency.

The sample comprised HCWs working all over Italy during the Pandemic, with a mean age of 43.46 years (SD = 10.22; range: 25–70 years), a mean of 15.03 (SD = 10.23) years of working experience, and a mean of 36.30 (SD = 17.73) hours of work per week, with an average of 1.63 days of rest per week (SD = 0.84).

Our sample was composed by 79% (362 out of 458) physicians, 9.8% (45 out of 458) nurses, 5.2% (24 out of 458) technicians, 1.7% (8 out of 458) psychologists, 0.7% (3 out of 458) OSS, 0.7% (3 out of 458) OTA, 0.7% (3 out of 458) volunteers, 0.4% (2 out of 458) pharmacists, 0.2% (1 out of 458) obstetricians and 1.5% (7 out of 458) other kind of HCWs.

The study was approved by the European Institute of Oncology ethics committee (R1185/20-IEO 1248). Participants provided written informed consent before being asked to fill in an online survey characterized by a standardized questionnaire to measure the mental health status (the 12-item General Health Questionnaire, GHQ; Goldberg et al., 1997), and Visual Analog Scales (VAS) to assess personal experience associated with the situation. In particular, general distress, fear for themselves, their family members and cohabitants and their patients, the anger felt in this period, the perceived level of loneliness and the perceived level of abandonment by the Institutions were assessed. Given the association between perception of control on the situation and the presence of distress (Bhanji et al., 2016), perceived control on the situation was also measured with a VAS. The 12-item GHQ was characterized by 4-point Likert scale answers, with low scores indicating a good mental health status and high scores indicating a bad mental health status. Scores above the threshold of 13/14 indicate the presence of psychological distress (Piccinelli et al., 1993; Goldberg et al., 1997). The VAS were on a range from 0 (not at all) to 100 (completely), with higher values indicating a worse condition except perceived control of the situation. Finally, questions were asked on workload-related information (average number of rest days per week in this period and average working hours per week in this period) and socio-demographic information (years of working experience and age).

We performed descriptive statistics (mean and standard deviation) and, considering a statistical significance of $p > 0.05$, we performed a bivariate correlational and a stepwise backward regression analysis on collected data. We performed our analysis with SPSS 26.

RESULTS

Descriptive statistics for GHQ-12 scores and Visual Analog Scales for all 458 participants are reported in **Table 1**. The mean score for GHQ-12 was 21.26 (SD = 4.46), indicating a

generally high level of psychological distress. The high score in psychological dysfunction was confirmed by physicians' perceived distress directly measured with VAS (M = 67.90, SD = 23.16, r = 0.54, $p < 0.01$).

Regarding specific emotional reactions due to the COVID-19 emergency, participants indicated high levels of fear for family members and cohabitants (M = 77.67, SD = 27.16) and fear for patients (M = 67.16, SD = 27.71). Instead, fear for themselves received a significantly lower score (M = 48.59, SD = 30.98) compared to the experience of fear for others – fears for family members and cohabitants and for patients [respectively $t(457) = -20.55$, $p < 0.001$ and $t(457) = -11.08$, $p < 0.001$); moreover, fear for family members was significantly higher than fear for patients [$t(457) = 8.14$, $p < 0.001$]. Perceived control related to the situation was the lowest score (M = 41.21, SD = 26.85). Correlation analysis demonstrated a significant negative association between perceived control of the situation and emotional reactions ($p < 0.01$). A negative correlation was found also between perceived control and general mental health ($p < 0.01$) and general distress ($p < 0.01$).

A stepwise backward regression analysis was performed to analyze the predictive effect of fear (for themselves, for family members and cohabitants and for patients), anger, feeling alone, perception to feel abandoned and perceived control on mental health. The final model included perceived control, fear for patients and family, feeling alone and anger as significant predicting factors, explaining 28.5% of the variability in the total GHQ-12 score ($R^2 = 0.285$, $p < 0.001$). Of these variables, feeling alone significantly made the largest contribution in the GHQ-12 score (β = 0.221), followed by anger and fear for family members and cohabitants, fear for patients, and perceived control of the situation (respectively: β = 0.176; β = 0.159; β = 0.153; β =−0.119).

Regression analysis showed also a predictive role of years of experience, feeling alone, fear for patients, and fear for themselves on perceived control (R^2 = 0.062, $p < 0.001$), with a lower perceived control in presence of higher levels of feeling alone (β = −0.117), fear for patients (β = −0.081) and fear for themselves (β = −0.099). On the contrary, years of working experience significantly affected the perceived control (β = 0.133, $p < 0.05$), with more years being associated with a higher perceived control.

DISCUSSION

During COVID-19 pandemic's phase 1, HCWs' life was surrounded by fear. Usually, HCWs are afraid of being blamed and punished but in this period a new fear is added (Gorini et al., 2012). They fear for their patients, and when they finish the endless time in the hospital, they go back to their home and they are afraid to infect families or cohabitants. The fear affects directly the mental health status, and also the perceived control on the situation that, in turn, influences the HCWs' psychological state. Despite fear being a predictive factor of mental health and distress, feeling alone and anger emerged as relevant emotions affecting HCWs' psychological wellbeing. Our results are in line

TABLE 1 | Variables descriptive statistics and correlations.

		Mean	SD	N	1	2	3	4	5	6	7	8	9	10	11	12	13
1	GHQ-12	21.26	4.466	458		0.540**	0.311**	0.359**	0.339**	−0.225**	0.369**	0.382**	0.330**	−0.064	0.042	−0.029	0.008
2	Perceived stress	67.9	23.161	458			0.473**	0.439**	0.437**	−0.179**	0.404**	0.392**	0.386**	−0.132**	−0.014	−0.001	0.036
3	Fear for themselves	48.59	30.989	458				0.464**	0.258**	−0.142**	0.348**	0.291**	0.379**	−0.016	−0.079	0.074	0.115*
4	Fear for family members/cohabitants	77.67	27.16	458					0.492**	−0.150**	0.309**	0.238**	0.355**	−0.068	−0.006	−0.055	−0.015
5	Fear for patients	67.16	27.713	458						−0.134**	0.250**	0.215**	0.330**	−0.021	0.018	−0.018	0.002
6	Perceived control of situation	41.21	26.851	458							−0.140**	−0.168**	−0.158**	−0.051	0.015	0.120*	0.110*
7	Anger	48.62	34.625	458								0.401**	0.489**	−0.01	−0.057	0.047	0.076
8	Feeling alone	47.56	34.727	458									0.442**	−0.082	−0.017	0.004	0.049
9	Feeling abandoned by institutions	61.15	32.593	458										0.027	−0.036	0.031	0.055
10	Days of rest per week	1.637	0.8482	452											−0.223**	−0.015	−0.045
11	Hours of work per week	36.304	17.7377	455												0.021	0.041
12	Years of working experience	15.031	10.2339	458													0.921**
13	Age	43.4639	10.22828	457													

*Significant correlations 0.05 two-tailed; **significant correlations 0.01 two-tailed.

with previous studies about these themes (Sadler and Weiss, 1975; Simard et al., 2013). The relevance of loneliness as a contributor to mental health is confirmed by previous studies showing its predictive role in the development and maintenance of depressive and anxiety symptoms (Wang et al., 2018; Hill and Hamm, 2019). Moreover, loneliness has been found to have impact on other chronic and various diseases: for example, cognitive decline (Shankar et al., 2013), cardiovascular diseases (Herlitz et al., 1998; Sorkin et al., 2002; Hawkley et al., 2010), cancer (Antoni et al., 2006), and inflammatory diseases (Luanaigh and Lawlor, 2008).

Our study links primary emotions with a cognitive aspect: the perception of lack of control. Considering the stress and negative emotions, together with the perceived difficulties in controlling the situation, it is not surprising that these findings are related to mental health.

In COVID-19's phase 1, the pick of infected people was at its maximum and HCWs had to make rapid and often ethically challenging decisions on who and how to care (Wallace et al., 2020). Usually, professionals' decision-making priorities should consider patient preferences (Marton et al., 2020; Monzani et al., 2020) to empower patients to reach the preferred decision (Arnaboldi et al., 2020). In this period, however, the low availability of ventilators compared to the high number of critical patients required HCWs to make life-or-death decisions (Rosenbaum, 2020). This might cause "*decision fatigue,*" a psychologically taxing phenomenon originating from the evaluation of pros and cons to make a good decision in the context of high potential risks (Baumeister et al., 1998) that, if not managed, will lead to higher distress (Chen et al., 2018). Moreover, to adapt to the complex environment, HCWs use heuristics that become inevitable (Mazzocco and Cherubini, 2010), and lead to mistakes. On top of that, preliminary studies on trauma during the COVID-19 pandemic (Li et al., 2020) suggested that HCWs may experience vicarious traumatization and emotional dissociation from what they are seeing and experiencing (Masiero et al., 2020): this may lead to PTSD if not timely managed. PTSD may have tremendous consequences and should be monitored not only in the patients' population (Arnaboldi et al., 2014) but also in the HCWs' one.

Perceived lack of control, high level of stress, negative emotions – all symptoms retrieved in our sample – are risk factors for Burnout Syndrome. Potential consequences of not managed distressed conditions will have implications not only for HCWs (Suñer-Soler et al., 2014) but also for patients and health systems: physical problems, diminished job satisfaction, less quality of care, absenteeism, negative attitude. It is fundamental, then, to implement actions and interventions to take care of physicians and HCWs during and after the emergency, to prevent a more costly situation.

The study presents some limitations. The sample only comprehends Italian HCWs, making the results not comprehensive of possible different findings of other nationalities. However, we think that the Italian experience remains an interesting context to consider. Another limit is that our model only explains 28.5% of HCW's mental health. It is advisable that future research should consider other factors that could explain psychological distress in a more comprehensive way (i.e., individual aspects, the personality of the HCWs).

We also did not consider the working environment of the HCWs that could have caused a difference in how the COVID-19 outbreak has impacted the professionals. Some areas of Italy were more impacted than others and some hospital wards became COVID-19 specific. HCWs that worked in such highly impacted hospitals could have been more affected than others. In particular, we assume the different settings to have an impact on the decision fatigue experienced by the HCWs and on their emotional reactions that we mentioned above.

Among other results, we retrieved a detrimental emotional reaction of HCWs; moreover, perceived control, fear for patients and for families, feeling alone and anger, predict mental health. To mitigate these symptoms and to prevent their evolution in chronic diseases, it is pivotal to implement tailored psychological interventions that help HCWs to develop and improve skills in order to manage their emotional reactions, cope to the stressful working environment and foster their psychological well-being (Masiero et al., 2018).

DATA AVAILABILITY STATEMENT

The datasets presented in this article are available from the corresponding author on reasonable request. Requests to access the datasets should be directed to giulia.marton@ieo.it.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the European Institute of Oncology ethics committee (R1185/20-IEO 1248). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

GM, LV, and KM planned and conducted the study and drafted the manuscript. GP and MG supervised all the processes, provided critical guidance, and revised the manuscript. All authors contributed to the article and approved the submitted version.

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Caring for Coronavirus Healthcare Workers: Lessons Learned From Long-Term Monitoring of Military Peacekeepers

Christer Lunde Gjerstad[1,2], Hans Jakob Bøe[1,3], Erik Falkum[2,4], Andreas Espetvedt Nordstrand[1,5], Arnfinn Tønnesen[1], Jon Gerhard Reichelt[6] and June Ullevoldsæter Lystad[2,4,7]*

[1] Institute of Military Psychiatry, Norwegian Armed Forces Joint Medical Services, Oslo, Norway, [2] Institute of Clinical Medicine, Faculty of Medicine, University of Oslo, Oslo, Norway, [3] Division of Mental Health and Addiction, Kongsberg DPS, Vestre Viken Hospital Trust, Kongsberg, Norway, [4] Division of Mental Health and Addiction, Department of Research, Oslo University Hospital, Oslo, Norway, [5] Department of Psychology, Norwegian University of Science and Technology (NTNU), Trondheim, Norway, [6] Norwegian Armed Forces Joint Medical Services, Oslo, Norway, [7] Section of Early Psychoses Treatment, Division of Mental Health and Addiction, Oslo University Hospital, Oslo, Norway

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Andrew E. P. Mitchell, University of Chester, United Kingdom

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***Correspondence:**
Christer Lunde Gjerstad
cgj083@gmail.com

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Background: The current outbreak of the coronavirus disease (COVID-19) is of unprecedented proportions in several regards. Recent reports suggest that many frontline healthcare workers (HCWs) suffer from mental health problems, including posttraumatic stress symptoms (PTSS). Previous studies have identified several key factors associated with short-term PTSS in pandemic HCWs, yet limited data is available on factors associated with long-term PTSS. Understanding the psychological impact of the pandemic on HCWs is important in planning for future outbreaks of emerging infectious diseases. In the current study, we look to findings from a highly relevant subsection of the trauma field, the military domain.

Objective: Pandemic HCWs and military peacekeepers may experience similar stressors in the line of duty. This study investigated whether factors linked to short-term PTSS in pandemic HCWs were also associated with long-term PTSS in military peacekeepers.

Materials and Methods: Peacekeepers who reported pandemic-relevant stressors during deployment to a UN peacekeeping mission were included in the study (N = 1,627). PTSS was self-reported using the Posttraumatic Stress Disorder Checklist – Military Version. Descriptive instruments were used to assess possible factors associated with PTSS. A multiple linear regression analysis was performed to explore associations between these factors and PTSS.

Results: Our model accounted for 50% of the variance in PTSS, $F(1503,11) = 139.00$, $p < 0.001$. Age, relationship and employment status, preparedness, working environment, social support after deployment, barriers to disclose, recognition, and loneliness were all significantly associated with PTSS on average 30 years after

deployment. The most important risk factors of long-term PTSS were personal barriers to disclose one's experiences and current unemployment.

Conclusion: Several factors linked to short-term PTSS in pandemic HCWs were associated with long-term PTSS in peacekeepers. We discuss how these findings may be used to prevent long-term PTSS in HCWs involved in the current COVID-19 outbreak.

Keywords: COVID-19, mental health, posttraumatic stress disorder, resilience (psychological), healthcare workers, military

INTRODUCTION

At time of writing, the world is struggling to cope with a coronavirus disease (COVID-19) pandemic of unprecedented proportions. As of August 20th, 2020, the World Health Organization (2020) has estimated almost 20 million confirmed cases and nearly 780,000 confirmed deaths in 216 countries. In this regard, many have voiced concern over the potential burden that is being put upon healthcare workers (HCWs) involved in the treatment of COVID-19 patients (i.e., Greenberg et al., 2020; Truog et al., 2020). Due to rapidly growing numbers of critically ill patients, no approved vaccine, and shortages of essential medical resources and staff, these HCWs are currently dealing with serious challenges (Chen et al., 2020). Some have even gone as far as comparing the current trials of HCWs to those of war (Horton, 2020). In particular, long and irregular work hours, shortages of personal protective equipment (PPE), personal infection risk, fear of infecting friends and family, social isolation, moral dilemmas such as deciding who to prioritize for life-saving treatments, and feelings of helplessness when not being able to help dying patients may be the brutal reality for many HCWs involved in the COVID-19 effort (Kang et al., 2020).

Research following previous pandemics like the 2003 severe acute respiratory syndrome (SARS) outbreak has shown that stressors experienced by HCWs may pose an imminent risk of stress reactions and development of adverse mental health consequences (Bai et al., 2004; Chua et al., 2004; Lee et al., 2007). In line with this, recent data from hospital wards involved in the treatment of COVID-19 patients indicate that a substantial number of HCWs experience symptoms of mental health problems, such as depression, anxiety, insomnia, and posttraumatic stress disorder (PTSD; Huang et al., 2020; Lai et al., 2020; Spoorthy, 2020).

In an effort to aid the world in this time of need, prominent voices within the trauma research community have encouraged researchers to "employ all heavy guns of scientific practice, including novel statistical analysis, unique study designs, and creative collaborations and combinations of trauma disciplines in order to deepen our understanding of the mental health implications of the current crisis" (Horesh and Brown, 2020). Attempting to respond to this call, we look to findings from a relevant subsection of the trauma field, namely, the military domain. Although not directly comparable, the challenges and dilemmas soldiers face during military peacekeeping missions are similar in nature to the current struggles of HCWs (Greenberg et al., 2020).

Peacekeeping personnel routinely make quick life-or-death decisions based on uncertain information, as well as working for extended periods in hazardous, high-risk environments with elevated levels of psychological stress. Moreover, peacekeepers are often unable to intervene due to mandate restrictions when witnessing suffering in other, often innocent parties. Thus, they frequently deal with experiences of helplessness. In addition, peacekeeping personnel and HCWs share the common feature that they are, to some extent, trained and prepared for an exceptional work environment. Finally, deployment as a peacekeeper involves enduring long-time separation from family and loved ones (Weisæth and Sund, 1982; Mehlum and Weisæth, 2002; Norwegian Armed Forces Joint Medical Services, 2016). This experience may be comparable to the self-isolation many pandemic HCWs impose on themselves to reduce risk of infecting loved ones.

Given that stressors experienced by military peacekeepers and COVID-19 HCWs are similar, lessons learned from past peacekeeping missions may have potential to inform today's situation. We know from previous pandemic research that several factors influence levels of psychological distress among HCWs. In particular, prior training and preparedness, workload levels, opportunities for rest and recuperation, social support, personal barriers to disclose one's experiences, recognition and acknowledgment, and feelings of loneliness have been found to impact stress levels (Maunder et al., 2003; Chan and Huak, 2004; Tam et al., 2004; Marjanovic et al., 2007; Khalid et al., 2016; Brooks et al., 2018; Huremović, 2019; Chen et al., 2020; Xiao et al., 2020). However, most of these studies have only examined mental health consequences during or shortly after a pandemic; little is known of what predicts mental health over time. Data on long-term mental health consequences following high stressor exposure is available in military populations (i.e., Gjerstad et al., 2020). Applying these data to identify factors important for long-term mental health outcomes may help recognize possible areas of support and intervention for HCWs facing today's challenges. By looking at subgroups of military peacekeepers reporting stressors akin to those of HCWs involved in the COVID-19 effort, we may find characteristics of those who retain their mental health despite deeply challenging circumstances. Such knowledge may be of use to hospitals in supporting critical frontline personnel and preventing adverse mental health consequences in the long run.

In the current study, we examined data from a large, post-deployment survey of soldiers deployed to a UN peacekeeping operation. Specifically, we wanted to explore whether factors that

have been linked to short-term stress and mental health problems among pandemic HCWs are also associated with long-term posttraumatic stress symptoms (PTSS) in peacekeepers reporting similar stressor exposure during deployment. Hopefully, these findings may be transferable to the civilian healthcare domain and prove valuable in caring for HCWs in the years following this pandemic.

MATERIALS AND METHODS

Participants

The study used data from a cross-sectional, post-deployment survey of Norwegian peacekeepers deployed to the United Nations Interim Force in Lebanon (UNIFIL). All Norwegian military personnel deployed to Lebanon between 1978 and 1998 were invited to participate, in total 20,678 men and women. Of the invited personnel, 11,633 responded. However, 1,028 of these were either active refusals (913) or incomplete responses (115), resulting in 10,605 valid responses and a final positive response rate of 51.3%. The response rate was comparable to those obtained in other studies on military populations (i.e., McAndrew et al., 2013; Forbes et al., 2016).

A comparison of the demographic characteristics of responders and non-responders showed that responders were slightly older and had lower frequencies of sick leaves and benefits. A complete description of the demographic characteristics of responders and non-responders have been published elsewhere (Gjerstad et al., 2020).

For the current study, peacekeepers who reported pandemic-relevant stressors during deployment (N = 1,627) were identified and included in the final sample for further analyses. Pandemic-relevant stressors were defined as stressors similar to the ones experienced by HCWs during pandemics (Greenberg et al., 2020), such as providing care to critically wounded people, being exposed to dangerous or toxic environments, risking infection from serious illnesses, making mistakes/misjudgments that result in harm or death to others, participating in morally questionable actions, or failing to take action when deemed necessary. Relevant items were discussed in the research group, achieving consensus on constructs reflecting the research objective. See **Supplementary Appendix A** for a complete list of items. Only peacekeepers who reported at least one pandemic-relevant stressor *and* rated the stressor as moderately/extremely stressful were included. Mean time since deployment in the sample was 30 years (range: 18–38 years).

Sex and age group (in years: 30–39, 40–49, 50–59, 60–69, 70+) were extracted from the Norwegian Labor and Welfare Administration (NAV). Current relationship status (in a relationship, single) and employment status (employed, unemployed) were self-reported by the respondents at the time of survey. See **Table 1** for demographic characteristics of the sample.

TABLE 1 | Demographic characteristics of the study population (N = 1,627).

Characteristic	*N*	*n*	%
Sex	1627		
Female		23	1.4
Male		1604	98.6
Age Group, Years	1627		
30–39		9	0.6
40–49		397	24.4
50–59		849	52.2
60–69		312	19.2
70+		60	3.7
Relationship Status	1612		
In a Relationship		1191	73.9
Single		421	26.1
Employment Status	1568		
Employed		1196	76.3
Unemployed		372	23.7

Procedure

A printed version of the survey questionnaire, as well as a letter containing an internet link and unique login credentials, were mailed to all invited participants, giving them the choice of answering either the printed version or an equivalent digital version of the questionnaire. The data collection phase lasted from September 2014 to April 2015 and included two reminders.

Measures

Dependent Variable

Posttraumatic stress disorder checklist – military version (PCL-M)

The PCL-M (Weathers et al., 1993) is a commonly used self-rating instrument containing 17 items representing the Diagnostic and Statistical Manual of Mental Disorders, 4th ed., text rev. (DSM-IV-TR; American Psychiatric Association, 2000) diagnostic criteria for PTSD. It is a well-validated measure for screening of PTSS in military populations and shows good temporal stability, internal consistency, and convergent validity (Wilkins et al., 2011). Respondents were asked to rate the frequency of symptoms experienced during the past week. Each item was rated on a 5-point Likert scale with the response categories 1 (*not at all*); 2 (*a little bit*); 3 (*moderately*); 4 (*quite a bit*); and 5 (*extremely*), giving a total score range of 17–85 (M = 32.58, SD = 16.63, SE = 0.41, α = 0.97). A higher score indicated more PTSS.

Independent Variables

The instruments described in this section were constructed specifically to capture the unique experiences of Norwegian Armed Forces personnel deployed to Lebanon or Afghanistan (Norwegian Armed Forces Joint Medical Services, 2012, 2016). The instruments were mainly assembled to serve important descriptive purposes; hence, most of them were not yet empirically validated. As recommended by Eisinga et al. (2013), Cronbach's coefficient alpha was reported as a measure of reliability for instruments containing three or more items, while Spearman–Brown coefficient was reported for instruments containing only two items.

Preparedness

Preparedness was measured by the following two items: "*The service corresponded to my civilian or military education or work experience*" and "*I was given adequate training and was well prepared for the service.*" Respondents were asked to indicate how much they agreed with each statement on a 5-point Likert scale with the response categories 1 (*not at all*); 2 (*to a small degree*); 3 (*to some degree*); 4 (*to a large degree*); and 5 (*to a very large degree*), giving a total score range of 2–10 (M = 6.06, SD = 1.82, SE = 0.05, r_{SB} = 0.50). A higher score indicated a higher degree of preparedness.

Workload

Workload was measured by the following two items: "*The workload was too heavy*" and "*The work was demanding.*" Respondents were asked to indicate how much they agreed with each statement on a 5-point Likert scale with the response categories 1 (*not at all*); 2 (*to a small degree*); 3 (*to some degree*); 4 (*to a large degree*); and 5 (*to a very large degree*), giving a total score range of 2–10 (M = 6.73, SD = 1.68, SE = 0.04, r_{SB} = 0.67). A higher score indicated a higher workload.

Rest and recuperation

Rest and recuperation were measured by five statements concerning opportunities for rest/sleep, recreation, and personal space, as well as sanitary conditions and access to food/drink during deployment. Respondents were asked to indicate how much they agreed with each statement on a 5-point Likert scale with the response categories 1 (*not at all*); 2 (*to a small degree*); 3 (*to some degree*); 4 (*to a large degree*); and 5 (*to a very large degree*), giving a total score range of 5–25 (M = 14.96, SD = 3.65, SE = 0.09, α = 0.81). A higher score indicated better opportunities for rest and recuperation.

Social support

Social support was measured both as perceived support from colleagues and superiors during deployment and as perceived access to social support after deployment.

Social support during deployment was gauged by the following two items: "*I experienced cohesion and support from my colleagues*" and "*I had superiors who were supportive of me.*" Respondents were asked to indicate how much they agreed with each statement on a 5-point Likert scale with the response categories 1 (*not at all*); 2 (*to a small degree*); 3 (*to some degree*); 4 (*to a large degree*); and 5 (*to a very large degree*), giving a total score range of 2–10 (M = 6.94, SD = 1.66, SE = 0.04, r_{SB} = 0.55). A higher score indicated a higher degree of social support.

Social support after deployment was gauged by the following two items: "*In the time after deployment, I had access to people who could support me if I had problems*" and "*In the time after deployment, how many people were so close to you that you could count on them for support if you had substantial personal problems?.*" Respondents were asked to indicate how much they agreed/how many close confidents they had on a 5-point Likert scale with the response categories 1 (*not at all/none*); 2 (*to a small degree/1 person*); 3 (*to some degree/2 persons*); 4 (*to a large degree/3–5 persons*); and 5 (*to a very large degree/6+ persons*), giving a total score range of 2–10 (M = 6.47, SD = 2.31, SE = 0.06, r_{SB} = 0.68). A higher score indicated a higher degree of social support.

Personal barriers to disclose

The measure of personal barriers to disclose one's experiences was developed by the project group for the 2012 Afghanistan Study (Norwegian Armed Forces Joint Medical Services, 2012; Nordstrand et al., 2020). Respondents were asked to relate to their deployment and rate the following three items: "*I experienced incidents which I have not been able to tell others about, not even those closest to me*"; "*I have had/have problems that I am not able to share with family or friends*"; "*There is no one at home who is able to understand what I have experienced.*" Each item had a 5-point Likert response format with the following response categories: 1 (*completely disagree*); 2 (*disagree somewhat*); 3 (*either/or*); 4 (*agree somewhat*); and 5 (*completely agree*), giving a total score range of 3–15 (M = 8.31, SD = 3.52, SE = 0.09, α = 0.76). A higher score indicated more personal barriers to disclose.

Recognition

Recognition was measured by five statements concerning perceived recognition and acknowledgment of one's effort by government/politicians, media/public debate, family/friends, society in general, and the armed forces. Each item had a 5-point Likert response format with the following response categories: 1 (*completely disagree*); 2 (*somewhat disagree*); 3 (*either/or*); 4 (*somewhat agree*); and 5 (*completely agree*), giving a total score range of 5–25 (M = 14.39, SD = 4.49, SE = 0.11, α = 0.87). A higher score indicated a higher degree of recognition.

Loneliness

Loneliness was measured by a single item: "I felt lonely." Respondents were asked to indicate how much they agreed with the statement on a 5-point Likert scale with the response categories 1 (*not at all*); 2 (*to a small degree*); 3 (*to some degree*); 4 (*to a large degree*); and 5 (*to a very large degree*), giving a total score range of 1–5 (M = 2.02, SD = 0.93, SE = 0.02). A higher score indicated a stronger feeling of isolation/loneliness.

Data Analysis

Descriptive statistics were used to report demographic characteristics. A correlation matrix displayed bivariate relationships between the regression variables. Multiple linear regression analysis was executed to explore key factors associated with PTSS. All variables were entered in the same step. The tests of collinearity (i.e., tolerance and VIF) were all within acceptable limits (Hair et al., 2014). In cases of missing data, listwise deletion was employed. This applied for up to 3.6% of the sample. All analyses were performed using IBM SPSS Statistics version 25.0 (IBM Corp, 2017).

RESULTS

Age, relationship status, and employment status have previously been identified as potential confounder variables in trauma studies (Chan and Huak, 2004; Tam et al., 2004; Bosmans and Der Velden, 2018). Hence, they were included as control variables in the regression analysis. Due to the large sex bias in the current

sample (98.6% males), we did not control for sex. See **Table 1** for demographic characteristics of the sample.

The intercorrelation matrix showed significant small to medium correlations between all independent variables (except age) and PTSS, with the strongest correlations being with personal barriers to disclose (r = 0.54) and social support after deployment (r = −0.45). There were also significant small to medium correlations between several of the independent variables. See **Table 2** for complete intercorrelation matrix.

The results of the regression analysis are displayed in **Table 3**. Overall, the model accounted for 50% of the variance in PTSS, $F(1503,11) = 139.00$, $p < 0.001$, and all variables except social support during deployment were significantly associated with PTSS. Lower age, being single, and being unemployed at the time of survey were associated with more PTSS. Being unemployed at the time of survey was the most important factor among the demographic variables (β = 0.26, $p < 0.001$). In terms of the other independent variables, a higher degree of preparedness, better opportunities for rest and recuperation, more social support after deployment, and more perceived recognition were associated with less PTSS, while higher workload, more personal barriers to disclose one's experiences, and a stronger feeling of loneliness were associated with more PTSS. Personal barriers to disclose was the single most important factor associated with PTSS (β = 0.29, $p < 0.001$).

TABLE 3 | Summary of multiple linear regression analysis for factors associated with PTSS (N = 1,514).

	B	*SE B*	β
Demographics			
Age Group	−1.73	0.43	−0.08***
Relationship Status	3.49	0.72	0.09***
Employment Status	10.33	0.80	0.26***
Preparedness	−0.52	0.19	−0.06**
Working Environment			
Workload	0.61	0.21	0.06**
Rest and Recuperation	−0.41	0.11	−0.09***
Social Support			
During	0.09	0.21	0.01
After	−1.02	0.16	−0.14***
Barriers to Disclose	1.37	0.10	0.29***
Recognition	−0.39	0.08	−0.10***
Loneliness	2.30	0.38	0.13***
Adj. R^2		0.50	
F		139.00***	

** $p < 0.01$, *** $p < 0.001$.

DISCUSSION

Summary of Main Findings

Our regression model showed that age, relationship and employment status, preparedness, working environment, social support after deployment, barriers to disclose, recognition, and loneliness were all significantly associated with long-term PTSS in our sample of peacekeepers. Social support during deployment was, however, not associated with PTSS. The most important risk factors of PTSS were personal barriers to disclose one's experiences and unemployment at time of survey.

TABLE 2 | Intercorrelation matrix (Pearson two-tailed) for PTSS and independent variables (N = 1,627).

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
1. PTSS	32.58	16.63												
2. Age Group	4.01	0.78	−0.01											
3. Relationship Status			0.21***	0.07**										
4. Employment Status			0.31***	0.30***	0.25***									
5. Preparedness	6.06	1.82	−0.29***	0.02	−0.04	−0.05								
6. Workload	6.73	1.68	0.29***	0.05*	0.03	0.11***	−0.14***							
7. Rest and Recuperation	14.96	3.65	−0.37***	−0.11***	−0.05*	−0.10***	0.41***	−0.43***						
8. Social Support During	6.94	1.66	−0.22***	−0.07**	−0.06*	−0.08**	0.24***	−0.02	0.26***					
9. Social Support After	6.47	2.31	−0.45***	−0.05	−0.12***	−0.19***	0.25***	−0.14***	0.27***	0.28***				
10. Barriers to Disclose	8.31	3.52	0.54***	−0.06*	0.07**	0.16***	−0.25***	0.31***	−0.35***	−0.17***	−0.44***			
11. Recognition	14.39	4.49	−0.39***	0.11***	−0.07**	−0.09***	0.29***	−0.16***	0.30***	0.27***	0.37***	−0.39***		
12. Loneliness	2.02	0.93	0.39***	−0.03	0.09**	0.13***	−0.25***	0.19***	−0.31***	−0.43***	−0.31***	0.28***	−0.25***	

*Spearman's rho is reported for correlations involving the two dichotomous variables relationship status and employment status. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.*

Demographic Variables

Lower age, being single, and being unemployed were all risk factors of long-term PTSS, with unemployed being most important. The relationship between unemployment and mental health problems has been confirmed through review studies (i.e., Shuo and Vishal, 2013). An explanation of the adverse consequences of unemployment may be found in the so-called *healthy worker effect phenomenon*; employed individuals tend to have lower morbidity and mortality rates than unemployed individuals (Shah, 2009). Recent findings suggest that this effect is also relevant in a post-trauma recovery context, where employment is associated with significantly lower levels of posttraumatic stress (Bosmans and Der Velden, 2018). Further, preliminary results from a study investigating factors associated with mental health problems in the general public during the COVID-19 pandemic suggest that employment protects against mental health problems (Ebrahimi et al., 2020). Healthcare workers' employment status in the aftermath of a pandemic should thus be considered, as unemployment could prolong the process of recovery and lead to more severe posttraumatic stress reactions over time. Particular attention should be paid to those HCWs who have been recruited specifically to work with COVID-19 patients due to extraordinary staffing needs (i.e., Mansoor, 2020). Such HCWs may be students, retired or otherwise outside the workforce, and possibly be more likely to experience unemployment after the pandemic has passed.

Preparedness

A higher degree of preparedness, in terms of sufficient training and correspondence between previous education/work experience and service, was associated with fewer symptoms of long-term posttraumatic stress in our sample. Preparedness may be a key factor in the development of PTSS by means of its association with perceived threat (Schnurr et al., 1993). In the case of the current pandemic, realistic training and preparations will likely reduce stress levels and perceptions of threat among frontline HCWs and hence mitigate development of long-term PTSS (Greenberg et al., 2015; Tan et al., 2020). Preparedness may also protect HCWs from feeling overwhelmed and increase their ability to maintain the professional stance and distance needed for coping with the pandemic over time. Specifically, these findings might highlight the importance of allotting time for HCWs to familiarize themselves with novel medical procedures and practicing technical skills.

Working Environment

Workload and rest and recuperation were both significantly associated with PTSS. Higher workload was associated with more PTSS, while better opportunities for rest and recuperation were associated with less PTSS. This is concurrent with previous findings (Litz, 2014; Prince et al., 2015; Chappelle et al., 2019) and is easily transferrable to the ongoing pandemic. High workloads and excessive work hours have been highlighted as potential sources of mental health problems in COVID-19 HCWs (Spoorthy, 2020). From the field of occupational medicine, workload and shift duty are well-known workplace stressors (McFarlane and Bryant, 2007), and in the context of a pandemic, this is adding to potentially traumatic experiences. Optimally, hospitals and healthcare services should identify and manage workload risks at an organizational level, avoiding adverse consequences in a timely manner. Managing such risks also entails facilitating sufficient opportunities for rest and recuperation for HCWs. Moreover, if possible, ensuring that taxing work assignments are rotated between personnel may be an important stress-preventive strategy (Marjanovic et al., 2007; Adriaenssens et al., 2015). Potential pitfalls may otherwise be non-attendance due to stress, excessive workload, prospective illness, and long-term mental health problems.

Social Support and Personal Barriers to Disclose

Perceived social support from colleagues and superiors during deployment was not significantly associated with long-term PTSS. This contrasts with findings from the healthcare domain. Several studies have documented that social support in the workplace is negatively associated with general psychiatric symptoms and PTSS in pandemic HCWs (Chan and Huak, 2004; Tam et al., 2004). Previous studies have hypothesized that the links between social support and PTSS may be dependent upon trauma typology (Valentiner et al., 1996; Ullman and Filipas, 2001). In particular, the moderating effects of social support on morally challenging traumas may be sensitive to both the type of social support given and from whom the social support is provided. In other words, the impact of social support may be greater if it is provided by close friends or significant others, especially if the relevant trauma is morally challenging. A characteristic of the stressor exposure of both peacekeepers and HCWs is the common occurrence of morally challenging traumas (Jordan et al., 2017; Kang et al., 2020).

The protective effect of post-trauma social support is documented in several studies on both military and civilian populations. In a recent study, Nordstrand et al. (2020) examined the effect of post-trauma social support on posttraumatic development in a sample of Afghanistan veterans. The authors also looked at how social support interacted with personal barriers to disclose traumatic experiences. Although barriers were originally associated with posttraumatic deprecation, this effect diminished when social support was included in the model. The authors concluded that post-trauma social support seemed to buffer against the negative effect of barriers; however, this effect will have to be confirmed by prospective studies.

In the current study, a similar negative association was found between barriers to disclose and PTSS. In fact, barriers to disclose was the most important factor associated with PTSS in our regression model. However, unlike in Nordstrand and colleagues' model (Nordstrand et al., 2020), both social support and barriers to disclose were significantly associated with PTSS, albeit in opposite directions. Although perceived social support in the aftermath of trauma seems to protect against long-term PTSS, barriers to disclose may weaken this effect. Hence, it is vital to overcome personal barriers to disclose one's experiences in order to utilize available social support. This is concurrent with findings

from both the military and civilian trauma domain (Ullman and Filipas, 2001; Guay et al., 2006; Thoresen et al., 2014).

Moreover, studies have demonstrated strong correlations between morally challenging traumas and socially inhibitory feelings such as guilt and shame (Ramage et al., 2016; Jordan et al., 2017; Nordstrand et al., 2019), thus increasing reticence to talk about such experiences (Pietrzak et al., 2009; Gray et al., 2012). Accordingly, it may be important to not only be aware of the potentially morally challenging stressors HCWs face but also help lower barriers toward disclosing such stressors to significant others. Our findings further imply that healthcare administrators should facilitate mechanisms and support systems that help break down such barriers and encourage HCWs to share their experiences. Removing barriers to disclose seems crucial to prevent long-term PTSS.

Recognition

Perceived recognition of effort was significantly associated with lower levels of long-term PTSS in our sample. Recognition in the form of positive homecoming receptions and similar appreciative events have previously been associated with less psychological distress in peacekeepers (Sareen et al., 2010). Similarly, a study investigating organizational support to HCWs during the Toronto SARS outbreak found that recognition from hospital management was associated with lower perceived personal threat and less emotional exhaustion (Fiksenbaum et al., 2006). Further, a lack of positive media coverage, albeit a more circumferential measure of public acknowledgment, has been found to impact mental health in peacekeepers negatively, leading them to feel forgotten and less important (Raju, 2014). Societal recognition and acknowledgment are thus factors likely to be related to mental health, both in peacekeepers and in pandemic HCWs. Sufficient public support and recognition may consequently be key determinants of post-outbreak mental health in COVID-19 HCWs.

Loneliness

Although only measured with a single item, loneliness had a strong positive association with PTSS in the current study. Peacekeepers who reported feeling lonely during deployment also reported more long-term symptoms of PTSS. Loneliness is not unique to peacekeeping or military personnel; HCWs may be confronted with similar circumstances during the ongoing pandemic. Whereas most people are encouraged to work from and stay at home with their families, HCWs face higher workloads, working in shifts as well as having to deal with serious illness. This, combined with a concern of potentially infecting friends and family, may result in social isolation and, in turn, loneliness (Ornell et al., 2020).

Loneliness is meanwhile a well-established associate of poor physical health (Hawkley et al., 2010; Valtorta et al., 2016). However, loneliness is also a prominent risk factor of mental illness (Masi et al., 2011; Wang et al., 2018). A meta-analysis by Masi et al. (2011) identified strategies such as enhancing social support and increasing possibilities for social interactions as important interventions for reducing loneliness. Applied to the ongoing pandemic, providing HCWs with increased access to activities considered to be effective coping mechanisms (Shwalb, 2007) may be of importance. Further, the use of digital platforms to maintain contact with close ones may also prevent loneliness to a certain degree (Chen et al., 2020). Finally, formal and informal social support from managers and coworkers in terms of improving open communication and establishing buddy systems for collegial support may be important preventive measures (de Boer et al., 2014).

Limitations

Several methodological issues warrant consideration. The cross-sectional nature of the study does not allow for causal interpretation of the data; longitudinal studies are needed to explore temporal relationships between the independent variables and PTSS. Further, it could be argued that surveying respondents about what they experienced on average 30 years ago makes the data vulnerable to recollection bias. However, studies have demonstrated that the fear of recollection bias is often exaggerated (McNally, 2003). Moreover, self-report may be viewed as an unreliable way of measuring posttraumatic stress. Bearing this in mind, we have used symptoms of posttraumatic stress rather than cases of PTSD as the dependent variable.

To accommodate requirements of brevity and applicability to the research setting and the population, some of the independent variables were measured using unvalidated questionnaires. The reliance on these measures' face validity may be a limitation that should be considered.

Finally, caution should be applied in generalizing these results from peacekeepers to pandemic HCWs. Although peacekeepers and HCWs face similar stressors during service, a peacekeeping mission and a pandemic are ultimately two different things. In addition, most peacekeepers in our sample were male, whereas most HCWs are female (Boniol et al., 2019). However, *post hoc* analyses revealed that the PTSS distributions were not significantly different between male and female peacekeepers, $t(1603) = -0.89$, $p = 0.37$. Further, sex was not significantly associated with PTSS when added to the regression model ($\beta = 0.00$, $p = 0.815$). Thus, our findings may hopefully be of relevance to both male and female frontline personnel exposed to major stressors or potentially traumatic events in the line of duty.

Conclusion and Clinical Implications

The current study has identified several key factors associated with long-term posttraumatic stress in a sample of military peacekeepers exposed to pandemic-relevant stressors. Our results seem to confirm that factors linked to short-term stress and mental health problems among pandemic HCWs are also associated with long-term PTSS in peacekeepers. These findings may transfer to HCWs facing the ongoing coronavirus pandemic. Importantly, we suggest that healthcare administrators facilitate social support systems that encourage HCWs to share difficult experiences with others, as this may prevent feelings of loneliness

and help maintain resilience in the face of crisis. Moreover, particular attention should be paid to HCWs who have been recruited specifically to work with coronavirus patients due to extraordinary staffing needs, but who are usually either students, retired or otherwise outside the workforce. These individuals may be less prepared and more at risk of PTSS. Attending to these concerns may prove valuable in alleviating long-term mental health problems in this all-important group of frontline health care providers.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because they are stored in accordance with the existing legislation regulating the Norwegian Armed Forces Health Registry. Requests to access the datasets should be directed to the Norwegian Armed Forces Health Registry, email: datatilgang@forsvaretshelseregister.no.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Norwegian Armed Forces Joint Medical Services Research Council and the Regional Committee for Medical and Health Research Ethics of South-East Norway. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CG and JL contributed to the theoretical conception of the study and the interpretation of the results, performed the statistical analyses, and drafted the manuscript. All authors reviewed and edited the manuscript and made a substantial intellectual contribution to the manuscript and approved it for publication.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.566199/full#supplementary-material

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The Effect of the Fear of COVID-19 on Healthcare Professionals' Psychological Adjustment Skills: Mediating Role of Experiential Avoidance and Psychological Resilience

İsmail Seçer[1], Sümeyye Ulaş[2] and Zeynep Karaman-Özlü[3]*

[1] Faculty of Education, Counseling and Guidance, Atatürk University, Erzurum, Turkey, [2] School of Health, Gümüşhane University, Gümüşhane, Turkey, [3] Faculty of Nursing, Atatürk University, Erzurum, Turkey

As the COVID-19 outbreak is rapidly spreading all over the world, it's secondary consequences will negatively affect both societies and individuals. The target group, expected to be exposed to the secondary negative consequences most intensely during the pandemic process and afterward, is undoubtedly the healthcare professionals. In this research, the impact of the fear that healthcare professionals in Turkey developed against the outbreak of COVID-19 on their psychological adjustment skills is examined, and in this context, the mediating role of experiential avoidance and psychological resilience is examined. In this context, an answer was sought for the question "Does experiential avoidance and psychological resilience have a mediating role in the impact of COVID-19 fear on psychological adjustment skills of healthcare professionals?" The research was carried out with a total of 370 healthcare professionals reached via online data collection method. Structural equation modeling was used in the data analysis process, and as a result, it was determined that the fear of COVID-19 had a negative effect on the psychological adjustment in healthcare professionals; however, psychological resilience was found to have a protective function that limits this effect, and experiential avoidance has a risk factor that aggravates this effect. Findings obtained from the research are discussed in the context of the literature.

Keywords: fear of COVID-19, psychological adjustment, experiential avoidance, psychological resilience, healthcare professionals

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University of Valladolid, Spain

****Correspondence:***
İsmail Seçer
ismail.secer@atauni.edu.tr

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INTRODUCTION

The COVID-19 epidemic started in late 2019 in China, spread rapidly throughout the world, and has affected both societies and individuals in many aspects. After being described as a pandemic by World Health Organization [WHO] (2020), a wide variety of prevention and treatment approaches have been applied worldwide. Applying precautions such as social distancing and strict quarantine in many countries especially in China, Italy, Spain, and Turkey has become one of the most basic tools used to limit the spread of the disease.

Despite all kinds of precautions, millions of people worldwide have been infected with this disease (World Health Organization [WHO], 2020). However, the number of those who recovered have been one and a half million (World Health Organization [WHO], 2020). The number of people who died due to the pandemic has been more than 200,000. The burden of all individuals infected, treated, and returned to their normal life or passed away is on the shoulders of healthcare professionals all over the world. Healthcare professionals have to identify the people infected with the disease, respond to their treatment needs, carry out the severe and difficult treatment processes in hospitalized patients, face the psychological breakdown created by each patient passed away and also face the risk of developing the disease at any time. Each mentioned situation is a difficult living condition in itself, and these conditions are expected to create secondary consequences for healthcare professionals in the short- and long-term. Banerjee (2020) and Ornell et al. (2020) stated that there is an important possibility to see the secondary consequences in every aspect of the society during pandemic periods and that emotional and behavioral problems such as *anxiety, fear, depression, suicide, substance abuse*, etc. may come to the fore among them. In this context, it is thought that the healthcare professional, who are at the forefront of the fight against the pandemic, have an unwanted but important possibility to develop the secondary symptoms in addition to the possibility of getting infected with the virus.

Individuals' responses to challenging living conditions can generally be as shock, panic, acute stress, post-traumatic stress disorder, grief disorder, anxiety disorder and depression, etc. (Aydın, 2020). Each of these forms of response directly points to the individual's psychological adjustment skills. If psychological adjustment is considered as the ability of the individual to cope with daily life difficulties, to control intense anxiety, depressive symptoms, and stress factors, it can be said that traumatic and challenging living conditions can have an effect that forces the psychological adjustment skills of the individual. In this context, it can be interpreted that the difficult life conditions experienced by healthcare professionals due to the COVID-19 outbreak may put them at a disadvantage and trigger various psycho-social problems in the context of psychological adjustment skills.

In this context, it can be said that the first negativity expected to threaten the psychological adjustment skills of the healthcare professionals is the fear developing due to COVID-19. Fear is a defense mechanism of an individual against dangerous situations and includes the basic responses of the individual in order to survive and protect themselves against these threatening situations. However, the disproportionate level of fear can predispose to various psychopathologies (Shin and Liberzon, 2010; Garcia, 2017; Shigemura et al., 2020; Wang et al., 2020). Even in healthy individuals, there may be a risk of densification of symptoms such as stress, and thus establishing an environment for psychological disorders (Ornell et al., 2020; Shigemura et al., 2020). Although there is no definite epidemiological data regarding the psychological effects of COVID-19 on individuals and its effect on public health, the results of the limited studies show that the fear of getting COVID-19 leads to intense emotional and behavioral consequences such as boredom, loneliness, anxiety, sleep problems and anger (Brooks et al., 2020b). The results of studies indicate depression, anxiety disorders, post traumatic stress disorder (PTSD), paranoid and psychotic disorders, and even suicide among the emotional behavioral consequences of this fear (Xiang et al., 2020). Considering the fact that healthcare professional may also be susceptible to various psychopathological conditions, it may be thought that the potential risk situation will increase even more. Hence, the data related to the literature indicate that traumatic and challenging living conditions can be more common in individuals with prior psychological disorders (Wang et al., 2020; Park and Park, 2020). Research results on the former Ebola-like outbreaks also support this view (Reardon, 2015; Shigemura et al., 2020). Even if the pandemic periods are over, secondary psycho-social effects expected to occur in healthcare professional who experience trauma closely, and it may affect the individual's quality of life for a long time (Shultz et al., 2016). Therefore, it can be expected that the fear that healthcare professionals develop in this process will have a negative effect on their psychological adjustment skills by triggering various psychopathological symptoms.

There are also some characteristics that strengthen or make the individual's position disadvantageous in the face of difficult living conditions. In this context, experiential avoidance can be shown as an important determining variable among the variables that shape the level of exposure of the individual to challenging life events. Experiential avoidance is defined as reluctance to experience emotions, thoughts, moments and physical feelings that are considered negative and avoidance responses to reduce the frequency or effect of these experiences (Hayes et al., 1996). It is also expressed as the rigid and unchangeable attitude that the individual adopts in the face of negativities and is associated with various psychological problems in this aspect (Ottenbreit and Dobson, 2004). This concept, which includes both different experiences avoided and different strategies used for avoidance, also covers the cognitive, emotional and behavioral dimensions of avoidance. In this sense, it is thought that experiential avoidance has important effects on the psychological adjustment skills of the individual in the short- and long-term. That is, facing negative situations, the individual often uses a number of ways such as paying attention to another direction, denial and repression, but these ways can prepare an environment for the effects of the negativity avoided in the long run to continue and the problems associated with it to become widespread (Briggs and Price, 2009; Hayes et al., 2012). Accordingly, it can be said that the possible avoidance responses due to the fear of COVID-19 can play an important role in the emergence and persistence of many psychological problems. There are only a limited number of studies addressing the psychological effects of the COVID-19 outbreak on individual and public health, as the problem is still new. However, limited studies indicate that individuals show severe signs of adjustment disorders (Ornell et al., 2020; Shigemura et al., 2020). Individuals naturally will try to get rid of this problem through effective coping strategies. However, the secondary effects developing due to the pandemic may become chronic in individuals who show avoidance reactions with the effect of various psycho-social factors. The data related to the literature support this idea. For example, Santanello and Gardner (2007) and

Mahaffey et al. (2013) determined that individuals with high experiential avoidance have intense anxiety disorders. Cribb et al. (2006) and Briggs and Price (2009) determined that they have depression. Rawal et al. (2010) determined that they have eating disorders, Orcutt et al. (2005) determined post-traumatic stress disorders, and Machell et al. (2015) determined that low level of subjective well-being. Therefore, it can be argued that the healthcare professionals' avoidance responses, which we can define as the dysfunctional coping approaches, are a risk factor that can disrupt psychological adjustment skills in the short- and long-term.

Despite the risk factor expected to be experienced in healthcare professionals through the experiential avoidance, psychological resilience can be demonstrated as a feature that strengthens the positions of the healthcare professionals against the adverse effects caused by the COVID-19 outbreak, and it enables them to cope effectively both personally and professionally. Psychological resilience has been defined by Brooks et al. (2020a) and Earvolino-Ramirez (2007) as the ability of the individual to quickly rally, recover and return to pre-crisis status after being hurt. Similarly, it is defined as the ability of the individuals to be able to return to the status that enables them to be successful in uncertain and challenging processes (Luthans et al., 2006; Seçer and Ulaş, 2020a) and to fulfill the tasks and behaviors expected from them (Öz and Yılmaz, 2009). From this point of view, psychological resilience can be seen as an important protective function in professions serving in traumatic processes including healthcare professionals (Brooks et al., 2020a), and in this respect, it can be thought that it has an effect that prevents the psychopathologies developed due to the COVID-19 process from becoming chronic and limits its dimension of threatening the life of the individual in a short- and long-term.

In line with the information related to the literature given above, it is clear that the fear of COVID-19 poses a significant risk for its potential to disrupt healthcare professionals' psychological adjustment skills. This risk can be expected to deepen in healthcare professionals with experiential avoidance. On the other hand, it is thought that psychological resilience can strengthen the position of healthcare professional in dealing with the negativity caused by the epidemic. Accordingly, in this research, the effect of fear of getting COVID-19 on the psychological adjustment levels of healthcare professionals was examined through the mediating role of experiential avoidance and psychological resilience. The results of the research are expected to contribute to the understanding of the nature and consequences of secondary health problems likely to develop due to the COVID-19 in healthcare professionals as well as to expand our perspective on understanding individual risks and protective factors. It is possible that this broadening in our perspective will have important consequences for the development and implementation of preventive and rehabilitative practices for healthcare professionals after the pandemic. In this direction, answers to the questions given below were sought within the scope of the research.

(1) What is the general view of psychological adjustment skills in healthcare professionals?
(2) Does the fear of COVID-19 have a direct predictive effect on psychological adjustment in healthcare professionals?
(3) How is the effect of COVID-19 fear on psychological adjustment shaped in healthcare professionals after the variables of experiential avoidance and psychological resilience were added to the model?

MATERIALS AND METHODS

Participants

Participants of the research consist of 390 healthcare professionals aged between 20 and 65 years (m = 16.40, SD = 2.14). 73.3% of the participants are females, 25.2% are males, and 1.5% are those who did not indicate their genders. In reaching the participants, an online data collection process was used. In this context, the data were collected from a total of 390 healthcare professionals (doctors, nurses, pharmacists, health officers, medical attendants, etc.) by reaching them from the healthcare organizations in different regions of Turkey through a convenient sampling method. In this context, especially the relevant hospital administrations were contacted and they were asked to direct the online data collection link to the personnel they deem appropriate. Forty-five percent of the healthcare professionals constituting the participants are married, 52.4% are single, and 7% are in the divorced-separate category. In addition, 14.7% of the participants have at least one chronic condition (In the personal ınformation form, it was asked "Have you have a psychological or medical illness?" and data on 17 healthcare professionals who stated that they had a psychological illness were not included in the analysis) and 58.7% of them have at least one task related to COVID-19 in the hospitals they work. Considering their assigned positions, 49.3% of the participants work in other services other than intensive care and outpatient clinics (Dialysis Unit, Chemotherapy Unit, Blood Center, etc.), 20.2% in emergency services, 16% in intensive care services, 8.8% in outpatient services, and 5% in ambulance services.

Measures

The Fear of COVID-19 Scale

The Fear of COVID-19 Scale is a self-report based assessment tool consisting of seven items and one dimension developed by Ahorsu et al. (2020) to assess the anxiety and depressive symptoms that develop due to the COVID-19 outbreak in individuals. The scale is a four-point Likert type (never, rarely, often, and always) for individuals in the age group 18 and over (Sample questions are like "I am very afraid of coronovirus and talking about coronovirus bothers me"). The scale was adapted to Turkish culture for adults by Satici et al. (2020). The scale preserved the seven items in its original form in Turkish culture (χ^2/SD = 2.10, REMSEA = 0.041, RMR = 0.037, SRMR = 0.040, CFI = 0.99). The internal consistency value of the scale was calculated as Cronbach Alpha 0.91. The scores that can be obtained from the scale range from 7 to 28. The high scores indicate the high level of fear of coronavirus.

Experiential Avoidance Scale

Experiential Avoidance Scale is a self-reporting four-point likert type (never, rarely, often, and always) assessment tool adapted to Turkish culture (Ekşi et al., 2018) and developed to determine the avoidance responses of individuals against various experiences (Sahdra et al., 2016). The sub-dimensions included in the scale are *behavioral avoidance, distress aversion, procrastination, distraction/suppression, repression/denial*, and *distress endurance* (Sample questions are: "Even if it is very little, I avoid activities that may hurt me and avoid situations where I may feel nervous"). There are five items in each sub-dimension and the scale consists of 30 items in total. The scores that can be obtained from the scale range from 30 to 120. In the scale, only the scores of the sub-dimensions are calculated instead of the total score and the high scores indicate the problematic avoidance in the relevant sub-dimension. Within the scope of this research, the factor structure of the scale was reviewed based on the data obtained from the study group and model fit indexes (χ^2/SD = 2.41; REMSEA = 0.071, RMR = 0.073, SRMR = 0.070, CFI = 0.98) and internal consistency coefficient Cronbach alpha = 0.85 were determined to be sufficient.

Brief Resilience Scale

Brief Resilience Scale is a four-point likert type (never, rarely, often, and always) assessment tool developed by Smith et al. (2008) and adapted to Turkish culture by Doğan (2015). The scale consists of six items, and the high scores indicate a high level of psychological resilience. The scores that can be obtained from the scale range from 6 to 24 (Sample items are: "It does not take me a long time to come to myself after stressful situations and I will survive difficult times with very little trouble"). In this research, the construct validity of the scale was reviewed, and it was determined that the model fit indices (χ^2/SD = 1.96; REMSEA = 0.062, RMR = 0.063, SRMR = 0.067, CFI = 0.98) were at a good level and internal consistency coefficient Cronbach alpha = 0.91 were determined to be sufficient.

Depression Anxiety Stress Scales

Depression Anxiety Stress Scales is a four-point likert type (never, rarely, often, and always) assessment tool developed by Lovibond and Lovibond (1995) to assess symptoms of depression, anxiety, and stress, and then revised to 21 items by Brown et al. (1997). The scale was adapted to Turkish by Yılmaz et al. (2017). The data on the construct validity of the scale (χ^2/SD = 2.84; REMSEA = 0.051, RMR = 0.036, CFI = 0.98) showed that the three-factor structure with 21 items had a good fit level and internal consistency coefficient Cronbach alpha = 0.79 were determined to be sufficient (Sample questions are: "I felt scared even though there was no valid reason, and I was worried as I would panic and have egg on my face."). The scores that can be obtained from the scale range from 21 to 84, and high scores indicate the high levels of the symptoms of depression, anxiety, and stress.

Procedure and Data Analyses

The research initiated with obtaining permission to conduct the research from Gümüşhane University Health Sciences Ethics Committee, then, the necessary permissions were provided from the local administrators. In the data collection process, online tools were used due to the intensive working hours of the healthcare professional and social distancing restrictions. In this context, the online data collection link[1] prepared via Google Forms was delivered to healthcare professionals through email and instant messaging apps. In this sense, healthcare professionals were contacted through the relevant hospital chief physicians and other relevant units, and additional explanations about volunteering and data confidentiality were also added to the online data collection link. Information regarding the fact that they can cancel filling the questionnaire at any time was also added. The online data collection process was completed within 15 days. Data collection and compilation were carried out by three researchers experts in health sciences, psychology, and psychological counseling. Since the data collection process was online, there was no data loss. On the other hand, when the parametric conditions were examined, it was determined that the data of 17 participants included extreme values that would disturb normality, and it was decided to exclude them from the data set.

In order to find answers to the research questions, structural equality analyses were carried out with the LISREL 9.2 software. In this context, the confirmatory measurement model was tested to examine the fit of the model constructed in the preliminary analysis. In the measurement model, one implicit variable was defined for the fear of COVID-19, experiential avoidance, psychological resilience, and psychological adjustment variables, and a total of 22 indicative variables were defined. The fit indices for the measurement model (χ^2/SD = 1.60; REMSEA = 0.071, RMR = 0.073, SRMR = 0.073, NFI = 0.95, CFI = 0.97, GFI = 0.92) show that the constructed model was confirmed and that all implicit variables have a good level of agreement with the indicator variables they represent and other implicit variables (Tabachnick and Fidell, 2013; Seçer, 2015). At the stage after the verification of the measurement model, three different models created in the context of research questions were tested with the structural equation model. CFI, NFI, GFI, RMR, SRMR, RMSEA, and χ^2 values, which are the fit indices frequently used in the structural equation model, were examined. In the evaluation of the model fit indices, different criteria were taken into account as suggested. In this context, Schumacker and Lomax (2004) and Seçer (2015) suggest that in the structural equation model, model fit indices should be $\geq$0.90 for acceptable fit and $\geq$0.95 for perfect fit for RFI, TLI, CFI, NFI, NNFI, and IFI. They suggest that model fit indices should be $\geq$0.85 for acceptable fit and $\geq$0.90 for perfect fit for GFI and AGFI, and $\leq$0.08 for acceptable fit and $\leq$0.50 for perfect fit for RMR, REMSEA, and SRMR.

RESULTS

Three different models were tested for the purposes of the research. In this context, the research hypothesis first constructed as Model 1 as "Fear of COVID-19 directly predicts

[1]https://forms.gle/DL7ojNSEbBGsAUNM6

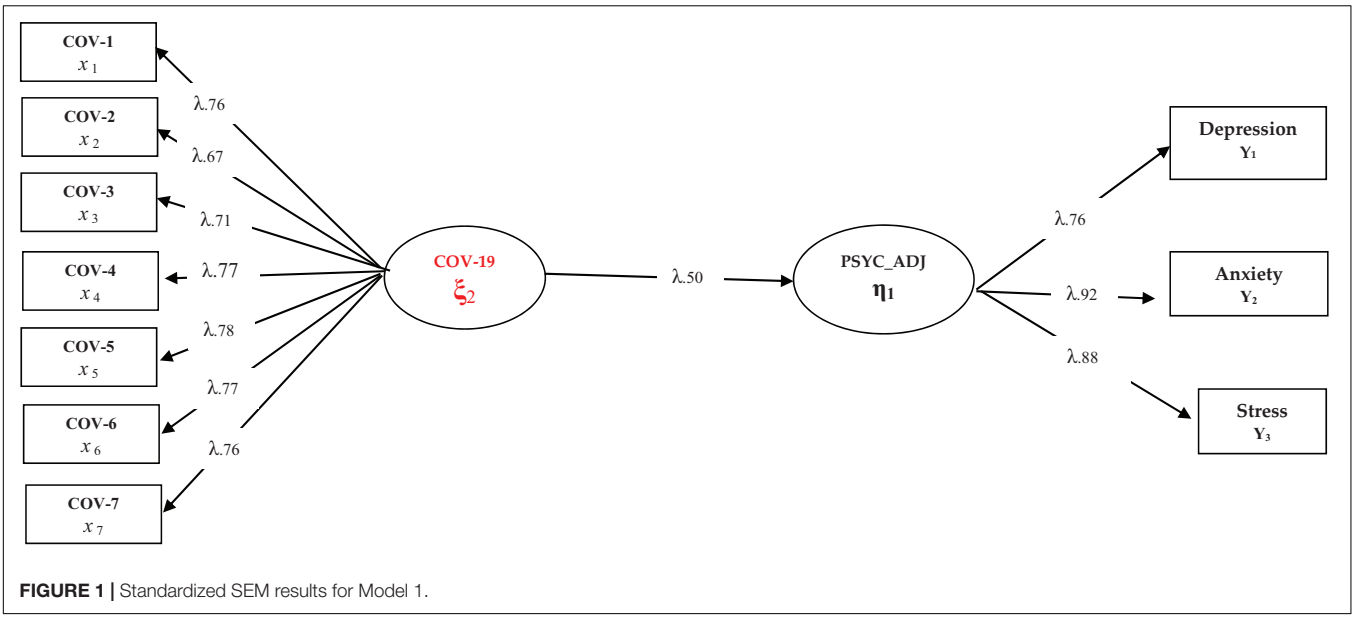

FIGURE 1 | Standardized SEM results for Model 1.

psychological adjustment skills in healthcare professionals" was tested. In this model, fear of COVID-19 is expected to negatively and directly predict psychological adjustment skills in healthcare professionals. The findings regarding Model 1 are presented in **Figure 1**.

Considering the fit index values [$\chi^2(44{,}26/34) = 1.30$; CFI = 0.97; TLI = 0.96; NFI = 0.94;GFI = 0.93] of the model tested in **Figure 1**, it can be said that all the implicit variables in Model 1 have a significant relationship with the observed variables ($p < 0.001$). In addition, it is understood that the fear of COVID-19 has a negative predictive effect on psychological adjustment skills ($\beta = 0.50$, $p < 0.01$, 25%). This finding can be interpreted that the fear of COVID-19 has a strong and negative effect on health professionals' psychological adjustment skills. In order to better understand the predictive coefficients between variables in structural equation models, it is recommended to examine the mediation relationships by including other possible variables. In this context, it is useful to examine the findings related to Model 2 and Model 3. Prior to the examination of other models, depending on the verification of the hypothesis tested in Model 1, the variables of experiential avoidance and psychological resilience were included in the related model. In this model, the effect of fear of COVID-19 on psychological adjustment skills was tested both directly and indirectly. In this context, Model 2 can be expressed as: How has the direct effect of COVID-19 fear on psychological adjustment skills in healthcare professionals changed after including experiential avoidance and psychological resilience in the model?

Figure 2 shows the findings related to the structural model constructed as Model 2. In this sense, when the related model findings are analyzed, a significant change is observed in the direct correlation coefficients between the fear of COVID-9 and psychological adjustment skills with the inclusion of experiential avoidance and psychological resilience in the model. The general rule in the mediating relationships is that when the "mediating variable" is included in the model, there is a significant decrease in the direct predictive coefficients obtained in Model 1 (Tabachnick and Fidell, 2013). Accordingly, when **Figure 2** is examined, it is seen that the direct predictive coefficient of the fear of COVID-19 on psychological adjustment skills is ($\beta = 0.34$, $p < 0.01$, 12%). However, the same predictive coefficients were determined in Model 1 as ($\beta = 0.50$, $p < 0.01$, 25%). These findings reached in Model 2 reinforce the idea that the variables included in the model may have an intermediary role. In addition, when **Figure 2** is examined, it is understood that experiential avoidance has a negative effect and psychological resilience has a positive effect on psychological adjustment skills [$\chi^2(456{,}30/204) = 2.23$; CFI = 0.95; TLI = 0.95; SRMR = 0.060; RMSEA = 0.053]. Based on this finding, the direct predictive path from the fear of COVID-19 to psychological adjustment skills was removed from the model and thus the full mediation relationship was analyzed in order to test the full mediation relationship of these variables. Accordingly, Model 3 was constructed as follows; "Does the role of experiential avoidance and psychological resilience play a role in the relationship between fear of COVID-19 and psychological adjustment skills in healthcare professionals?". The findings obtained are presented in **Figure 3**.

When **Figure 3** is examined, it is seen that the tested model is well adapted and a significant change is obtained in the predictive coefficients of the variables whose mediation role is tested after removing the direct path from the fear of COVID-19 to psychological adjustment skills. In addition, when the fit indexes of the constructed model are examined, it can be said that they indicate a good level of fit [$\chi^2(299.32/205) = 1.46$; CFI = 0.98; TLI = 0.97; SRMR = 0.048; RMSEA = 0.046]. When the findings related to the mediation model are analyzed, the

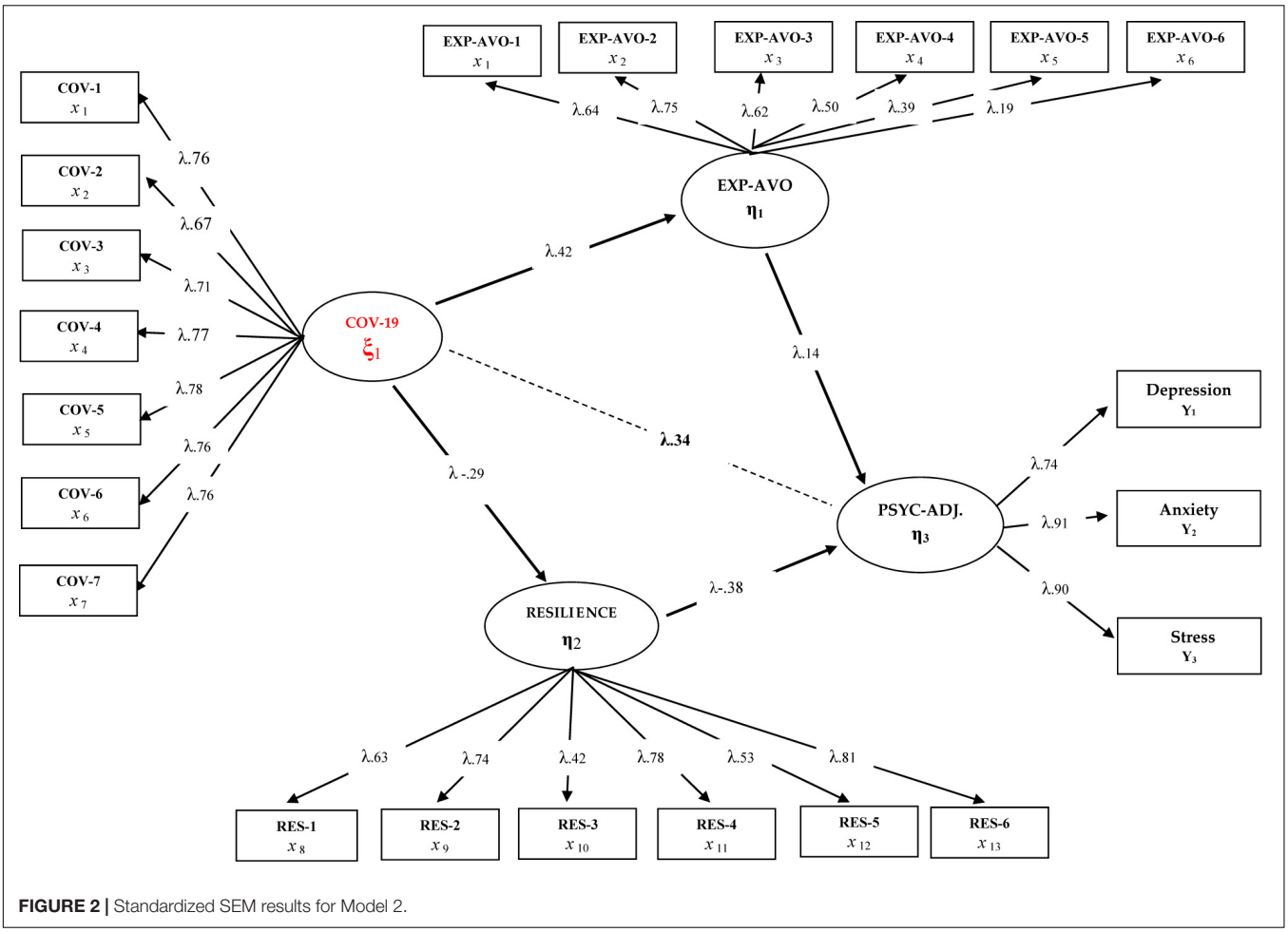

FIGURE 2 | Standardized SEM results for Model 2.

fear of COVID-19 has a positive relationship with experiential avoidance (β = 0.46, $p < 0.01$, 21%) and a negative relationship with psychological resilience (β = −0.32, $p < 0.01$, 10%). In the other dimension of the mediation model, it is seen that low psychological adjustment skills are positively predicted by experiential avoidance (β = 0.46, $p < 0.01$, 21%) and negatively by psychological resilience. There is also a significant increase in the mentioned predictive coefficients compared with Model 2. These findings can be interpreted that the impact of COVID-19 fear on low psychological adjustment skills in healthcare professionals was predicted indirectly by the variables of experiential avoidance and psychological resilience.

DISCUSSION

In this study, in which the effect of fear developed due to the COVID-19 pandemic in healthcare professionals on psychological adjustment skills was dealt in the context of experiential avoidance and psychological resilience, are discussed by considering the constructed models.

In this context, the first important finding reached within the context of the objectives of the research is the predictive role of the fear of COVID-19 on psychological adjustment skills in healthcare professionals. The fear developed in connection with COVID-19 has come to the forefront as an important pressure tool on depressive symptoms, anxiety and stress, which form psychological adjustment skills. During the pandemic with a traumatic nature, healthcare professionals are likely to be affected by the pandemic process and the adverse conditions they face in patients, both as an individual and as a professional (Greenberg et al., 2020; Schwartz and Graham, 2020). Banerjee (2020); Ornell et al. (2020), Shigemura et al. (2020), and Seçer and Ulaş (2020b) stated that the pandemic process should be considered as a traumatic difficult life process. In this regard, it can be thought that COVID-19 may affect psychological adjustment skills negatively in the short and long term by triggering intense stress, anxiety and depressive symptoms in healthcare professionals.

Although the negative effect of COVID-19 outbreak on psychological adjustment skills was determined during the research process, two different models were also tested by constructing the mediating roles of the variables of experiential avoidance and psychological resilience, which are thought to shape this effect significantly. When the mediating roles of these variables between the fear of COVID-19 and psychological

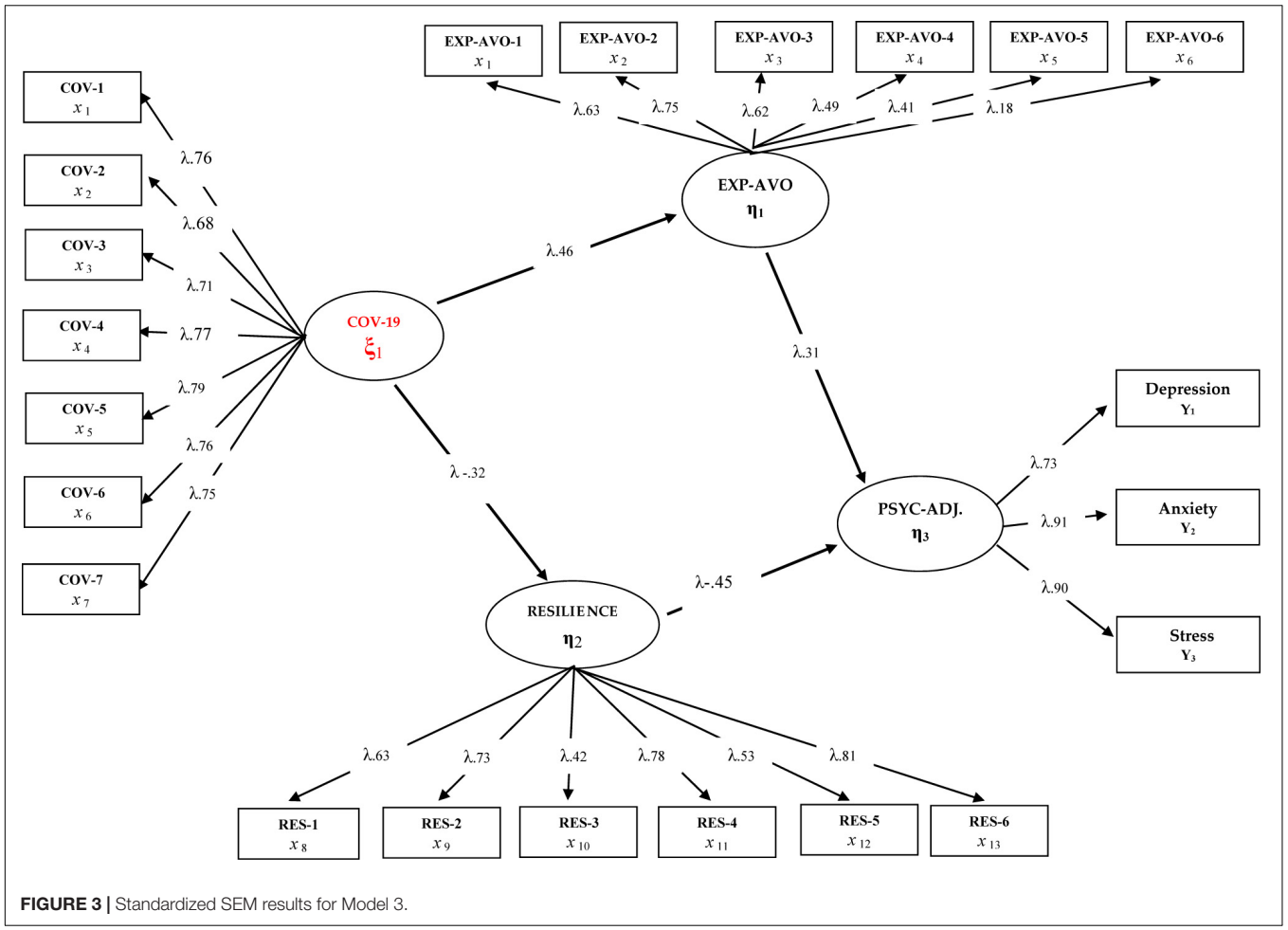

FIGURE 3 | Standardized SEM results for Model 3.

adjustment skills were examined in the context of direct and indirect effects, it was seen that the predictive effect of the fear of COVID-19 on psychological adjustment skills occurred indirectly through these two variables. As a result of the mediation models, it was observed that the fear of COVID-19 put pressure on the experiential avoidance behavior in healthcare professionals, and experiential avoidance weakened their psychological adjustment skills. Hayes et al. (1996) defined experiential avoidance as reluctance to experience the negative feelings, thoughts, memories, and bodily feelings of the individual and avoidance reactions to reduce the frequency or effect of these experiences. Greenberg et al. (2020) stated that it is an important reflection of trauma. In this sense, it can be said that the intense fear associated with COVID-19 can direct the individual to dysfunctional avoidance responses, and this avoidance behavior will lead to various psychopathological symptoms (Ottenbreit and Dobson, 2004). Undoubtedly, the pandemic has created a psycho-socially challenging situation in healthcare professionals, just like everyone else, and this appears to be a significant risk factor in the psychological adjustment skills of healthcare professionals in the short and long term. It can be considered as an inevitable result that this effect causes emotional and behavioral problems in healthcare professionals either acutely or chronically (Orcutt et al., 2005; Briggs and Price, 2009; Hayes et al., 2012; Schwartz and Graham, 2020). This finding also shows consistency with the results of studies dealing with common disorders that are common in individuals with experiential avoidance. In this sense, emotional and behavioral problems such as low subjective well-being (Machell et al., 2015), eating disorders (Rawal et al., 2010), post-traumatic stress disorders (Orcutt et al., 2005), and depression (Briggs and Price, 2009) are common problems among those with a high level of experiential avoidance. In this regard, it can be thought that the negative psychological effect created by the COVID-19 outbreak will trigger traumatic experiential avoidance in healthcare professionals. As an important result of this, it is useful to take into account that healthcare professionals showing high levels of experiential avoidance can face various psycho-social adjustment problems.

It is thought that high levels of experiential avoidance may be associated with low psychological flexibility and this will put pressure on the individual's adaptation skills (Bond et al., 2006). Psychological flexibility, which is put forward as one of the basic criteria of being healthy (Kashdan and Rottenberg, 2010), is defined as the flexibility and determination that an individual will show in order to cope with stressful and

difficult life events, and achieve important life goals (Bond et al., 2006; Dalrymple and Herbert, 2007). Flexibility also guides the individual's decisions and actions in this direction and strengthens the self-efficacy belief (Deci and Ryan, 2000). In this sense, it can be thought that those with high level of experiential avoidance will not be flexible enough and therefore will be deprived of effective coping and adaptation skills by displaying rigid behavioral patterns that lead to various psychopathologies (Kashdan and Rottenberg, 2010). In addition, clinical findings showed that having a low of level psychological flexibility, depression and social anxiety, etc. indicates that it significantly affects the healing process in disorders (Dalrymple and Herbert, 2007; Rüsch et al., 2008; Berking et al., 2009). Hence, it can be thought that low psychological flexibility (associated with experiential avoidance) may lead to a greater negative impact of the COVID-19 outbreak on healthcare workers. Therefore, examining the relationship between psychological flexibility and resilience can make important contributions to the literature.

Despite the short- and long-term risk of experiential avoidance on the psychological adjustment skills of healthcare professionals, it was determined that the level of psychological resilience of healthcare professionals has an important protective function. Psychological resilience is defined as the ability of the individual to recover in the face of difficult living conditions (Brooks et al., 2020a) and quickly return to his/her former and better status (Earvolino-Ramirez, 2007). In this respect, it has a psychological quality that healthcare professionals will need most during the epidemic process (Greenberg et al., 2020).

Findings obtained from the research reveal that fear of COVID-19 poses a risk for psychological resilience in healthcare professionals. In this sense, the high level of resilience appears to be a quality that protects the psychological adjustment skills of healthcare professionals while reducing the risk of COVID-19 on healthcare professionals. Therefore, it seems possible to limit or even prevent the negative impact of the fear and anxiety created by the epidemic on healthcare professionals through experiential avoidance-like features with the help of psychological resilience. In this sense, it is thought that emergency measures to improve the psychological resilience of healthcare professionals may contribute to the prevention of negative effects that may occur in the short and long term due to the epidemic. This will also strengthen the psychological adjustment skills of healthcare professionals and activate the effects that will strengthen their quality of life, life satisfaction and professional commitment.

Limitations and Future Research

The findings of this research should be evaluated in the context of its limitations. The research was carried out only in a relational and cross-sectional context due to the negative effects caused by the pandemic. Data collection was also carried out online for the same reason and through convenient sampling method. The impact of these on research results should be taken into account. The research includes only on-the-job healthcare professionals who have not yet been infected. In this regard, it is thought that there is a need for studies involving healthcare professionals infected with the virus and recovered. In addition, it is considered that applying multimethod or mixed methods research in terms of data diversification will provide significant outcomes in the context of external validity. In addition, it is thought that studies focusing on comparisons between different countries may present important findings in terms of understanding the nature of the problem.

Implications

The results of the research are considered to shed light on awareness of understanding the nature of the secondary effects that healthcare professionals will have depending on the epidemic and on prevention approaches to be used for the protection of healthcare professionals' psychological health. In this case that the epidemic spread rapidly all over the world, it is considered that it will contribute to the understanding of the behavioral consequences of the emotional state developed due to COVID-19. Today, studies focusing on the secondary outcomes of the outbreak have gained momentum, and it is expected that similar research ideas will be created.

DATA AVAILABILITY STATEMENT

All datasets presented in this study are included in the article/supplementary material.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Gümüşhane University Health Sciences Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

As a result of the review of the relevant literature, İS, ZK-Ö and SU acted together in the process of revealing the research idea. After determining the research subject, all authors took an active role in completing the research procedures. After obtaining the research permissions and ethics committee approvals, all authors conducted the data collection and analysis together. The process of creating online data collection processes and delivering them to the target groups was fulfilled together. The transfer of the data collected online to the SPSS environment and examination of its suitability for analysis and parametric test conditions were done by the İS and ZK-Ö. Data analysis and reporting processes were done by SU. In the writing process of the study, the introduction and discussion part was written by İS and ZK-Ö significantly and SU contributed to this process. The Methods and Findings section of the research were prepared for publication by ZK-Ö and contributed by İS and SU. The Discussion section is a section created by both authors together. During the publication of the manuscript, the feedback from the editors and the referees were organized together by all authors.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

BRIEF RESEARCH REPORT
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Comfort Always: The Importance of Providing Psychological Support to Neurology Staff, Patients, and Families During COVID-19

Jennifer A. Foley, Edgar Chan, Natasja van Harskamp and Lisa Cipolotti*

Department of Neuropsychology, National Hospital for Neurology and Neurosurgery, London, United Kingdom

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Edited by:
Eduardo Salas,
Rice University, United States

Reviewed by:
Suzie Xu Wang,
Leeds Beckett University, United Kingdom
Rudi Coetzer,
Betsi Cadwaladr University Health Board, United Kingdom
Kelsey C. Hewitt,
Emory University, United States

****Correspondence:***
Jennifer A. Foley
Jennifer.Foley@nhs.net

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Background: Although the impact of COVID-19 disruption on healthcare staff is increasingly understood, there has been no discussion of how it affects neurological patients and their families. This study sought to understand the impact of COVID-19 on staff, patients and families.

Methods: The Department of Neuropsychology at the National Hospital for Neurology and Neurosurgery established three new support services for staff, patients and families. Semi-structured interviews elicited concerns and if these were affected by COVID-19. Staff members were asked to complete the General Health Questionnaire-12.

Results: Few staff members presented for support, but nearly all indicated significant distress, reflecting increased anxiety and reduced social support. Patients described exacerbated emotional, cognitive and physical concerns, and greater vulnerability to isolation and economic hardship. Families and carers reported increased distress arising from hospital lockdown.

Conclusion: COVID-19 disruption affects staff, patients and families. Patients and families described additional challenges, which emphasize the importance of providing psychological support during these extraordinary times.

Keywords: neuropsychology, COVID-19, healthcare workforce, mental health, patients and caregivers

INTRODUCTION

To meet the challenges posed by the COVID-19 emergency, health services have had to transform radically. Many clinicians have been redeployed to the frontline and/or temporary new hospitals. Clinical academics have been asked to return to clinical duties. Specialist services must now provide much more general medicine. As health services scramble to cope with the influx of COVID-19 patients, services for other patient groups, including those with neurological conditions, have necessarily been curtailed. Even when current arrangements are stepped down, it is likely that governmental recommendations for social distancing, case isolation and vulnerable patient shielding will continue to limit service delivery. Furthermore, patients are also less willing to use the

limited clinical services that are available, as evidenced by the marked decrease in stroke admissions (Markus and Brainin, 2020). The full implications of these changes for neurological patients have yet to be fully realized. Indeed, although there is increased understanding of the psychological implications of COVID-19 on healthcare staff (Gold, 2020; Zhu et al., 2020), and of the neurological and psychiatric manifestations of COVID-19 (Manji et al., 2020; Rogers et al., 2020), hitherto there has been no discussion on the psychological impact of COVID-19 disruption on neurological patients and their families.

The COVID-19 emergency has caused an "unprecedented level of individual and societal fear and anxiety" (Tsamakis et al., 2020). Its threat, and its constant prominence in the media, has fueled a cataclysm of mental health issues (Garfin et al., 2020), particularly for those with pre-existing vulnerabilities (Gobbi et al., 2020). For patients with neurological conditions, these stressors have been combined with dramatic reductions in clinical care and enforced isolation; potentially having a ruinous effect upon mental health (Helmich and Bloem, 2020; Stojanov et al., 2020; Yao et al., 2020). As neurological patients already carry an increased risk of neuropsychiatric disturbance, the psychological impact may be catastrophic. Despite this, there has been no focus on mental health in any of the existing neurology recommendations (Association of British Neurologists, 2020).

Similarly, there has been no guidance on how best to support neurological patients' families and/or informal carers (henceforth termed "family members"). Hospital restrictions have prohibited visitors, limiting the education and support family members receive from healthcare professionals, even following acute neurological events. For those supporting outpatients, nationwide restrictions have meant they may now be confined to their caring role without breaks, respite or support (e.g., Edwards and Carroll, 2020). Unfortunately, such inadequate preparation for discharge and insufficient support may well become a lethal cocktail.

In response, we redesigned our clinical services at the Department of Neuropsychology at the National Hospital for Neurology and Neurosurgery (NHNN; Cipolotti et al., 2020; Foley et al., 2020). Before COVID-19, the Department focussed on the assessment, management and treatment of patients with complex neurological, neurosurgical and neuropsychiatric conditions. However, like other services (Coetzer and Bichard, 2020), the emergency has meant that we have had to adapt our usual care. Assessments are now limited to inpatients with acute symptoms or on emergency pathways (e.g., brain tumor, stroke). All therapeutic support to outpatients (e.g., Parkinson's disease, multiple sclerosis) is now delivered remotely, either by telephone or video. We have also developed three new services. Following best practice guidance (World Health Organization [WHO], 2020) and research emerging from China (Chen et al., 2020), we like many others (e.g., Waldman et al., 2020) have developed new neuropsychological support services for staff. We also developed new services designed to support our neurological patients and their family members. Here, we present our preliminary findings on these new services to illuminate how COVID-19 has impacted staff, patients and families, and provide recommendations for future care.

METHODS

For staff, the new neuropsychological support services for staff consisted of daily telephone and twice-weekly walk-in and telephone clinics, offering one-to-one support. This new service was advertised to all staff (approximately 1,500 clinical and non-clinical staff). All those presenting for support underwent detailed clinical psychological assessment using a semi-structured interview (see **Appendix 1**), including questions relating to the mental health impact of COVID-19 based on the limited available literature coming from China (for a review, see Rajkumar, 2020). The interview elicited staff members' concerns; whether these were related to COVID-19; and their history of psychological difficulties. Based upon this and the presenting problems, they were offered follow-up of tailored psychological support; referred to neuropsychiatry or their general practitioner for medication review; or discharged. Staff members were asked to provide demographic information; profession; length of service at NHNN; location of work; and whether they had contact with COVID-19 patients. They also completed the General Health Questionnaire-12 (GHQ; Goldberg and Williams, 2000) to assess the presence of psychological symptoms. A binary scoring method was used, with a total score of 4 or above indicating psychological distress.

For patients, all those who had neuropsychological outpatient appointments rescheduled were offered a telephone consultation, offering one-to-one psychological support. This service was also advertised to NHNN consultants and local community neuropsychology teams. Patients opting in to this new service underwent clinical psychological assessment using a semi-structured interview (see **Appendix 2**). This sought to elicit their concerns; whether these were affected by COVID-19; and their history of psychological difficulties. Based upon this and the presenting problems, patients were offered follow-up of tailored psychological support or discharged. GHQ scores, patients' demographic and clinical details were collected.

For family members of inpatients or outpatients, telephone clinics were established and advertised to NHNN clinical teams. Those referred for support underwent clinical psychological assessment using a semi-structured interview (see **Appendix 3**). This sought to elicit the main concerns; COVID-19-related changes; and history of psychological difficulties Following this, the family member was offered one-to-one psychological support; psychoeducation on the neurological condition, cognitive functioning, mood and fatigue; signposting to sources of further information and support; and/or relevant further guidance, sent through the post. Demographic and clinical details were collected, as well as their relationship to the patient.

Qualitative responses to the semi-structured interviews and concerns noted by the neuropsychologists were transcribed, coded and analyzed using a grounded theory approach (Strauss and Corbin, 1998) to elicit emerging themes. All identified themes were compared within each group (staff, patient or family member) to form overarching categories. Categories identified in earlier sessions were then cross-referenced with those from later sessions to determine when data saturation was sufficient. We illustrate each of these thematic categories with

quotations. The service audit was done in compliance with the Helsinki Declaration.

RESULTS

To date, 23 staff members have presented for psychological support, including two referred by their managers. The majority were female (86.9%), with a mean age of 40 years (range 25–63). Most were clinical staff (82.6%), but professional roles were diverse, ranging from cleaner to consultant. Half worked on inpatient wards (56.5%), and had or were about to have contact with COVID-19 patients (43.5%). Length of service at NHNN ranged from less than 1 to 12 years (mean = 5.75 years). On the GHQ, mean score was 6.56/12, with most (77.8%) scoring at or above clinical cut-off, indicating significant levels of psychological distress. Thematic categories emerging from the structured interviews and illustrative quotations are presented in **Table 1a**.

The most common theme was raised general anxiety. This manifested as increased worry and panic attacks, with anxiety about themselves, others and/or the future. For nearly all (93.8%), this anxiety was caused or exacerbated by COVID-19. Other frequent themes were loss of social support (e.g., at work and in general because of social distancing rules), concern about infection (with equal numbers describing concern about themselves or friends/family members contracting COVID-19), and work stressors (redeployment and PPE). Half of the staff members (43.4%) revealed previous history of anxiety and/or depression, with most of these (70%) requiring formal psychological intervention in the past. Although those with previous history had higher scores on the GHQ (mean = 7.8) than those without (mean = 4.9), there were no differences in themes raised. Half (56.5%), including all those with previous history of psychological difficulties, were offered follow-up, with two referred onto neuropsychiatry or their general practitioner for consideration of anti-anxiety medication.

Telephone consultations have been held with 21 outpatients with stroke (29%), Parkinson's disease (14%), multiple sclerosis (14%), epilepsy (10%), neurosurgical conditions (10%), ataxia (0.5%), metabolic disorder (0.5%), dystonia (0.5%), neuro-oncology (0.5%), or memory concerns awaiting assessment/diagnosis (0.5%). Half were male (52%), with an average age of 54 years (range 27–89). On the GHQ, mean score was 6.75/12, with most (75.0%) scoring at or above clinical cut-off, indicating significant levels of psychological distress. Thematic categories emerging from the structured interviews and illustrative quotations are presented in **Table 1b**.

The most common theme was emotional challenges. This reflected both anxiety and low mood, triggered by the neurological symptoms (88.2%) and further exacerbated by COVID-19 (82.3%). For example, one patient described feeling anxious about coping with declining function caused by ataxia and this was compounded by the additional pressures of managing home-schooling and the threat of redundancy. Other frequent themes included concerns about cognitive/physical difficulties, with nearly half of these distressed about the impact of COVID-19 on their hospital care and/or carer support. Several described difficulties coping with isolation, particularly those with sensory disabilities, no longer able to attend day centers or receive informal care, and/or those with fewer social contacts, unable to ask others for support with essential activities. Several described how the emergency had affected their working ability and financial resources, already hampered by neurological disability. Two thirds (67%) were offered follow-up.

Telephone consultations have been held with 26 family members and carers of patients with stroke (85%) or Parkinson's disease (15%). 19% also had suspected or confirmed COVID-19. The majority were inpatients (81%), male (76%), and with an average age of 67 years (range 27–90). The relationship to the patient was partner (46%), child (44%), sibling (8%), or parent (4%). Themes emerging from the consultations are presented in **Table 1c**.

The most common theme was feeling excluded from the patient's care, mostly arising because they were unable to visit them in the hospital. This was particularly upsetting for those who were spokesperson for a patient with communication and/or cognitive difficulties, with family members worrying they were not receiving appropriate care. For example, one family member was particularly concerned that the staff had not been informed that his father, an inpatient with Parkinson's disease, needed to receive his Parkinson's medications on time. Another frequent theme highlighted the unique emotional challenges they were facing; many expressed shock about their family member's diagnosis and felt unsupported by both hospital staff and their social network. Others described anxiety about their family members' care and not being able to communicate with them. Many described concerns about the impact of COVID-19 on their family members' clinical care, describing delayed or reduced services. Some were anxious about expedited discharge and their ability to cope at home with the patient. Others were worried about accessing specialist services after discharge. It is notable that all of these themes were directly affected by COVID-19. A third of all families and carers (31%) were offered follow-up.

DISCUSSION

These preliminary findings illustrate the psychological impact of COVID-19 on staff, neurological patients and their families. Although few staff members presented for formal psychological support, nearly all endorsed significant levels of distress on the GHQ, with half requiring follow-up within our service and/or referral for medication review. Many had previous mental health history, suggesting that this increased vulnerability to psychological distress during the current emergency. Interestingly, this previous history did not affect the nature of their concerns; nearly all described increased anxiety and many reporting feeling estranged from their normal sources of support. These findings suggest that these issues are universal, but experienced as more challenging by those with previous mental health issues. This highlights the importance of providing formal staff support to those with higher levels of distress and/or previous mental health history. In the future, it may be useful

TABLE 1 | Percentage endorsing each identified thematic category emerging from neuropsychological services for (a) staff, (b) patients, and (c) family members.

	Identified thematic categories	Illustrative quotations	%
(a) Staff (*n* = 23)	General anxiety	"It's an ongoing trauma," "It feels hard to switch off"	70%
	Loss of social support (e.g., loss of structure at work, loss of social network because of distancing rules)	"I feel alone"	52%
	Concern about infection (of themselves or family members)	"I'm scared I will get COVID-19 and die," "I'm worried about passing it on to my landlady"	43%
	Concern about redeployment	"I don't have the skills to work on the ward," "I feel underqualified"	26%
	Concerns about PPE	"I don't have the correct PPE"	13%
(b) Patients (*n* = 21)	Emotional challenges (e.g., anxiety, low mood)	"I'm anxious about the future," "My anxiety has escalated"	81%
	Concerns about cognitive/physical difficulties (e.g., worsening of neurological symptoms, fatigue)	"I'm frustrated by my dystonia," "I'm worried about my memory"	48%
	Difficulties with isolation (e.g., not being able to receive same care or attend day centers)	"I'm unable to attend my usual activities"	29%
	Financial/work concerns (e.g., redundancy, fewer work opportunities)	"I'm worried I will be laid off," "My employment opportunities have been decimated"	24%
	Delayed or reduced clinical care (e.g., delayed surgery, reduced rehabilitation)	"I'm not getting adequate care," "I feel very let-down"	19%
	Concern about infection	"I'm worried my wife will pass the virus onto me," "I'm vulnerable"	14%
(c) Family members (*n* = 26)	Excluded from patient's care (e.g., unable to visit, not included in clinical discussions)	"Information seems restricted," "I don't know how much to call," "I feel in limbo"	50%
	Emotional challenges (e.g., shock, anxiety, reduced social support)	"I'm anxious about her coming home," "I have no support"	46%
	Delayed or reduced clinical care (e.g., slow to present to stroke services, faster discharge despite significant needs)	"There will be no rehabilitation options," "Delayed appointments mean that his symptoms are getting worse"	42%
	COVID-19 (e.g., bereavements, anxiety about virus transmission)	"She won't be able to keep to COVID rules," "I'm worried she'll get the virus in hospital"	38%
	Difficulties communicating with inpatients (e.g., sensory/cognitive deficits, lack of mobile phone)	"I cannot visit and only have limited time on the phone," "I've had no contact"	38%

to promote staff support by embedding psychologists within staff teams to facilitate disclosure of psychological distress and provide individually tailored support.

We were also able to document the profound impact of COVID-19 disruption on patients and their families. Patients reported high rates of distress on the GHQ and described how their emotional, cognitive and physical symptoms exacerbated by the emergency. Many also described how their neurological condition exacerbated their vulnerability to loneliness and economic hardship. These findings are particularly important given the expected long-term health service changes and looming economic downturn.

For family members, many concerns were a direct result of not being allowed into hospital, with reports of feeling excluded from patients' care, and feeling bereft of the usual support provided by hospital staff. These findings illustrate the necessity of family liaison, at admission so they can provide information about patients' needs and wishes, and throughout, so they can feel involved and supported by healthcare professionals, particularly in preparation for discharge.

These preliminary findings, although limited by small participant numbers, provide a snapshot of the psychological impact of the COVID-19 emergency. Unfortunately, we were not able to provide GHQ scores for family members, but we were able to document that half of these described acute psychological distress. In the future, we would like to compare all groups with the same measures and consider how these and the issues raised change as we emerge from the height of the pandemic to learning to live with its impact.

During this pandemic, we have witnessed the profound physical and psychological impact of the COVID-19 emergency, emphasizing the importance of providing direct psychological care to hospital staff, patients and families. In this study, we have found that although staff, patients and families all demonstrate psychological distress and reduced levels of social support, only patients and families bear the additional burden of neurological illness and disability. This highlights the need of providing psychological support to these vulnerable groups during these extraordinary times.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because: We do not have permission to share these data. Requests to access the datasets should be directed to JF, Jennifer.Foley@nhs.net.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the local clinical governance committee of the National Hospital for Neurology and Neurosurgery. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

JF, EC, NH, and LC: conception and design of the study, collection and assembly of data, and revising it critically for important intellectual content. JF, EC, and LC: analysis and interpretation of the data and drafting the article. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

APPENDIX 1: NHNN STAFF SUPPORT SERVICE SEMI-STRUCTURED INTERVIEW

NHNN Staff Support Service

1. Main concerns

    Getting infected?
    Family worried?
    Bringing the virus home?
    Dealing with uncooperative or panicked patients?
    Shortage of PPE?
    Feeling incapable of caring for critically ill?
    Lack of rest?

2. COVID –related changes (e.g., home environment, transport, isolation, role change)
3. Pre-COVID psychological factors/Risk factors/? E.g., previous/current history of psychological problems, medication use, suicide risk?
4. Protective factors?

Plan/Outcome:
☐ No Follow-up ☐ Follow-up ☐ Refer to Neuropsychiatry/General Practitioner

APPENDIX 2: NHNN PATIENT SUPPORT SERVICE SEMI-STRUCTURED INTERVIEW

NHNN Patient Support Service

1. Main concerns

    Health conditions?
    Access to medical follow-up?

2. COVID –related changes (e.g., home environment, transport, isolation, role change)
3. Pre-COVID psychological factors/Risk factors/? E.g., previous/current history of psychological problems, medication use, suicide risk?

    Previously poor mental health/self-harm?
    Separation from family/support networks?
    Reliance on social services?
    Low household income?
    Literacy/access to information?

4. Protective factors?

Plan/Outcome:
☐ No Follow-up ☐ Follow-up ☐ Refer to Neuropsychiatry/General Practitioner

APPENDIX 3: NHNN FAMILY MEMBER SUPPORT SERVICE SEMI-STRUCTURED INTERVIEW

NHNN Family Member Support Service

1. Main concerns

    Health conditions?
    Access to medical follow-up?

2. COVID –related changes (e.g., home environment, transport, isolation, role change)
3. Pre-COVID psychological factors/Risk factors/? E.g., previous/current history of psychological problems, medication use, suicide risk?

    Previously poor mental health/self-harm?
    Separation from family/support networks?

Reliance on social services?
Low household income?
Literacy/access to information?

4. Protective factors?

Plan/Outcome:
☐ No Follow-up ☐ Follow-up ☐ Refer to Neuropsychiatry/General Practitioner

frontiers in Psychology

OPINION
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Use of Heart Rate Variability Biofeedback to Reduce the Psychological Burden of Frontline Healthcare Professionals Against COVID-19

Juan-Pablo Aristizabal[1], *Raphael Navegantes*[2], *Eline Melo*[3] *and Antonio Pereira Jr.*[2,3]*

[1] Graduate Program in Neuroscience and Behavior, Federal University of Pará, Belém, Brazil, [2] Graduate Program in Electrical Engineering, Federal University of Pará, Belém, Brazil, [3] Graduate Program in Cell Biology and Neuroscience, Federal University of Pará, Belém, Brazil

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***Correspondence:**
Antonio Pereira Jr.
apereira@ufpa.br

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Fear of getting infected and infecting other people, feeling responsible for the physical and mental well-being of their patients, working in a novel and unpredictable context subject to work overload and shortage of personal protective equipment are just a few of the difficult situations that frontline healthcare professionals are facing in the ongoing fight against COVID-19 (**Figure 1A**) (Liu et al., 2020). When this experience is superimposed on the typical baseline stressors of the profession such as low morale and low wages, it can contribute to increasing the burden of mental health problems experienced by healthcare professionals during the pandemic and will probably persist even after the COVID-19 crisis has passed. According to Lai et al. (2020), of 1,257 health workers involved with the diagnosis and treatment of COVID-19 patients who were surveyed in China, a considerable proportion experienced symptoms of anxiety (44%), depression (50%), insomnia (34%), and general distress (71%). A similar study carried out in Italy points to the same results: out of 1,379 health professionals surveyed, a high proportion presented symptoms associated with posttraumatic stress disorder (49%), major depressive disorder (25%), anxiety (20%), insomnia (8%), and perceived stress (22%) (Rossi et al., 2020). Posttraumatic stress disorder (PTSD), in particular, though commonly linked with war veterans, is expected to have a surge of occurrences in frontline health professionals after the pandemic (Dutheil et al., 2020). This adds to the realization that both during and after a pandemic, the number of people affected in their mental health tend to be greater than the number of people affected by the infection itself (Reardon, 2015). HIV, Ebola, Zika, H1N1, SARS, and MERS are just a few recent examples of pandemic diseases with such characteristics (Kisely et al., 2020; Ornell et al., 2020).

An acute stressful situation causes the immediate activation of the sympathetic nervous system (SNS) and the hypothalamus–pituitary–adrenal axis (HPA) and kicks off the release of catecholamines (adrenaline and noradrenaline) and cortisol in the bloodstream that prepares the body for action, enabling physiological and behavioral fight or flight responses geared for the organism's survival (Godoy et al., 2018) (**Figure 1B**). These responses include heart rate acceleration, increased myocardial contraction force, arterial vasodilation in skeletal muscles, arterial vasoconstriction in the digestive system, and relaxation of smooth muscles in the pupils and bronchi, among others (Mendoza and Foundas, 2007). The body stays on high alert as long as cortisol and adrenaline levels remain high. After a while, the parasympathetic nervous system (PNS) brakes those responses through the vagus nerve and promotes the "rest and digest" phase that restores the body after the danger has subsided.

Healthcare professionals facing high-stress situations are likely to present harmful physiological adaptations associated with overactivation of the SNS. Though the body can quickly react to stressful situations through the HPA axis, many disease states are characterized by chronically elevated sympathetic nerve activity (SNA) (Fisher et al., 2009). The body's inability to return to basal homeostatic levels of both catecholamines and cortisol in the bloodstream caused by chronic stressors can have devastating wear and tear effects on the cardiovascular, digestive, immune, and nervous systems (Dünser and Hasibeder, 2009). In the current pandemic situation, which will probably continue until an effective vaccine arrives, it is important to ask how this crisis is affecting the mental health of healthcare professionals and how we can help them to avoid future chronic health complications due to chronic overactivation of the fight or flight response.

In a healthy person in a resting state, the heartbeat frequency is not regular but changes constantly due to sympathetic/parasympathetic regulation. Heart rate patterns are normally determined by the tonic functional outflow from the vagus nerve to the heart (i.e., cardiac vagal tone) (Porges, 1995). The heart rate variability (HRV), or the time variation between consecutive heartbeats, is an emerging property of autonomic regulatory systems operating at different time scales and helping the body adapt to different environmental and psychological challenges. The normal range of HRV depends on the interaction between sympathetic and parasympathetic inputs to the heart (Lombardi and Stein, 2011). While increased HRV is usually associated with good health conditions, lowered HRV is an indicator of risk related to various pathologies (Lopes and Palmer, 1976).

The neurovisceral integration (NVI) model (Thayer and Lane, 2000; Thayer et al., 2009) proposes that adaptive behavior depends on the integration of neural networks spanning both the central (CNS) and autonomic nervous systems (ANS) tasked with regulating cardiovascular function. Thus, there is a bidirectional communication pathway between the ANS and the CNS providing a dynamic regulation mechanism in which brain structures affect the functioning of visceral organs, and these, in turn, send afferent sensory information to the brain affecting its function (Hess, 1949).

Since the 1980s, biofeedback-based intervention tools have been developed, which aim to train people in the voluntary control of physiological parameters through audiovisual feedback mechanisms. There are several types of biofeedback approaches based on different physiological signals such as electromyography, peripheral body temperature, and heart rate variability (HRV-B) (Lehrer and Gevirtz, 2014). HRV-B aims to stimulate efferent vagal activity and induce respiratory sinus arrhythmia (RSA) through repeated exercises of diaphragmatic respiration control (Porges and Kolacz, 2018), resulting in increased HRV (Shaffer and Ginsberg, 2017). RSA is the normal variation in heart rate that accompanies breathing: inhalation temporarily suppresses vagal activity, decreasing the time between heartbeats and increasing the heart rate, while exhalation produces the opposite effect. The practice of HRV-B induces the person to breathe in a low frequency (∼10 breaths per minute), lengthening the exhalation period to increase the amplitude of the RSA and the HRV (Lehrer and Gevirtz, 2014). The final goal of this procedure is to increase the flexibility and recovery capacity of the cardiovascular system facing stressful situations, allowing the individual to return to homeostatic equilibrium states (Gevirtz, 2013). A recent study showed that even a single session of HRV- B was able to increase HRV (Lin et al., 2020).

Two proposed mechanisms underlie HRV-B training. The first is the induction of the baroreflex—a rapid negative feedback loop in which elevated blood pressure due to inspiration decreases heart rate and blood pressure (Lombardi and Stein, 2011). The second is based on the idea that oscillatory rhythms associated with the respiratory drive influence oscillatory patterns in the vagal and sympathetic outflows (Lopes and Palmer, 1976). Due to the relationship between heart rate and breathing, HRV-B can also improve efficiency in respiratory gas exchange. Due to the fact that HRV-B can improve blood pressure control through baroreflex and vagal stimulation while inducing feelings of relaxation and well-being (Lehrer et al., 2020), it has become a very popular method of psychological intervention in recent years (Lehrer and Gevirtz, 2014). For instance, it has been proven to alleviate anxiety symptoms in students (Lee et al., 2015), posttraumatic stress in war veterans (Schuman and Killian, 2019), and depressive symptoms on persons with major depressive disorder (Caldwell and Steffen, 2018), and also improve cognitive, artistic, and sports performance (Lehrer et al., 2020). The HRV is obtained from electrocardiogram (ECG) measurements and the different parameters of HRV are obtained in both the time and frequency domain. Usually, the easiest and fastest way to represent vagally mediated changes in HRV is with time-domain variables, such as the root mean square of successive differences between normal heartbeats (rMSSD) (Shaffer and Ginsberg, 2017) (**Figures 1C,D**). The rMSSD is the main feature used in mobile HRV applications because it is easy to acquire and compute with short time measures (Penttila et al., 2001).

During an HRV-B training session, the person may be instructed to sit or lie supine in a relaxed position and to maintain diaphragmatic respiration rates between 6 and 10 breaths per minute, while being guided by real-time feedback display of their heart rate and respiration rate. This feedback can be gamefied and be adjusted according to the evaluated parameters and represent the success or failure of the training. Eventually, the person should become aware of the control they can exercise over autonomous processes such as HRV (Caldwell and Steffen, 2018).

This intervention is becoming increasingly attractive as therapeutic support probably due to the latest developments in portable devices, which have increased its accessibility and practical utility in different contexts. While some mobile applications may require the purchase of specialized external sensors (Goessl et al., 2017), others rely on smartwatches (Hernando et al., 2018) and even cell phone cameras (Peng et al., 2015; Bánhalmi et al., 2018). In any case, these electronic consumer devices are easy to use and allow the design of personal training programs adjusted to age, sex, height, weight, and physical aptness. They are implemented with different types of feedback in the

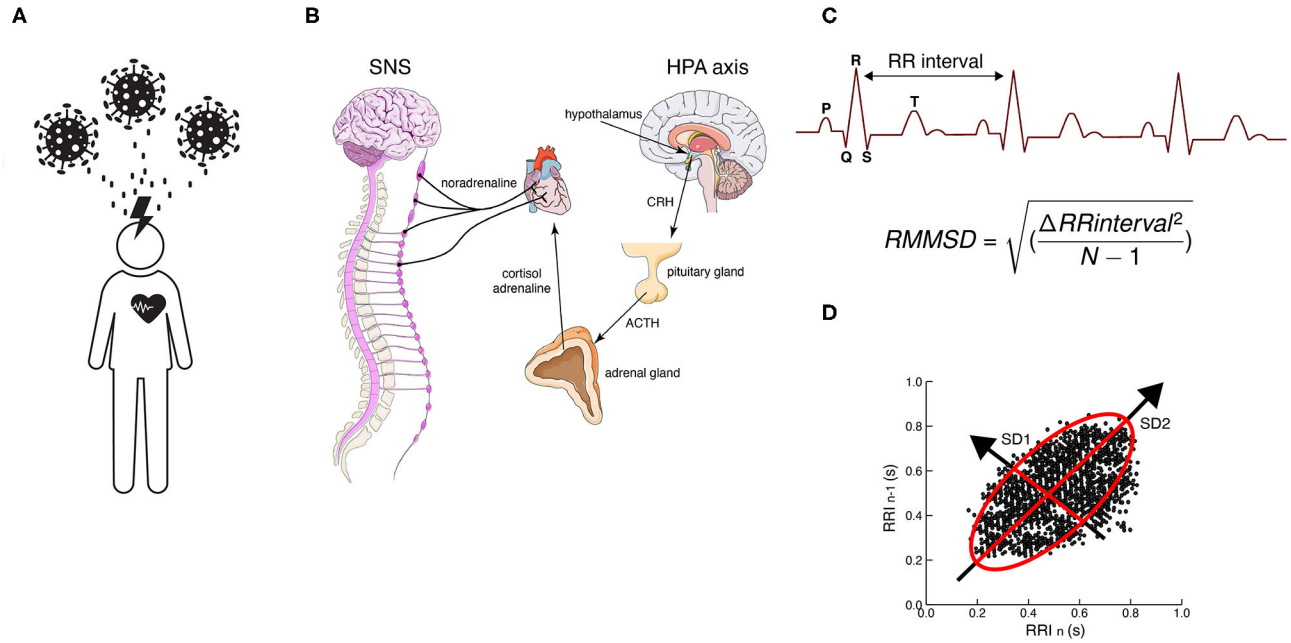

FIGURE 1 | (A) Work-related chronic stress of professional healthcare workers due to COVID-19. **(B)** Hypothalamus–pituitary–adrenal (HPA) axis activation due to chronic stress conditions caused by COVID-19. Time-domain tools used to assess HVR **(C)** RMSSD (root mean square of successive differences) and **(D)** Poincaré plots, a geometrical and nonlinear tool to assess the dynamics of HRV. Both evaluate R-R interval variability. CRH, corticotropin-releasing hormone; ACTH, adrenocorticotropic hormone; SNS, sympathetic nervous system.

form of games, videos, and sounds and allow the export of data for visualization and traceability of training history (Peake et al., 2018).

Though the negative mental health effects of COVID-19 are not restricted to healthcare professionals, the fight against the pandemic depends on their being capable to perform their jobs optimally without compromising their health. Supporting the mental health of these individuals is a critical part of the public health response to COVID-19. Most healthcare organizations traditionally put their resources toward supporting staff only once they have developed a mental health pathology. However, beyond treating the disease, it is important to promote prevention campaigns focused on mitigating the psychological impact of the pandemic (Walton et al., 2020). Thus, it is important to mobilize all available resources to help healthcare workers to fulfill their professional obligations and keep being available for the prolonged fight against COVID-19 and many other threats facing humankind in the future. Given the challenges of social distancing, easily available technological tools are an important adjunct to traditional psychological therapies, and HRV-B training is an accessible way to help reduce the mental toll imposed by COVID-19 on frontline professionals.

Even if you do not have access to HRV-B, ideally assisted by a trained professional, you still can perform diaphragmatic breathing exercises, which have also been shown to have positive effects in the reduction of feelings of stress and anxiety through modulation of HRV (Ma et al., 2017).

Diaphragmatic or abdominal paced breathing is the conscious use of your diaphragm to breathe at a rate of 10 times per minute while making sure to exhale longer than you inhale (Szulczewski, 2019).

For this exercise you must:

1- Find a comfortable and quiet place.
2- Sit in a comfortable chair or lie on your back with a pillow under your head.
3- Place one hand on your chest and the other on your abdomen.
4- Close your lips and slowly inhale through the nose, counting to 4 in your head (during inhalation, the abdomen must raise the hand and your chest must remain still).
5- Expel the air slowly through your mouth, counting to 6 (as you expel the air, you should feel your abdomen sink).
6- Practice this breathing technique for 5 to 10 min and try to perform it during your breaks 3 to 4 times a day.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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REVIEW
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On the Nature of Fear and Anxiety Triggered by COVID-19

Carlos M. Coelho[1,2,3], Panrapee Suttiwan[3], Nikolett Arato[4] and Andras N. Zsido[4]*

[1]School of Psychology, ISMAI University Institute of Maia, Maia, Portugal, [2]School of Health of Porto Polytechnic, Psychosocial Rehabilitation Lab, Center for Rehabilitation Research, Porto, Portugal, [3]Department of Psychology, Faculty of Psychology, Chulalongkorn University, Bangkok, Thailand, [4]Institute of Psychology, University of Pécs, Pécs, Hungary

Emergencies that occur during natural disasters, such as avalanches, earthquakes, and floods, tend to be sudden, unexpected, and ephemeral and recruit defensive responses, similar to the ones recruited when faced with dangerous animals. Defensive behaviors are triggered by activity in survival circuits that detects imminent threats and fear is the conscious emotion of that follows immediately. But this particular threat (COVID-19) is useable and mysterious, triggering anxieties much more than fear. We conducted a literature search on May 1, 2020 in Google Scholar, PsychInfo, and PubMed with search terms related to COVID-19 fears and found 28 relevant articles. We categorized the papers into six groups based on the content and implications: fear of the unknown, social isolation, hypochondriasis, disgust, information-driven fears, and compliance. Considering the nature of fear and anxiety, combined with the characteristics of the present COVID-19 situation, we contemplate that physicians and other health care workers of several specialties, as well as police officers, fire-fighters, and rescue personnel, and first responders might be more able to deal with COVID-19 if they have (a) some tolerance of the unknown, (b) low illness anxiety disorder, (c) tolerance to social isolation; (d) low levels of disgust sensitivity; (e) be granted financial support, (f) have priority if needed medical assistance (g) use caution relatively to the COVID-19 media coverage and (h) be trained to have high levels of efficacy. Possibilities for preventive and therapeutic interventions that can help both health care personnel and the general population are also discussed.

Keywords: coronavirus disease 2019, anxiety, fear of the unknown, illness anxiety disorder, posttraumatic stress disorder, isolation, disgust sensitivity, media coverage

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****Correspondence:***
Carlos M. Coelho
carlos.s@chula.ac.th;
ccoelhovr@gmail.com

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INTRODUCTION

CO stands for corona, VI for virus, D for disease, and 19 designates the year it was discovered. Coronavirus disease 2019 (COVID-19) is caused by the 2019 novel coronavirus (SARS-CoV-2) of probable Pangolin origin (Zhang et al., 2020) with the potential to cause severe respiratory tract infection among infected humans (Chen et al., 2020) and is commonly transmitted from person to person *via* aerosol and droplet contamination.

We are now amidst a current global pandemic declared March 11, 2020, that started in Hubei province of China in late December 2019 and in Europe in February 2020. This pandemic disrupts the lives of people across the world due to its rapid spread, high mortality rate, the

toll on health care systems, and devastating economic impact (Callaway et al., 2020). Its spread has been exponential being now in most world countries and becoming an emergent global challenge with over 11.5 million confirmed cases, about 540,000 confirmed deaths as of July 8, 2020. SARS-CoV-2, has been spreading and led to diverse clinical symptoms (COVID-19) including but not limited to cough, high fever, fatigue, and shortness of breath. Especially older individuals and/or those with other medical conditions are at risk of developing severe respiratory problems in the course of COVID-19. In such situations, the disease may progress to multi-organ failure, pneumonia, and death (Centers for Disease Control and Prevention, 2020; World Health Organization, 2020). Here, we alert for the need to create some tranquility in the media and political positions. If people are allowed to know more about what we know and do not know about the complexity of what we are dealing with, a wrong sense of understanding the causal processes underlying policies will contribute to further political polarization (Fernbach et al., 2013) and this, in turn, will enhance more fear and suspicion (Brooks et al., 2020). Presented with such a high infection rate and mortality, individuals are disquieting. Fear can strengthen the damage of the disease, leading individuals to not think rationally when reacting to COVID-19 (Ahorsu et al., 2020). On the opposite, insufficient fear can result in harm for individuals and society (e.g., ignoring government measures or reckless policies; Mertens et al., 2020). Next, we discuss the main features associated with the potential worries and fears related to COVID-19 with the final aim of speculating about some personality characteristics likely more resilient to deal with infected people.

MATERIALS AND METHODS

We used a two-stage systematic approach to identify articles that examined the effect of emotional arousal on visual search performance. The initial search was conducted on May 1, 2020 in Google Scholar, PsychInfo (journal article subdatabase), and PubMed with search terms [("fear" OR "phobia") AND ("COVID" OR "COVID-19" OR "coronavirus" OR "SARS-CoV-2" OR "SARS coronavirus")]. After the initial search, we removed duplicates and examined the resulting articles' references to ensure all relevant papers were included. There were no exclusion criteria for the type of participant sample (e.g., clinical). The search resulted in 28 peer-reviewed papers. We categorized the papers into six groups based on the content and implications: fear of the unknown, social isolation, hypochondriasis, disgust, information-driven fears, and compliance. **Table 1** shows the included studies. In the next section, we are going to discuss these factors with regard to previous results regarding other pandemics and theories of fear.

TABLE 1 | Studies included in this review were grouped based on the type of fear they are tapping into.

Group	Study
Fear of the unknown	
	Mertens et al., 2020
	Satici et al., 2020b
Social isolation	
	Bradbury-Jones and Isham, 2020
	Casale and Flett, 2020
	King et al., 2020
	Lin, 2020
	Mertens et al., 2020
	Thombs et al., 2020
	Yang et al., 2020
Hypochondriasis	
	Akgün et al., 2020
	Asmundson and Taylor, 2020
	Banerjee, 2020
	McKay et al., 2020
	Rajkumar, 2020
	Schimmenti et al., 2020
	Thombs et al., 2020
	Vanni et al., 2020
	Wong et al., 2020
Disgust	
	Brooks et al., 2020
	McKay et al., 2020
	Mota et al., 2020
	Satici et al., 2020b
	Troisi, 2020
Information-driven	
	Ali, 2020
	Asmundson and Taylor, 2020
	Erku et al., 2020
	Landau-Wells and Saxe, 2020
	Sefidbakht et al., 2020
Compliance	
	Brooks et al., 2020
	Fernandez, 2020
	Harper et al., 2020
	Jørgensen et al., 2020
	Mertens et al., 2020
	Olesen et al., 2020
	Presti et al., 2020

RESULTS

COVID-19 Comprises Multiple Fears

Emergencies that occur during natural disasters, such as avalanches, earthquakes, floods, and hail, and human-made disasters, such as a building collapse, air disasters, industrial/technological accidents, and fires tend to be sudden, unexpected, and ephemeral. These kinds of threat recruit defensive responses similar to the ones recruited during unexpected personal situations such as when crossing a road, riding a bicycle or driving a car, or when faced with dangerous animals or people (Zsido et al., 2020b). Defensive behaviors are immediate responses (LeDoux, 2012) triggered by activity in survival circuits that detects threats (LeDoux, 2014) and leading to the conscious emotion of fear that follows immediately. But this particular threat (COVID-19) is useable and mysterious even, triggering anxiety much more than fear. Dealing with it requires prolonged coping mechanisms more than immediate defensive reactions.

The current COVID-19 pandemic presents a significant occupational hazard for physicians and other health care workers

of several specialties such as those who perform or participate in head and neck region examinations (e.g., Ota and Asada, 2020), dental and oral medicine (Meng et al., 2020), ophthalmologists (e.g., Shabto et al., 2020), etc. Delayed access to hospital care for emergency conditions deriving from workers' multiple roles adds to the panoply of stressful conditions, affecting many with unrelated problems such as children's occasional infections, acute onset of chronic conditions, endocrine disorders (e.g., diabetes), or surgical needs (e.g., appendicitis; Lazzerini et al., 2020).

People worry that individual and societal economic resources might be scarce or unable to recover any time soon (Thombs et al., 2020). Societal safety measures such as the lockdowns designed to prevent the spreading of infections, if too prolonged or strict, can disrupt the economy and bring unemployment. The economic consequences of the COVID-19 pandemic also have a psychological impact on individuals worldwide due to the loss of jobs of millions of individuals told to remain in their houses, when unable to work from home (Pakpour and Griffiths, 2020). This is leading to a financial crisis and recession, and an overall suicide rate increment (Mamun and Ullah, 2020).

The COVID-19 pandemic formed a serious multi-etiological global mental health challenge influencing every aspect of life and disrupting the social fabric. COVID-19 is a situation able to bring about several fears (e.g., contamination, future, financial instability, xenophobia, and agoraphobia, etc.) and to trigger elements related to anxiety and fear (similar to specific phobias). Fear is usually avoided, but like pain or hunger, it can be adaptive to deal with imminent threats. Anxiety can also be adaptive to deal with potential threats, but when not well calibrated to the actual threat, it can be deleterious, both at the individual and societal levels (Mertens et al., 2020). An increased level of concern does not necessarily lead to intention to self-isolate – indeed, the opposite may be true in some cases (Bacon and Corr, 2020). It is imperative to understand how personality influences the way people's reactions differ in response to the present situation.

Fear of the Unknown and Intolerance of Uncertainty

The fear or anxiety can be brought about both by knowing or having more information and by fear of the unknown related to the virus. In fact, an uncertain and continuous threat can become chronic and burdensome (Mertens et al., 2020). With many infected people being asymptomatic, reports and calculations on the fatality rate are impossible to perform accurately, and there is no way for a person to know if the other next to him is infected or not, adding more uncertainty to the situation. Intolerance to uncertainty is related to when the unknown is perceived intensely resulting in anxiety (Fergus, 2013). Fear of the unknown appears to be a fundamental fear and is a core component of anxiety (Gallagher et al., 2014; Carleton, 2016). COVID-19 related fears recruit not only fear of the unknown but also the anxiety that accompanies situations that are unpredictable and uncontrollable. So the fear at this undetectable threat is easily learned, irrespective of the probability of its occurrence. Accordingly, a study on COVID-19 (Satici et al., 2020b) corroborated that the inability to tolerate uncertainty is related to fear of COVID-19 *via* rumination, and this affected well-being due to the prominent focus on negative emotions. No matter how much training a person endures, they will likely need some tolerance to uncertainty, particularly at this stage.

Social Isolation and Social Support

There is a worry that isolation and movement restrictions will be long-lasting with a heavy toll on mental health and well-being, social functioning, and work (Thombs et al., 2020). As the fear of contagion and proximity to others (Lin, 2020) is high, many millions of people have begun working remotely and billions are quarantined or isolated at their own homes, schools and universities canceled face-to-face classes, and restaurants, bars, gyms, and other gathering places in many countries have closed (Casale and Flett, 2020). Still, Mertens et al. (2020) found concerns for others' to be the most often indicated concern. Stressful situations increase the need for social support and to affiliate with others; people who typically are highly focused on their interpersonal needs will suffer more with the current pandemic and imposed conditions of social isolation (Casale and Flett, 2020). The perceived discrepancy between the desired and actual quality of social relationships – loneliness – can have serious mental and physical health effects, threatens the sense of safety and well-being (Stickley et al., 2016; Leigh-Hunt et al., 2017; Holt-Lunstad, 2018) and is linked to hypochondriasis (Brink and Niemeyer, 1993) and obsessive–compulsive symptoms (Timpano et al., 2014). The lockdown can also facilitate problematic behaviors such as online gaming (King et al., 2020), domestic violence (Bradbury-Jones and Isham, 2020) as well as stigma and xenophobia (e.g., Yang et al., 2020). Contrary to most doctors, nurses, police officers, fire-fighters, etc. that are often working in teams and very hardly ever alone, the present situation requires people to isolate, and this alone can be too hard to take for some professionals in the frontline.

Hypochondriasis

COVID-19 can carry many fears and worries associated. Schimmenti et al. (2020) mention among others, the fear of body symptoms and their possible meanings. Hypochondriasis is named as illness anxiety disorder in the DSM-5 manual (American Psychiatric Association, 2013) and can be likely related to hospital emergency flow of people who misinterpret their bodily sensations as signs of potential infection (Asmundson and Taylor, 2020). Individuals prone to monitor physical sensations would benefit from education regarding the potential for false alarms regarding these interpretations by decreasing anxiety (McKay et al., 2020). Anxiety might lead to obsessive use of medications like hydroxychloroquine, which has recently emerged in guidelines for COVID-19 (Banerjee, 2020).

COVID-19 is also related to the worry that health care systems may be overrun and that adequate medical care will not be available for all those affected (Thombs et al., 2020)

or others that have different health problems. Yet, many patients in need of medical care avoid hospitals (Wong et al., 2020). Some patients refuse surgical treatment due to fear of COVID-19 contagion even at the risk of survival (Vanni et al., 2020) and patients' fear and suffering among intensive are now magnified. Many patients are unable to communicate consistently if at all, causing fear of abandonment, feelings of isolation, psychological suffering that can and should be mitigated with ongoing, bi-directional communication strategies (see Akgün et al., 2020).

Also related to fear of contamination is obsessive-compulsive disorder (OCD). OCD has distinct dimensions, namely, (a) fear of contamination and cleaning compulsions, (b) obsessions of repugnant or taboo nature and checking compulsions, (c) obsessions and compulsions related to symmetry, and (d) hoarding. Researchers suggest that there may be close links between some dimensions of OCD and behaviors that evolved to protect our ancestors from infectious diseases (Rajkumar, 2020). Worldwide there have been reports of increased symptoms, distress, and concern about OCD and also hoarding disorder (Banerjee, 2020) related to COVID-19.

Disgust

Disgust is also related to previous fears such as illness anxiety disorder and OCD. Mota et al. (2020) found the pandemic affected people's dreams, reflecting mainly fear of contagion, and important changes in daily habits related to contamination and cleanness. Worries of personal infection or infection of friends and family members are common among people exposed to any infectious disease outbreak (Brooks et al., 2020). A paper from Troisi (2020) sums up very well how fear of COVID-19 infection is biologically predisposed, likely to reflect a biologically predisposed form of learning. As stimuli that trigger disgust are also often potential vehicles of infection, such as feces, rotten flesh or food, and body fluids such as blood, sneezes, cough, vomit, or bad breath. Similarly to other fears, the selection set a low threshold for disgust, being triggered by innocuous stimuli, in a brain prewired to over-respond (Nesse, 2005) and fear harmless stimuli, such as congenital malformations (Troisi, 2020). Therefore, being in close physical proximity to those people categorize as in a potential risk group can result in maladaptive psychological consequences – e.g., anxiety or depressive mood – during epidemics (Satici et al., 2020b). This is supported by previous research showing that disgust domains (propensity and sensitivity) positively predicted contamination fear (Olatunji et al., 2004; Cisler et al., 2007) and behavioral avoidance in contamination fear (Deacon and Olatunji, 2007); especially regarding blood–injection–injury type fears (Sawchuk et al., 2000). Relatively to COVID-19, both disgust propensity – that is, the likelihood to experience disgust in the presence of common disgust elicitors – and disgust sensitivity – that is, the degree to which one interprets physical sensations as resulting from disgust and the potential of a contaminant being present – to predict fear of contracting COVID-19 (McKay et al., 2020).

Political and Information-Driven Fears

The COVID-19 pandemic brought an extraordinary challenge to policymakers as well. In fact, a connection has been shown between individual differences for political organization and sensitivity to threats (Landau-Wells and Saxe, 2020). Further, it is well-known that people regularly hold extreme positions about complex policies regarding which they know less about than they think they do (see e.g., Carpini and Keeter, 1996; Rozenblit and Keil, 2002; Fernbach et al., 2019). This erroneous idea of understanding the causal processes underlying policies contributes to political polarization (Fernbach et al., 2013). Extreme ideologies are characterized by a relatively simplistic, black-and-white perception of the social world, overconfidence, and intolerance (van Prooijen and Krouwel, 2019), leading to beliefs in simple solutions to a complex crisis (e.g., van Prooijen et al., 2018).

This way of thinking enters in direct clash with scientific thinking, always researching, confirming, exploring, and changing. The need for rapid study and research into COVID-19 has stirred the social, political, and scientific world. For example, in February 2020, health authorities advised people that masks and gloves were not indispensable for avoiding infection in healthy people (Asmundson and Taylor, 2020) but since policies changed (in May) and currently people are required to use masks when inside public spaces. As uncertainty and fear are particularly strong among the political extremes, the present rapid changes mixed with misinformation and fear can bring about a cycle of fear and mistrust amidst the COVID-19 pandemic.

And as if all this were not enough, we are also surrounded by rumors and conspiracy theories as well as geopolitical strategies and counterstrategies at a global level, eventually affecting how the outbreak is managed (Ali, 2020). There is a proliferation of fake medicines, fake news, and medication misinformation surrounding COVID-19 (Erku et al., 2020). For example, the belief that consumption of alcohol can be beneficial in preventing the COVID-19 infection leads to an outbreak of methanol poisoning in Iran (Sefidbakht et al., 2020).

Fear, Efficacy, and Compliance

A recent study (Harper et al., 2020) using Ahorsu et al. (2020) Fear of COVID-19 Scale found that perceiving COVID-19 threat as severe was positively associated with preventive behaviors, suggesting that perceived threat can be a motivational factor to smooth the progress of prevention, being a normal and functional response within the present context. Hence, if fear can trigger safety behaviors in some people and might be able to mitigate contamination, officials should take measures to ensure that to tell people what is happening and why and provide clear communication reinforcing the sense of altruism (Brooks et al., 2020). The pandemic disease causes patients, health professionals, and the general public to endure an overpowering psychological pressure. Not only the disease itself and the losses it imposes are frightening and costly but also too are the social regulations and behavioral adjustments required

combating the disease (Presti et al., 2020). Mertens et al. (2020) suggest that media communication should be clear and unambiguous to reduce uncertainty, without sensationalism or disturbing images.

Further, they also argue that media communication should avoid inducing more fear because that likely will not promote behavioral change (see also Peters et al., 2013). Moreover, feelings of anxiety and fear may not predict high levels of protective behavior among the public (Jørgensen et al., 2020). In contrast, authorities can increase compliance by fostering feelings of efficacy, particularly among those who do not feel threatened, promoting compliance without fear (Jørgensen et al., 2020). In sum, people need to know and be trained in the specific protective measures and feel capable of following them (Rippetoe and Rogers, 1987; Jørgensen et al., 2020). This is particularly useful to health care workers, police, fire-fighters, and rescue personnel as they tend already to show lower fear levels compared to the general population.

Fernandez (2020) pinpointed several influential unmet needs related to stress and psychological problems among medical staff stressing and well summarizing our previously mentioned arguments. The factors include insufficient communication, lack of (and also erratic) information, inadequate protective equipment, fear of the unknown and uncertainty, concern about infection leading to self-isolation and thus, vulnerability to stress, anxiety, depression, insomnia, and fear. An approach taking into account fostering feelings of efficacy was initiated in a Danish Hospital (Olesen et al., 2020) by intensive education of all staff and facilitation collaboration between infection prevention and control nurse and a psychologist. Combining psychoeducation in coping strategies toward fear and high level of stress, how to use personal protection equipment (PPE) correctly. The staff became confident of their ability to assess risk behavior when close to patients with COVID-19 and began trusting their knowledge of infection prevention and the correct use of PPE. This approach enhanced rational thinking and fostered a professional attitude (Olesen et al., 2020).

CONCLUSION

Research on the psychological reactions to previous epidemics and pandemics suggests that various psychological vulnerability factors may play a role in the extreme anxiety some people might presently manifest. COVID-19 survivors are at risk of developing posttraumatic stress disorder (PTSD) in particular (a) hospitalized individuals, (b) individuals who were not provided healthcare, (c) healthcare workers and other professionals at risk during the pandemic, (d) stigmatized groups, and (e) individuals with mental health problems such as depression, anxiety, and substance misuse disorders, and other severe conditions such as brief reactive psychosis were also reported (Anmella et al., 2020; Sękowski et al., 2020). Individual differences such as intolerance of uncertainty, perceived vulnerability to disease, and anxiety (worry) proneness were stressed by previous research (Taylor, 2019; Asmundson and Taylor, 2020). Similarly, through an online study conducted in March 2020, Mertens et al. (2020) found intolerance of uncertainty, health anxiety, the risk for loved ones, and consulting more information sources (e.g., regular media, social media, and professional media) as independent predictors for the fear of the coronavirus.

There are, of course, possibilities for preventive and therapeutic interventions that can help both health care personnel and the general population. Social support, for instance, has long been posited as a protective factor against the psychological and physiological impacts of exposure to negative life events such as fear and stress. (Cohen and Wills, 1985; Thoits, 1986, 2011; Uchino et al., 2012; Zeidner et al., 2016; Vine et al., 2019). Further, adaptive emotion regulation strategies used to cope with stressors can result in a more positive subjective well-being (Gross and John, 2003; Garnefski and Kraaij, 2006; Mauss et al., 2013; Kraaij and Garnefski, 2019). A recent study (Zsido et al., 2020a) examined how university students coped with the negative mental health effects of the COVID-19 lockdown and found that the most prominent protective factor was positive refocusing, a cognitive emotion regulation strategy that increased mental well-being, reduced depression and anxiety symptoms, loneliness, and problems with sleeping. Regarding therapeutic interventions, the cognitive-behavior therapy approaches may help by focusing on reducing the negative thoughts, worry, and anxiety symptoms potentially leading to excessive fears. Members of the health care personnel and the general population can use self-monitoring to recognize maladaptive patterns in their thoughts and behaviors. Physical exercise and activity along with relaxation, distress tolerance, and acceptance can help cope with these thoughts (Benhamou and Piedra, 2020; Murphy et al., 2020). Proper communication by experts and others can also promote resilience, e.g., by providing a clear, optimistic vision and a realistic plan, taking decisive action, and facilitating open and frequent communication (Kinman et al., 2020; Wu et al., 2020).

Considering the nature of fear and anxiety, combined with the characteristics of the present COVID-19 situation, we contemplate that physicians and other health care workers of several specialties, as well as police officers, fire-fighters, and rescue personnel, and first responders might be more able to deal with COVID-19 if they have (a) some tolerance of the unknown, (b) low illness anxiety disorder, (c) tolerance to social isolation; (d) low levels of disgust sensitivity; (e) be granted financial support, (f) have priority if needed medical assistance; (g) use caution relatively to the COVID-19 media coverage; and (h) be trained to have high levels of efficacy. Ahorsu et al. (2020) Fear of COVID-19 Scale used a sample comprised 717 Iranian participants and there are already Turkish (Satici et al., 2020a), Bengali (Sakib et al., 2020), Arabic (Alyami et al., 2020), Israeli (Bitan et al., 2020), and Italian versions (Soraci et al., 2020). Lee (2020) also created the Coronavirus Anxiety Scale. These scales would likely correlate with the above-mentioned variables. Future research should focus on pointing to protective and risk factors of psychological well-being and

also to show what variables predict specific fear and anxiety in such scenarios.

AUTHOR CONTRIBUTIONS

Conceptualization: CC. Methodology: CC and AZS. Formal analysis and investigation: AZS, NA, and PS. Writing – original draft preparation and supervision: CC and PS. Writing – review, editing, and resources: AZS and NA. Funding acquisition: CC, PS, NA, and AZS. All authors contributed to the article and approved the submitted version.

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Factors Impeding Health-Care Professionals to Effectively Treat Coronavirus Disease 2019 Patients in Pakistan: A Qualitative Investigation

Ali Raza[1], Sheema Matloob[2], Noor Fareen Abdul Rahim[3], Hasliza Abdul Halim[2], Amira Khattak[4], Noor Hazlina Ahmed[2], Durr-e-Nayab[5], Abdul Hakeem[6] and Muhammad Zubair[7]*

[1] Business Administration Department, Sukkur IBA University, Sukkur, Pakistan, [2] School of Management, Universiti Sains Malaysia, Penang, Malaysia, [3] Graduate School of Business, Universiti Sains Malaysia, Penang, Malaysia, [4] Prince Sultan University, Riyadh, Saudi Arabia, [5] Department of English, The Women University Multan, Multan, Pakistan, [6] Department of Business, National College of Business Administration & Economics, Lahore, Pakistan, [7] Ghulam Muhammad Mahar Medical College Teaching Hospital, Sukkur, Pakistan

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***Correspondence:**
Ali Raza
ali.raza@iba-suk.edu.pk

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The coronavirus disease 2019 (COVID-19) pandemic, first reported in late December 2019, is regarded as the most significant public health emergency of the century. According to the World Health Organization (WHO), the current outbreak of COVID-19 has affected millions of people and killed hundreds of thousands in more than 200 countries, including Pakistan. Health-care professionals (HCPs) cannot minimize human interactions or isolate themselves from patients due to their jobs and moral duties. Hence, the outbreak needed HCPs to work in adverse and challenging conditions with possible mental health problems. In light of the stated background, this study aims to explore and understand the factors that impede HCPs to effectively treat COVID-19 patients in Karachi, Pakistan. Based on qualitative methods, a phenomenological approach was considered to record the true experiences of HCPs. Twelve doctors and nurses were recruited from five COVID-19 designated hospitals in Karachi, Sindh Province, using purposive and snowball sampling. Semi-structured in-depth telephone interviews were conducted from April 6 to 14, 2020, and analyzed through thematic analysis. The findings suggest that there were two types of constraints, institutional and personal, which were impeding HCPs to treat COVID-19 patients effectively. Institutional constraints include the poor condition of isolation wards, inadequate availability of personal protective equipment (PPE), excessive and uneven workload, and absence of emotional and psychological support in hospitals. Besides, personal constraints include nervousness due to the novel virus, a constant fear of becoming infected, fear of taking virus to family, extreme isolation and loneliness, and feeling of powerlessness. The study found that HCPs in Pakistan have been dealing with a high risk of infection, causing mental health problems such as stress, anxiety, and depressive symptoms. These mental health problems not only affect attention, understanding, and decision-making capacity of HCPs, which could hinder the fight against COVID-19, but they could also

have a continuous effect on their overall well-being on a long-term basis. Therefore, the present study outlines important clinical and policy strategies that are needed to support HCPs as the pandemic continues.

Keywords: COVID-19, health-care professionals, Pakistan, obstruction, qualitative investigation

INTRODUCTION

The coronavirus, first reported in late December 2019, spread wide in January 2020 as China was preparing to celebrate New Year (World Health Organization [WHO], 2020a). Chinese authorities specified Wuhan City as the source of the virus, specifically the seafood marketplace. Originally named "severe acute respiratory syndrome coronavirus 2" (SARS-CoV-2) due to its genetic similarities to SARS, the World Health Organization (WHO) named it coronavirus disease 2019 ("COVID-19") on February 11, 2020 (World Health Organization [WHO], 2020b). By the end of January, COVID-19 was announced as a public health emergency; however, on March 11, 2020, it was declared as a worldwide pandemic (Cucinotta and Vanelli, 2020). The current estimates (June 13, 2020) indicate that 7,553,182 people are infected with COVID-19 across the globe. Among them, 423,349 people have lost their lives in the battle against the pandemic (World Health Organization [WHO], 2020c). The unpredictable outbreak and unknown nature of the clinical presentation, changing symptoms, and transmission methods of COVID-19 have caused high psychological fear among common people as well as health-care professionals (HCPs) fighting as frontline workers (Berger et al., 2020; Rana et al., 2020; Xiao et al., 2020).

Pakistan reported the first confirmed COVID-19 case on February 26, 2020, in Karachi. The Ministry of National Health Services Regulations and Coordination (2020) confirmed 139,230 COVID-19 cases with 2,632 deaths on June 14, 2020. Pakistan has raised concerns that the nation may be the next to be hit hard by the pandemic unless effective and timely steps are taken. Moreover, WHO has warned Pakistan for an increase of 200,000 cases by mid of July, as the virus has already spread over 115 districts mainly in two provinces, Punjab and Sindh (The News International, 2020). Thousands of HCPs are at the frontline of the pandemic, but a shortage of personal protective equipment (PPE) and other medical facilities has subjected them to the risk of the disease (Aamir Latif, 2020).

Since WHO has ranked Pakistan as 122nd among 191 countries in overall quality of health-care systems, for inadequate health infrastructure and HCPs (Tandon et al., 2000; Sadiq et al., 2019; World Health Organization [WHO], 2020c), the country is placed 154th out of 191 countries in global Healthcare Access and Quality (HAQ) index where the burden of disease is high (Fullman et al., 2018; Murray et al., 2018). In addition, the Human Development Index (HDI) value is as low as 0.56, which positioned the nation at 152nd out of 189 countries (United Nations Development Program [UNDP], 2019). In this serious situation, when the health system is already weaker in catering to the needs of the country's 208.8 million population, the advent of COVID-19 is unfortunate. HCPs are always there on the frontline for the elective treatment and urgent medical care for COVID-19. It makes HCPs at the most significant risk for being infected (Ali et al., 2020).

In Pakistan, the sudden surge of COVID-19 infections and deaths of HCPs was worrying. In April, 480 HCPs were infected, and five doctors died since the COVID-19 outbreak hit the country on February 26 (Gul, 2020). The official sources stated that the exact number of HCPs affected was still unknown. The exponential rise in infections raises the safety and prevention concerns among HCPs, and they refused to perform their duties in COVID-19 wards and emergency units. Moreover, the situation became more concentrated when around 150 doctors and nurses called for strike in Quetta city against the poor working conditions and lack of medical supplies, e.g., PPE. In addition, the HCPs were raising their voices about the inability of the government and health department to deal with the pandemic and for carelessly risking the HCPs' lives at large (Hashim, 2020; Khan, 2020). Instead of listening to their concerns, the state authorities used physical force to disperse strikers. Furthermore, the government allowed the state authorities to use tear gas and to beat up strikers with sticks and fists in which many doctors were injured. In addition, more than two dozen HCPs were arrested (Khan, 2020).

The state authorities' actions were shocking for the entire nation, as in many countries around, the world people came out to the streets to applaud their health workers during the crises. The adverse behavior on HCPs causes even more mental health problems affecting the efficiency and effectiveness of their work and has long-term harmful effects on their overall well-being (World Health Organization [WHO], 2005; Lima et al., 2020). Banerjee (2020) stated that addressing the mental health issues in medical workers is thus crucial for the better prevention and control of the pandemic. In Pakistan, several online comments are calling for the frightening state of HCPs working in the isolation wards. However, to the best of our knowledge, no systematic qualitative research has been conducted to address the urgent issue. In the view of the scenario as mentioned earlier, the present study aimed to explore and understand the factors that might have caused the HCPs to resist serving in COVID-19 isolation wards/emergency units and effectively treat COVID-19 patients in Pakistan.

MATERIALS AND METHODS

Research Approach

In the present study, the phenomenological approach was used to obtain rich experiences of the doctors and nurses who had firsthand knowledge and experience of the situation. The phenomenological approach allows exploring and understanding

in-depth the lived experiences of the phenomenon with a retrospective view (Salmon, 2012).

Study Design and Settings

Exploratory qualitative research under the phenomenological approach was considered appropriate to address the main research objective(s). The qualitative inquiry provides more in-depth and broader insights into the phenomena that might have remained unnoticed by survey-based research methods (Punch, 2013). The participants of this study include doctors and nurses who were working in the COVID-19 wards/emergency units and had direct contact with confirmed and suspected COVID-19 patients for at least 2 weeks. The study participants were chosen regardless of their experiences and medical specialty. The study was conducted in Karachi—a cosmopolitan city and the largest city with a population of more than 30 million in Sindh Province. The first COVID-19 case was confirmed on February 26, 2020, in Karachi, Sindh Province. Within 15 days, the number of total confirmed cases (COVID-19 positive) reached 20 out of 471 suspected cases, with the highest numbers in Sindh Province in Pakistan (National Institute of Health Sciences [NIHS], 2020). Besides, 25% of the recorded COVID-19 cases and deaths in Pakistan have been reported in Karachi. It has emerged as the most-affected city of Pakistan (Gulf Times, 2020). At the time of the investigation, Karachi city reported 38,515 (May 14, 2020), which was the highest COVID-19 confirmed cases among other cities in Sindh Province (Health Department, 2020). It is essential to mention that Sindh Province was also among the most affected provinces of Pakistan, having 129,179 COVID-19 confirmed cases in comparison with Punjab with 96,036, Khyber Pakhtunkhwa (KPK) 35,293, Baluchistan 12,742, Islamabad (Federal) 15,578, Gilgit-Baltistan 2,816, and Azad Kashmir 2,277 (Health Department, 2020). In addition, most HCPs were infected with COVID-19 virus in Sindh with 1,804 including 1,626 doctors and 178 nurses. Also, at the time of the advent of the COVID-19 outbreak in Pakistan, Karachi was the only city in Sindh Province that designated few hospitals to deal with COVID-19 patients, and no other cities had the facility for treating COVID-19 patients (Government of Sindh, 2020).

On April 2020, there were only seven designated hospitals in Karachi (both public and private) that established temporary isolation wards inside and outside of hospitals to treat the increasing number of COVID-19 cases. The intention was to target those hospitals that had maximum number of HCPs. Out of seven, five hospitals agreed to participate in the study. Among the five, three were government hospitals and two were private hospitals. The remaining two hospitals declined to participate in the study, as their research departments were looking into research matters. The detailed characteristics of selected hospitals are shown in **Table 1**.

The participating hospitals only allowed to contact HCPs on the phone rather than face-to-face meetings. In doing so, the hospital management provided phone numbers of willing participants. The researchers initially contacted HCPs through text messages to ask for their convenient time for the interview. The researchers reassured all participants that their involvement is voluntary and that they have the right to withdraw from the study at any point without stating any justification. They were also assured that their responses would be kept confidential and that the results of the study will be reported in a collective report form. For the present study, ethical approval was received by the Ethical Review Board of NCBA&E under reference number NCBAE-RYK/REF/20/474.

Data Collection and Procedures

Semi-structured in-depth telephone interviews were conducted with doctors and nurses. The interview guide was developed based on the review of recent preliminary studies (see Mukhatiar, 2020; Rana et al., 2020). The review of the literature shows a very limited original research related to challenges faced by HCPs during the COVID-19 outbreak (in April 2020), and the majority of these studies were at preliminary stages. Specifically, in the context of Pakistan, there was no single original research study found during searching of the literature review in search engines using multiple keywords, which evidences severe dearth of original research. Furthermore, the novel situation instigated the researchers to conduct the original study to address the matter, but the notion was still emerging in that context at the time when data were collected for this research. Hence, it was not possible for us to detail the predetermined list of themes; instead, we allowed data-driven themes to emerge that facilitated us to obtain the rich experiences of HCPs from the interviews, which served the core purpose of the qualitative inquiry. Therefore, the interview guide with open-ended questions was prepared. The summary of interview topics or domains is detailed in **Table 2**.

The sample size was determined by theoretical sampling; i.e., at the point where no new themes from participants' experiences emerged, data collection was stopped. Theoretical sampling was achieved after 12 interviews; however, two additional interviews were conducted to observe if any new themes were emerging (Creswell and Poth, 2016). To access the participants, both purposive and snowball sampling techniques were used to obtain the rich and diverse experiences of the HCPs. Here, it is also important to mention that unlike other qualitative studies, which are conducted in everyday settings, this study was conducted in the emergency times and very chaotic situations. The countrywide lockdown, fear of the highly contagious virus, and difficulty in getting access to hospitals and HCPs made the fieldwork challenging. Despite these conditions, we managed to conduct 12 with two additional interviews.

The participants were initially contacted through SMS/WhatsApp rather than a direct phone call to ensure their privacy. In the preliminary conversation in the text messages, we introduced ourselves and the main reason for the contact, and we requested for the convenient time for the interview. Once the initial contact was developed, we started the phone call with greetings and by thanking them for their valuable time despite their hectic schedules. We also repeated the purpose of the contact, e.g., the main aim of the research study, and assured them that their identities and responses would be kept strictly confidential. Furthermore, we explained that the call would be recorded for analytical purposes.

Nevertheless, the audio file will be deleted immediately once the research process is completed. We initiated with the broad

TABLE 1 | Hospitals characteristics.

No.	Hospitals	Number of beds in isolation wards	Total number of ICU beds	Total number of HCPs working in isolation wards (approximate figures)*	Number of participating HCPs
Government-run hospitals authorized for admitting COVID-19 patients (Karachi)					
1	Hospital A	48	10	Total doctors: 17 (8 hours rotation) Nurses: 10	03
2	Hospital B	50	28	Doctors: 21 (8 hours rotation) Nurses: 10	02
3.	Hospital C	65	12	Total doctors: 25 (8–10 hours rotation) Nurses: 10	04
Private hospitals authorized for admitting COVID-19 patients					
1	Hospital D	40	20	Doctors: 20 Nurses: 11–15	1
2	Hospital E	45	30	Doctors: 11 Nurses: 11–15	2

*Source: Health Department (2020). *Data directly obtained from respective hospitals.*

TABLE 2 | Summary of the interview topics/domains.

No.	Summary of the interview topic guides
1	Personal feelings and experiences while working in the isolation wards/ICUs.
2	Problems and challenges faced by HCPs in treating COVID-19 patients.
3	Future directions (What key steps should be urgently taken).

question "Can you please tell me about your experience of working in the isolation ward or taking care of COVID-19 patients?" Further questions were asked, for example, how did you feel on the first day? How are your feelings now? What challenges did you encounter? How did you respond? What is the response of hospitals regarding those challenges? What kind of support did you receive? In this process, we carefully used the probes, e.g., please tell me more and why/how/when, to promote in-depth discussion. In the end, we expressed our appreciation to them for their incredible and matchless contribution during the pandemic situation. Also, we sincerely thanked them for sharing their stories genuinely to us. Once again, we reminded and reassured them that all conversations would be kept confidential and ensured our availability by providing our contact details for further information or questions. Each interview was conducted in Urdu, the national language of Pakistan, and lasted for at least 30–40 min. The authors conducted all interviews between April 6 and 14, 2020.

Analysis

The interviews were analyzed using the Braun and Clarke (2006) method of thematic analysis. Each interview was transcribed into Urdu and translated into English. Data analysis occurred concurrently with data collection, and the transcriptions of each interview were completed within 24 hours of the interviews. All the transcripts were reviewed twice before the first transcript was imported into Atlas.ti 8.03. To validate the findings, the researchers tried to eliminate the subjectivity biasness by assigning a single task to two researchers. This practice was done for interviews and analysis. The analyses from two different researchers were matched for internal validation (congruity purpose). The remaining co-authors reviewed the generated themes to ensure that they are truly reflective of the content of the interviews. In addition, a mutual consensus was reached among all assigned research team members.

RESULTS

Participants

A total of 27 participants consisting of doctors and nurses were approached and screened for set inclusive criteria of the study. Out of 27 participants, five did not meet the inclusion criteria. Of 22 remaining eligible participants, four declined to participate in the study. Finally, 18 participants agreed to participate in the study. Among the 18, there were 10 physicians and 8 nurses. However, the researchers reached the point of saturation on the 12th interview. The mean age of participants was 31.5 years. There were eight male and four female participants. A majority of the participants (9/12) were working in the public sector, while the rest were associated with the private health-care sector. The mean experience of the participants was 2.9 years. The participants joined the COVID-19 isolation wards from early March, around 15–34 days before the interviews were conducted. The demographic distribution of the study participants is detailed in **Table 3**.

FINDINGS

The findings show that all participants were highly committed to take an active part in the battle against the COVID-19 pandemic. The thematic analysis of the interviews resulted in two major themes or categories. The major themes emerged were institutional and personal constraints (especially fear), which were impeding HCPs to perform their jobs effectively (**Figure 1**). The findings show similar responses from the private and public sectors. The themes generated from the interviews show no significant differences mainly because

TABLE 3 | Participants profile.

Characteristics	Frequency
Participants	
Nurses	5
Physicians	7
Gender	
Male	8
Female	4
Age group	
25–30	6
31–35	6
>40	
Participants service sector	
Public	9
Private	3
Service experience (years)	
1–5	12
6–10	
>10	
Working days in isolation wards before interview (days)	
1–10	
11–20	5
>20	7

location, conditions, and constraints associated with dealing COVID-19 patients were the same.

Institutional Constraints for Health-Care Professionals in Treating Coronavirus Disease 2019 Patients

Poor Conditions of Isolation Wards

The majority of the participants was worried about the poor condition of isolation wards and considered it as a significant obstacle in following the standard operating procedures (SOPs) in handling COVID-19 patients:

> *I cannot stand there for long. There are no hygiene measures; uneven floor, broken windows, and lack of equipment. How can I treat the patient in such conditions?* (D1)

The findings show that most of the state-run isolation wards were built in unrestrained buildings or non-functional departments of hospitals. In addition, schools, hostels, and labor colonies were used to accommodate COVID-19 patients. According to the participants, these isolation wards lacked the necessary facilities endangering the lives of patients and HCPs:

> *There is no common room for us where we could wear protective suits or disinfect us before or after the duty. I used to wear all my protective gears outside the building in open sunlight and then walk to the building in extremely hot weather.* (N2)

Besides, the study found that some isolation centers were set up inside the hospitals by modifying the normal wards for COVID-19 patients. These isolation wards did not meet the criteria or SOPs given by WHO for handling COVID-19 patients. The participants mentioned that the government was not proactive at the beginning of the COVID-19 outbreak in Pakistan. They were very late in disseminating information and official directives, and in allocating the necessary financial budget. Therefore, the sudden surge in COVID-19 patients in the country, especially in Karachi, has created a panic in the health-care sectors and failed to provide any standard facility for the patients. Going through these situations, all participants found themselves in mental distress and extreme pressure for contaminated and unsafe working conditions. On the other hand, the participants working in the private sector were far from satisfied with the facilities, e.g.,

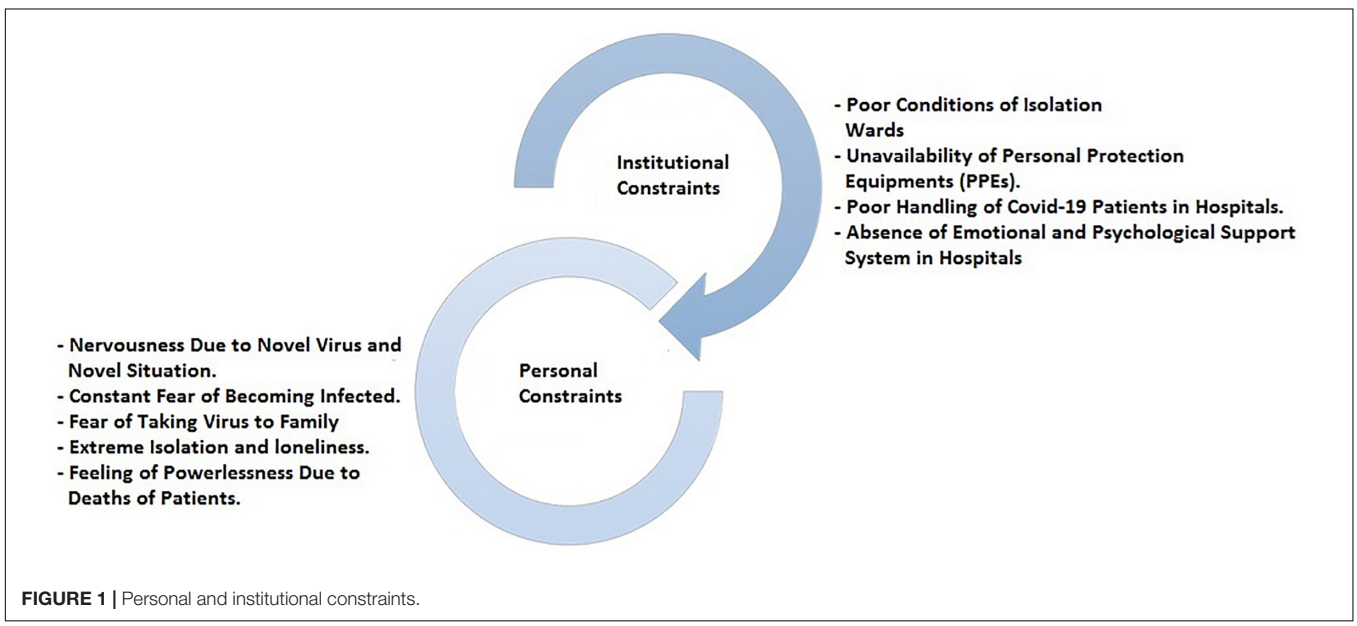

FIGURE 1 | Personal and institutional constraints.

infrastructure of wards, in that they cannot treat some of the patients:

> *We only have 40 beds in isolation wards and few beds in ICU for the COVID-19 patients; which clearly are not sufficient for the velocity of new cases. The patients need to pay a high price ranging from Rs.100,000 to 150,000 per day, and only rich people can avail this facility.* (D4)

The participants disclosed that the private sector provides the patients with premium services, but only a handful can afford and make use of them. In addition, the participants expressed deep concerns on the unrealistic charges per day for COVID-19 patient. They expressed that only elites can avail that service. Also, the participants were not happy with the safety precautions they were presented with.

Fighting as Frontline Soldiers Against the Pandemic With No Weapons and Defense Mechanism

The study found shortage or unavailability of PPE as one of the major causes of HCPs' frustration and distress. The majority of the participants considered this situation "insane," as many of them were putting their lives at significant risk:

> *We have no idea how many patients we have infected or will infect. There are severe stress and fear among us. Then we decided to protest for PPEs not only for ourselves but to save lives of others.* (D5)

The participants said, at early stages, that they used regular glasses, sports goggles, and plastic sheets to protect the face and plastic bags as the gown, risking their lives to treat COVID-19 patients. The participants witnessed many of their colleagues getting infected with COVID-19 infection due to lack of administrative support.

> *I lost one of my best friends married just a month ago, due to virus infection because there were no sufficient PPEs available. I wrapped his body in a plastic bag, disinfected him and buried without a proper funeral process. I cannot forget that moment. I am exhausted.* (N2)

Since PPE was unavailable and the working conditions worsened, the majority of health-care employees refused to serve COVID-19 patients and protested against the government and the concerned department.

In response, the participants recalled of the incident that took place in Peshawar, KPK Province, where police assaulted the HCPs who protested for PPE and vulnerable working conditions:

> *I cannot imagine how police can do this to HCPs. In the morning, they saluted them for leading the battle against COVID-19, and when they complained about PPEs, police used physical force on them. We cannot find this type of offence in the world.* (D7)

In addition, the HCPs expressed the most profound concern over a debate on social media regarding their refusal to conduct duties and challenge their loyalty with the profession in this critical situation:

> *Do I need to go on the suicide mission to prove my loyalty as a doctor? What if, all of the HCPs get infected? Who will be treating the patients? The authorities are hiding their incompetence by blaming the doctors and nurses, which is an offence.* (D5)

Moreover, the participants reported that the PPE that they received was of poor quality. They further briefed that the items (masks, gowns, and shoes) they are receiving are of substandard:

> *HCPs infected despite wearing the proper PPEs and following the SOPs. This thing also created a sense of fear among HCPs and doubt about the quality and effectiveness of PPEs.* (N5)

Poor Handling of Coronavirus Disease 2019 Patients in Hospitals

Due to lockdown measures in the country, the outpatient departments (OPDs) were closed in all hospitals nationwide. However, emergency departments were open to deal with the normal flow of visiting patients to hospitals. We were informed that the emergency departments have no proper setup or a separate desk for suspected COVID-19 patients at initial screening. Once they were confirmed as COVID-19 patients, they were then transferred to isolation wards. The participants stated that the entire process of dealing with COVID-19 patients in these hospitals is an open threat to the entire crowd of the hospital:

> *I see the patients using the same gate of the hospital or even departments for entrance and exit. Moreover, we cannot identify the COVID-19 patients by simply checking their temperature at gates. Some have very mild symptoms. The handling is poor; rather, I say there is criminal negligence.* (D1)

The participants revealed that the majority of the patients are illiterate and belong to low-income families. They are scared to provide correct information about their illness. For example, they hide their symptoms and their travel history and provide misleading information about their previous contacts and families:

> *The parents came to our hospital for their daughter's sickness as she had a consistent cough. They told me that she has a dust allergy and has a history of asthma. While on screening, the patient was found positive for the COVID-19. Later, we came to know that she was living with her husband, who recently came from Dubai and is also sick at home.* (N1)

The study found that patients who are asymptomatic or have mild symptoms are real threats to the HCPs.

A Never-Ending Fight; Excessive and Uneven Workload

The participants illustrated that they are exhausted due to the overwhelming workload in isolation wards and intensive care units (ICUs). Unlike the regular wards, many uncertainties prolong their stay and duties:

> *When I get back from my shift, I am exhausted and cannot figure out how many days or nights have passed on.* (D2)

The participants indicated that some patients become unexpectedly seriously ill and therefore require mental and psychological help too. All these create stress and extra burden

for HCPs, as they have been given the responsibility to maintain a positive and healthy environment in the ward:

> *Patients with COVID-19 are isolated and have not seen their families for a long time. Thus, we are the main and only point of contact. We often spend our time to make them relax in critical situations regardless of our own mental state.* (N5)

Obligations for staff include not just the additional workload created by such pandemics but also concerns of infection for themselves and their families, dealing with modern and continuously changing measures and PPE, taking care of patients who are severely ill and taking good care of colleagues who have already fallen ill.

Absence of Emotional and Psychological Support System in Hospitals

All participants reported that hospitals do not have any interventions or help, which could provide psychological and social assistance to HCPs in COVID-19 pandemic. Moreover, there is no one to listen to them and help out with present fears, anxiety, and stress:

> *Literally no one ever thinks of what we are facing in our daily lives. There is no actual channel or helpline for psychologically drained health workers.* (D7)

Another participant expressed:

> *In our case, we are struggling to get necessary logistics; getting psychological help in this situation is considered a luxury for many authorities.* (D6)

The study found that HCPs were also struggling to attain sufficient support from family members due to the risk of infection involved. The pressure from family further causes depression and lack of confidence among them. However, the participants reported that they often get psychological support from their colleagues and discuss their problems with them.

Personal Constraints

Nervousness Due to the Novel Virus

The participants revealed that, initially, they were very nervous and lacked the confidence to treat patients with COVID-19. They stated the novel nature of the "virus" itself and its unknown nature, properties, and behavior as some of the major causes of their nervousness:

> *The virus is still in the discovery phase, and there is no enough information available regarding its risk, transmission, pathogenicity and treatment.* (D5)

Here, the participants discussed that they are relatively young and had no previous experience of working in ICU or isolation wards under such pandemic situations. In addition, the researchers found that most of the specialist doctors were elderly persons who were more vulnerable to infection. Therefore, the hospital administration did not allow them to have direct contact with COVID-19 patients. However, they were continuously in contact with HCPs in isolation wards.

Constant Fear of Becoming Infected

The participants informed that they are hyperactive and ensure that they must not catch the virus infection. This constant mental stress accelerates the state of fear and anxiety while doing duty in the isolation wards.

> *Walking into a hall of 100 COVID-19 positive patients brings a lot of uncertainty and fear among* HCPs. *The only certainty in our lives is "Virus" itself because it is definitely in the air, on the furniture we sit, on the equipment we use and even every surface we touch there. We all know the virus does not discriminate.* (N3)

Besides, they reported inadequate health-care facilities in the isolation wards that increase the risk of being infected. Moreover, the study found that the HCPs were concerned as most of the doctors and nurses have been infected with the virus.

The safety of the HCPs should be the top priority because if frontline doctors and nurses were infected, they would become a potential risk for others and patients. Unfortunately, there was a lack of sufficient testing of HCPs who are at high risk of contracting the infection.

They discussed that there is very "little" testing for health-care workers, especially for those who show symptoms:

> *We should be tested at least once a week to make sure that we are not vectors for spreading this infection.* (D1)

The participants emphasized on "aggressive testing" of COVID-19 for HCPs as the solution to mitigate their mental distress. If not, these HCPs can be a significant source of virus dissemination across the population.

Fear of Taking Virus to Family

HCPs working in the emergency unit reported the feeling of interpersonal isolation and the fear of passing the virus to their families. They expressed serious concerns and fear when they return to home from work:

> *I am confident about my fight with multiple fears in the hospital. But when it comes to my family, I am afraid about the consequences.* (N4)

Another participant expressed:

> *When I go back home, I throw my clothes in the hamper, run to shower, disinfect all my belongings including, keys, cell phone and even doorknobs, everything. Still, I try not to touch my children which is very painful sometimes.* (D1)

The majority of the participants revealed they are residents of a small apartment, and they do not have any space to self-isolate after the hospital duty. In addition, they could not rent another apartment or a room due to the financial constraints and dependents at their homes:

> *In Karachi, the apartment rents are so high, one small unfurnished apartment rents about Rs.10,000. How can I afford it with a low salary and for how much time? Still, we do not know when this pandemic will be over.* (D4)

Treating COVID-19 patients has affected individual HCPs lives, especially females, to purposely take volunteer leave from

work due to pressure from their immediate family to avoid any direct contact from virus carrier:

> *In our hospital, medical staff includes nurses and doctors were warned by their husbands not to treat the COVID-19 patients otherwise, they will not be allowed to come home.* (N1)

It must be noticed that such social issues have the potential to weaken the health-care system treating COVID-19 patients in the country.

Extreme Isolation and Loneliness

The participants expressed their feelings of being isolated all the time. They are supposed to keep a distance from the family, friends, and even their colleagues so that they may not be a source of transmitting the infection to their social circle:

> *I feel I am in the incubator. No one really wants to be around me knowing that I am treating COVID-19 patients.* (D5)

Feeling of Powerlessness

The participants expressed the feeling of "powerlessness" because they cannot save people from dying:

> *As soon as we get to work, you never know what is coming next. In a moment, everything looks so fine, charming, and hopeful. In next, everything is just simply opposite, i.e., respiratory failure, and unfortunate sudden death.* (D7)

Another participant shared:

> *It is tough to see or even imagine people dying from virus and their infected bodies wrapped around.* (N3)

DISCUSSION AND CONCLUDING REMARKS

The present study highlights HCPs' lived experiences of battling the COVID-19 pandemic in Pakistan. The findings of the study revealed that the HCPs are working under extreme pressures and making tough decisions. The complex decisions mainly revolve around balancing their physical and mental health-care needs with those of patients and providing care for all unwell patients with inadequate resources resulting mainly in mental health problems (Greenberg et al., 2020).

The participants expressed their deep concerns over unavailability of PPE, deprived conditions of isolation wards, and insufficient supplies. The shortage of PPE, protective gears, and other medical supplies is a global phenomenon and not only in Pakistan, which is a worrying factor in the current scenario. Although Pakistan, being a developing country, is in more critical condition, developed countries are also facing the same issues. There is a lack of adequate PPE, face shields, gowns, and hand sanitizer in the United States, and health-care workers in Italy experienced high rates of infection and death partly because of inadequate access to PPE (Ranney et al., 2020). Similarly, the findings of the study revealed that there is a lack of proper infrastructure to effectively treat COVID-19 patients and the administration flaws in the handling of COVID-19 patients in hospitals. The government has established isolation wards and quarantine areas in teaching hospitals, but these hospitals violate COVID-19 preparedness guidelines (Saqlain et al., 2020a,b). HCPs working in risky conditions experience physical distress and decreased immunity that result in different psychological disorders (Huang et al., 2020).

Considering these issues, it is important for hospital management and relevant authorities to arrange the necessary medical supplies even before letting HCPs into the isolation wards or emergency units. In this context, the previous research shows that during the SARS epidemic, infection control initiatives and higher level of trusts on equipment, e.g., PPE and medical supplies, were related to lower levels of emotional exhaustion (Chong et al., 2004; Marjanovic et al., 2007). In addition, government and hospital authorities must ensure that the isolation wards and emergency units for COVID-19 patients must adhere with the guidelines of WHO. The better working conditions improve the efficiency of HCPs, reduce the state of fear, and lessen the chance of mental distress. The proposed recommendation was also supported by the study of Adams and Walls (2020), who argued that the monitoring and supervision of infection prevention with control measures, reasonable working hour, and appropriate shifts arrangement are key to prevent HCPs from the burnout.

In the current study, psychological factors such as fear of the contracting virus, fear of taking virus to home, and nervousness were also identified as the major themes. These findings are confirmed by very recent studies conducted across the world (see Naushad et al., 2019; Spoorthy et al., 2020; Zhang et al., 2020). As mentioned by Mukhatiar (2020) and Grover et al. (2020), anxiety of falling sick or fear of death could make people hopeless and burnt out. HCPs are facing the worst fear due to their direct contact with the COVID-19 patients by being on the frontline. As found by Zhang et al. (2020), medical health workers had a higher prevalence of psychological problems and risk factors for developing them than non-medical health workers. In this same context, the findings also witnessed that the hospitals mostly lack the facility of psychological support for HCPs. As discussed earlier, the poor conditions at hospitals heightened the risk and fear among the HCPs and infecting their families. Considering these issues, sound infection prevention practices are needed to provide a safe and secure working environment. HCPs who lived at home have concerns about transmitting the virus to family members, which needs to be addressed by hospital administration. One way is to provide separate living accommodation (Adams and Walls, 2020) or financial assistance to secure the family from the unknown virus.

Undoubtedly, the advent of COVID-19 in Pakistan brings various serious challenges for HCPs who are on the frontline. However, these challenges were exponential for the young and junior HCPs who had few clinical experiences in infectious intensive care and belonged to different specialties. The deployment of young HCPs was due to the virus itself, as the older adults are most vulnerable to the worse effect of infection (Vox, 2020). In this study, the participating HCPs' mean age was 31.5 years and had experience of 2.9 years,

which shows that they have noticeably less experience than senior specialists and consultants. The findings suggest the HCPs explicitly expressed the sense of powerlessness about their patients suffering and the loss of lives. They also expressed their fears, lack of management, and problems in emotional stability. These findings are confirmed by the study of Mamas (2020), who stated that junior doctors were moved from being trained to delivery service, and their placement is at greater risk.

Furthermore, Mamas (2020) pointed out that over 100 doctors have died during the COVID-19 pandemic in Italy. In Spain, 20% of those infected with COVID-19 are the individuals who work in the health services. Similarly, in reports in China, the United States, and the United Kingdom, many HCPs have died due to COVID-19 infection. Here, we do not undervalue the novel and contagious nature of the virus and shortages of PPE, but it is a greater risk that junior doctors were deployed in the areas that they may not be familiar with (Mamas, 2020).

Moreover, it is argued that medical equipment such as ventilators is irrelevant when the doctors do not know about their proper usage. Therefore, it is imperative to familiarize with the necessary skill set even there is a lower risk environment and data to practice to perform immediate procedures in the emergency units. In a similar context, the most recent study, i.e., a case report (see Ramachandran, 2020), shared the experiences of one of the junior doctors who shared the story about treating patients to becoming a patient of COVID-19. The reports state that the junior doctor, even though he was at the start of a medical career, showed lack of control and difficulties in information processing. It may be caused by fatigue. This situation strongly indicates the junior or young doctors were not fully ready to handle the outbreak of infectious diseases and required substantial training, education, and improved communication (Huang et al., 2020).

Undoubtedly, at the start of a medical career, high mortality was seen in patients; sudden deaths and no standard treatment were the most significant challenges that shake their confidence. In addition, with the communication challenges posed by strict limitations on family visits, junior doctors should receive additional training and support in breaking bad news (Coughlan et al., 2020). Well-being is particularly crucial for deployed junior HCPs, and simple measures such as introducing junior doctor forums can provide trainees with a space to reflect on stressful experiences with their peers. Despite the considerable disruption to postgraduate training and education, deployment to critical care offers unique opportunities for clinical and professional development (World Health Organization [WHO], 2013). Senior support can help junior doctors acquire transferable skills that will enhance their performance in any field of medicine (Charles and Kumar, 2020).

In the end, it is essential to note that when HCPs become sick, it incapacitates their whole ability and effort to curb the outbreak in the country. During SARS and Middle East respiratory syndrome (MERS) epidemics, HCPs were at higher risk of mental health problems and suffering from post-traumatic stress disorder after the epidemic (see Maunder et al., 2003; Marjanovic et al., 2007; Lee et al., 2018). There is a need to properly prepare staff for the associated challenges to reduce the risk of mental health problems through various mechanisms. As suggested by Greenberg et al. (2020), routine support processes (such as peer support programs) should be made available to the medical staff workers. Furthermore, HCPs require health protection and adequate working conditions, e.g., provision of necessary and sufficient medical protective equipment, the arrangement of adequate rest, and "recovery programs aimed at empowering resilience and psychological well-being" (Zhang et al., 2020, p. 8). Adams and Walls (2020) suggested a supportive system for the health-care workers, for example, ensuring that workers feel they get adequate rest, provision of food, and rest breaks. Results of the recent study suggested that the social support given to medical staff caused a reduction in anxiety and stress levels (Xiao et al., 2020). Urgently, hospitals and relevant authorities need to monitor HCPs mental health continuously and to provide rapid support systems, professional psychological counseling, and crisis interventions (Chen et al., 2020).

The limitations of the study were that all the participating doctors and nurses were interviewed by telephone because there was strict lockdown in Karachi, and there was no physical access to the hospitals. Therefore, the non-verbal expressions was not observed and recorded. The semi-structured guide was not pretested, but the researchers were well trained in conducting telephone interviews before this study. Secondly, the study employed a theoretical sampling where every new interview has given an idea of the new questions that need to add until the researchers reached theoretical saturation point.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because of the confidentiality agreement with respective hospitals and the participants.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethical Review Board National College of Business Administration & Economics (NCBA&E). Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

AR and SM formulated the idea of this urgent research, due to emerging and rapidly evolving situation of COVID-19 in Pakistan; made substantial contributions to the conception of the study; and shared and discussed their idea with MZ, who is an MBBS doctor, to check the ground reality and possibility for the conduct of study. MZ assessed the overall situation,

verified the facts, and contributed to data collection process by obtaining the permission from relevant hospital administrations through proper channels. AR and DN conducted the telephone interviews, performed the translation and then transcription simultaneously. AR and AH analyzed qualitative data to get emerging themes. AK, NAR, and HA participated as experts and reviewing analysis process and findings. NA provided feedback on each step of the investigation. AR, SM, and DN took lead to draft the *Introduction* and *Materials and Methods*. AK provided tremendous help in drafting the *Abstract* and *Discussion and Concluding Remark*. All the authors were significantly involved in the investigation to contribute to the knowledge in this study.

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Psychological Pathways Linking Public Trust During the Coronavirus Pandemic to Mental and Physical Well-being

Ayokunle A. Olagoke[1,2], Olakanmi O. Olagoke[3] and Ashley M. Hughes[2,4]*

[1] Division of Community Health Sciences, School of Public Health, University of Illinois at Chicago, Chicago, IL, United States, [2] Center of Innovations in Chronic and Complex Healthcare, Edward Hines Jr. VA Medical Center, Hines, IL, United States, [3] Department of Internal Medicine, John H. Stroger, Jr. Hospital of Cook County, Chicago, IL, United States, [4] Department of Biomedical and Health Information Sciences, College of Applied Health Sciences, University of Illinois at Chicago, Chicago, IL, United States

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Obianuju Aguolu, Yale University, United States

***Correspondence:**
Ayokunle A. Olagoke
aolago2@uic.edu

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The well-being of the public during the 2019 coronavirus (COVID-19) pandemic is deeply rooted in institutional trust in the government's risk communication effort. The objective of this study was to examine the psychological pathway through which public trust in the government is associated with mental and physical well-being. We collected cross-sectional data from 501 participants aged ≥18 years using an online panel. Public trust in the government was assessed as our exposure variable. We screened for psychological distress by combining the Patient Health Questionnaire and the General Anxiety Disorder scale. Physical well-being was examined using self-rated health. We further assessed the roles of risk perceptions. The author conducted a one-way analysis of variance (ANOVA), Pearson's correlations, multivariable regressions, and mediation analyses (using the Preachers and Hayes' approach). Participants were 55.29% female, 67.86% Caucasian/white with a mean age of 32.44 ± 11.94 years. Public trust in the government regarding COVID-19 was negatively correlated with psychological distress ($r = -0.20$; $p < 0.001$) and positively associated with physical well-being ($r = 0.13$; $p < 0.001$). After adjusting for sociodemographic and socioeconomic factors, public trust remained negatively associated with psychological distress (β = −0.19; 95% confidence intervals, [CI] −0.30, −0.09) and positively associated with physical well-being (β = 0.26; 95% CI [0.16, −0.37]). Perceived self-efficacy to practice COVID-19 protective behavior partially mediated the relationship between public trust and psychological distress (13.07%); and physical well-being (28.02%). Perceived self-efficacy to protect self against COVID-19 infection can serve as a psychological pathway through which public trust may be associated with mental and physical health.

Keywords: public trust, coronavirus disease, perceived self-efficacy, mental health, physical health

INTRODUCTION

The 2019 Coronavirus disease (COVID-19) pandemic, caused by the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2), has led to unprecedented interruptions to the normal way of life for many individuals around the world (Diamond and Willan, 2020). Compared to other infections, the virus poses a unique global challenge for several reasons, such as its rate of spread, uncertainties about the virus and its future, conflicting information from health and government authorities, and its lethality (Holmes et al., 2020; Lazzerini and Putoto, 2020). These socio-epidemiological implications have led to the recommendation and enforcement of strict regulations and preventive strategies such as self-isolation, physical distancing, and restricted movements (Sibley et al., 2020; Wilder-Smith and Freedman, 2020). However, some of these strategies are life-threatening and critical risk factors for poor physical and mental health.

Regarding mental well-being, early works on the public's response have established an expected increase in symptoms of anxiety, depression, and harmful behaviors such as suicide, self-harm, alcohol and substance misuse, domestic and child abuse globally (Gunnell et al., 2020; Sibley et al., 2020). Regarding physical health, so far, the pandemic associated risks to physical health has included sedentary lifestyles and lack of physical exercise resulting in obesity, reduced levels of muscular, cardiovascular, metabolic, endocrine, and nervous systems activities (Narici et al., 2020). Evidence from previous outbreaks portrayed similar trends. For instance, in 2003, the severe acute respiratory syndrome (SARS) epidemic was associated with a 30% rise in suicidal attempts among individuals aged 65 years and older; almost 50% of recovered patients remained anxious, and more than a quarter of health-care workers reported probable emotional distress (Tsang et al., 2004; Yip et al., 2010).

A notable antecedent of physical and mental well-being during outbreaks is risk communication. Risk communication can be defined as a purposeful exchange of information among interested parties about the nature, magnitude, significance, or control of a risk (Covello, 1992; Olagoke et al., 2020). During the COVID-19 public health emergency, the US government, and the Centers for Diseases Control (CDC) have kept the public abreast of the progress of the pandemic. Frequent press releases, including regularly occurring live updates from local and national leaders (i.e., US governors and the US presidential taskforce) on the outbreak status (number of tests, cases, deaths, and recovery), preventive measures, and regulations (CDC, 2020; Sha et al., 2020) flood media outlets. The daily risk communication efforts intend to inform the public on the current status, ease the physical and mental tension by providing information that is considered to be factual. However, there is a burgeoning need to investigate the public's response to this information, including the perceived trustworthiness of the information sources. As an example, the US president tweeted lamentations regarding how the media "refuses to report the truth or facts accurately" about the White House News conferences and "not worth the time and efforts" anymore (Wagtendonk, 2020). The public's experience with institutional successes and failures may impact their trust in the government's communication (Hudson, 2006).

Regarding the COVID-19 pandemic, a plethora of information sources has arisen, which often debunk information provided by the local or national government. There have also been mixed reactions about the government's slow response to the pandemic. This cumulative experience may spur feelings of betrayal by the official authorities and feed conspiracy theories by rival political parties, eroding the public's trust and increasing the public's anxious response. This lack of institutional trust may further result in poor physical and mental health (Nilsen et al., 2019; Garrett, 2020; Olagoke et al., 2020). More evidence of how institutional distrust may have a strong implication on the people's perception of the pandemic, their physical and mental well-being, therefore, warrant a more in-depth investigation.

Psychologically, the public's trust in the government's risk communication and social persuasion strategies may affect their perception of the pandemic's severity, their vulnerability to the virus and their perceived self-efficacy in practicing preventive behavior or taking care of their health (Brug et al., 2004; Bish and Michie, 2010; Olagoke et al., 2020). These perceptions can offer multiple risk pathways through which the public's trust may influence well-being. The objectives of this study were to (i) examine the association between the public's trust in the government's risk communication effort and mental and physical well-being and (ii) conduct a mediation analysis of the psychological correlates through which public trust influences mental and physical well-being.

MATERIALS AND METHODS

Participants and Procedures

We recruited participants via Prolific, an online crowdsourcing platform for researchers (Palan and Schitter, 2018). This platform is renowned for its diverse participant pool and high-quality data collection. Participants from prolific tend to be less experienced survey-takers with higher scores on attention-checks, engagement in lesser dishonest behavior and can reproduce existing results (Peer et al., 2017). Participants were eligible if they resided in the US and were 18 years or older. We collected cross-sectional data from 502 participants on the 22nd of March, 2020, through the Qualtrics online survey. Ethical approval was obtained from the University's Institution Review Board (IRB). All participants gave their informed consent before proceeding with the survey.

Measures

Public Trust in the Government

We measured public trust with four questions (Liao et al., 2011). Participants rated their agreement or disagreements with the following statements regarding COVID-19 (i) *I am confident that the government's information is helpful.* (ii) *I trust what the government says about coronavirus.* (iii) *Government health websites are trustworthy* (iv) *I trust the government to do what is needed to protect our health.* Response options ranged from 1 *(Strongly agree)* to 5 *(Strongly disagree)*. Items were reverse

coded and averaged such that higher values represented greater trust (α = 0.72).

Perceived Severity of COVID-19

We measured the perceived severity of COVID-19 with a single item that asked respondents, "*Coronavirus is a serious infection for me to contract."* Response options ranged from 1 *(Strongly disagree)* to 5 *(Strongly agree).*

Perceived Self-Efficacy to Practice COVID-19 Protective Behavior

We assessed perceived self-efficacy using a 4-item measure (Ajzen, 2002) that asked about the participant's perceived confidence and perceived control in practicing preventive actions and protecting themselves against COVID-19 infection. An example of an item is "*It is possible for me to protect myself against coronavirus infection."* Response options ranged from 1 *(Strongly disagree)* to 5 *(Strongly agree),* α = 0.83.

Psychological Distress

We combined the shortened version of the Patient Health Questionnaires- PHQ-2 (Gelaye et al., 2016) which has an intraclass correlation of 0.92, with the Generalized Anxiety Disorder- GAD-2 (Seo and Park, 2015) scale, which has a reliability of 0.82, to create a 4-item composite variable of psychological distress. An example of a question used is *"Over the past 2 weeks, how often have you been bothered by any of the following problems: feeling nervous, anxious, or on the edge*?" Responses ranged from 1 (Not at all) to 4 (Nearly every day). Lower numbers indicate lower psychological distress.

Physical Well-Being

We assessed subjective well-being using the Self-rated Health (SRH) item (Ware and Sherbourne, 1992). The SRH is a widely used, well-validated, and reliable measure of subjective health and overall physical well-being (Sirois, 2020). It is a predictor of several important health-related outcomes, including cortisol responses to stress, morbidity, and mortality. We asked participants, "*How good or bad has your health been over the last 3 months?*" on a 5-point scale ranging from 1 *(Excellent)* to 5 *(Terrible).* Responses were reverse scored so that higher values reflect better physical well-being.

Covariates

As public trust and well-being are likely to be influenced by key demographics (e.g., age, sex), we assessed key demographic variables for participants' descriptions and statistical control (Liu et al., 1998; Primack et al., 2009). More specifically, we collected the following important demographic characteristics: sociodemographic characteristics, e.g., age (continuous variable), sex (female, male) race (White, African American, Asian, Hispanic, American Indian, Middle East and North Africa (MENA) and marital status (married, divorced, separated, widowed, or single). Socioeconomic status (SES) characteristics were household income (<$20,000, $20,000–<$35,000, $35,000–<$50,000, $50,000–<$75,000, and $75,000 or more); employment status, and highest education attainment (less than high school, high school graduate, some college, college graduate or more). We also assessed participants' most recent information sources (e.g., Doctor's office, television, government websites, scientists/researchers' websites/academic journals, etc.).

Data Analysis

First, we conducted descriptive analysis (means and their standard deviations; frequencies and their percentages). Second, we conducted analyses of variances (ANOVA) and Pearson's correlations to assess the relationship between public trust, risk perceptions (perceived severity and perceived self-efficacy), and physical and mental well-being. Third, we also conducted multivariable regression analyses, adjusting for sociodemographic covariates to assess the relationship between public trust and psychological distress and physical well-being. Fourth, we assessed whether perceived severity and perceived self-efficacy partially mediated the relationship between public trust and (i) psychological distress, (ii) physical health. To test the significance of the mediation effect, we used the Preacher and Hayes' approach of calculating standard errors and 95% confidence intervals of the relationship of public trust with well-being through risk perceptions (Preacher and Hayes, 2008; Hayes, 2009). We used 5,000 bootstrapped samples to estimate the bias-corrected confidence interval. We confirmed our analysis using the traditional mediation Sobel's test to assess the full mediated pathways, which is an independent test of the indirect effects that is treated similarly as a *z*-test (Sobel, 1982; MacKinnon et al., 2002). We recorded a very low amount of missing data for the major study variables of interest (0–5%). Hence, we used case deletion techniques, which are considered harmless ways to handle presumably ignorable low amounts of missing data (Schafer, 1999; Collins et al., 2001).

RESULTS

After excluding one participant who failed the attention check (**Table 1**), the other participants (N = 501) reported a mean age of 32.44 ± 11.94 years, being females (55.29%), White (67.86%), single/never married (68.46%), college graduate or more (53.71%), and employed (54.89%). The government's website as shown in **Figure 1** (29.05%) and medical website (23.28%) were rated as their most recent source of information. Participants reported mean (with standard deviations) levels of public trust (3.47 ± 0.93), perceived self-efficacy in practicing COVID-19 protective behavior (4.01 ± 0.67), perceived severity of COVID-19 (3.73 ± 1.19), psychological distress (2.02 ± 0.85) and physical well-being (3.83 ± 0.86) (**Table 2**). Participants who were single/never married, had lesser than high school/high school as their highest educational attainment, earned $15,0000–$34,999, students, and those who had a perceived risk of unemployment reported the highest psychological distress. Those who reported being male, with a college degree or more, earning > $75,000, and were students reported the highest physical well-being. Public trust was positively associated with self-efficacy (r = 0.19, $p < 0.001$), perceived severity (r = 0.04, $p > 0.05$), physical well-being (r = 0.13, $p < 0.001$), and negatively associated with psychological distress ($r = -0.20$, $p < 0.001$).

TABLE 1 | Mean (SD) of occurrences of psychological distress and Physical well-being by participants' characteristics (N = 501)†.

		Psychological distress		Physical well-being	
Variables	**No. (%) of participants**	**Mean (SD)**	***P*-value**	**Mean (SD)**	***P*-value**
Sex			0.29		<0.001
Female	277 (55.29)	1.96 (0.92)		3.70 (0.90)	
Male	224 (44.71)	1.87 (0.94)		3.98 (0.78)	
Race‡			0.98		0.462
White	340 (67.86)	1.93 (0.94)		3.81 (0.84)	
African American	30 (5.99)	1.92 (1.05)		3.87 (0.82)	
Asian	72 (14.37)	1.85 (0.86)		3.96 (0.83)	
Hispanic	41 (8.18)	1.94 (0.87)		3.80 (0.90)	
American Indian/MENA/others	18 (3.59)	1.94 (0.97)		3.56 (1.25)	
Marital status‡			<0.001		0.396
Single/Never married	343 (68.46)	2.05 (0.93)		3.81 (0.88)	
Married	128 (25.55)	1.61 (0.83)		3.91 (0.82)	
Widowed/Divorced/Separated	30 (5.99)	1.98 (1.03)		3.70 (0.79)	
Highest education‡			<0.001		0.024
Less than High school/High school	70 (14.03)	2.20 (1.06)		3.75 (0.87)	
Some college	161 (32.26)	2.05 (0.97)		3.70 (0.92)	
College or more	268 (53.71)	1.77 (0.83)		3.93 (0.81)	
Household income‡			0.005		<0.001
Less than $15,000	50 (1.02)	2.10 (0.81)		3.42 (0.91)	
$15,000–$34,999	80 (16.03)	2.2 (0.97)		3.60 (0.89)	
$35,000–$49,999	82 (16.43)	1.99 (0.99)		3.84 (0.87)	
$50,000–$74,999	109 (21.84)	1.80 (0.90)		3.89 (0.77)	
Over $75,000	178 (35.67)	1.79 (0.90)		4.01 (0.83)	
Employment status			0.01		0.007
Employed	275 (54.89)	1.80 (0.87)		3.89 (0.80)	
Student	102 (2.36)	2.10 (0.95)		3.97 (0.81)	
Unemployed/retired/disabled/others	110 (22.59)	1.98 (0.98)		3.64 (0.94)	
Perceived risk of unemployment			<0.001		0.616
Yes	190 (38)	2.20 (0.80)		3.85 (0.86)	
No	310 (62)	1.91 (0.87)		3.81 (0.87)	

†*n may vary due to missing responses.*
‡*Results from this group should be interpreted with caution due to the small n. MENA, Middle East and North Africa.*

After adjusting for sociodemographic and SES (**Table 3**), public trust in the government was negatively associated with psychological distress (β = −0.16; 95% confidence intervals [CI] = −0.24, −0.08) and positively associated with physical well-being (β = 0.12; 95%CI = 0.04,0.20). Perceived severity was positively associated with psychological distress (β = 0.12; 95%CI = 0.07,0.19) and negatively associated with physical well-being (β = −0.13; 95%CI = −0.19, −0.07). Perceived self-efficacy in practicing COVID-19 protective behavior was found to be negatively associated with psychological distress (β = −0.19; 95%CI = −0.30, −0.08) and positively associated with physical well-being (β = 0.27; 95%CI = 0.16,0.37).

Standardized mediation tests on perceived severity showed a non-significant indirect effect of public trust on psychological distress (β = −0.01; 95% bias-corrected confidence interval [CI] = −0.03,0.01) and physical well-being (β = 0.01; 95%CI = −0.01,0.02). However, perceived self-efficacy partially mediated 13.07% of the relationship between public trust and psychological distress (β = −0.02; 95%CI = −0.04, −0.01) (**Figure 2**) and physical well-being (β = 0.03; 95%CI = 0.01 − 0.06) (**Figure 3**).

DISCUSSION

In this study, the relationship between public trust in the government and (i) psychosocial distress and (ii) physical well-being, was partially mediated by perceived self-efficacy to practice COVID-19 protective behavior. Our findings suggest that this perceived self-efficacy can serve as a psychological pathway through which public trust in the government may be associated with mental and physical well-being during this pandemic.

Our finding is supported by the principles of Social Cognitive Theory (SCT; Bandura, 1977), which relates trust to self-efficacy. SCT posits that self-efficacy is the center of human agency (Bandura, 2002); it is the individual's belief in their capability to take control of their behavioral outcomes through their actions (in this case, their health outcomes). This theory provides further insight and explanation for our findings.

Self-efficacy is constructed from four types of sources—direct experiences, observation of other's actions, social persuasion through communication, and physiological states (Bandura et al., 1999). Our measure of public trust in the government consisted of the domains of social persuasion (e.g., trust in the information provided on the government's website). It is therefore suggested that individuals who are persuaded by the information delivered by the government regarding COVID-19 are more likely to report higher self-efficacy which in turn influences their physical and mental well-being.

Major life events like disease pandemics induce psychosocial stress among the population. The psychological consequence

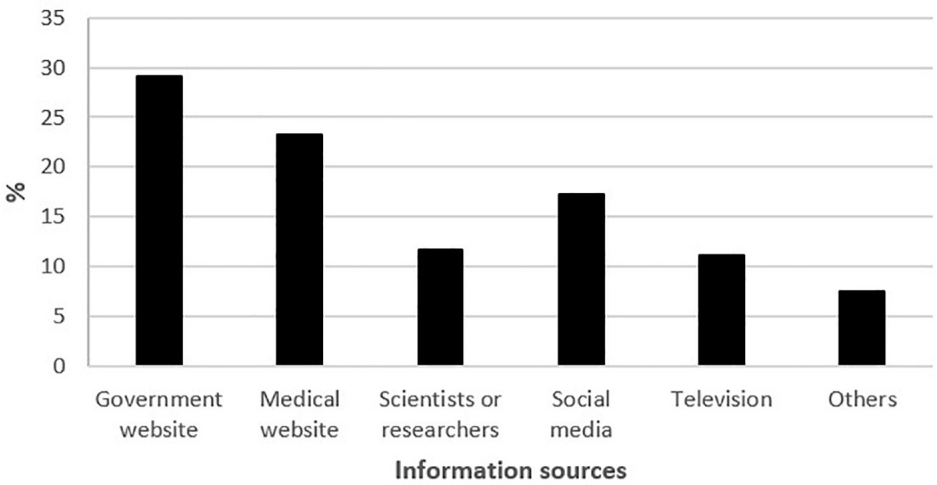

FIGURE 1 | Most recent sources of COVID-19 information.

TABLE 2 | Mean descriptions and correlation matrix between variables.

Pearson correlations (r)								
	Variables	**Mean (SD)**	**1**	**2**	**3**	**4**	**5**	**6**
1	Age	32.44 (11.94)	–	0.01	0.26***	−0.03	−0.19***	−0.07
2	Public trust in the government	3.47 (0.93)		–	−0.04	0.19***	−0.20***	0.13**
3	Perceived severity of COVID-19	3.73 (1.19)			–	−0.10*	0.13**	−0.19***
4	Perceived self-efficacy to practice COVID-19 protective behavior	4.01 (0.67)				–	−0.17***	0.23***
5	Psychological distress	2.02 (0.85)					–	−0.26***
6	Physical well-being	3.83 (0.86)						–

****p < 0.001, **p < 0.01, *p < 0.05 (two-tailed test).*

TABLE 3 | Multivariable linear regression of mental and physical well-being on predictor variables.

Variables	**Psychological distress**		**Physical well-being**	
	Model 1 Estimates β (95% CI)	**Model 2 Estimates β (95% CI)**	**Model 1 Estimates β (95% CI)**	**Model 2 Estimates β (95% CI)**
Public trust in the government	−0.17 (−0.24 to −0.09)	−0.16 (−0.24 to −0.08)	0.10 (0.02–0.18)	0.12 (0.04–0.20)
Perceived severity of covid-19	0.12 (0.07–0.19)	0.13 (0.07–0.20)	−0.12 (−0.19 to −0.06)	−0.13 (−0.19 to −0.07)
perceived self-efficacy in practicing covid-19 protective behavior	−0.22 (−0.32 to −0.11)	−0.19 (−0.30 to −0.08)	0.28 (0.18–0.39)	0.27 (0.16–0.37)

Model 1 adjusted for sociodemographic factors (age, race, sex, and marital status). Model 2 added SES factors (household income, employment status, and education) to Model 1.

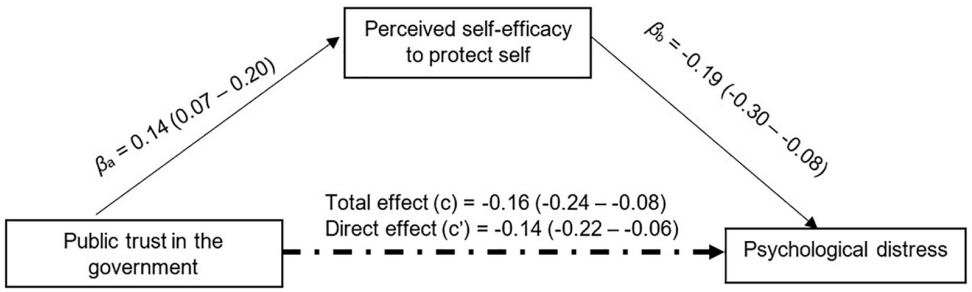

FIGURE 2 | Mediation analysis Perceived self-efficacy to protect self against COVID-19 mediates 13.07% of the total effect of public trust in the government on psychological distress with 5,000 bootstrap resamples β = −0.02, *SE* = 0.01. Bias-corrected 95%CI = −0.04 to -0.01.

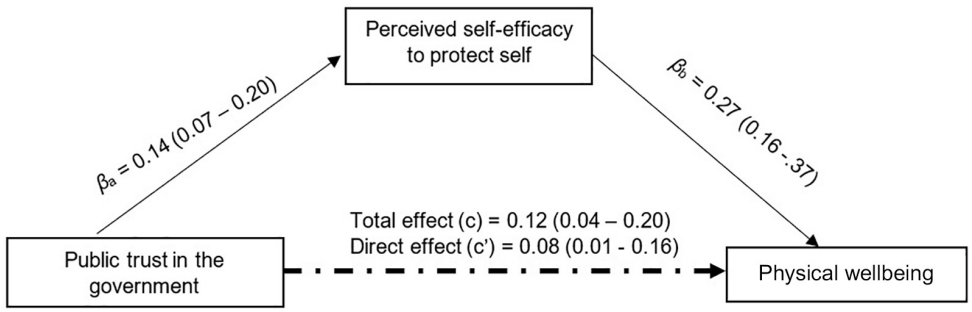

FIGURE 3 | Mediation analysis Perceived self-efficacy to protect self against COVID-19 mediates 28.02% of the total effect of public trust in the government on physical well-being with 5,000 bootstrap resamples β = 0.03, *SE* = 0.01. Bias-corrected 95%CI = 0.01 to 0.06.

of this type of stress includes anxiety and depression (Olagoke et al., 2020; Sibley et al., 2020). Our findings provide compelling evidence from the epicenter of the coronavirus pandemic, which shows that young adults were especially prone to generalized anxiety disorder (GAD) and depression. Therefore, considering that this population avidly utilizes social media, our findings suggest that their mental and physical well-being are more likely to be improved by exposure to messages from a government they can trust.

Another major implication of our study is the need for government institutions to conduct COVID-19 risk communication efforts in a way that they earn the public's trust. Also, our results indicate considerable negative associations between perceived severity and three variables: self-efficacy and mental and physical well-being. In other words, as the perceived severity increases, individuals are reporting lower scores of self-efficacies as well as mental and physical well-being. Considering these relationships, risk communication efforts should seek to balance the communication of the seriousness of COVID-19 with information that boosts self-efficacy in practicing COVID-19 protective behavior. Based on our findings, which suggests that perceived self-efficacy may increase with mental and physical well-being, we recommend the development of a reporting guideline for risk communication during pandemics events. This guideline can correct the imbalance in the type of risk information and make sure that there is an equilibrium between severity-framed and efficacy-framed communication.

Limitations

Our study is not without its limitations; first, our sample selection was not random, consisting mainly of young, educated adults; hence, our results may not be generalizable across the US and should be interpreted with caution. Second, our use of a cross-sectional study design makes it challenging to establish causal ordering and warrants a careful interpretation of our result. Although recent longitudinal studies on COVID-19 suggests a validation of the zero-order relationships in our model (Wang et al., 2020), future studies should consider a longitudinal assessment of these relationships to understand the mediating roles of risk perception in the relationship between public trust in the government and mental and physical well-being.

CONCLUSION

The current study sought to further investigate the psychological pathway through which public trust in the government's effort to manage the COVID-19 pandemic is associated with physical and mental well-being. Risk communication by government institutions, conducted in a way that earns trust, may improve the perceived self-efficacy to practice COVID-19 preventive behavior, which is positively associated with mental and physical well-being.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the institution review board of the University of Illinois at Chicago. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AO: conceptualization, data curation, formal analysis, methodology, and writing—original draft. OO: writing—original draft and writing—review and editing. AH: methodology, supervision, and writing—review and editing. All authors contributed to the article and approved the submitted version.

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BRIEF RESEARCH REPORT
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Multisensory, Nature-Inspired Recharge Rooms Yield Short-Term Reductions in Perceived Stress Among Frontline Healthcare Workers

David Putrino[1], Jonathan Ripp[2], Joseph E. Herrera[1], Mar Cortes[1], Christopher Kellner[3], Dahlia Rizk[4] and Kristen Dams-O'Connor[1,5]*

[1]Department of Rehabilitation and Human Performance, Icahn School of Medicine at Mount Sinai, New York, NY, United States, [2]Office of Well-Being and Resilience, Icahn School of Medicine at Mount Sinai, New York, NY, United States, [3]Department of Neurosurgery, Icahn School of Medicine at Mount Sinai, New York, NY, United States, [4]Division of Hospital Medicine, Mount Sinai Beth Israel, New York, NY, United States, [5]Department of Neurology, Icahn School of Medicine at Mount Sinai, New York, NY, United States

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***Correspondence:**
David Putrino
dputrino83@gmail.com; david.putrino@mountsinai.org

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We are currently facing global healthcare crisis that has placed unprecedented stress on healthcare workers as a result of the coronavirus disease 2019 (COVID-19). It is imperative that we develop novel tools to assist healthcare workers in dealing with the significant additional stress and trauma that has arisen as a result of the pandemic. Based in research on the effects of immersive environments on mood, a neuroscience research laboratory was rapidly repurposed using commercially available technologies and materials to create a nature-inspired relaxation space. Frontline healthcare workers were invited to book 15-min experiences in the Recharge Room before, during or after their shifts, where they were exposed to the immersive, multisensory experience 496 Recharge Room users (out of a total of 562) completed a short survey about their experience during an unselected, consecutive 14-day period. Average self-reported stress levels prior to entering the Recharge Room were 4.58/6 (±1.1). After a single 15-min experience in the Recharge Room, the average user-reported stress level was significantly reduced 1.85/6 (±1.2; $p < 0.001$; paired t-test). Net Promoter Score for the experience was 99.3%. Recharge Rooms such as those described here produce significant short-term reductions in perceived stress, and users find them highly enjoyable. These rooms may be of general utility in high-stress healthcare environments.

Keywords: COVID-19, stress, burnout, trauma, relaxation, biophilic design

INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic in New York City led to surges of critically ill patients into hospitals that were already operating at or above capacity. Exceptional in the lifetimes of most hospital workers, this rapid influx required physicians, nurses, and other clinicians to endure extreme workloads in unfamiliar practice environments. There were shortages in personal protective equipment and other supplies, and many practitioners

and support staff were redeployed from usual duties to serve on the frontlines caring for COVID-19 patients. Hospital workers were facing tremendous stress, all while navigating severe disruptions to daily life outside of work. Sources of stress, anxiety, and fear ranged from tangible to abstract: closure of schools, loss of childcare, economic hardship, fear of contracting the virus, fear of spreading the virus to loved ones, loss of patients, family members and coworkers to COVID-19, concern regarding one's ability to perform new duties with minimal training, existential concerns about moral duties and responsibilities, and uncertainty regarding the future (Albott et al., 2020; Blake et al., 2020).

The confluence of these factors can impose moral suffering, fear, outrage, disgust, and depletion among health care workers (Patel et al., 2018) who may feel unprepared, unprotected, and unheard (Shanafelt et al., 2020). Moral injury, defined as the experience of "perpetrating, failing to prevent, bearing witness to, or learning about acts that transgress deeply held moral beliefs and expectations" (Litz et al., 2009; Currier et al., 2015), is often discussed in the context of war and combat, but these ideas are now being invoked in the language used by healthcare workers describing their responses to the current pandemic (Bai et al., 2004; Albott et al., 2020; Shanafelt et al., 2020). A recent survey found that healthcare workers at a large medical center in Baltimore, Maryland reported moral injury severity similar to that of military service members who served 7-month deployments in war zones, with particularly notable similarities in feelings of betrayal by others (Hines et al., 2020).

The World Health Organization (WHO) has recognized that protecting the mental health and well-being of healthcare workers, particularly those serving on the front lines, is essential for ensuring the immediate and long-term capacity of the healthcare community (McAlonan et al., 2007; World Health Organization, 2020). Absent a public health crisis such as the COVID-19 global pandemic, approximately 50% of physicians are experiencing burnout. Burnout was first described by Freudenberger (1971) as emotional depletion combined with exhaustion, real or perceived inefficacy, emotional lability, and psychosomatic symptoms that most often occurs in care settings requiring long hours, personal involvement, and empathy (Reith, 2018). Employee burnout has an extensive and well-documented negative impact on health care systems and organizations (Patel et al., 2018; Shanafelt et al., 2020). Absent a public health crisis such as the COVID-19 global pandemic, approximately 50% of physicians are experiencing burnout. Given the potential consequences on the emotional well-being of the workforce and overall care quality (Panagioti et al., 2018), the current need for brief, feasible, and scalable interventions to promote health care worker wellness and resilience is unparalleled. Ideally these interventions would promote readiness, another term borrowed from the military, which reflects the reality that frontline workers are needed to return to duty and ready to work at high levels of cognitive and physical performance (Nindl et al., 2018).

Healing environments designed to reduce stress and increase control in patients can result in less need for pain medication, fewer medical errors, better sleep, and improved outcomes (Parsons and Hartig, 2000; Zimring et al., 2004). A growing body of research indicates that virtual reality applications, particularly those that involve immersive architectural environments with visual and auditory manipulations, can directly impact emotions and their concordant psychophysiological responses (Badia et al., 2019). Consistent with the notion that humans are innately connected to nature, exposure to virtual environments that incorporate biophilic stimuli can lower physiological stress indicators, such as blood pressure and heart rate (Yin et al., 2019). Some evidence suggests that augmented reality manipulations to the built environment in urban environments may augment stress levels in urban environments in particular (Kalantari, 2016). To our knowledge, healing environments have not been widely implemented or investigated in frontline healthcare workers treating patients with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

In the field of cognitive neuroscience, the ability to maintain focus on a task or set of environmental stimuli is often referred to as "directed attention" and is thought of a finite cognitive resource that can be depleted (Vohs et al., 2014; Ohly et al., 2016). Directed attention fatigue (DAF) results in cognitive difficulties, poor decision making, emotion dysregulation, and performance variability during attentional tasks (Linden et al., 2005; Ohly et al., 2016). Attention restoration theory (ART) is a concept that has gained momentum in the field of environmental psychology, which postulates that DAF can be overcome by exposure to scenes depicting rich natural environments or direct exposure to nature (Kaplan, 1995). According to ART, a major goal of creating a restorative environment is to create scenes that encourage "soft fascination," a cognitive state where one's attention is held by the scene that they are taking in, but in a way that still permits reflection and the ability to address lingering, unresolved thoughts (Basu et al., 2019). During the initial 2020 surge of SARS-CoV-2 cases in the United States, our team developed and created multisensory, nature-inspired Recharge Rooms in a New York City hospital and made them available to essential staff. Design of these rooms followed the principles of ART to create experiences of soft fascination for users with the intention of creating moments of stress relief and relaxation. Here, we report initial user responses to the Recharge Room experience.

MATERIALS AND METHODS

We rapidly converted under-utilized research laboratory space in a New York City hospital into custom-designed "Recharge Rooms" to provide an opportunity for health care workers to rest and refresh themselves during or after their shift. The Recharge Rooms were designed by following the principles of ART (Korpela and Hartig, 1996; Sahlin et al., 2016), with a specific focus on creating natural scenes and experiences that shift users away from states of directed attention and promoted states of soft fascination (Kaplan, 1995; Kaplan and Berman, 2010). Since soft fascination is often most easily elicited by scenes of nature (Basu et al., 2019), the resultant rooms created multisensory (visual, auditory, and olfactory), nature-inspired experiences, as these

have also previously been found to confer physiological benefits (Maxwell and Lovell, 2017). These environments include silk imitation plants, projected scenes of soothing natural landscapes, low lighting that is tailored in color to match the projected landscapes, high definition audio recordings of nature sounds paired with relaxing music, and an infusion of essential oils and calming scents using an essential oil diffuser. The first candidate room selected for transformation into a Recharge Room was a rectangular, 179.38 square foot neurophysiology laboratory (**Figure 1A**). Four adults with moderate technical knowledge of the operation of consumer electronic devices such as HD projectors, WiFi technology, Google Home, Bluetooth speakers, and Hue Bridge automatic lighting systems spent approximately 4 h transforming this existing hospital space (**Figure 1B**) to a functional Recharge Room (**Figure 1C**).

All materials that were used for the transformation were easily sourced from online vendors. The user experience was designed to be voice-activated using Google Home, allowing visiting healthcare workers to activate the projector to screen different natural scenes on a blank wall in the room without having to interact with screens or touch any items in the room, minimizing user interaction with any surfaces. The Hue Bridge lighting system was programmed to synchronize with the different nature scenes being projected in the room (i.e., Hue lights would turn blue for ocean scenes and green for forest scenes). All materials are non-porous and can be quickly sanitized after each use for infection control purposes. Yuzu, hinoki, roman chamomile, and lavender essential oils were used to create scent profiles that were associated with the visualization of different natural scenes using an essential oil diffuser in one corner of the room. These essential oils were selected based on existing literature showing their efficacy in producing stress relieving and soothing effects (Matsumoto et al., 2014; Ali et al., 2015; Ikei et al., 2015).

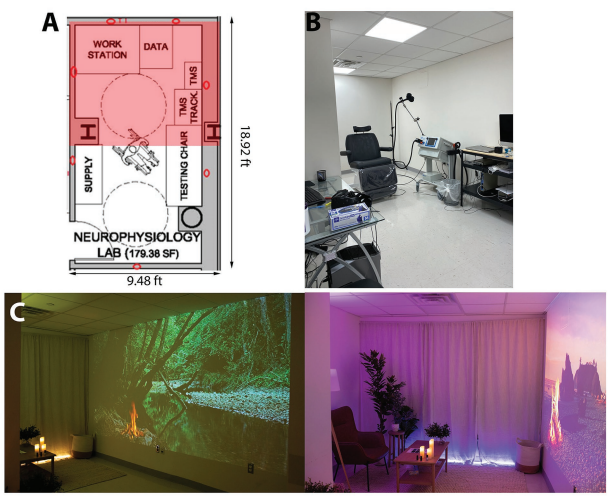

FIGURE 1 | (A) Architectural plans of a candidate room to be repurposed as a recharge room. The pink shading represents the part of the room that is visible in the photographs of the space. **(B)** The room prior to transformation in its usual use-case as a neurophysiology testing space. **(C)** The finished Recharge Room showing two different scenes that are available to healthcare workers.

The silk imitation plants that were used to create the impression of a green space in the hospital room were arranged in a semi-circular pattern in behind the arranged seating that was available in the room. This was done to create the impression being fully immersed and surrounded by a natural environment.

Information about the Recharge Rooms, located at Mount Sinai Hospital, with a description of the overall environment and the hours of operation (4:30am–10pm daily), was distributed to staff *via* a website curated by the Icahn School of Medicine at Mount Sinai's Office of Resilience and Well-being in partnership with the Mount Sinai Health System's COVID-19 Staff Response. Frontline healthcare staffs were invited to book 15-min recharge experiences online to prevent crowding and breaching of social distancing protocols.

Prior to entering the recharge space for their scheduled appointment, users were prompted to complete a single-item Likert-style measure of perceived stress that was purpose-developed by the study team (Question 1, **Table 1**). Upon completion of a 15-min experience in the Recharge Room, users were again prompted to complete a measure of their perceived stress levels (Question 2, **Table 1**), and the Net Promoter Score (NPS), a well-validated measure of user experience (Question 3, **Table 1**; Reichheld, 2003). Finally, respondents were given the option of providing additional comments in an open-ended "additional comments" section prior to submission of the online survey form (Question 4, **Table 1**). Survey data gathered from all users during a consecutive 4-day period of general operation are presented here. We calculated descriptive statistics, conducted a paired *t*-test to quantify changes in stress levels, and calculated a NPS. All analyses were conducted in MATLAB version R2019b (Mathworks, Natick, MA).

RESULTS

Two hundred and nineteen frontline healthcare workers who requested use of the space during an unselected consecutive 14-day period completed the survey (out of a total of 562 healthcare workers who scheduled time to visit the space). At the time of data collection, the hospital had already admitted and managed 6,690 COVID-positive inpatients, with 1,034 of these requiring intubation and ventilator management. The surge continued throughout the data collection period, with hospital staff admitting more than 600 COVID-positive cases daily, and ventilator utilization was at nearly 70% of the hospital's capacity.

TABLE 1 | User experience questionnaire characteristics.

Question (response range)	Lower anchor	Upper anchor
What was your stress level like when you walked in? (1–6)	Not stressed at all	Extremely stressed
What is your stress level like after your experience? (1–6)	Not stressed at all	Extremely stressed
How likely are you to recommend this experience to a friend or colleague? (0–10)	Not at all willing	Very willing
Any additional comments? (N/A)	N/A	N/A

Prior to entry into the Recharge Room, average stress level was reported as 4.6/6 (±1.1). After a single 15-min experience in the Recharge Room, the average user-reported stress level was 1.85/6 (±1.2), representing an average 59.6% reduction in self-reported stress levels (**Figure 2**; $p < 0.001$; paired *t*-test).

The NPS for the experience was 99.3%, with 100% of respondents identifying as "promoters" (scores ranging between 8 and 10) of the experience.

A total of 207/496 respondents submitted qualitative feedback *via* the open-ended "additional comments" question. These qualitative comments were universally positive, such as "*This is wonderful!*" or "*This is such a needed and appreciated space at this time. It would be great if something similar could remain when this new normal is over.*" Additionally, several comments suggested that users viewed the experience as a gesture of institutional support, e.g., "*This is amazing! It's a nice way for the system to show support for <hospital> employees!*"

DISCUSSION

Results from this program evaluation illustrate dramatic reductions in perceived stress, following brief exposure to a multisensory immersive Recharge Room. These findings support the utility of this low-cost, readily scalable support space for health care workers providing frontline care during the COVID pandemic. Open-ended written responses and spontaneous verbal feedback suggest that the Recharge Room influenced some of the key contributors to healthcare worker burnout (West et al., 2018) as well as the common primary endpoints of structured wellness intervention efforts (Panagioti et al., 2017).

The COVID-19 pandemic has placed stress on individual health care workers that is unprecedented for most, and the relationships between these feelings of moral suffering, exhaustion, fear, and stress are not known. The factors contributing to distress among COVID-19 healthcare workers may be somewhat unique, such as the anticipatory anxiety that may precede deployment to a COVID unit among clinicians assigned to COVID units, widespread supply shortages (Adams and Walls, 2020) that necessitate impossible choices between personal safety and patient care, and the expectations to perform tasks outside of one's training or expertise which creates moral dilemmas unlike those encountered even in high stakes clinical care settings (McAndrew et al., 2018). Results of the current evaluation, therefore, may not generalize to the healthcare worker stress and anxiety experienced absent a global pandemic.

The current program evaluation project lacks the rigor of a structured clinical trial, and the use of a single-item self-report state stress measures as opposed to well-validated measures of burnout represent clear limitations of this work. Future research

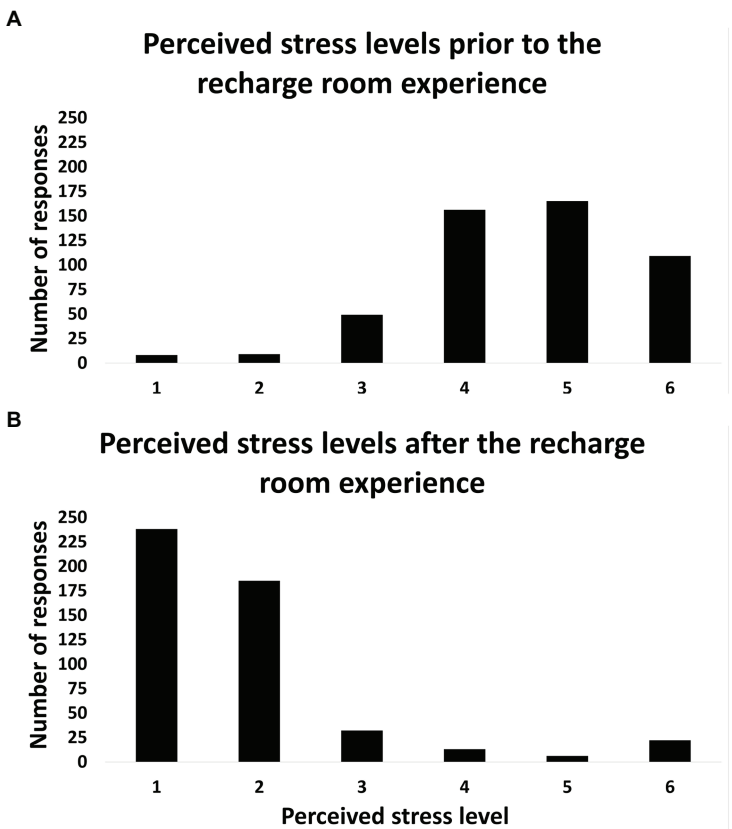

FIGURE 2 | Bar graphs showing the distributions of perceived stress ratings of healthcare workers before **(A)** and after **(B)** a 15-minute experience in the Recharge Room.

in a carefully controlled trial using a broader battery of validated self-report measures alongside physiological indices of stress response, as is standard in environmental psychology research, is warranted. Despite the impressive reductions in stress demonstrated here, the maintenance of these effects requires further investigation. In addition, use of the NPS as a standardized and well-validated measure of user experience was appropriate in the setting and scope of this program evaluation; however, there are limitations in how much such a short form can measure. Thus, while our NPS findings indicated that all Recharge Room users considered themselves to be "promoters" of the experience, in further research, we will conduct a more detailed user experience assessment in order to identify the specific aspects of the experience that create the strongest responses in the average user. This will allow us to identify ways in which to enhance the experience for future users.

There exists only limited evidence for the effectiveness of interventions designed to address stress and burnout in healthcare workers, though the need for such interventions is widely recognized (Marine et al., 2006). Recharge Rooms such as those described herein may facilitate short-term alleviation of distress experienced by frontline responders to the COVID pandemic.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval were not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

DP, JH, MC, DR, and CK contributed to the conception and design of the Recharge Rooms. DP designed the questionnaire, collected the data, and performed the statistical analysis. DP, JR, and KD-O wrote the first draft of the manuscript. All authors contributed to the article and approved the submitted version.

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Psychosocial Correlates of Mental Health and Well-Being During the COVID-19: The Spanish Case

Sara Esteban-Gonzalo[1], Juan Luis González-Pascual[2], María Caballero-Galilea[2] and Laura Esteban-Gonzalo[2,3]*

[1] Faculty of Biomedicine, Department of Psychology, Universidad Europea de Madrid, Madrid, Spain, [2] Faculty of Biomedicine, Department of Nursing, Universidad Europea de Madrid, Madrid, Spain, [3] Faculty of Medicine, Department of Nursing, Universidad Autónoma de Madrid, Madrid, Spain

Background: The COVID-19 pandemic has hit almost all countries around the globe, seriously affecting the welfare of populations. Spain is especially hard-hit. In this context, the purpose of the present study is to analyze social, demographic, and economic correlates of mental health during the COVID-19 pandemic in the population residing in Spain.

Method: The sample of this cross-sectional study was comprised of 801 participants aged 18 or older and residing in Spain. Data collection was carried out during March and April 2020. Data of mental health (GHQ12) and well-being (Positive and Negative Affect Schedule) indicators, and those of a wide number of social, demographic, and economic variables were recorded. Linear regression models were built to value associations between mental health and social, demographic, and economic indicators.

Results: Mental health morbidity was higher in women, younger people, individuals with medium studies, people with fewer children, singles, students, and unemployed individuals. Positive affect was higher among women, people with a high level of studies, those not co-living with dependent seniors, the self-employed, the employed, and those working outside home. Negative affect was negatively associated with age and number of children and was higher among women, people with basic studies, singles, individuals co-living with dependent seniors, homemakers, and students.

Conclusion: The most vulnerable populations were found to be women, younger people, people with basic or medium studies, students and individuals with no remunerated activities, single populations, and those co-living with dependent seniors as well as those with a reduced number of children.

Keywords: wellbeing, mental health, COVID-19, Spain, pandemic

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****Correspondence:***
Sara Esteban-Gonzalo
sara.esteban.gonzalo@gmail.com

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INTRODUCTION

The entire world is now struggling to overcome one of the most devastating pandemics of the XXI century, until now (Remuzzi and Remuzzi, 2020; World Health Organization [WHO], 2020b; Zu et al., 2020). COVID-19 has hit almost all countries around the globe generating important consequences at different levels. Economic, social, and public health systems have been seriously

overwhelmed by the pandemic, putting the welfare state at great risk (Alvarez et al., 2020; Dong et al., 2020; Figari and Fiorio, 2020; Nwogugu, 2020). Particularly in Spain between March 19th and April 26th, 2020, there were 212,640 new detected infections and 22,329 deaths (Estadística, 2019). Experts from many disciplines—epidemiologists, economists, and politicians—are confronting this threat by collectively analyzing how the virus behaves and thereby implementing a great variety of changes in our societies (Atkeson, 2020; Ferguson et al., 2020; Fernandes, 2020).

In order to inhibit the spread of the virus, most countries have established some form of a state of emergency including quarantine periods in which citizens are under strict lockdown and isolation (Parmet and Sinha, 2020; World Health Organization [WHO], 2020a). While this measure has been found to be effective in controlling the progress of the virus (Nussbaumer-Streit et al., 2020), such aggressive restrictions have seriously impacted society as a whole with significant consequences for psychological, social, and economic welfare (Chatterjee et al., 2020; Ho et al., 2020; Lewnard and Lo, 2020). In a context in which education centers, shops and businesses are closed, and most economic activities have been canceled, the social drama has reached incalculable limits (Anderson et al., 2020; Singh and Adhikari, 2020).

In periods of uncertainty such as natural disasters, economic crises, and serious health threats, a great variety of studies have found significant changes in people's mental health and well-being (Pollard, 2001; Kramer and Bala, 2004; Shannon and Lee, 2008; Afifi et al., 2012). The existing studies in Spain on mental health during COVID-19 have found higher prevalence of psychological distress in women and people of lower middle age. Work situation, living with children under 16, and presence of symptoms of the virus were also found to be predictors of mental health (Gómez-Salgado et al., 2020). Others studies carried out in Spanish population have analyzed the information received, prevention measures, beliefs, concerns, and population's knowledge about COVID-19, concluding that the degree of concern for COVID-19 and the number of hours spent consulting information on COVID-19 had predictive effects on psychological health (Domínguez-Salas et al., 2020). Also, similar studies have pointed out that being in the older age group, economic stability, and the belief that adequate information had been provided about the pandemic were negatively related to psychological distress. Nevertheless, having symptoms associated with the virus or to have a close relative infected was associated with symptoms of depression, anxiety, or posttraumatic stress disorder (González-Sanguino et al., 2020). Conducting leisure activities and the perception of being in good health have also been found associated with a better mental health (Rodríguez-Rey et al., 2020a).

Similar studies carried out in United Kingdom have reported higher self-harm behaviors and thoughts of suicide among people experiencing socioeconomic disadvantage, unemployment, disability, chronic physical illnesses, mental disorders, and COVID-19 diagnosis (Iob et al., 2020). Preexisting physical and mental health conditions and low social support were also associated with depressive symptoms (Frank et al., 2020). Complementary studies in Italy, a country similarly affected by the pandemic, showed that those with a family member infected by COVID-19 and young people who had to work outside home presented higher levels of anxiety and stress (Mazza et al., 2020). These studies have also emphasized the risk of psychological distress among parents due to school closures and suspended educational services for children (Fontanesi et al., 2020).

Most existing long-term studies on global pandemics were carried out in China and other Asian countries during the SARS pandemic or during the Ebola and influenza pandemics (Brooks et al., 2020). According to these studies, those who were quarantined reported high prevalence of psychological distress and disorders. General psychological symptoms, emotional disturbance, depression, stress, low mood, irritability, posttraumatic stress symptoms, and emotional exhaustion were found among those affected by quarantine (Person et al., 2004; Mihashi et al., 2009; Yoon et al., 2016; Brooks et al., 2018). People in quarantine after being in contact with those who potentially had SARS reported fear, nervousness, sadness, or guilt (Reynolds et al., 2008). The few studies on sleep disorders during COVID-19 have found higher prevalence of poor sleep quality among health workers when compared with other professions (Huang and Zhao, 2020) and quality of sleep being positively associated with social support (Xiao et al., 2020b) and social capital (Xiao et al., 2020a) and negatively associated with levels of stress and anxiety (Xiao et al., 2020b). It has also been found that four to six months after quarantine, anxiety and feelings of anger decreased (Jeong et al., 2016). However, some long-term effects of quarantine such as alcohol use and dependency symptoms persisted even after three years among sanitary workers (Wu et al., 2008), as did avoidance behaviors such as minimized contact with others and staying clear of crowded enclosed places and public spaces (Reynolds et al., 2008).

The impact of a pandemic on mental health does not seem to affect everyone at the same level. A study carried out in Australia during the 2007 influenza pandemic found that younger age (Pollard, 2001; Kramer and Bala, 2004; Shannon and Lee, 2008; Afifi et al., 2012; Anderson et al., 2020; Chatterjee et al., 2020; Gómez-Salgado et al., 2020; Lewnard and Lo, 2020; Singh and Adhikari, 2020), lower educational status, female gender, and having kids could exacerbate this impact (Taylor et al., 2008). Stressors during quarantine should also be considered. The duration of quarantine seems to be associated with posttraumatic stress symptoms, avoidance behaviors, and anger (Hawryluck et al., 2004; Pellecchia et al., 2015). Fears of infection have also been associated with psychological outcomes even several months later (Jeong et al., 2016). Confinement, loss of usual routine, and reduced social and physical contact have been associated with boredom and frustration, generating distress among quarantined individuals (Blendon et al., 2004; Robertson et al., 2004; Cava et al., 2005; Reynolds et al., 2008; Braunack-Mayer et al., 2013). Difficulties in taking part in day-to-day activities, shopping for basic needs, or participating in social networking could enhance this frustration (Hawryluck et al., 2004; Jeong et al., 2016). Inadequate supplies and poor information have also been found to be associated with

frustration, anxiety, anger, confusion, and stress (Blendon et al., 2004; Reynolds et al., 2008; Pellecchia et al., 2015; Jeong et al., 2016).

Lastly, post-quarantine effects may also be taken into account. Both the economy and individuals—particularly the most vulnerable—suffer from the impact of financial loss when people are unable to work. Considerable socioeconomic distress and symptoms of psychological disorders may materialize (Mihashi et al., 2009; Pellecchia et al., 2015; Jeong et al., 2016). Social stigma and rejection after quarantine were reported among those more exposed to the pandemic such as health workers who suffered from social discrimination, fear, and suspicion (DiGiovanni et al., 2004; Hawryluck et al., 2004; Cava et al., 2005; Lee et al., 2005).

Mental health is defined by the World Health Organization as "a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community" (World Health Organization [WHO], Department Whosa, Health WHODoM, and Abuse, 2004). Mental health can be measured by different diagnostic methods such as the Composite International Diagnostic Interview (CIDI) or Schedules for Clinical Assessment in Neuropsychiatry (SCAN). However, short questionnaires have been found to be useful and valid measures of mental health to facilitate a general picture of the mental health status of an individual or a population and identify risk groups or monitor changes over time (Hoeymans et al., 2004).

Well-being is a key aspect of mental health (Galderisi et al., 2015). The hedonic well-being approach defines well-being in terms of pleasure and pain (Ryan and Deci, 2001), considering feelings such as happiness, sadness, anger, stress, and pain. It is commonly measured by analyzing positive and negative experiences in people's daily lives with experience sampling methodologies (ESM) or similar methods based on diary techniques to appraise subjective experiences in daily life such as the Day Reconstruction Method (Diener et al., 1985b; Keyes et al., 2002; Kahneman et al., 2004; Steptoe et al., 2015). Empirical findings suggest that positive and negative affect should be separately measured as independent dimensions by asking people about their feelings at a given period of time (Diener et al., 1985a).

For all these reasons, the purpose of the present study is to analyze social, demographic, and economic correlates of mental health during the COVID-19 pandemic in the population residing in Spain. We aim to evince the factors capable of predicting improvement or exacerbation of psychological distress.

METHOD

Study Design and Participants

This cross-sectional study was designed to assess the associations between social, demographic, and economic factors and mental health indicators during the COVID-19 pandemic in Spain. Snowball technique and convenience sampling were followed to recruit participants as follows: (1) Students enrolled in the nursing degree at the Autonomous University of Madrid were contacted by email and through academic platforms. All potential participants contacted were invited to share the study information with other people within their environment. (2) Professors and researchers directly involved in the present research informed their personal and professional contacts of the study by email and invited them to participate and disseminate the information. (3) Social networks (Facebook, Instagram, Twitter) were used to recruit additional participants. The advert of the study was published on behalf of participation by the European University of Madrid which was accessible to the general public. Similarly, the proposal to participate in the study was published in the professional and personal profiles of each of the researchers involved in the present research. Participants as well as those who decided not to participate in the study were able to share the information of the study with their social and professional networks.

After potential participants were informed of the objectives and relevant information of the study, they could indicate consent to participate in the study or not. Upon a positive response, the anonymous questionnaire was deployed. All participants who met the inclusion criteria were recruited. Inclusion criteria were to currently reside in Spain, be aged 18 or over, be able to read, understand, and complete the questionnaire in Spanish, be interested in participating in the study, and provide informed and written consent. Data was collected between March 19th and April 26th, 2020, the most critical periods of the COVID-19 pandemic registered in Spain.

A total of 37 participants were excluded from the study because they did not meet the inclusion criteria of age (they were under 18 years old). Further, participants in the study were asked if they were active health professionals. Those who met this condition (117 participants) were not included in the present analysis, since their status as health workers has important implications for both risk of infection and mental health and well-being status. As a result, 801 participants provided valid data of mental health indicators and were considered for the analysis. The sample size was calculated using the G-Power tool, for a linear multiple regression, considering an Alpha error of 0.05 and a 0.95 statistical power. *Post hoc* statistical power calculations were also carried out, for an alpha error of 0.05 and according to the effect size range obtained in the models (considering the two predictors used), showing a statistical power higher than 0.95 in all cases.

Measurement Instruments

Mental Health Indicators

Three mental health and well-being indicators were considered in the present study: psychological health status and positive and negative affect.

The Goldberg General Health Questionnaire (GHQ-12) was used to assess mental health, employing its short version. This questionnaire is a widely used instrument designed to discriminate whether or not psychological morbidity is present. The validation study of the Spanish version revealed an adequate internal consistency, which ranges between 0.82 and 0.90, a

sensitivity between 76 and 100, and a Cronbach's alpha of 0.76 (Muñoz et al., 1993). The score ranges from 12 to 48, with higher scores indicating worse mental health. In the present sample, a Cronbach's alpha of 0.849 was found for this scale. An example item of the questionnaire would be "*Have you been able to concentrate on whatever you are doing*?"

The Positive and Negative Affect Schedule (PANAS) was employed to measure well-being. This questionnaire is formed by two independent scales, each consisting of 10 items. The positive affect scale measures feelings such as joy or pleasure, and the negative affect scale includes feelings such as anxiety and sadness. Higher scores indicate higher levels of positive and negative affect. The instrument consists of a Likert scale that ranges from very slightly or not at all, to extremely (Watson et al., 1988). This questionnaire is a widely used instrument to assess positive and negative affect (Linley et al., 2009). In the present study, the Spanish version was used, which respects the same bidimensional structure and shows adequate test–retest reliability (range from 0.79 to 0.93 in both scales) (Ostir et al., 2005) and convergent and discriminant validity (Ortuño-Sierra et al., 2015). The score ranges from 10 to 30 in both scales. In the present sample, a Cronbach's alpha of 0.715 was found for positive affect, and 0.811 for negative affect. An example item of the scale would be "*Indicate the extent to which you have felt distressed over the past week*."

Social, Demographic, and Economic Factors

Age, number of children, and dwelling size (m^2) were reported as a number by the participants.

Gender was indicated by asking: what is your gender? (Possible answers were female, male, and other).

Country of origin was indicated after the question: what is your country of origin? (Spain/other).

Level of education was identified by participants as basic level of studies (primary and secondary school), medium level of studies (baccalaureate and technical education), and high level of studies (completed university studies).

Marital status was identified by each participant from the possible answers: married, single, unmarried partner, separated/divorced, and widowed.

Current employment status, during the COVID-19 pandemic was defined as self-employment, employment, unemployment, homemaker, retired, or student.

Living with dependent seniors, current reduced income due to the COVID-19 pandemic, and working outside home (required to continue working as essential workers during the pandemic) were indicated as yes or no.

Length of confinement was calculated from the date of completion of the questionnaire, considering March 14th as the first day of confinement (coinciding with the declaration of state of alarm in Spanish territory).

Covariates

Self-referred current medical diagnosis of COVID-19 (yes/no) was included as covariate for the analysis, given its potential influence on mental health indicators.

Ethical Procedures

The protocol for the present study obtained approval from the Ethics Committee of the Faculty of Biomedical and Health Science of the European University of Madrid (No CIPI/20/135). All participants were informed of the purpose and intent of the study and provided written consent. Similarly, anonymity of each of the participants was ensured.

Data Analyses

All statistical analysis was conducted using the Statistical Package for the Social Sciences software version 21.0 (SPSS. Inc., Chicago, United States) and STATA/SE 14.1 software (Stata Corp LP).

Descriptive statistics (mean values and standard deviations or numbers and percentages) were calculated to describe participant characteristics. Differences between categorical variables and mental health indicators were addressed using Student's t test for dichotomous variables and ANOVA test for variables with more than 2 categories. The Spearman correlation test was employed to value associations between quantitative variables and mental health indicators after assessing the distribution of each variable using the Kolmogorov–Smirnov test (all, $p < 0.001$).

Linear regression was used to test the association between social, demographic, and economic factors, and mental health indicators. Non-parametric variables were transformed to address normality. Unadjusted models and models adjusted for current medical diagnosis of COVID-19 were fitted. There were no relevant differences between unadjusted and adjusted models; thus, only adjusted models will be shown in the results section.

RESULTS

Mean and standard deviation (SD) values of the mental health indicators are presented in **Table 1**. A mean of 25.7 (5.5 SD) for the mental health score, a mean of 24.4 (2.8 SD) for positive affect, and a mean of 18.0 (3.6 SD) for the negative affect score were obtained.

Characteristics of the participants are also presented in **Table 1**. Of the participants examined, 2.9% had a current medical diagnosis of COVID-19, a condition which was not associated with mental health indicators. The mental health score was higher in younger people ($p < 0.001$, $r = -0.23$), women (5.8 ± 0.2, $p < 0.001$), people with a medium level of studies (26.8 ± 5.9, $p = 0.002$), those with a lower number of children ($p < 0.001$, $r = -0.15$), single people (26.5 ± 5.8, $p = 0.001$), and students (28.3 ± 6.4, $p < 0.001$). The positive affect score was higher in women (24.6 ± 2.6, $p < 0.001$), people with a high level of studies (24.8 ± 2.6, $p < 0.001$), those not living with dependent seniors (24.4 ± 2.7, $p = 0.006$), self-employees (25.2 ± 2.6, $p < 0.001$), those with a shorter length of confinement ($p = 0.039$, $r = -0.07$), and those working outside home (24.7 ± 2.6, $p = 0.012$). Finally, the negative affect score was higher in younger people ($p < 0.001$, $r = -0.17$), women (18.5 ± 3.5, $p < 0.001$), people with a basic level of studies (18.9 ± 3.8, $p = 0.008$), those with a lower number of children ($p = 0.007$, $r = -0.9$), single and widowed people (18.5 ± 3.4 and 18.5 ± 3.6, respectively, $p = 0.002$), people living

TABLE 1 | Characteristics of the participants examined.

n	801	Mental health score	P^a	Positive affect score	P^b	Negative affect score	P^c
Mental health scores (12–48) [mean, SD]	25.7 (5.5)						
Positive affect scores (10–30) [mean, SD]	24.4 (2.8)						
Negative affect scores (10–30) [mean, SD]	18.0 (3.6)						
Current Medical diagnosis COVID-19 infection			0.873#		0.893#		0.924#
Yes	2.9	25.9 (3.9)		24.4 (2.8)		18.0 (2.2)	
No	97.1	25.7 (5.5)		24.3 (2.8)		18.0 (3.7)	
Age [mean, SD]	40.8 (13.8)		<0.001 (−0.23)x		0.564 (0.02)x		**<0.001 (−0.17)**x
Gender (%)			**<0.001**#		**<0.001**#		**<0.001**#
Female	71.0	5.8 (0.2)		24.6 (2.6)		18.5 (3.5)	
Male	29.0	4.3 (0.2)		23.7 (3.0)		16.7 (3.5)	
Other	0.0	–		–		–	
Country of origin (%)			0.701#		0.195#		0.138#
Spain	90.0	5.5 (0.2)		24.3 (2.8)		18.1 (3.6)	
Other	10.0	5.2 (0.5)		24.7 (2.9)		17.4 (3.7)	
Level of education (%)			**0.002***		**<0.001***		**0.008***
Basic level of studies	5.7	25.1 (6.3)		23.6 (2.7)		18.9 (3.8)	
Medium level of studies	33.3	26.8 (5.9)		23.7 (2.9)		18.3 (3.6)	
High level of studies	61.0	25.2 (5.0)		24.8 (2.6)		17.7 (3.6)	
Number of children [mean, SD]	0.8 (1.0)		**<0.001 (−0.15)**x		0.912 (0.04)x		**0.007 (−0.9)**x
Marital status			**0.001***		0.091*		**0.002***
Married		24.8 (4.7)		24.4 (2.5)		17.6 (3.9)	
Single		26.5 (5.8)		24.2 (3.0)		18.5 (3.4)	
Unmarried partner		26.4 (5.6)		24.7 (2.5)		18.2 (3.2)	
Separated/divorced		24.9 (5.7)		25.0 (2.6)		16.6 (3.9)	
Widowed		25.2 (6.1)		23.0 (3.6)		18.5 (3.6)	
Living with dependent seniors (%)			0.510#		**0.006**#		**0.006**#
Yes	9.0	26.1 (6.0)		23.5 (2.8)		19.1 (3.4)	
No	91.0	25.6 (5.4)		24.4 (2.7)		17.9 (3.6)	
Employment status (%)			**<0.001***		**<0.001***		**0.003***
Self-employment	8.5	24.2 (5.2)		25.2 (2.6)		17.7 (3.9)	
Employment	59.9	25.4 (5.2)		24.7 (2.5)		17.9 (3.6)	
Unemployment	8.1	27.1 (5.5)		23.4 (2.8)		18.5 (3.3)	
Homemaker	2.4	23.9 (5.7)		23.3 (3.4)		19.6 (3.8)	
Retired	7.6	23.8 (4.0)		23.4 (2.8)		16.6 (3.6)	
Student	13.5	28.3 (6.4)		23.5 (3.2)		18.7 (3.5)	
Dwelling size (m^2) [mean, SD]	114.3 (102.0)		0.444 (−0.02)x		0.715 (0.01)x		0.468 (−0.26)x
Length of confinement [mean, SD]	20.5 (6.5)		0.465 (0.02)x		**0.039 (−0.07)**x		0.621 (0.17)x
Reduced income (%)	26.6		0.543#		0.272#		0.569#
Yes		25.5 (5.6)		24.5 (2.8)		18.1 (3.5)	
No		25.8 (5.4)		24.3 (2.7)		17.9 (3.7)	
Work outside home (%)	26.9		0.245#		**0.012**#		0.159#
Yes		26.1 (5.3)		24.7 (2.6)		18.3 (3.8)	
No		25.6 (5.5)		24.1 (2.8)		17.9 (3.6)	

*P^a-value for comparing socioeconomic and labor indicators and mental health score. P^b-value for comparing socioeconomic and labor indicators and positive affect score. P^c-value for comparing socioeconomic and labor indicators and negative affect score. xSpearman correlation test, P (correlation coefficient). #T-Student test. *ANOVA test. Bold values mean that $p \leq 0.05$.*

TABLE 2 | Linear regression models for *mental health score* (n = 801).

			Model 1	
	n	**β (SE)**	**95% CI**	***P***
Age	801	−0.09(0.01)	−0.12–0.06	**<0.001**
Gender	800			
Women		1.70(0.42)	0.87–2.54	**<0.001**
Country of origin	801			
Other than Spain		−0.22(0.64)	−1.50–1.04	0.727
Level of education	801			
Basic level of studies		−0.66(0.84)	−2.31–0.99	0.434
Medium level of studies		1.61(0.40)	0.80–2.41	**<0.001**
High level of studies		−1.36(0.39)	−2.13–0.58	**0.001**
Number of children	800	−0.83(0.18)	−1.20–0.48	**<0.001**
Marital status	800			
Married		−1.48(0.39)	−2.25–0.70	**<0.001**
Single		1.41(0.39)	0.64–2.18	**<0.001**
Unmarried partner		0.78(0.66)	−0.51–2.08	0.238
Separated/divorced		−0.81(0.75)	−2.28–0.65	0.277
Widowed		−0.47(1.60)	−3.62–2.66	0.767
Living with dependent seniors	801	0.45(0.68)	−0.88–1.78	0.508
Employment status	801			
Self-employment		−1.56(0.69)	−2.93–0.20	**0.025**
Employment		−0.67(0.39)	−1.45–0.10	0.091
Unemployment		1.55(0.71)	0.16–2.95	**0.029**
Homemaker		−1.83(1.27)	−4.34–0.67	0.152
Retired		−2.08(0.73)	−3.52–0.65	**0.004**
Student		3.04(0.56)	1.94–4.14	**<0.001**
Dwelling size (m^2)	786	−0.00(0.00)	−0.00–0.00	0.178
Length of confinement	801	0.05(0.02)	−2.42–2.14	0.074
Reduced income	801	−0.26(0.44)	−1.13–0.59	0.546
Work outside home	746	0.52(0.45)	−0.36–1.42	0.247

Statically significant values are in bold. Model 1: Analyses were adjusted for current medical diagnoses COVID-19. β, unstandardized coefficient.

TABLE 3 | Linear regression models for *positive affect score* (n = 801).

			Model 1	
	n	**β (SE)**	**95% CI**	***P***
Age	801	0.00(0.00)	−0.00–0.01	0.517
Gender	800			
Women		0.93(0.21)	0.51–1.36	**<0.001**
Country of origin	801			
Other than Spain		0.43(0.33)	−0.22–1.08	0.194
Level of education	801			
Basic level of studies		−0.73(0.43)	−1.58–0.11	0.090
Medium level of studies		−1.02(0.20)	−1.43–0.62	**<0.001**
High level of studies		1.12(0.20)	0.73–1.51	**<0.001**
Number of children	800	0.05(0.09)	−0.13–0.24	0.564
Marital status	800			
Married		0.07(0.20)	−0.32–0.47	0.713
Single		−0.29(0.20)	−0.68–0.10	0.147
Unmarried partner		0.34(0.34)	−0.32–1.01	0.312
Separated/divorced		0.66(0.38)	−0.08–1.42	0.082
Widowed		−1.41(0.81)	−3.02–0.18	0.084
Living with dependent seniors	801	−0.95(0.34)	−1.63–0.27	**0.006**
Employment status	801			
Self-employment		0.94(0.35)	0.25–1.64	**0.008**
Employment		0.92(0.20)	0.52–1.31	**<0.001**
Unemployment		−0.98(0.36)	−1.70–0.27	**0.007**
Homemaker		−1.11(0.65)	−2.39–0.16	0.089
Retired		−1.05(0.37)	−1.78–0.32	**0.005**
Student		−1.03(0.28)	−1.59–0.46	**<0.001**
Dwelling size (m^2)	786	0.00(0.00)	−0.00–0.00	0.186
Length of confinement	801	−0.02(0.01)	−0.05–0.00	0.122
Reduced income	801	0.24(0.22)	−0.19–0.69	0.271
Work outside home	746	0.59(0.23)	0.13–1.05	**0.012**

Statically significant values are in bold. Model 1: Analyses were adjusted for current medical diagnoses COVID-19. β, unstandardized coefficient.

with dependent seniors (19.1 ± 3.4, $p = 0.006$), and homemakers (19.6 ± 3.8, $p = 0.003$).

Linear regression models for the mental health score are presented in **Table 2**. A one-unit increase in age (β = −0.09, 0.01(SE), $p < 0.001$) and in number of children (β = −0.83, 0.18(SE), $p < 0.001$) was associated with decreased mental health scores. Similarly, a high level of studies (β = −1.36, 0.39(SE), $p = 0.001$), being married (β = −1.48, 0.39(SE), $p < 0.001$), being self-employed (β = −1.56, 0.69(SE), $p = 0.025$), and being retired (β = −2.08, 0.73(SE), $p = 0.004$) were linked to lower mental health scores. On the other hand, referring gender as female (β = 1.70, 0.42(SE), $p < 0.001$), reporting a medium level of studies (β = 1.61, 0.40(SE), $p < 0.001$), being single (β = 1.41, 0.39(SE), $p < 0.001$), being unemployed (β = 1.55, 0.71(SE), $p = 0.029$), and being a student (β = 3.04, 0.56(SE), $p < 0.001$) were associated with a higher mental health score.

Linear regression models for positive affect scores are presented in **Table 3**. Medium level of studies (β = −1.02, 0.20(SE), $p < 0.001$), living with dependent seniors (β = −0.95, 0.34(SE), $p = 0.006$), being unemployed (β = −0.98, 0.36(SE), $p = 0.007$), being retired (β = −1.05, 0.37(SE), $p = 0.005$), and being a student (β = −1.03, 0.28(SE), $p < 0.001$) were linked to decreased positive affect scores. On the other hand, referring gender as female (β = 0.93, 0.21(SE), $p < 0.001$), a high level of studies (β = 1.12, 0.20(SE), $p < 0.001$), being self-employed (β = 0.94, 0.35(SE), $p = 0.008$), being employed (β = 0.92, 0.20(SE), $p < 0.001$), and working outside home (β = 0.59, 0.23(SE), $p = 0.012$) were linked to a higher positive affect score.

Finally, linear regression models for negative affect scores are presented in **Table 4**. A one-unit increase in age (β = −0.04, 0.00(SE), $p < 0.001$) and in number of children (β = −0.35, 0.12(SE), $p = 0.004$) was associated with lower negative affect scores. Also, a high level of studies (β = −0.77, 0.26(SE), $p = 0.004$), being married (β = −1.58, 0.26(SE), $p = 0.028$), being separated or divorced (β = −1.45, 0.50(SE), $p = 0.004$), being and retired (β = −1.50, 0.48(SE), $p = 0.002$) are linked to lower negative affect scores. However, reporting gender as female (β = 1.85, 0.28(SE), $p < 0.001$), basic studies (β = 1.25, 0.56(SE), $p = 0.027$), being single (β = 0.85, 0.26(SE), $p = 0.001$), living with dependent seniors (β = 1.23, 0.45(SE), $p = 0.006$), being a homemaker (β = 1.68, 0.85(SE), $p = 0.049$), and being a student (β = 0.81, 0.38(SE), $p = 0.033$) were related to higher negative affect scores.

TABLE 4 | Linear regression models for *negative affect score* (*n* = 801).

			Model 1	
	n	**β (SE)**	**95% CI**	***P***
Age	801	−0.04 (0.00)	−0.06–0.02	**<0.001**
Gender	800			
Women		1.85 (0.28)	1.30–2.40	**<0.001**
Country of origin	801			
Other than Spain		−0.64 (0.42)	−1.49–0.20	0.138
Level of education	801			
Basic level of studies		1.25 (0.56)	0.14–2.35	**0.027**
Medium level of studies		0.52 (0.27)	−0.01–1.06	0.055
High level of studies		−0.77 (0.26)	−1.29–0.25	**0.004**
Number of children	800	−0.35 (0.12)	−0.60–0.11	**0.004**
Marital status	800			
Married		−1.58 (0.26)	−1.10–0.06	**0.028**
Single		0.85 (0.26)	0.34–1.37	**0.001**
Unmarried partner		0.24 (0.44)	−0.62–1.11	0.582
Separated/divorced		−1.45 (0.50)	−2.43–0.47	**0.004**
Widowed		0.46 (1.07)	−1.63–2.57	0.663
Living with dependent seniors	801	1.23 (0.45)	0.35–2.12	**0.006**
Employment status	801			
Self-employment		−0.33 (0.46)	−1.25–0.58	0.475
Employment		−0.16 (0.26)	−0.69–0.35	0.528
Unemployment		0.51 (0.47)	−0.42–1.44	0.284
Homemaker		1.68 (0.85)	0.00–3.35	**0.049**
Retired		−1.50 (0.48)	−2.46–0.54	**0.002**
Student		0.81 (0.38)	0.06–1.55	**0.033**
Dwelling size (m^2)	786	−0.00 (0.00)	−0.00–0.00	0.459
Length of confinement	801	−0.01 (0.02)	−0.05–0.02	0.528
Reduced income	801	0.16 (0.29)	−0.41–0.74	0.568
Work outside home	746	0.43 (0.30)	−0.17–1.03	0.161

Statically significant values are in bold. Model 1: Analyses were adjusted for current medical diagnoses COVID-19. β, unstandardized coefficient.

DISCUSSION

According to our results, the most vulnerable populations in terms of mental health morbidity were women, younger people, individuals with a medium level of studies, those with fewer children, single individuals, students, and the unemployed. In contrast, positive affect was higher among women, those with a high level of studies, those not co-living with dependent seniors, the self-employed, the employed, and those working outside home due to the COVID-19 pandemic. Lastly, negative affect was negatively associated with age and number of children and was higher among females, people with a basic level of studies, single individuals and those with unmarried partners, individuals co-living with dependent seniors, homemakers, and students.

As expected, and in line with prior studies, more vulnerable individuals in terms of socioeconomic status were more likely to report symptoms of psychological distress (Blendon et al., 2004; Cava et al., 2005; Reynolds et al., 2008; Taylor et al., 2008; Braunack-Mayer et al., 2013). Educational level and employment status were related to psychological morbidity and well-being. Those with high educational status showed lower psychological morbidity and a more favorable positive affect score, which coincides with prior studies in Australia collected during the influenza pandemic in Taylor et al. (2008), and recent studies in Spain (Domínguez-Salas et al., 2020; Gómez-Salgado et al., 2020; Rodríguez-Rey et al., 2020a). Although the causes are unknown, it may be interpreted that a lower educational level, in itself a good indicator of socioeconomic status (Galobardes et al., 2006), could be linked to higher socioeconomic vulnerability and thus act as a stressor in a situation of uncertainty, worsening people's psychological discomfort (Zahran et al., 2011). Similar effects are estimated in the case of employment status when explaining higher psychological morbidity among unemployed people. As has been previously found in Spanish studies during the COVID-19 (Gómez-Salgado et al., 2020), unemployment may lead to higher psychological distress (Esteban-Gonzalo et al., 2018), especially in a context of socioeconomic uncertainty. Studies carried out under normal conditions in Europe indicated that unemployment leads to deterioration of health status, especially among women and people in prime working age (Heggebø, 2016). Concretely in Spain, recession periods have contributed to poorer mental health among unemployed men and women, to the point of increasing suicide rates (Córdoba-Doña et al., 2016; Rivera et al., 2016). Those who were active, in terms of being able to keep a remunerated job and at the same time preserve their working routines and incomes, showed higher levels of positive affect. The higher psychological distress found among students is also remarkable and is probably attributable to negative expectations as to their career advancement.

Unexpectedly, no significant associations were found between length of confinement, mental health morbidity, and negative/positive affect. Prior studies have found contradictory results. While some pointed out negative effects of quarantine duration on psychological health (Hawryluck et al., 2004; Robertson et al., 2004), not all studies could assure such effects (Brooks et al., 2020). The progress and evolution of the outbreak in the Spanish case should be contextualized. COVID-19 impacted the Spanish territory very rapidly during the first weeks, collapsing the sanitary system and generating panic in the population. The first period of quarantine was especially dramatic given the amount of negative news in the media informing of the progress of the pandemic, characterized by an increasing number of deaths. Thus, uncertainty, fear and hysteria were dominant feelings during this first period (Tapia and Jerónimo, 2020; Zaar and Ávila, 2020). An improvement in this critical situation during the second period of the crisis may have contributed to balance the malaise of the population. Similar findings have been observed by other Spanish researchers. Specifically, a study carried out during the first 3 weeks of confinement found that the odds of having a higher level of health risk behaviors (a change toward a higher number of health risk behaviors than before the confinement) decreased during the confinement, suggesting that the Spanish adult population may have adapted to the new situational context by gradually improving their health behaviors (López-Bueno et al., 2020a). For instance, the same researchers found significant inverse associations between overall adherence to physical activity and current perceived anxiety, proposing that higher levels of

perceived anxiety and worse mood might be mitigated by a minimum amount of weekly physical activity, which increased in the confinement context (López-Bueno et al., 2020b).

Stressors during quarantine should also be considered. Number of children, co-living with a dependent senior, and being alone were found to be related to mental health or well-being. It was also unexpected to find that an increased number of children at home was associated with better mental health status and lower levels of negative affect. Prior studies have identified similar tendencies, suggesting the protective effects of having two or more children at home (Taylor et al., 2008). However, having only one child may, paradoxically, be counterproductive in terms of mental health (Taylor et al., 2008). In a context in which children are deprived of social interactions, one might hypothesize that co-living with other children could compensate the lack of social stimulus. Children with siblings could maybe enjoy a game companion at home, substituting other friends and colleagues and minimizing the impact of confinement. This fact could improve both children's and parents' well-being in terms of delegating more responsibility to older children.

Dependent seniors co-living at home were found to be a stressor during quarantine, with lower levels of positive affect and higher levels of negative affect among caregivers, a finding validated by the existing literature on caregiving and its damaging effects on mental health and well-being (Shifren and Kachorek, 2003; MacNeil et al., 2010). This aspect may be particularly salient in the context of the quarantine in which external support is lacking.

Lastly, although previous literature suggests that having more space at home might be related to increased well-being (Ratcliffe, 2010; Nakazato et al., 2011; Solari and Mare, 2012), particularly in a context of confinement in which movements outside the home are restricted, no associations between dwelling size and mental health indicators were observed in the present study. Some studies carried out in normal conditions have found that dwelling conditions may affect psychological well-being albeit indirectly, in that the relation is due more to the extent to which a person's expectations of residential satisfaction are met (Phillips et al., 2005). Other studies have stated that financial capability may be a significant moderator between dwelling size and well-being (Taylor et al., 2011).

Finally, sociodemographic factors should also be considered. Age, gender, and marital status have been found to be related to mental health and well-being. In congruence with prior studies carried out in Spain during the COVID-19, women showed higher mental morbidity (Taylor et al., 2008; Domínguez-Salas et al., 2020; Rodríguez-Rey et al., 2020a) and higher scores in positive and negative affect. The fact that women usually experience lower levels of mental health and well-being is a well-known phenomenon (Seedat et al., 2009; Heise et al., 2019), with higher emotional intensity and higher levels in both positive and negative affect (Thomsen et al., 2005; Burns and Machin, 2010). However, quarantine may entail a multiplier effect if the amount of responsibilities at home, specifically for women with children, are taken into account (Taylor et al., 2008). Similar effects have been identified with respect to age, with better mental health and well-being in older individuals. Previous and recent studies carried out during the COVID-19 outbreak in Spain and other European countries have also found a protective effect of age in quarantine contexts, suggesting that younger people are particularly vulnerable, do not cope as well with the situation, and are also less likely to be resilient when it comes to coping with adversity (Taylor et al., 2008; Bruine de Bruin, 2020; Rodríguez-Rey et al., 2020a; Skoog, 2020). Also, one may hypothesize that older adults are better trained in practicing self-control and resilience. Some studies have found that self-control interacts with age, enhancing perceived control by older individuals, at least in normal contexts (Sinha et al., 2002). Older adults are capable of high resilience despite socioeconomic backgrounds, personal experiences, and declining health (MacLeod et al., 2016).

This study is not without its limitations, as follows: (1) Perhaps the most relevant limitation we must point out is that the use of social networks to recruit participants for this study may associate a sample selection bias. However, the need to assume this limitation was due to the confinement of the entire Spanish population for the full duration of data collection. There were scarce possibilities of reaching potential participants by other means. In spite of the limitations associated with the use of social networks for data collection, the decision to proceed was supported by some scientific works that have pointed out that social media data maintain the capacity for addressing broad social questions while upholding methodological integrity (Davis and Love, 2019). Other studies carried out in the same temporal and geographical context have also assumed this remarkable but insurmountable limitation (Rodríguez-Rey et al., 2020a,b). Therefore, our results must be considered with caution, since they will not be generalizable to the general Spanish population. (2) The cross-sectional design of the studio does not allow us to establish cause-and-effect relationships. We can only report associations between mental health indicators and social, demographic, and economic factors. Future longitudinal studies should be carried out to extend the cross-sectional perspective examined in this study. (3) Although all questionnaires were carefully selected and all are valid and reliable, the variables are self-reported, which could bias the inherent quality of the data. (4) Unmeasured covariates or the presence of measurement error in the covariates included in the models may lead to residual confounding. In addition, we lack information related to the psychiatric history of the participants, teleworking, infection or death of a close relative, children's age, and number of hours consulting information on COVID, which may influence mental health status and well-being during confinement. (5) Information regarding geographical area of residence was not available, which may play a role since the territory was not equally affected by COVID-19. However, the unifying factor of the national state of alarm and the confinement of the population throughout Spain must be considered, with its repercussions at the psychological level regardless of the rate of infection. For this reason, the regression models were controlled by the medical diagnosis of Covid reported by participants. Regardless of the Covid infection rate in each area, all regions of Spain were confined under the same restrictions during the data collection period (Real Decreto 465/2020, de 17 de marzo). (6) Finally, one of the most vulnerable

social groups in the context in which this work was developed is the older adult population. Although a total of 103 participants reported to be 60 years old or older, unfortunately we cannot offer a specific vision of the problem in terms of mental health of this sector of the population. Future studies should be specifically directed at understanding the mental health conditions of this group and associated factors.

However, this study provides information about social, demographic, and economic factors able to influence the mental health of a population unable to exert their basic freedoms in the unique instance of a health emergency.

In conclusion, the most vulnerable populations in terms of mental health morbidity and well-being were women, younger people, people with basic or medium level of studies, students and individuals with no remunerated activities, singles, and those with unmarried partners. Stressors during confinement were co-living with dependent seniors and having few children. These results highlight the need to consider psychosocial predictors of mental health and well-being in order to design and implement future intervention programs to monitor mental health and well-being outcomes among the most vulnerable individuals in the highly probable context of future pandemics.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, under limited conditions.

ETHICS STATEMENT

The protocol for the present study obtained approval from the Ethics Committee of the Faculty of Biomedical and Health Science of the European University of Madrid. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SE-G was the coordinator, main investigator of the study, and oriented and revised the article. LE-G was the coordinator and main investigator of the study, and analyzed the data. JG-P was an investigator of the study and revised the article. MC-G was an investigator of the study and revised the article. All authors have read and agreed to the published version of the manuscript.

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Mental Health Outcomes Among Healthcare Workers and the General Population During the COVID-19 in Italy

Rodolfo Rossi[1], Valentina Socci[2], Francesca Pacitti[2], Sonia Mensi[3], Antinisca Di Marco[4], Alberto Siracusano[1,5] and Giorgio Di Lorenzo[1,6]*

[1] Chair of Psychiatry, Department of Systems Medicine, University of Rome Tor Vergata, Rome, Italy, [2] Department of Biotechnological and Applied Clinical Sciences, University of L'Aquila, L'Aquila, Italy, [3] Department of Anesthesiology, Intensive Care and Emergency Medicine, IRCCS Fondazione Policlinico Universitario A. Gemelli, Rome, Italy, [4] Department of Information Engineering, Computer Science and Mathematics, University of L'Aquila, L'Aquila, Italy, [5] Psychiatry and Clinical Psychology Unit, Fondazione Policlinico Tor Vergata, Rome, Italy, [6] IRCCS Fondazione Santa Lucia, Rome, Italy

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Edited by:
Elena Vegni,
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University of Milan, Italy

****Correspondence:***
Rodolfo Rossi
rudy86.rossi@gmail.com

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Introduction: During the COVID-19 pandemic, healthcare workers in Italy have been exposed to an unprecedented pressure and traumatic events. However, no direct comparison with the general population is available so far. The aim of this study is to detail mental health outcomes in healthcare workers compared to the general population.

Methods: 24050 respondents completed an on-line questionnaire during the contagion peak, 21342 general population, 1295 second-line healthcare workers, and 1411 front-line healthcare workers. Depressive, anxious, post-traumatic symptoms and insomnia were assessed. Specific COVID-19 related potential risk factors were also considered in healthcare workers.

Results: Depressive symptoms were more frequent in the general population (28.12%) and front-line healthcare workers (28.35%) compared to the second-line healthcare workers (19.98%) groups. Anxiety symptoms showed a prevalence of 21.25% in the general population, 18.05% for second-line healthcare workers, and 20.55% for front-line healthcare workers. Insomnia showed a prevalence of 7.82, 6.58, and 9.92% for the general population, second-line healthcare workers, and front-line healthcare workers, respectively. Compared to the general population, front-line healthcare workers had higher odds of endorsing total trauma-related symptoms. Both second-line healthcare workers and front-line healthcare workers had higher odds of endorsing core post-traumatic symptoms compared to the general population, while second-line healthcare workers had lower odds of endorsing negative affect and dissociative symptoms. Higher total traumatic symptom score was associated with being a front-line healthcare worker, having a colleague infected, hospitalized, or deceased, being a nurse, female gender, and younger age.

Conclusion: This study suggests a significant psychological impact of the COVID-19 pandemic on the Italian general population and healthcare workers. Front-line healthcare workers represent a specific at-risk population for post-traumatic symptoms. These findings underline the importance of monitoring and intervention strategies.

Keywords: depression, anxiety, epidemiology, PTSD, risk factors

INTRODUCTION

Beginning in late February 2020 Italy has been the first European country to face the COVID-19 pandemic. Despite evidence of a relevant impact of the lockdown measures on mental health in the general population (GP) (Rossi et al., 2020b), healthcare workers (HCW) were exposed to a number of additional stressful events while working under extreme pressure with COVID-19 patients, and thus represent a highly at-risk population (Rossi et al., 2020a).

Challenges for staff include the increased workload and physical exhaustion due to the severe condition of the patients, witnessing a higher-than-usual death's rate among their patients, fears of contagion for themselves and their families and seeing colleagues falling ill or dying (Walton et al., 2020; Zhang Y. et al., 2020).

Indeed, in the very early stages of the pandemic, the Italian national healthcare service and its regional articulations were subject to a never seen before pressure, with most intensive care units (ICU) running short of beds in a few days. Furthermore, lack of preparation for such a pandemic resulted in lack of security protocols and protection devices for HCW, which resulted in a tremendously high number of infected and deceased personnel.

Italian media stressed the war-like scenario in which ICU were working, allegedly performing triage with physician having to cherry-pick which patient to provide care to.

The psychological impact of this unprecedented health emergency might have significant long-term reverberations. Also, addressing the exact consequences of the COVID-19 pandemic on mental health of HCW is additionally critical (Firew et al., 2020), as mental health issues may hinder working ability of medical staff. For this reason, supportive interventions for HCW are necessary at this stage.

Despite the huge number of publications on the mental health burden in HCW, very few data have been published so far.

Recent reviews and original investigations confirm a high rate of anxious and depressive symptoms, as well as poor sleep quality and post-traumatic symptoms (Johnson et al., 2020), among HCW (Chew et al., 2020; Pappa et al., 2020; Talevi et al., 2020; Vindegaard and Benros, 2020).

Preliminary data from China during the COVID-19 pandemic showed a depression rate 50.3%, anxiety 44.6%, and insomnia 34.0% (Lai et al., 2020), although another works from China report lower rates of anxiety and depression in medical HCW (Huang and Zhao, 2020; Zhang W. et al., 2020). Kang et al. (2020) found that as much as 36% of medical staff reported subthreshold psychological symptoms.

In this scenario, we reported preliminary data on the very immediate burden of the COVID-19 outbreak on mental health on 1300 Italian HCW, finding that frontline young women, regardless of the working position (i.e., nurse, physician, healthcare assistant (HCA), etc.), had higher odds of several mental health outcomes, including PTSD symptoms, anxiety, depression and insomnia (Rossi et al., 2020a). We identified a number of job-related risk factors, including having a colleague infected, hospitalized, or deceased by COVID-19. Working directly with COVID-19 patients, i.e., being a Frontline HCW, was a major risk factor for all of the selected outcomes.

However, our preliminary data left some unsolved questions. Firstly, the odds of negative mental health outcomes in HCW compared to GP remains to be elucidated. Secondly, considering potential differences in the degree of exposure to a number of COVID-19 related traumatic events in HCW and GP, a more in-depth analysis of post-traumatic symptoms warrants further consideration.

Aim of the Study

In this article, we aim to further detail mental health outcomes in an enlarged sample of HCW, with particular focus on post-traumatic symptoms (PTSS), and to compare selected outcomes between HCW and GP. Further, COVID-19 related risk factors were selected in order to capture potentially stressful events related to the increased pressure on the workplace.

MATERIALS AND METHODS

Study Design

This cross-sectional web-based observational study is a part of a long-term monitoring program of mental health outcomes in the general population and health care workers. On-line consent was obtained from the participants, that were allowed to terminate the survey at any time they desired. The survey was anonymous, and confidentiality of information was assured. Three weeks after the beginning of the lockdown, a survey was conducted among a self-selected sample. Every person living in Italy $\geq$18 years was eligible. Approval for this study was obtained from IRB at the University of L'Aquila. This study adheres to the Declaration of Helsinki.

Sampling Strategy and On-Line Questionnaire Dissemination

For the purpose of this study, two versions of an online questionnaire, one for the general population and one for

HCW, were spread across the Italian population between March 25th and April 7th. The two questionnaires included the same psychometric measures but differed in the risk factors explored (see below). The general population questionnaire was spread using sponsored adverts on Facebook, while the HCW was spread using targeted posts on thematic Facebook groups and pages, as well as using a snowball spreading technique starting from the researchers' acquaintances. Both versions of the questionnaire asked the participants to re-share the questionnaire link. Finally, the general population questionnaire included a link to the HCW version on its first page: in case an HCW encountered the GP link on-line, he/she was prompted to move to the HCW version of the questionnaire. Because of the particular dissemination technique, it was not possible to have precise data on response rate, however, using the Facebook Ads app, it was possible to estimate that the number of link clicks was about 100.000, while nearly one million people were reached by the ad.

Outcome Measures

The time frame for all of the following psychometric instruments was set to the last 2 weeks.

The Italian version Global Psychotrauma Screen (GPS) (Olff et al., 2020; Rossi et al., 2020c) is a 22 self-report instrument with yes/no answers that covers both stress-related symptoms and risk and protective factors. Symptoms investigated are (17 items): post-traumatic stress symptoms, depression, sleep problems, dissociation, dysfunctional coping strategies including substance abuse and self-harm, and other physical, emotional, or social problems. Risk and protective factors are (5 items): other stressful events, childhood trauma, history of mental illness, social support, and psychological resilience.

The following scores were derived from the GPS.

(1) "GPS symptoms" (GPS-Sym): this score is the sum of all 17 symptoms items. Internal consistency $\alpha = 0.81$.
(2) "GPS-post-traumatic symptoms" (GPS-PTSS): this score aggregates 4 items including core post-traumatic symptoms, i.e., re-experiencing, avoidance, hyperarousal, and insomnia. Internal consistency $\alpha = 0.63$.
(3) "GPS-Negative affective symptoms" (GPS-NegAff): this score evaluates 11 items including symptoms related to disturbances in self-organization (DSO), anxiety, depression, self-harm, substance abuse, and other physical, emotional, or social problems. This cluster of symptoms qualifies complex post-traumatic symptoms and it is related to complex PTSD. Internal consistency $\alpha = 0.76$.
(4) "GPS-dissociative symptoms" (GPS-Diss): this score includes depersonalization and derealization. Internal consistency $\alpha = 0.41$.

In order to address COVID-related post-traumatic symptoms, items 1 and 2, regarding re-experiencing and avoidance, respectively, were slightly rephrased, referring to COVID-specific events or situations.

The Italian version of the 9-item Patient Health Questionnaire (PHQ-9) was used to assess depression. PHQ-9 comprises nine depressive symptoms, rated on a 4-point Likert scale, range 0–27). The total score has been taken into consideration as a continuous variable. PHQ-9 is a widely used instrument in epidemiological research as a depression screener. In our sample, internal consistency was $a = 0.87$.

The Italian version of the 7-item Generalized Anxiety Disorder questionnaire (GAD-7) was used to assess anxiety symptoms. GAD-7 includes 7 symptoms, rated on a 4-point Likert scale, range 0–21 (Spitzer et al., 2006). The total score has been taken into consideration as a continuous variable. GAD-7 is a widely used instrument in epidemiological research as an anxiety screener. In our sample, internal consistency was $a = 0.91$.

The Italian version of the 7-item Insomnia Severity Index (ISI) was used to assess sleep problems. ISI is a 7-item self-report questionnaire assessing the nature, severity, and impact of insomnia, on a 5-point Likert scale, range 0–28, with higher scores indicating higher severity of insomnia symptoms (Bastien et al., 2001; Castronovo et al., 2016). The total score has been taken into consideration as a continuous variable. ISI is a widely used instrument to evaluate sleep disorders. In our sample, internal consistency was $a = 0.90$.

Exposure Measures, Covariates, and Confounders

The following COVID-related potential stressful exposures were assessed in the HCW cohort:

TABLE 1 | Sample characteristics.

	General Population (GP)	Second-line Health Care Workers (SHCW)	Frontline Health Care Workers (FHCW)
N	21342	1295	1411
Gender (Female)	17,183 (80.52%)	1,025 (79.15%)	1,125 (79.73%)
Age	38.95 (12.77)	43.47 (11.2)	40.64 (10.28)
Region			
North	9500 (45.21%)	506 (40.51%)	932 (67.83%)
Center	5325 (25.34%)	416 (33.31%)	306 (22.27%)
South	6188 (29.45%)	327 (26.18%)	136 (9.9%)
Job			
Homemaker	1481 (6.94%)	–	–
Unemployed	2586 (12.12%)	–	–
Employed	13006 (60.94%)	–	–
Retired	378 (1.77%)	–	–
Student	3891 (18.23%)	–	–
Other HCW	–	396 (30.58%)	300 (21.26%)
Nurse	–	397 (30.66%)	578 (40.96%)
Physician	–	302 (23.32%)	356 (25.23%)
Gp	–	42 (3.24%)	42 (2.98%)
Non-specialist Physic	–	20 (1.54%)	20 (1.42%)
Healthcare Assistant	–	138 (10.66%)	115 (8.15%)
Education			
Lower education	2043 (9.57%)	38 (2.93%)	41 (2.91%)
High School	10238 (47.9%)	249 (19.23%)	335 (23.74%)
Graduate	6572 (30.79%)	527 (40.6%)	533 (37.77%)
Post-Graduate	2489 (11.66%)	472 (36.45%)	497 (35.22%)

- working in direct contact with COVID-19 patients (i.e., front-line vs. second-line HCW);
- being exposed, infected, or hospitalized due to COVID-19;
- having a colleague who was infected, hospitalized, or deceased due to COVID-19;
- having been re-assigned to a different unit;
- job: Physician, Nurse, Healthcare Assistant, Other HCW (includes technicians, lab staff, and other health care workers).

The following potential confounders were selected in the two cohort:

- gender;
- age;
- geographical Area (Northern Italy: Aosta Valley, Piedmont, Lombardy, Liguria, Trentino-Alto Adige, Veneto, Friuli-Venezia Giulia, Emilia-Romagna; Center Italy: Tuscany, Umbria, Marche, Lazio; Southern Italy: Abruzzo, Molise, Puglia, Campania, Calabria, Basilicata, Sicily and Sardinia);
- education level: lower education, undergraduate, graduate, post-graduate degree.

Statistical Analysis

Descriptive analyses were performed in order to assess the rates of mental health outcomes in the sample as well as the prevalence of the selected risk factors.

A panel of logistic or linear regression analyses was conducted – as appropriate depending on the dependent variable being continuous or binomial, in order to assess the association between risk factors and outcomes. Firstly, the association between belongingness to one of the three groups was explored as a putative risk factor. Selected confounders were introduced in subsequent analysis. Secondly, HCW-specific risk factors were tested in the HCW group.

RESULTS

Sample Characteristics

Sample characteristics as well as rates of mental health outcomes are reported in **Table 1**. A total of 24050 respondents completed the questionnaire, of which 21342 were general population respondents (GP), 1295 were second-line healthcare workers (SHCW) and 1411 were front-line healthcare workers (FHCW).

In the total sample, 19334 (80.39%) were female, independently of the group ($\chi^2_2 = 1.867$, $p = 0.393$). Mean age was 39.3 years (range: 18 to 88; SD = 12.6), with GP having a lower mean age (38.95; SD = 12.77) compared to SHCW (43.47; SD = 11.2) and FHCW (40.6; SD = 10.28).

Geographical distribution showed a higher abundance of FHCW in the northern regions compared to central and southern Italy ($\chi^2_4 = 364.543$, $p < 0.001$).

Prevalence of Mental Health Outcomes

Prevalence of mental health outcomes is reported in **Table 2**. Depressive symptoms (PHQ-9 $\geq$ 15) were more frequent in the GP (28.12%) and FHCW (28.35%) compared to the SHCW (19.98%) groups ($\chi^2_2 = 40.551$; $p < 0.001$). Anxiety symptoms (GAD $\geq$ 15) showed a more balanced distribution among

TABLE 2 | Psychopathology and prevalence of mental health outcomes.

					Bonferroni *post hoc* test		
	General Population (GP)	**Second-line Health Care Workers (SHCW)**	**Frontline Health Care Workers (FHCW)**	**Statistics (ANOVA or χ^2)**	**GP vs. SHCW**	**GP vs. FHCW**	**SHCW vs. FHCW**
PHQ Tot	10.67 (6.39)	9.49 (5.67)	11.03 (5.76)	$F_{2,23979} = 24.16$; $p < 0.001$	$p < 0.001$	$p = 0.122$	$p < 0.001$
PHQ $\geq$ 15	5984 (28.12%)	258 (19.98%)	400 (28.35%)	$\chi^2_2 = 40.551$; $p < 0.001$			
GAD Tot	9.03 (5.95)	8.54 (5.61)	9.54 (5.41)	$F_{2,23973} = 9.62$; $p = 0.001$	$p = 0.013$	$p = 0.005$	$p < 0.001$
GAD $\geq$ 15	4520 (21.25%)	233 (18.05%)	290 (20.55%)	$\chi^2_2 = 7.706$; $p = 0.021$			
ISI Tot	10.42 (7.26)	10.26 (7.10)	11.68 (7.01)	$F_{2,23995} = 20.65$; $p < 0.001$	$p = 1.00$	$p < 0.001$	$p < 0.001$
ISI $\geq$ 22	1665 (7.82%)	85 (6.58%)	140 (9.92%)	$\chi^2_2 = 11.209$; $p = 0.004$			
GPS-sym	7.22 (3.85)	6.78 (3.66)	7.88 (3.44)	$F_{2,24021} = 29.23$; $p < 0.001$	$p < 0.001$	$p < 0.001$	$p < 0.001$
GPS-PTSS	2.11 (1.36)	2.33 (1.36)	2.63 (1.2)	$F_{2,24028} = 106.32$; $p < 0.001$	$p < 0.001$	$p < 0.001$	$p < 0.001$
GPS-NegAff	4.53 (2.63)	3.96 (2.39)	4.67 (2.32)	$F_{2,24027} = 31.71$; $p < 0.001$	$p < 0.001$	$p = 0.176$	$p < 0.001$
GPS-Diss	0.57 (0.66)	0.47 (0.62)	0.59 (0.66)	$F_{2,24021} = 14.43$; $p < 0.001$	$p < 0.001$	$p = 1.00$	$p < 0.001$

the three groups, with a prevalence of 21.25% for the GP group, 18.05% for SHCW and 20.55% for FHCW ($\chi^2_2 = 7.706$; $p = 0.021$). Similarly, insomnia symptoms showed a prevalence of 7.82%, 6.58% and 9.92% for the GP, SHCW and FHCW group, respectively ($\chi^2_2 = 11.209$; $p = 0.004$).

Regarding GPS sub-scores, GPS-Sym was 7.22 (SD = 3.85) in the GP group, 6.78 (SD = 3.66) in the SHCW group and 7.88 (SD = 3.44) in the FHCW group ($F_{2,24021} = 29.23$; $p < 0.001$). GPS-PTSS score was 2.11 (SD = 1.36), 2.33 (SD = 1.36) and 2.63 (SD = 1.2) in the GP, SHCW and FHCW, respectively ($F_{2,24028} = 106.32$; $p < 0.001$). GPS-NegAff score was 4.53 (SD = 2.63) in the GP group, 3.96 (SD = 2.39) in the SHCW group and 4.67 (SD = 2.32) in FHCW group ($F_{2,24027} = 31.71$; $p < 0.001$). GPS-Diss score was 0.57 (SD = 0.66) in the GP group, 0.47 (SD = 0.62) in SHCW group and 0.59 (SD = 0.66) in the FHCW group ($F_{2,24021} = 14.43$; $p < 0.001$). Bonferroni *post hoc* test showed that all pairwise comparison were statistically significant, except for GP vs. FHCW on the GPS-NegAff and GPS-Diss subscale.

Regression Analyses

Results from the first panel of regressions are reported in **Table 3**. Compared to the GP group, SHCW had lower odds of endorsing depressive, anxious, and lower levels of total trauma related symptoms (GPS-Sym), with higher levels of core PTSS (GPS-PTSS) and lower levels of trauma-related negative affective symptoms (GPS-NegAff).

FHCW had higher odds of endorsing insomnia and trauma-related symptoms (GPS-Sym). Regarding GPS sub-scores, both SHCW and FHCW had higher odds of endorsing core PTSS (GPS-PTSS score) compared to the GP group, while SHCW had lower odds of endorsing symptoms from the negative affect and dissociative cluster (GPS-NegAff and GPS-Diss scores).

Concerning putative risk factors (**Table 4** and **Figure 1**), for HCW, depressive symptoms were associated with being an FHCW, being infected by COVID-19, having a colleague infected, being reassigned to a different job, being a nurse or a non-specialist physician, female gender and younger age. Anxious symptoms were associated with being infected, female gender, and younger age. Insomnia was associated with being a nurse and a female gender. A higher total GPS symptom score was associated with being an FHCW, having a colleague infected, hospitalized, or deceased, being a nurse, female gender, and younger age. Of the GPS subscales, PTSS were associated with being an FHCW, having a colleague infected, hospitalized or deceased, being a nurse or a Healthcare Assistant (HCA), female gender, and younger age.

DISCUSSION

In this article, we report on the mental health outcomes of a sample of Italian HCW and a GP sample during the peak of the critical infection of the COVID-19 outbreak. Preliminary data from a part of this sample were previously published elsewhere (Rossi et al., 2020a,b). Results confirmed high rates of depression symptoms, anxiety symptoms, insomnia, and PTSS both in the

TABLE 3 | Logistic and linear regression of group category on mental health outcomes.

Unadjusted	*PHQ-9*		*GAD-7*		*ISI*		*GPS-Sym*		*GPS-PTSS*		*GPS-NegAff*		*GPS-Diss*	
	OR [95% CI]	*p*	*OR [95% CI]*	*p*	*OR [95% CI]*	*p*	*b [95% CI]*	*p*	*b [95% CI]*	*p*	*b [95% CI]*	*p*	*b [95% CI]*	*p*
GP	Ref													
SHCW	0.64*** [0.56,0.73]	<0.001	0.82** [0.71,0.94]	0.0063	0.83 [0.66,1]	0.11	−0.44*** [−0.66, −0.23]	<0.001	0.22*** [0.15,0.3]	<0.001	−0.57*** [−0.72, −0.42]	<0.001	−0.1*** [−0.14, −0.064]	<0.001
FHCW	1 [0.9,1.1]	0.85	0.96 [0.84,1.1]	0.54	1.3** [1.1,1.6]	0.0048	0.65***[0.45, 0.86]	<0.001	0.51*** [0.44, 0.59]	<0.001	0.14 [−0.01, 0.27]	0.059	0.01 [−0.03, 0.04]	0.641
***Adjusted*§**														
GP	Ref.													
SHCW	0.68*** [0.58,0.78]	<0.001	0.89 [0.76,1]	0.124	0.73** [0.57,0.93]	0.01	−0.19 [−0.4,0.029]	0.089	0.25*** [0.17,0.33]	<0.001	−0.35*** [−0.5, −0.21]	<0.001	−0.09*** [−0.12, −0.047]	<0.001
FHCW	1 [0.91,1.2]	0.651	0.98 [0.85,1.1]	0.786	1.2* [1,1.5]	0.025	0.73*** [0.52,0.94]	< 0.001	0.55*** [0.47,0.62]	<0.001	0.17* [0.029,0.31]	0.018	0.017 [−0.021,0.054]	0.384

*GP, general population; SHCW, second-line healthcare workers; FHCW, frontline health care workers; PHQ-9, patient health questionnaire; GAD-7, generalized anxiety disorder questionnaire; ISI, insomnia severity index; GPS-Sym, global psychotrauma screen – total symptom score; PTSS, post-traumatic symptoms; NegAff, negative affective symptoms; Diss, dissociative symptoms.§adjusted by age gender region education. *p < 0.05; **p < 0.01; ***p < 0.001. Effect of the independent variable on PHQ, GAD and ISI were estimated using logistic regression; effects of the independent variable on GPS total score and subscores were estimated using linear regression.*

TABLE 4 | Logistic and linear regression of potential risk factors on mental health outcomes in healthcare workers.

n = 2589	PHQ		GAD		ISI		*GPS-Sym*		*GPS-PTSS*		*GPS-NegAff*		*GPS-Diss*	
	OR [95% CI]	***p***	***OR [95% CI]***	***p***	***OR [95% CI]***	***p***	***b [95% CI]***	***p***	***b [95% CI]***	***p***	***b [95% CI]***	***p***	***b [95% CI]***	***p***
Frontline	1.3* [1,1.6]	0.022	1.1 [0.84,1.3]	0.64	1.3 [0.94,1.8]	0.1	0.42** [0.12,0.72]	0.006	0.12* [0.012,0.23]	0.031	0.22* [0.025,0.42]	0.028	0.07* [0.014,0.13]	0.014
Infected	1.7** [1.2,2.4]	0.004	0.77 [0.48,1.2]	0.26	1.1 [0.65,2]	0.67	0.33 [−0.25,0.91]	0.261	0.06 [−0.16,0.28]	0.588	0.35 [−0.035,0.74]	0.075	−0.079 [−0.19,0.03]	0.157
Colleagues involved														
Colleagues not involved	Ref.													
Deceased	1.7 [1,2.8]	0.05	1.2 [0.67,2.2]	0.52	1.9 [0.97,3.9]	0.062	1.8*** [1,2.6]	<0.001	0.57*** [0.29,0.86]	<0.001	1*** [0.51,1.5]	<0.001	0.2** [0.06,0.35]	0.006
Hospitalized	1.1 [0.88,1.5]	0.31	1.2 [0.87,1.6]	0.31	1.3 [0.85,1.9]	0.24	1.4*** [0.98,1.7]	<0.001	0.4*** [0.26,0.54]	<0.001	0.81*** [0.57,1.1]	<0.001	0.14*** [0.071,0.21]	<0.001
Infected	1.4** [1.1,1.8]	0.002	1.4** [1.1,1.8]	0.007	1 [0.71,1.5]	0.92	1*** [0.68,1.3]	<0.001	0.31*** [0.19,0.43]	<0.001	0.6*** [0.38,0.81]	<0.001	0.092** [0.031,0.15]	0.003
Job reassigned	1.3* [1,1.7]	0.021	1.2 [0.94,1.6]	0.12	1.3 [0.87,1.8]	0.22	0.31 [−0.071,0.68]	0.112	0.092 [−0.049,0.23]	0.202	0.15 [−0.097,0.41]	0.229	0.06 [−0.011,0.13]	0.095
Job														
Other HCW	ref													
Nurse	1.5** [1.2,1.9]	0.001	1.2 [0.92,1.6]	0.18	2.01*** [1.3,3]	<0.001	0.47** [0.12,0.82]	0.008	0.28*** [0.15,0.41]	<0.001	0.16 [−0.067,0.4]	0.165	0.023 [−0.042,0.088]	0.483
Physician	0.92 [0.69,1.2]	0.56	0.95 [0.71,1.3]	0.75	0.93 [0.57,1.5]	0.78	0.0091 [−0.37,0.39]	0.963	0.097 [−0.046,0.24]	0.183	0.083 [−0.17,0.34]	0.522	−0.17*** [−0.24, −0.1]	<0.001
Gp	1.5 [0.81,2.6]	0.21	1.1 [0.56,2.1]	0.82	1.6 [0.66,3.8]	0.31	0.56 [−0.25,1.4]	0.177	0.22 [−0.082,0.53]	0.153	0.36 [−0.18,0.9]	0.191	−0.022 [−0.17,0.13]	0.777
Non-specialist phy∼n	2.2* [1.1,4.4]	0.026	1.1 [0.5,2.5]	0.78	1.4 [0.41,4.9]	0.57	0.1 [−1,1.2]	0.852	0.11 [−0.3,0.53]	0.588	0.05 [−0.68,0.78]	0.895	−0.059 [−0.27,0.15]	0.578
HCA	1.4 [0.98,2]	0.062	1.2 [0.82,1.8]	0.34	1.7 [0.99,3]	0.053	0.3 [−0.2,0.81]	0.235	0.27** [0.078,0.45]	0.006	−0.056 [−0.39,0.28]	0.742	0.095* [0.00064,0.19]	0.048
Male	Ref													
Female	1.9*** [1.5,2.5]	<0.001	2.2*** [1.7,3]	<0.001	1.7* [1.1,2.6]	0.014	1.9*** [1.6,2.3]	<0.001	0.69*** [0.56,0.81]	<0.001	1.1*** [0.84,1.3]	<0.001	0.2*** [0.14,0.26]	<0.001
Age§	0.84** [0.75,0.94]	0.002	0.76*** [0.67,0.86]	<0.001	0.96 [0.81,1.1]	0.64	−0.57*** [−0.72, −0.41]	<0.001	−0.067* [−0.13, −0.01]	0.025	−0.5*** [−0.61, −0.4]	<0.001	0.003 [−0.026,0.033]	0.817
Region														
North	Ref													
Center	1.1 [0.89,1.4]	0.33	1.2 [0.95,1.5]	0.13	0.95 [0.67,1.4]	0.79	0.13 [−0.19,0.45]	0.412	0.14* [0.019,0.26]	0.023	−0.029 [−0.24,0.18]	0.786	0.025 [−0.035,0.085]	0.411
South	0.91 [0.68,1.2]	0.51	1.4* [1,1.8]	0.033	0.89 [0.56,1.4]	0.6	0.08 [−0.31,0.47]	0.686	0.13 [−0.01,0.28]	0.068	−0.1 [−0.36,0.15]	0.431	0.049 [−0.024,0.12]	0.186

*GP, general population; SHCW, second-line healthcare workers; FHCW, frontline health care workers; PHQ-9, patient health questionnaire; GAD-7, generalized anxiety disorder questionnaire; ISI, insomnia severity index; GPS-Sym, global psychotrauma screen – total symptom score; PTSS, post-traumatic symptoms; NegAff, negative affective symptoms; Diss, dissociative symptoms; HCW, health care worker; HCA, health care assistant. §adjusted by age gender region education. *p <0.05; **p <0.01; ***p <0.001. Effect of the independent variable on PHQ, GAD, and ISI were estimated using logistic regression; effects of the independent variable on GPS total score and subscores were estimated using linear regression.*

n=2589	PHQ	GAD	ISI	*GPS-Sym*	*GPS-PTSS*	*GPS-NegAff*	*GPS-Diss*
Frontline HCW	1.3*	1.1	1.3	.42**	.12*	.22*	.07*
Being Infected	1.7**	.77	1.1	.33	.06	.35	-.079
Colleague Deceased	1.7	1.2	1.9	1.8***	.57***	1***	.2**
Colleague Hospitalized	1.1	1.2	1.3	1.4***	.4***	.81***	.14***
Colleague Infected	1.4**	1.4**	1	1***	.31***	.6***	.092**
Job Reassigned	1.3*	1.2	1.3	.31	.092	.15	.06 3
§Nurse	1.5**	1.2	2.01***	.47**	.28***	.16	.023
§Physician	.92	.95	.93	.0091	.097	.083	-.17***
§General Practitioner	1.5	1.1	1.6	.56	.22	.36	-.022
§Non Specialist Physician	2.2*	1.1	1.4	.1	.11	.05	-.059
§Healthcare Assistant	1.4	1.2	1.7	.3	.27**	-.056	.095*
Female	1.9***	2.2***	1.7*	1.9***	.69***	1.1***	.2***
#Age	.84**	.76***	.96	-.57***	-.067*	-.5***	.003
$Central Italy	1.1	1.2	.95	.13	.14*	-.029	.025
$Southern Italy	.91	1.4*	.89	.08	.13	-.1	.049

FIGURE 1 | Summary of risk factors for mental health outcomes in healthcare workers. Numbers in cells represent odds ratios for PHQ, GAD, and ISI and linear regression coefficients for GPS subscales. Red highlight: statistically significant positive association between risk factor and outcome. Green highlight: statistically significant negative association between risk factor and outcome. PHQ, patient health questionnaire; GAD, generalized anxiety disorder questionnaire; ISI, insomnia severity index; GPS, global psychotrauma screen; GPS-Sym, GPS total score; GPS-PTSS, GPS post-traumatic Symptoms; GPS-NegAff, GPS negative affect; GPS-Diss, GPS dissociative symptoms. §Reference category: other health care worker; #Standardized age. Negative associations show that younger age is associated with worst outcomes. $Reference category: Northern Italy; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

GP and HCW group during the acute phase of the COVID-19 emergency. Further, we aimed at addressing, for the first time, mental health outcomes in front and second-line HCW and the GP together, allowing a comparison among the three groups.

In this respect, we firstly compared mental health outcomes among FHCW, SHCW, and the GP groups, finding that being an SHCW was associated with lower odds of endorsing anxious or depressive symptoms compared to the GP, while being a front and second-line HCW was associated with higher PTSS compared to the general population. GPS-Negative Affect symptoms were associated with being FHCW compared to the GP in the adjusted model.

Our data suggest a complex pattern of distribution of mental health outcomes among the three groups.

SHCW have a more positive outcome profile compared to both GP and FHCW, except for PTSS. This result was kept after controlling for education level, age, and gender. In order to explain this result, based on previous evidence (Gan et al., 2020; Rossi et al., 2020b), we assume that much of the impact on depressive and anxious symptoms in the GP could be due to lockdown measures, social distancing, and economic instability in addition to traumatic experiences. SHCW could have been less exposed to lockdown measures, but not to social distancing, compared to the GP because they continued to work without being put under excessive pressure, and this could be a reason for which they were somewhat protected against depressive symptoms compared to the GP. On the other hand, SHCW may have been exposed to traumatic events at their workplace (especially indirect traumatic events, such as knowing of colleagues infected or deceased), hence showing an increase in PTSS symptoms compared to the GP.

However, this interpretation should be taken with caution, as the pattern of exposure to traumatic events, lockdown measures, and social distancing was not actually captured by our or others' data, rather it relies on lay evidence of how HCW and GP working pattern changed during the assessed time period.

FHCW didn't show an increase in depressive or anxious symptoms compared to the GP, while they showed a relevant increase in trauma-related symptoms. Furthermore, compared to SHCW, they showed higher levels of negative affective post-traumatic symptoms, suggesting that working as a front-line HCW is associated with a complex pattern of traumatic exposure, that could include physical and mental exhaustion, witnessing a high number of deaths of patients and colleagues and fear of contagion.

Secondly, we explored COVID-related risk factors for mental health outcomes in the HCW sub-sample only, finding that being an FHCW was associated with higher odds of endorsing depressive and post-traumatic symptoms compared to SHCW. The COVID-related risk factors explored were specifically associated with trauma-related symptoms such as PTSS and negative affect symptoms. In particular, colleagues' negative events, i.e., being infected, hospitalized, or deceased, were all associated with PTSS and trauma-related negative affective symptoms.

Taken together, these results suggest that, although the COVID-19 pandemic has had a relevant impact on the general population's mental health as a whole (Rossi et al., 2020b), HCWs are a population at heightened risk specifically for trauma-related symptoms.

Regarding putative risk factors in the HCW group, contrary to early data from Chinese HCW (Lai et al., 2020), in our sample, no specific working position was associated with higher odds of mental health outcomes, except for nurses and healthcare assistants having higher odds of insomnia. However, in line with previous data on both the GP and HCW (Liu et al., 2020; Qiu et al., 2020; Wang et al., 2020), being female was associated with all the mental health outcomes considered, suggesting that female gender represents a risk factor for mental health issues such as PTSS, Depression, Anxiety symptoms, and Insomnia in the context of the current emergency. Also, similarly to previous reports (Qiu et al., 2020; Wang et al., 2020), younger age was associated with all the selected mental health variables, except for Insomnia. These findings therefore further encourage the implementation of targeted interventions for different at-risk populations.

This study has a number of limitations, mainly due to the on-line sampling strategy and cross-sectional design. Firstly, a self-selection bias, which is frequent in web-based surveys, could have led to an overestimation of effect sizes. Moreover, it is possible that this effect was different in the HCW and GP subsamples, leading to a biased estimate of the group effect on the selected outcomes. Secondly, it was not possible to assess how many subjects were reached by the questionnaire, so a response rate could not be estimated. A different sampling strategy, based on mailing lists of medical associations could have yielded a more accurate sample, however, getting access to mailing lists owned by Local Health Authorities could have introduced a relevant delay in sampling, eventually causing us to miss the relevant timeframe for this study.

Thirdly, this study is based on self-report measures that inherently convey a systematic bias in estimated the target construct.

Lastly, this study is based on a cross-sectional design. Although follow-up data will be collected in the future, no baseline data on the same participants were available at the time of the recruitment, and the only epidemiological study available in Italy so far (Girolamo et al., 2006) dates back to 2006 and is based on very different data collection instruments, hampering any possible comparison with our data.

However, this study has several strengths as well, consisting in its large sample size, and the prompt data collection, that was conducted during the highest peak of contagions of COVID-19 and burden on the national health service.

Clinical Implications

This study suggests a significant psychological impact of the COVID-19 pandemic on both the Italian GP and HCW. In this context, our results further underline the importance of timely intervention strategies, with particular regard to HCW. Indeed, specific attention should be dedicated to FHCW, a highly vulnerable population exposed to a number of additional emergency-related stressful events. Health care systems should cope with the psychological impact of the pandemic on HCW by actively monitoring mental health outcomes and performance, modifying working shifts, and reducing the exposure to frontline workplace HCW, especially those exposed to a higher risk of unfavorable mental health outcomes, such as trauma-related symptoms, should be provided with training, psychological support, and treatments where necessary. Early detection and intervention strategies in both the general population and at-risk groups are crucially important in order to prevent the potential long-term adverse psychological impact of large-scale emergencies such as the current COVID-19 pandemic. On the other hand, further studies should attempt to address any possible protective factors or positive coping styles that may have protected the population from the risk factors associated with the pandemic.

Significant Outcomes

Front-line Health care workers are at heightened risk for Post-Traumatic symptoms. Second-line health care workers showed lower levels of depression and anxiety compared to the general population. Younger age and female gender, having a colleague involved with COVID-19 were associated with mental health outcomes.

Limitations

On-line self-selected sample; self-report assessment.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the University of L'Aquila IRB. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

RR, VS, FP, and GDL: conceptualization. RR: methodology and formal analysis. RR, SM, and GDL: data curation. RR and VS: writing–original draft. RR, VS, AD, FP, SM, AS, and GDL: writing–review and editing. All authors contributed to the article and approved the submitted version.

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REVIEW
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Stress Reduction Techniques for Health Care Providers Dealing With Severe Coronavirus Infections (SARS, MERS, and COVID-19): A Rapid Review

Edward Callus[1,2], Barbara Bassola[3], Valentina Fiolo[1], Enrico G. Bertoldo[1], Silvana Pagliuca[1] and Maura Lusignani[2,3]*

[1] Clinical Psychology Service, IRCCS Policlinico San Donato, San Donato Milanese, Italy, [2] Department of Biomedical Sciences for Health, Università degli Studi di Milano, Milan, Italy, [3] Nursing School, ASST Grande Ospedale Metropolitano Niguarda, Milan, Italy

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***Correspondence:**
Edward Callus
edward.callus@unimi.it

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Objective: A rapid review was conducted to identify the most effective stress reduction techniques for health care providers dealing with patients infected with severe coronavirus (SARS, MERS, and COVID-19).

Methods: PubMed, PsychInfo, Embase, and CINAHL databases were searched to identify relevant studies. Searches were restricted by date (2000 until present). All empirical quantitative and qualitative studies in which relaxation techniques of various types implemented on health care providers caring for patients during severe coronavirus pandemics and articles that consider the implementation of mental health care services considered to be pertinent, such as commentaries, were included.

Results: Fourteen studies met the selection criteria, most of which were recommendations. Only one study described a digital intervention, and user satisfaction was measured. In the recommendations, both organizational and individual self-care interventions were suggested.

Conclusions: Further research is necessary to establish tailor-made effective stress reduction interventions for this population, during these challenging and particular times.

Keywords: COVID-19, coronavirus, health care workers, psychological intervention, stress reduction techniques, review

INTRODUCTION

In the last 15 years, three global viral infectious diseases, severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), and coronavirus disease (COVID-19), have occurred worldwide, putting human lives at risk and challenging the health care providers working in the frontline. The SARS pandemic was declared as "contained" by the World Health Organization (WHO) in 2003 (World Health Organization, 2003).

It was reported by the Centers of Disease Control and Prevention that a total of 8,096 people in 29 countries were infected by it, out of whom 774 of them died (Centers for Disease Control and Prevention, 2016).

After the SARS pandemic occurred, population studies have shown that these kinds of events can cause anxiety, depression, stress, sleep disorders, and post-traumatic stress disorder (PTSD) (Hawryluck et al., 2004; Wu et al., 2005). Specifically, it is an experience of uncontrollable and excessive concern related to a number of situations or activities. Symptomatology includes restlessness, fatigue, and difficulty in concentrating, irritability, muscle tension, and sleep disturbances. It is not surprising that the health care workers who find themselves working in this situation encounter a lot of stress linked to both their personal safety and the safety of their families; this is an addition to the burden of dealing with patients who can experience severe psychological distress.

Concerns from health care workers and psychological distress during the previous SARS outbreak were linked to increased work stress, social isolation, and health fears. Factors related to the psychological distress of health professionals were physical and emotional exhaustion due to an overloaded health system, rapidly changing medical information and procedures, media control, nursing care, perception of self-risk, lifestyle affected by the epidemic, and subjective vulnerability (Maunder, 2004; Wong et al., 2005; Styra et al., 2008). In addition, when faced with the possibility of having to work in a pandemic, a significant proportion of health care workers did not go to work, despite having a strong sense of duty (Ives et al., 2009; Martinese et al., 2009).

During the SARS pandemic, health care workers reported significantly higher levels of distress, including burnout psychological stress and post-traumatic stress, hostility, and somatization (Chen et al., 2005; Maunder et al., 2006). It was suggested that healthcare workers should be screened when it comes to psychological distress, in order to provide psychological support (Chen et al., 2005). Prevention programs during SARS have been effective in diminishing anxiety and depression and improving sleep and quality of life (Chen et al., 2006).

In a cross-sectional study of 1,257 health care workers in 34 hospitals equipped with fever clinics or wards for patients with COVID-19 in multiple regions of China, a considerable proportion of health care workers reported experiencing symptoms of depression, anxiety, insomnia, and distress. It was suggested that, among Chinese health care workers exposed to COVID-19, women, nurses, those in Wuhan, and frontline health care workers had a high risk of developing unfavorable mental health outcomes and may need psychological support or interventions (Lai et al., 2020).

Among the health care providers, the frontline workers involved directly in handling COVID-19 patients are exposed at greater risk than others. Many reasons were found in adverse psychological outcomes ranging from excessive workload/work hours to inadequate personal protective equipment, over-enthusiastic media news, and feeling inadequately supported (Spoorthy et al., 2020).

Pervasive psychological problems have appeared among health care workers during the COVID-19 pandemic. The prevalence of symptoms of anxiety, depression, insomnia, and the overall psychological problems in health care workers during the COVID-19 pandemic in China was 46.04, 44.37, 28.75, and 56.59%, respectively (Que et al., 2020).

It has been demonstrated in various studies that relaxation techniques, such as the progressive muscular relaxation of Jacobson, the Mindfulness Based Stress Reduction techniques, and the relaxation techniques described by Benson, reduce stress, anxiety, and depression and improve quality of life in both patients and health care workers (Zinn, 1990; Botha et al., 2015; Carver and O'Malley, 2015; Greenlee et al., 2017; Tsitsi et al., 2017; Harorani et al., 2019; Ibrahim et al., 2019).

However, medical and nursing staff may be unable or reluctant to participate in psychological initiatives at the time of crisis (Chen et al., 2020). Initiatives such as staff training on psychological aspects in patient management and training in relaxation techniques (Chen et al., 2020) could therefore be useful, although the best approach during this pandemic is still unknown (Chen et al., 2020; Kang et al., 2020a; Xiang et al., 2020).

It is especially important to take into consideration the psychological care needs treatment preferences of the health care workers facing these kinds of situations. In one study, the impact on mental health care and perceptions of psychological care of the medical and nursing staff was explored in Wuhan (Kang et al., 2020b). The health care workers were divided into clusters according to their mental health disturbance: mild, moderate, and severe. When it comes to the interest in psychological care, the ones with subthreshold disturbances most wanted to obtain skills to help alleviate others' psychological distress, whereas other medical and nursing staff most wanted to obtain self-help skills.

In the cluster where higher levels of mental health problems were reported, the medical and nursing staff showed more interest in skills for self-rescue and showed more urgent desires to seek help from psychotherapists and psychiatrists. Medical and nursing staff with subthreshold disturbances did not think they needed help from others. The other workers saw a greater need to obtain help from professionals than from close family and friends. Also, the modalities of obtaining services vary according to their levels of mental health problems. Medical and nursing staff with subthreshold and mild disturbances preferred to obtain such services from media sources, while staff with heavier burdens wanted to seek services directly from professionals (Kang et al., 2020b).

For this reason, it is important to identify what kind of interventions could be most effective in this population, also when it comes to self-help materials such as relaxation recordings, which can be delivered also without the health care workers having direct contact with the professionals.

METHODOLOGY

This rapid review was aimed to identify the most effective stress reduction techniques for health care providers dealing

with patients infected with severe coronavirus (SARS, MERS, and COVID-19).

In particular, there was a focus on the best practices and interventions that aimed at reducing psychological distress among health care professionals dealing with patients infected with severe coronavirus infections. Additionally, the delivery mechanisms of the identified interventions, the instruments used to test their efficacy, the determinants of their effectiveness, and their impact on specific psychological variables were investigated.

It was decided to focus only on severe coronaviruses because they have similar characteristics, and the objective of the review was to identify interventions that were specific to the health care providers who were facing similar situations.

The main question this rapid review aims to answer is:

- Which are the most effective stress reduction techniques for health care providers dealing with patients infected with severe coronavirus (SARS, MERS, and COVID-19)?

The secondary questions that we explored are:

- Which is the most effective manner of delivery considering the severe coronavirus characteristics?
- What instruments are utilized to measure stress reduction techniques' efficacy?
- Which psychological variables are affected by stress reduction techniques?
- Which factors influence the effectiveness of stress reduction techniques' application?

PubMed, PsychInfo, Embase, and CINAHL databases were searched to identify relevant studies. Searches were restricted by date (2000 until present). Searches were conducted by two authors independently between 3rd and 18th June 2020.

The keywords utilized in the various databases can be seen in the **Supplementary Material** (database search strings).

All studies and any systematic reviews identified during the screening process were reference checked to identify additional studies. During the preliminary screening of literature, two authors worked independently. Google Scholar was searched as other source.

The objectives were formulated according to the Cochrane Systematic Review indications (Thomas et al., 2019) and following the Cochrane indications and training materials for rapid reviews.

The eligibility criteria were referable to the type of participants; the studies had to concern health professionals, even if not exclusively; they had to indicate a technique, model, or recommendations for stress reduction; they had to relate to a problem or variable of psychological distress in health professionals during outbreaks of SARS, MERS, or COVID-19, and mental health outcomes.

All empirical quantitative and qualitative studies in which relaxation techniques of various types implemented on health care providers caring for patients during severe coronavirus pandemics and articles that consider the implementation of mental health care services considered to be pertinent, such as commentaries, were included. In addition, there was an exploration of any indicators of effectiveness in lowering psychological distress including anxiety, depression, PTSD, burnout, and others. Studies relating to the stress conditions of operators not related to epidemics and which did not propose interventions or recommendations were excluded. Information extracted from studies and reviewed included psychological distress variables, intervention, efficacy measurements, follow-up results, and country of study.

One reviewer screened all titles and abstracts (BB), considering the focus of the review and the inclusion and exclusion criteria. In the presence of uncertainties, the full text of the article was consulted. After that, two separate reviewers identified the definitive list by consulting the full texts of all the articles (EGB and EC). The quality evaluation of included literature was performed using the AGREE II-Global Rating Scale (AGREE II-GRS) Instrument (Brouwers et al., 2016); the GRADE approach was used to interpret the results (Langendam et al., 2013) and to create **Table 1** ("Quality evaluation of the studies").

RESULTS

The workflow of the article selections can be seen in **Figure 1**, and the pertinent articles are reported in **Table 2**.

The search for documents produced 67 records. Forty-one of them were excluded because they were considered irrelevant after an independent analysis of title and abstract. The remaining 26 were analyzed in full text independently among the authors to assess their adherence to the selection criteria and 16 were excluded. Fourteen met the selection criteria and, after quality appraisal, were included in the narrative review (see **Table 2** for the selected studies).

One of the selected studies (Blake et al., 2020) is an intervention study, 1 is a case study (Sasangohar et al., 2020), 11 are opinions and recommendations (De Mei et al., 2020; Fessell and Cherniss, 2020; Galbraith et al., 2020; Hedderman et al., 2020; Kar et al., 2020; Maben and Bridges, 2020; Moazzami et al., 2020; Petzold et al., 2020; Shanafelt et al., 2020; Sultana et al., 2020; World Health Organization, 2020), and 1 is a letter to editor (Mukhtar, 2020). The quality of the studies was moderate to high. As reported by some of the authors, few of the reviewed considerations, recommendations, and suggestions have substantial evidence to support them. Some are based on direct requests from health care professionals and experience. All studies are written in English, except Petzold et al. (2020), which is written in German with abstracts in both languages, and De Mei et al. (2020), which is available in both English and Italian.

The purposes of the reviewed studies were to suggest interventions or recommendations and specific policy organizational recommendations, for the reduction of stress and psychological burden in health professionals during COVID-19 (De Mei et al., 2020; Fessell and Cherniss, 2020; Galbraith et al., 2020; Hedderman et al., 2020; Kar et al., 2020; Maben and Bridges, 2020; Moazzami et al., 2020; Petzold et al., 2020; Shanafelt et al., 2020; Sultana et al., 2020; World Health Organization, 2020) and to propose strategies and interventions such as mindfulness (Hedderman et al., 2020), telemedicine

TABLE 1 | Quality evaluation of the studies.

Authors and year	Rate the overall quality of the guideline development methods Lowest quality (1) Highest quality (7)	Rate the overall quality of the guideline presentation Lowest quality (1) Highest quality (7)	Rate the completeness of reporting Lowest quality (1) Highest quality (7)	Rate the overall quality of the guideline recommendations Lowest quality (1) Highest quality (7)	Rate the overall quality of the guideline Lowest quality (1) Highest quality (7)	I would recommend this guideline for use in practice Lowest quality (1) Highest quality (7)	I would make use of a guideline of this quality in my professional decisions Lowest quality (1) Highest quality (7)
Blake et al., 2020	NP	NP	NP	NP	NP	NP	NP
De Mei et al., 2020	3	4	2	7	4	5	3
Fessell and Cherniss, 2020	2	5	2	7	4	5	3
Galbraith et al., 2020	6	6	2	7	6	6	5
Hedderman et al., 2020	3	5	3	7	5	5	4
Kar et al., 2020	4	6	2	7	5	6	5
Maben and Bridges, 2020	4	6	3	7	6	6	5
Moazzami et al., 2020	NP	NP	NP	NP	NP	NP	NP
Mukhtar, 2020	2	4	3	7	4	5	3
Petzold et al., 2020	5	7	5	7	6	7	6
Sasangohar et al., 2020	5	6	5	7	6	6	6
Shanafelt et al., 2020	6	5	5	7	5	6	5
Sultana et al., 2020	5	4	5	7	5	6	5
World Health Organization, 2020	4	3	4	7	5	6	5

NP, not pertinent.

(Moazzami et al., 2020), and health model (Mukhtar, 2020). There are no differences between the recommendations referred to different populations and cultures. All studies are aimed at health professionals (De Mei et al., 2020; Petzold et al., 2020; Shanafelt et al., 2020; Sultana et al., 2020; World Health Organization, 2020), some at specific figures such as doctors (Fessell and Cherniss, 2020; Galbraith et al., 2020) or nurses (Maben and Bridges, 2020). Kar et al. (2020) include indications for the general population. None of the studies found discussed or proposed interventions or recommendations addressed to health care professionals involved in the SARS and MERS epidemics (Liu et al., 2020).

RELAXATION STRATEGIES DURING PANDEMICS

The study "Effects of progressive muscle relaxation on anxiety and sleep quality in patients with COVID-19" was conducted on 51 patients who tested positive for COVID-19 and admitted to the general hospital of Hainan from January 01. As of February 16, 2020, progressive muscle relaxation (PRM) was seen to have a positive effect on improving sleep quality and reducing anxiety in COVID-19 patients. The cause of the decrease in anxiety in patients after PMR practice could be the balance between the anterior nucleus and the hypothalamic nucleus. In fact, it has been shown that by reducing the activity of the sympathetic nervous system, it is possible to prevent the side effects of stress and anxiety and increase physical and mental relaxation (Ferendiuk et al., 2019).

In an attempt to develop a clinical protocol aimed at reducing the negative effects of the current pandemic on the psychophysical health of health care personnel and patients, further characteristics of relaxation practices were evaluated and investigated.

Health care personnel are subjected to numerous stressful factors during sometimes prolonged work shifts: taking care of more or less serious COVID-19-positive patients, the worry of a possible infection from COVID-19, the fear of being able to infect loved ones, quickly adapting to the reorganization of Operational Units and consequently to quickly changing their duties, working alongside unknown colleagues or doctors from an operational point of view, sustaining much heavier work rates, etc. All these factors lead to the accumulation of stress, which, over time, risks becoming chronic. This condition leads to an inevitable relapse on both a psychological and physiological level such as "chest and non-diaphragmatic breathing, muscle tension more intense than normal, a rapid heartbeat, a condition of sympathetic tone, the appearance of negative fantasies or a chronic fear" (Rispoli, 1999).

Breathing, for example, has been evaluated as a fundamental element for the mindful meditation practices introduced by Kabat-Zinn, as it allows you to pay "non-judgmental attention to your cognitive, emotional and physical experiences, while reorienting your concentration. on respiratory sensations to promote cognitive and emotional regulation and progressively relaxed districts" (Azam et al., 2019).

The main findings of the 2011 "Targeting the restricted α-subunit repertoire of airway smooth muscle GABAA receptors augments airway smooth muscle relaxation" study refer to the fact that human airway smooth muscle possesses GABAA

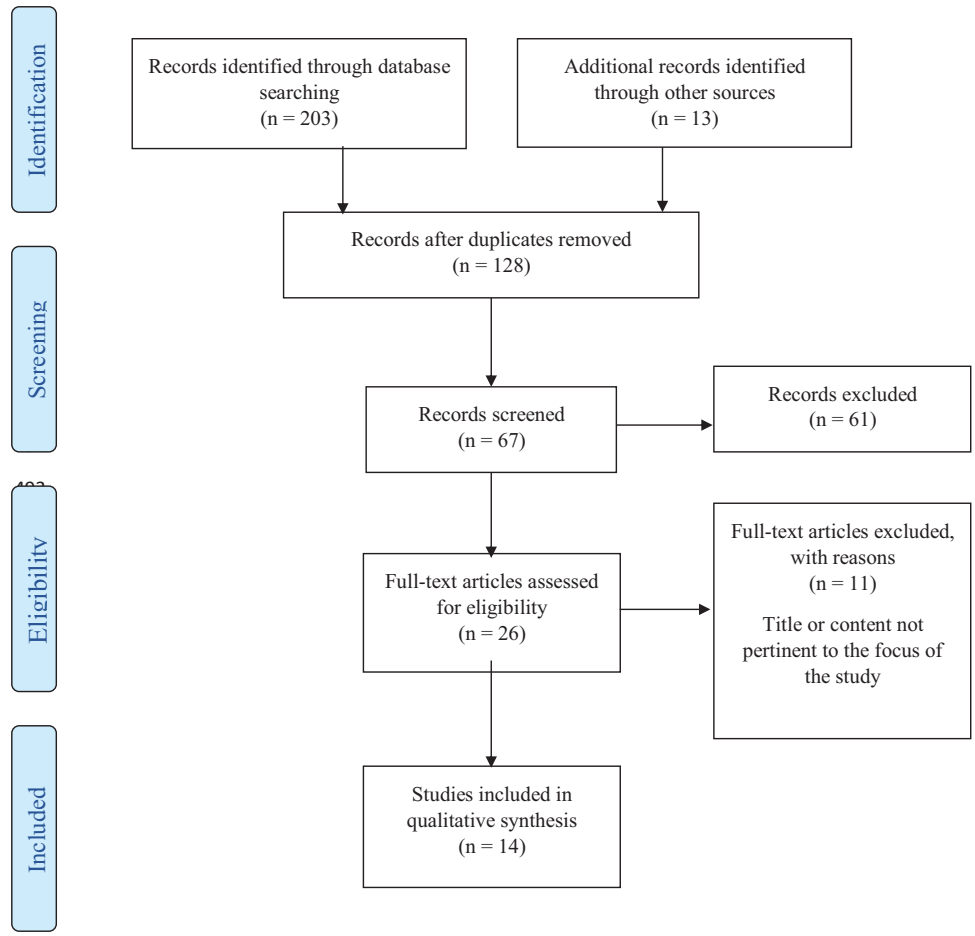

FIGURE 1 | Flow diagram of the selected studies.

receptors (gamma-aminobutyric acid) with a limited (but conserved) α-subunit phenotype that can be pharmacologically targeted by selective agonists to generate electrophysiological changes and facilitate relaxation of pre-contracted smooth muscle. The activation of the receptor can directly and spontaneously relax the pre-contracted smooth muscle of the airways by a variety of procontractile agents (Gallos et al., 2012).

Furthermore, in a review of the scientific literature (Pavan and Palese, 2016), it was shown that GABA is one of the most important inhibitory neurotransmitters and influences mood and emotions. Low levels are associated with depression and sleep disturbances, conditions also found in people with PTSD, as well as in anxiety situations in which there is a reduction in GABA (Rispoli, 2016).

The scientific evidences cited so far show the importance of increasing the presence of GABA neurotransmitters in the body especially in this moment of COVID-19 emergency, both for patients with respiratory problems and for all those, including patients, doctors, health workers, and the civilian population, who experience a strong state of anxiety.

Another study highlighted the beneficial effects of relaxation techniques in asthmatic patients by measuring lung function. The results show that the use of relaxation as an auxiliary treatment appears to help asthma patients better manage stress and prevent further attacks, thus improving their quality of life (Pourdowlat et al., 2019). Lahmann et al. (2009) had previously obtained similar results by evaluating the impact of relaxation and guided imagery techniques on asthmatic patients.

A recent review of the literature (Tarsha et al., 2020) found that body-oriented psychological therapies were effective in reducing headaches caused by a state of tension, non-cardiac (non-specific) chest pain, psychosomatically influenced asthma diseases, and irritable bowel disease as demonstrated in other studies (Loew et al., 2001; Lahmann et al., 2008a,b, 2009). The importance of the body in psychological therapies has already been highlighted for some time by Rispoli (1999, 2004, 2016) who already in 1999 spoke about the unity of body and mind, overcoming this dichotomy. His theoretical approach focused on targeted interventions on the body to alleviate psychological pathologies, strictly connected to the physical and physiological level, and fits into this perspective of body and mind integration (Rispoli, 2016).

TABLE 2 | Summary of the selected studies.

Authors, year, and country	Title	Psychological distress variables	Intervention	Efficacy measurements	Follow-up results
Blake et al., 2020—United Kingdom	Mitigating the Psychological Impact of COVID-19 on Healthcare Workers: A Digital Learning Package	Rest, work breaks, sleep, shift work, fatigue, healthy lifestyle behaviors, moral injury, coping, guilt, grief, fear, anxiety, depression, preventing burnout, and psychological trauma	The implementation of an e-package including evidence-based guidance, support, and signposting relating to psychological well-being for all United Kingdom health care employees	The e-package reported high user satisfaction with content, usability, and utility. All of the pre-defined success criteria were met for the fidelity assessment and implementation qualities.	Within just 7 days of release, 82% of participants reported having used the information provided in their work or home lives, and 100% would use it in the future.
De Mei et al., 2020—Italy	COVID-19: stress management among healthcare workers	Feeling angry, hostile, frustrated or helpless, depression, anxiety, insomnia, and increasing consumption of caffeine and tobacco	Advice for health care workers	Not tested	NA
Fessell and Cherniss, 2020—United States	Coronavirus Disease 2019 (COVID-19) and Beyond: Micro practices for Burnout Prevention and Emotional Wellness	Burnout	Recommendation about: mindfulness micro practice and self-reported stress levels via the widely used Depression Anxiety Stress Scales-21	Not tested	NA
Galbraith et al., 2020—United Kingdom	The mental health of doctors during the COVID-19 pandemic	Stress, stigma, suicidal ideation, feelings of shame, and professional failure	Recommendations about: managing doctors' stress at the organizational level (PPE, peer support training) and stress management at the individual level (mindfulness)	Not tested	NA
Hedderman et al., 2020—Ireland	Mindfulness moments for clinicians in the midst of a pandemic	Burnout, distress, emotional suffering, fear of contamination for themselves and loved ones, the breakdown of social support systems, the deaths of colleagues, and increased psychological distress	Tips for mindfulness moments for clinicians (MMFC) (mindfulness-based cognitive therapy (MBCT) programs; the RAIN (Recognize, Allow, Investigate, and Nurture) practice	Not tested	NA
Kar et al., 2020—India, Bangladesh, United Kingdom, and Nepal	Coping with Mental Health Challenges During COVID-19	Physical exhaustion, fear, emotional disturbance, sleep disorders, depressive symptoms, anxiety, suicidality, PTSD, and burnout	Recommendations for effective coping with mental health challenges: adequate awareness about the COVID-19; preparedness to meet the challenges; ignoring fake news and social media posts; regular scheduling of the daily activities; recreational activities and relaxation exercises; approaching health care system; positive thinking and installation of hope	Not tested	NA
Maben and Bridges, 2020—United Kingdom	Covid-19: Supporting nurses' psychological and mental health	Levels of occupational stress and resulting distress, concern for personal or family health, concern with the ethical obligations of continuing to provide care, concerns about shortages of staff and of personal protective equipment	Evidence-based psychological support: self-support (adequate food, shelter, rest, sleep and safety, calming strategies), peer support (peer support conversation), team support (buddying with more experienced colleagues), manager, and leader	Not tested	NA

(Continued)

TABLE 2 | Continued

Authors, year, and country	Title	Psychological distress variables	Intervention	Efficacy measurements	Follow-up results
Moazzami et al., 2020—Iran	COVID-19 and telemedicine: Immediate action required for maintaining healthcare providers well-being	Long work hours, sleep disturbances, debilitating fatigue, and the risk of getting infection and put their family at risk of a life-threatening condition	Recommendation of telemedicine	Not tested	NA
Mukhtar, 2020—Pakistan	Mental health and emotional impact of COVID-19: Applying Health Belief Model for medical staff to general public of Pakistan	Anxiety of falling sick or fear of death, sense of helplessness, hopelessness, exhaustion and burnout, nervous anticipation negative emotions, work–life balance	Recommendation about: Health Belief Model (HBM)	Not tested	NA
Petzold et al., 2020—Germany	Dealing with Psychological Distress by Healthcare Professionals During the COVID-19 Pandemia		The recommendations of the World Health Organization, the United Nations and the International Red Cross Society are summarized in the article	Not tested	NA
Sasangohar et al., 2020— United States	Provider burnout and fatigue during the COVID-19 pandemic: lessons learned from a high-volume intensive care	Occupational fatigue and burnout	Recommendations and policy implication at National, Regional and Organizational level	Not tested	NA
Shanafelt et al., 2020— United States	Understanding and Addressing Sources of Anxiety Among Health Care Professionals During the COVID-19 Pandemic	Sources of Anxiety: personal protective equipment, personal and family exposure to COVID-19, testing access, uncertainty about organization support, school closures, personal and family needs, being able to provide competent care, access to up-to-date information	Key components of how organization can respond	Not tested	NA
Sultana et al., 2020—Bangladesh	Burnout Among Healthcare Providers During COVID-19 Pandemic: Challenges and Evidence-based Interventions	Burnout, sleep deprivation, depression, and suicidal thoughts	Strategies recommended for addressing burnout among health care providers: provide awareness, mindfulness and self-care practices, availability of mental health services, digital technologies, organization-directed interventions	Not tested	NA
World Health Organization, 2020 —Switzerland	Healthcare Personnel and First Responders: How to Cope with Stress and Build Resilience During the COVID-19 Pandemic	Stress, anxiety, and fear	Tips to cope and enhance resilience	Not tested	NA

NA, not available.

INTERVENTIONS

In their study, Blake et al. (2020) describe the development and evaluation of a digital package using the Agile methodology, in the United Kingdom. The study includes three phases: a content development phase, a peer review phase, and a package implementation and evaluation phase. The package includes an evidence-based guide to support the psychological well-being for all United Kingdom health workers. The package outlines the actions that team leaders can undertake to provide psychologically safe spaces for workers, to provide a guide to reduce social stigma, and to increase peer and family support, self-care strategies related to sleep and rest, shift work, fatigue, and healthy lifestyle behaviors; it also includes emotion management strategies such as guilt, pain, fear, anxiety, depression, burnout prevention, and psychological trauma.

Enhancing Awareness

The revised studies report to inform health care personnel about the professional stress risks associated with the emergency care. Awareness can reduce stigma to mental health conditions such as burnout and develop resilience in the health care provider by preventing burnout (Sultana et al., 2020). Adequate awareness of COVID-19 and regular updates about appropriate precautionary measures are recommended (Kar et al., 2020).

Self-Care Interventions

Positive mental health can prevent work-related stress and burnout and should be promoted among health professionals in COVID-19. Several strategies are recommended for reducing the workload, such as mindfulness and promoting self-care (Sultana et al., 2020).

Mindfulness training is recommended for health care professionals because it can promote self-care and well-being (Fessell and Cherniss, 2020; Sultana et al., 2020; World Health Organization, 2020). Mindfulness programs are also recommended because they can increase resilience to stress, quality of professional life, and self-compassion.

Compassion for both self and others in a clinical setting is a necessary component to facilitate a therapeutic environment. Self-compassionate people react to adversaries' events in a more emotionally regulated model. Self-compassion is associated with a series of psychological strengths such as resilience, happiness, optimism, wisdom, curiosity, courage, exploration, and emotional intelligence (Hedderman et al., 2020).

Mindfulness-based interventions are particularly suitable for high-stress work contexts, can be practiced privately or in groups, in almost all environments, and can be conducted as briefly as possible (Galbraith et al., 2020). Mindfulness is recommended also for reducing work stress and suicidal ideation (Galbraith et al., 2020).

The promotion of self-care must start from the response to the essential needs of drinks, food, rest, and sleep (Maben and Bridges, 2020; Petzold et al., 2020; World Health Organization, 2020). It also includes indoor recreational activities and relaxation exercises to daily practice (Kar et al., 2020; World Health Organization, 2020). To protect self and take care of self, it is also recommended that professionals ignore fake news and reduce social media (Kar et al., 2020; World Health Organization, 2020).

Self-care micro practices such as diaphragmatic respiration has shown an improvement in stress reduction; it is believed that the mechanism acts by increasing parasympathetic activation and, given that diaphragmatic breathing is low cost, self-administered, non-pharmacological, and highly portable, the practice is recommended (Fessell and Cherniss, 2020). To improve self-care, it is also necessary to act on self-efficacy, and the promotion of self-efficacy is recommended both for medical staff and for public; strengthening self-efficacy beliefs is recommended as strengthening beliefs about the disease include its severity and susceptibility (Mukhtar, 2020).

Mental Health Services

Providing mental health services can be difficult during COVID-19, but such opportunities should be considered to prevent stress and burnout among professionals. Recommendations include building teams or multi-disciplinary teams of mental health experts who can provide mental health services or refer to appropriate resources if the health care worker shows signs of exhaustion (Sultana et al., 2020). Psychological counselors should be available in the staging areas of professionals to listen to staff difficulties and stories and provide support accordingly (Maben and Bridges, 2020; Shanafelt et al., 2020).

Group consultations or peer-support sessions are also recommended, which can allow specific topics to be dealt with in depth (Petzold et al., 2020; Sultana et al., 2020). Peer support and group support are particularly recommended among nurses for their "natural" tendency to take care of others and not themselves, which leads them to need others (colleagues and leaders) to remind them to think for themselves and to find ways to help new members feel safe, appreciated, and welcome as quickly as possible (Maben and Bridges, 2020).

Digital Technologies

The use of digital interventions to improve health services and care outcomes is also recommended during COVID-19. The push toward digital is twofold. On the one hand, the use of electronic medical records and telemedicine can reduce the overloaded work experience (Moazzami et al., 2020; Sultana et al., 2020) among the frontline health care workers in COVID-19.

Another approach is to provide mental health resources and interventions that use digital platforms such as mobile phones, apps, or Internet devices. This can positively affect working and mental life and health professionals (Sultana et al., 2020). Due to increased assistance demands, the professional engagement of the operators should be guaranteed by implementing and providing psychological support services by phone of via the web (De Mei et al., 2020).

Organizational Approaches

It is considered essential to improve organizational measures that affect the culture of work and stress in the workplace. Potential strategies include improving workflow management, organizing services focused on reducing workload, improving interoperability, organization of discussions and exchange of opinions, improvement of communication skills, providing adequate rest and exercise, and organizing seminars on coping skills (Sultana et al., 2020); such organizational support should include guarantees such as assistance to those doctors and nurses who fall ill, as well as medical and financial support for their families and protection from threats of neglect (Galbraith et al., 2020).

It is also recommended that the organization provide a resting place, guaranteed food and daily supplies, videos of their work to share with families to ease concerns, training to manage the patient's psychological problems, and the provision of personal protective equipment (De Mei et al., 2020; Maben and Bridges, 2020; Shanafelt et al., 2020; World Health Organization, 2020). The recommendations regarding the implementation of all the necessary measures to protect the occupational safety suggest that the employer and the managers of the health structures must guarantee the adoption of preventive and protective measures, providing personal protective equipment in sufficient quantities for the health workers; this increases the sense of security and reduces stress (De Mei et al., 2020; Maben and Bridges, 2020; Petzold et al., 2020; World Health Organization, 2020).

The reports also suggest that regular and honest communication from the leaders of the organization toward the frontline professionals is essential, as well as the visibility and guarantee of access to physiological and safety needs (De Mei et al., 2020; Maben and Bridges, 2020; Petzold et al., 2020; World Health Organization, 2020). It is recommended that the organization create a series of communication channels (listening groups, e-mail suggestion box, town halls, and managers visiting

hospital units) and ensure that the voice of health workers is part of the decision-making process (Shanafelt et al., 2020; World Health Organization, 2020).

The organization can also support health care professionals in addressing the mental health stigma in the workplace; creating a culture that encourages open communication and seeks to reduce the stigmatization of psychological vulnerability is recommended (Galbraith et al., 2020; Shanafelt et al., 2020).

Evaluation of the Intervention

None of the 14 revised studies reported results of application of the intervention or recommendations.

Blake and others report the evaluation of the digital package tested. A total of 17,633 consultations of the tested package were carried out within 7 days of completion, and the evaluation (n. 55) indicated a high user satisfaction for content, usability, and utility (Blake et al., 2020).

Fessell and Cherniss (2020) recommended both physiologic bio-markers (blood pressure and salivary cortisol) and self-reported stress levels via the Depression Anxiety Stress Scales-21 as evaluation for diaphragmatic breathing.

DISCUSSION

Frontline health care providers during the COVID-19 pandemic were and are still being exposed to an enormous amount of stress for many reasons, such as lack of adequate protection, physical fatigue, exhausting shifts, and sometimes organizational difficulties, which can also include lack of human resources and being requested to operate out of one's specialty out of necessity.

This rapid review was undertaken to assess the efficacy of stress reduction techniques for health care providers dealing with patients infected with severe coronavirus (SARS, MERS, and COVID-19). In particular, the authors were interested to identify what stress reduction techniques could be most effective in such particular circumstances.

Fourteen studies that fulfilled the selection criteria for this review were identified, 11 of which were recommendations. Only one intervention study met the quality appraisal criteria.

Only one intervention technique provided by a digital package using the Agile methodology (Blake et al., 2020) was described, and several recommended strategies based on individual, organizational, or team actions such as mindfulness, promotion of self-care, psychological counseling, digital platform information, and organizational support services were provided.

In the recommendations, it was specified that it is important to act on an organizational level. A lot of attention must be paid on communication, providing accurate updates in order to lower stress levels as much as possible, fostering a perception of control. All measures that guarantee the health care professionals' safety and enhance their well-being must be put into place. In particular, attention to the organization of shifts, the creation of a safe place, and clear access to mental health services were outlined.

It was also specified that the interventions need to be tailor-made and safe; therefore, in the time of the peak of the pandemic, telehealth services must be provided. Some health care professionals seem to prefer not to have a direct contact with a mental health professional; therefore, resources, such as relaxation recordings and digital packaging, should be made available.

A number or self-care interventions were proposed, acting directly on essential needs, recreational activities, and specific stress reduction techniques, such as mindfulness-based interventions, diaphragmatic respiration, and acting on self-efficacy.

Even though these general indications were provided, no specific indications as to specific stress reduction techniques, which could be particularly effective during the COVID-19 pandemic, were provided. Further studies involving the health care providers themselves, and the measures of both satisfaction and effectiveness in reducing stress, with the use of patient-reported outcomes on anxiety, depression, PTSD, and insomnia are required.

Limitations

Since a rapid review was conducted, there could bias as a consequence of streamlining the systematic review process. This bias could therefore have occurred during the selection of the studies, although three of the authors were involved in the selection in order to minimize this bias as much as possible.

CONCLUSION

Frontline health care professionals are indispensable during pandemics such as COVID-19; therefore, there should be an important investment in order to safeguard their mental health and to lower their stress as much as possible. Further research is necessary to establish tailor-made effective stress reduction interventions for this population during these challenging and particular times.

AUTHOR CONTRIBUTIONS

EC proposed the study design and the idea, analyzed the literature and its development, and gave the final approval of the manuscript. BB and EB analyzed the literature and contributed to the preparation of the manuscript. VF and SP contributed to the shaping of the manuscript. ML revised and approved the final manuscript. All authors approved the submitted version.

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Psychological Symptoms in Health Professionals in Spain After the First Wave of the COVID-19 Pandemic

María Dosil[1], Naiara Ozamiz-Etxebarria[2], Iratxe Redondo[2], Maitane Picaza[3] and Joana Jaureguizar[2]*

[1] Department of Research and Diagnostic Methods in Education, Universidad del País Vasco/Euskal Herriko Unibertsitatea UPV/EHU, University of the Basque Country UPV/EHU, Leioa, Spain, [2] Department of Developmental and Educational Psychology, Universidad del País Vasco/Euskal Herriko Unibertsitatea UPV/EHU, University of the Basque Country UPV/EHU, Leioa, Spain, [3] Department of Didactics and School Organization, Universidad del País Vasco/Euskal Herriko Unibertsitatea UPV/EHU, University of the Basque Country UPV/EHU, Leioa, Spain

Following the declaration of the COVID-19 outbreak as a global pandemic in March 2020, a state of alarm was decreed in Spain. In this situation, healthcare workers experienced high levels of stress, anxiety and depression due to the heavy workload and working conditions. Although Spain experienced a progressive decline in the number of COVID-19 cases until the last week of May (when a flattening of the case curve was achieved) and the work overload among health workers was substantially reduced, several studies have shown that this work overload is associated with the later emergence of psychological symptoms induced by stress. The aim of the present study was to evaluate the levels of stress, anxiety, depression, post-traumatic stress and compassionate fatigue in health professionals. The sample consisted of 973 health professionals 16.5% men, 82.9% women, and one non-binary person. The data were collected through an online questionnaire sent to the participants by e-mail. DASS-21 was used to measure anxiety, stress and depression, PCL-C to measure post-traumatic stress and ProQOL -vIV to measure compassion fatigue. In addition, other descriptive variables that could be related to these levels of psychological symptomatology were evaluated. The results reveal that after the work overload experienced during the COVID-19 pandemic, healthcare workers report psychological symptoms, post-traumatic stress and compassion fatigue. It is therefore recommended that these professionals be provided with psychological help in order to reduce the emotional impact of COVID-19, and consequently improve their mental health.

Keywords: healthcare professionals, stress, anxiety, depression, post-traumatic stress, compassion fatigue, COVID-19

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****Correspondence:***
Naiara Ozamiz-Etxebarria
naiara.ozamiz@ehu.eus

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INTRODUCTION

At the end of December 2019, the Chinese city of Wuhan reported a novel pneumonia caused by coronavirus disease 2019 (COVID-19) (Lai et al., 2020). The subsequent outbreak of COVID-19 not only caused great public concern, but also brought about huge psychological distress, particularly for the medical staff (Cheng and Li Ping Wah-Pun Sin, 2020; García-Iglesias et al., 2020;

Zhang et al., 2020). The growing number of confirmed and suspected cases, overwhelming workload, extensive media coverage, depletion of personal protective equipment, lack of specific medications and perceived inadequate support has contributed to the significant mental burden that has been carried by these health professionals (Lee et al., 2007; Lai et al., 2020; Pfefferbaum and North, 2020).

Stress reaction symptoms such as anxiety, depression, somatization and hostility have been reported during and after the previous pandemics (Mak et al., 2009). More recently, during the COVID-19 pandemic, the prevalence of depression, anxiety and stress-related symptoms were found to be 50.7, 44.7, and 73.4%, respectively, among Chinese healthcare workers (Lai et al., 2020). Likewise, another study in Turkey confirmed that 64.7% of physicians had depressive symptoms, 51.6% suffered from anxiety and 41.2% experienced stress-related symptoms in the early period of the COVID-19 outbreak (Elbay et al., 2020). Nevertheless, for the time being, very few studies have been carried out on the subject in the European context. One of these, that aimed to investigate the psychological health of Italian healthcare professionals, revealed that approximately 33.5% of them met the threshold for psychiatric morbidity. Furthermore, participants perceived their current psychological health to be worse during the COVID-19 emergency outbreak as compared to before the outbreak (Bettinsoli et al., 2020). In Spain, a study conducted with medical staff in the same time frame, reported that 46.7% of health professionals indicated suffering from stress, 37% from anxiety, 27.4% from depression and 28.9% from sleep problems, with higher levels of symptoms among women and older professionals. Furthermore, factors such as having been in contact with the virus or experiencing fear at work, triggered greater symptomatology (Dosil et al., 2020). More recently, a systematic review including 13 studies detected medium-high levels of anxiety (26.5–44.6%), depression (8.1–25%), concern and insomnia (23.6–38%) among these professionals, and found that mental health and mental functions were especially compromised on those professionals hting on the front line of battle against the virus (García-Iglesias et al., 2020).

Other important factors that have been scarcely investigated in relation with the COVID-19 are compassion satisfaction, compassion fatigue and post-traumatic stress. The little research existing on this subject has been conducted within the context of other pandemics and some previous emergency situations.

Compassion satisfaction (CS) and compassion fatigue (CF) are considered to be part of professional quality of life (ProQOL), understood as "the quality one feels in relation to their work as a helper." While CS includes positive aspects such as perceiving that helping is in itself a worthwhile endeavor, CF is defined as "the emotional residue resulting from exposure to work with those who suffer the consequences of traumatic events" (Acinas, 2012, p. 3). Individuals who experience CF describe a feeling of tiredness or mental exhaustion that causes a general decrease in their desire, ability or energy to help other individuals (OHIO Nurses Association, 2011; Cocker and Joss, 2016).

The literature has clearly established that CF is high among all health professionals, but particularly for those who work in environments where they are confronted daily with large numbers of people for whom the outcome is potentially dire, such as in the case of those diagnosed with COVID-19 that require admission to emergency or intensive care units (Wallace et al., 2020). In fact, frequently seeing or experiencing the death and suffering of patients, or having the responsibility for deciding how to ration or use health resources, increases the risk of developing CF and moral injury among healthcare professionals during pandemics (Doherty and Hauser, 2019).

With this regard, some authors warn that healthcare providers such as critical care nurses may be particularly affected by severe emotional distress, which has been associated with the development of CF and/or burnout (Alharbi et al., 2020; Denison and Baptiste, 2020). For example, a recent study conducted by Arribas-García et al. (2020) with oncology nursing staff, reported that 41.8% of them showed moderate levels of CF. Therefore, Li et al. (2020), caution against ignoring vicarious traumatization caused by the COVID-19 pandemic, and some authors recommend close monitoring of physical and emotional wellbeing and providing education to professionals in order to reduce CF (Alharbi et al., 2019). However, all of these issues have received relatively little attention in the context of this pandemic.

Further, post-traumatic stress disorder (PTSD) is understood as a state of psychological unbalance following exposure to exceptionally threatening or horrifying events and it is characterized by a typical symptom pattern of intrusions, persistence of trauma, avoidance of relevant stimuli, emotional numbing, and physiological hyper-arousal (Deja et al., 2006). Nevertheless, subsequent empirical studies have consistently demonstrated that substantial rates of subclinical post-traumatic stress symptoms (PTSS) exist and are more persistent (Yin et al., 2020).

Many previous studies have shown that professionals such as emergency rescuers are likely to suffer from PTSD after participating in an emergency (Ozen and Sir, 2004; Wang Y. X. et al., 2020). In the context of epidemics, PTSD is also very likely to appear. For example, during the SARS epidemic of 2003, the rate of PTSD among frontline medical staff was high, with reports of up to 25.8% (Xu et al., 2004), whilst another study revealed that approximately 20% of the participants were diagnosed with PTSD 2 months after the epidemic outbreak (Chan and Huak, 2004). In fact, some studies have shown that healthcare workers are subject to early onset PTSD not at the moment, but after spending a long period of time in a horrific situation (Lazarus, 2014; Brondolo et al., 2017).

In a more recent investigation carried out in the context of the COVID-19 pandemic and involving 371 Chinese healthcare professionals, the total prevalence of post-traumatic stress symptoms was 3.8% and prevalence reached 8.8% on those subjects with high-level exposure to COVID-19 (Yin et al., 2020). However, data from European population on PTSS seems to be even higher. Hence, a Greek study conducted in April, found that criteria for a probable post-traumatic stress disorder diagnosis were met by a total of 16.7% of healthcare professionals in their sample (21.7% of women; 5.1% of men) (Blekas et al., 2020).

Finally, it is important to point out that when analyzing distress levels of these professionals, some socio-demographic variables (age, sex, professional category, etc.) or some others,

such as direct exposure to COVID-19, may act as risk or protective factors. With this regard, Babore et al. (2020) found that female gender was a risk factor for that, but not the economic status, while Buselli et al. (2020) reported that some symptoms were more prevalent in the frontline staff and healthcare assistants than in the second-line staff and physicians, respectively.

As it can be observed, evidence-based evaluations targeting healthcare workers and their psychological needs in the COVID-19 pandemic are relatively scarce. The few studies that exist have been carried out above all in Asian population and have mainly been focused on the times when the pandemic was very active. However, there is very little research on this issue in Spain.

Spain is one of the countries hardest hit by the health crisis caused by the COVID-19 pandemic (Ruiz-Fernández et al., 2020). In fact, a lockdown had to be enforced on March 15, 2020, when it presented 5,753 confirmed cases and 136 deaths due to COVID-19 (World Health Organization, 2020). By April 25, 2020, the country started to ease the lockdown with a gradual lifting of restrictions due to decreasing trends in confirmed cases, hospitalizations, and daily deaths (Ministerio de Sanidad, 2020). During the mentioned period, 223,791 new cases were registered, along with 23,135 deaths. The Basque Country and Navarre were among the Spanish communities that required more time than the national average (18.33 days) to reduce the daily number of deaths. Moreover, The Basque Country presented together with La Rioja and Catalonia some of the highest rates of hospital and ICU admissions (Siqueira et al., 2020).

As cases of COVID-19 showed a progressive decline until the last week of June in our country, when a flattening of the case curve was achieved and burden placed on health workers were significantly reduced. It could be assumed that the new situation could lead to a decrease in psychological symptoms among these health professionals, since they were less exposed to danger and more aware of the improvement of the situation. Even so, several studies have shown that following this work overload, psychological symptoms can still appear due to the distress experienced previously (Ozamiz-Etxebarria et al., 2020). Nevertheless, there is a dramatic gap in the current scientific literature that actually addresses this issue.

Hence, taking into consideration all the mentioned above, the aims and hypotheses of this study were:

1. To measure the levels of stress, anxiety, depression, compassion fatigue and post-traumatic stress symptoms among health professionals in Spain after the flattening of the curve of the COVID-19. We hypothesized that all those levels would be lower than those observed at the outbreak of the pandemic. When comparing and contrasting the data, special consideration will be given to a study conducted previously by the authors at the beginning of the lockdown (Dosil et al., 2020).
2. To study the possible differences in the level of these symptoms displayed by the health professionals according to other relevant factors (such as age, gender, professional category, contact with COVID-19 and perception of social compliance of the health measures). It was hypothesized that symptoms would be greater among women, older professionals and those with greater contact with the COVID-19, and lower among nurses/auxiliaries/technicians and those who perceive that the health measures were being complied.

MATERIALS AND METHODS

Participants

This study was carried out with a total sample of 973 health professionals: 832 (85.5%) from the Basque Autonomous Community, 14(1.4%) from Navarra, and 127(13.1%) from other communities of Spain. The participants were working professionals from various hospital centers from both the public and private sectors. Of the participants, 165 (16.5%) were men, 807 (82.9%) were women and one person was considered non-binary. With regard to age, 42 (4.3%) were aged between 18 and 25 years, 221 between 26 and 35 (22.7%), 503 (51.7%) between 36 and 55 and 207 (21.3%) over 56. Of the participants, 433(44.5%) were doctors, 318 (32.6%) were nurses, and 222 (22.9%) were auxiliaries/technicians.

Measures and Instruments

An *ad hoc* instrument was used to collect information about whether they had had contact with any person diagnosed with COVID-19 (yes/no), and about their perception of whether people were respecting health measures (yes/no).

The *Depression and Stress Anxiety Scale-21* (DASS-21, Ruiz et al., 2017) was administered to measure stress, anxiety and depression symptoms. The DASS-21 scale is composed of 21 Likert-type items ranging from (0 = It didn't happen to me) to (3 = It happened to me a lot, or most of the time) and are organized into 3 subscales of 7 items each: Depression, Anxiety and Stress. The total scores of each subscale is within the range of 0–21. In addition, cut-off points analyzed by Antony et al. (1998) can be used in order to categorize depressive, anxiety, and stress symptoms into the following categories: no symptoms, mild, moderate, severe, and extremely severe. The DASS-21 has shown acceptable reliability and good validity (Antúnez and Vinet, 2012). Regarding the reliability in our study, the total Cronbach's alpha coefficient was = 0.88 for the depression scale = 0.87 for the anxiety scale = 0.82 and for the stress scale = 0.87.

Post-traumatic stress was measured using the *Post-traumatic stress scale* (*PCL-C scale*, Weathers et al., 1991, the Spanish version of Miles et al., 2008) which is a standardized self-report rating scale for PTSD that includes 17 items corresponding to the key symptoms of PTSD. The *PCL-C* is a 17-item self-rated questionnaire that is generally applied to any traumatic event. It includes a five-point Likert scale ranging from 1 (none) to 5 (extremely) for each item. The PCL-C provides a continuous score based on the number and severity of PTSD symptoms according to DSM-IV criteria. The questionnaire gives a total score, as well as allowing for the gradation of symptoms related to a stressful experience in the past according to three subscales: re-experimentation, avoidance/numbness, and hyperactivation. The higher the score, the more severe the symptoms of stress disorder. PCL-C is often used to evaluate the effects of diagnosis,

intervention and treatment of post-traumatic stress disorder. It has good reliability and validity and is one of the most widely used tools in this field (Wu and Wei, 2020). Cronbach's alpha was = 0. 94.

The *Professional Quality of Life Scale* (ProQOL v. IV) is used with health professionals who are exposed to situations of trauma and suffering (Stamm, 2005). The Spanish version of ProQOL v. IV (Morante-Benadero et al., 2005) is a self-administered questionnaire consisting of 30 items rated on a 5-point Likert scale (ranging from 1 = "never" to 5 = "very often"). The ProQOL measures two main dimensions: Compassion Satisfaction (CS) (10 items) and Compassion Fatigue (CF), which is composed of two subsets of symptoms: Burnout (BO) (10 items) and secondary traumatic stress (STS) (10 items). Compassion satisfaction (CS) is the satisfaction experienced by health professionals in doing their job properly, which also includes satisfaction in the relationship with their colleagues and the feeling that the work they do is of social value (Roney and Acri, 2018). BO is a syndrome of emotional exhaustion, depersonalization and lack of personal fulfilment in the workplace, characteristics that develop as a result of continuous exposure to occupational stressors (Lim et al., 2019). Secondary traumatic stress (STS) is a set of natural emotions and behaviors that arise after learning about a traumatic event in detail, experienced by someone significant. The STS is a gradual process that does not appear as an immediate response at the first contact with the person or their history of pain. It is, rather, the cumulative effect of systematic contact with people who are experiencing a very difficult emotional situation (Morales et al., 2016). Higher scores on each of these scales are taken to indicate higher CS and CF (including BO and STS) values. The mean score is 13 for the CF subscale, 37 for the CS subscale, and 22 for the BO subscale. Stamm (Sacco et al., 2015) reported Cronbach's alpha values of 0.80 for CF, 0.89 for CS, and 0.71 for BO, respectively (Ruiz-Fernández et al., 2020). For this study Cronbach's alpha was CS = 0.87, BO = 0.70 and STS = 0.84.

Procedure

The sample was recruited through non-probabilistic sampling. An online questionnaire was first created in Google Forms and sent to platforms, and through the institutional mail of the researchers. The questionnaire explains both the objectives of the study and the procedures to be followed during the questionnaire, as well as the right to voluntary withdraw from the study if appropriate. The study was approved by the Ethics Committee of the University of the Basque Country (UPV/EHU) (code M10/2020/070). For the collection of data, all the canons established by the Organic Law 15/99 on Personal Data Protection were followed. In the questionnaires, they participants were informed of the voluntary nature of their participation and of their necessary commitment to start the test. Therefore, the procedure followed is approved by the Ethics Committee and was carried out in accordance with the Helsinki Declaration of the World Medical Association.

Data Analysis

The data were analyzed with the statistical program SPSS v.26 (Armonk, NY, United States). First, the assumptions of normality and homocedasticity of variances were checked in order to decide whether to use parametric or non-parametric tests. Specifically, the critical level of $p < 0.05$ of the Kolmogorov-Smirnov statistics was analyzed, as well as the levels of asymmetry and kurtosis. From these analyses it was concluded that the data followed a normal distribution, so the authors decided to use parametric tests.

The different levels of depression, anxiety and stress were categorized with cut-off scores proposed by Antony et al. (1998): mild, moderate, severe and extremely severe.

First, both the frequencies and the percentages of the different levels of each scale were described. Then, comparative analyses were carried out, with the t-student test, using total scores of depression, anxiety, stress, post-traumatic stress and professional quality of life as dependent variables, and as independent variables sex (woman/man), having been in contact with COVID-19 (yes/no) and if they perceived that people respected the health norms to prevent the COVID-19 (yes/no). In these cases, the interval coefficients and effect sizes are provided (Cohen, 1988). Likewise, to explore the difference in means according to variables with more than two categories (such as age and professions of the participants), ANOVAs were carried out. In this case, Bonferroni's *post hoc* test was used to observe the differences between more than two groups.

RESULTS

Levels of Anxiety, Depression, Stress, Post-traumatic Stress, and Compassion Satisfaction/Compassion Fatigue in the Study Sample

The results revealed higher percentages of extremely severe or severe levels of anxiety and stress than of depression. Furthermore, moderate levels of depression, anxiety and stress (with percentages close to 20%) can be observed (see **Table 1**).

Post-traumatic stress levels in the sample were high (26.4%) and medium (44.7%). In contrast, the levels of Secondary Traumatic Stress (STS) were lower: 0.2% high and 19.2% medium. Burnout (BO) levels were generally medium (90.6%), while Compassion Satisfaction (CS) was high (33.2%) or medium (63.1%) (see **Table 2**).

TABLE 1 | Frequencies and percentages of the perceived level of depression, anxiety and stress symptoms (none, mild, moderate, severe, and extremely severe) suffered by health professionals.

	None	Mild	Moderate	Severe	Extremely severe
Depression	544 (55.9%)	138 (14.2%)	181 (18.6%)	63 (6.5%)	47 (4.8%)
Anxiety	459 (47.2%)	80 (8.2%)	218 (22.4%)	101 (10.4%)	115 (11.8%)
Stress	459 (47.2%)	84 (8.6%)	209 (21.5%)	162 (16.6%)	59 (6.1%)

Differences Between the Symptoms According to Gender and Age

Statistically significant differences were found according to gender for all the variables under study, with women showing higher levels than men in all cases, with medium or low effect sizes (see **Table 3**).

In terms of age differences, the results of the ANOVA revealed that participants aged 26–35 years scored higher on depression, anxiety, stress and post-traumatic stress. The oldest participants of the sample (35–55 and <56) showed more Burnout (BO) than the youngest participants, whilst the youngest (18–25 years) showed the lowest levels of Secondary Traumatic Stress (STS). And finally, the highest levels of Compassion Satisfaction (CS) were found among the 26–35, and 36–55 years-old participants (see **Table 4**).

Differences Between the Symptoms Studied According to Professional Category

Table 5 shows the differences in the means of the variables under study according to professional category. Significant differences are observed in all of the variables except for Secondary Trauma Stress (STS). Levels of depression, anxiety, stress and post-traumatic stress were significantly higher in nurses and technicians/auxiliaries than in physicians, with no differences found between nurses and auxiliaries, except for anxiety, with technicians/auxiliaries reporting the highest levels. Compassion Satisfaction (CS) was higher in the technicians/auxiliaries than in the nurses, whilst this was higher in the nurses than in the physicians. In contrast, Burnout (BO) was higher in doctors than in nurses, and no difference was found between nurses and technicians/auxiliaries.

TABLE 2 | Frequencies and percentages of the perceived level of post-traumatic stress and professional quality of life symptoms (low, medium, and high) suffered by health professionals.

	Low	Medium	High
Post-traumatic stress	281 (28.9%)	36 (3.7%)	72 (7.4%)
CS	435 (44.7%)	614 (63.1%)	882 (90.6%)
BO	257 (26.4%)	323 (33.2%)	19 (2%)
STS	783 (80.5%)	783 (80.5%)	783 (80.5%)

CS, Compassion Satisfaction; BO, Burnout; STS, Secondary Traumatic Stress.

TABLE 3 | Differences in the means of the variables according to the gender of the participants.

Dimensions	Gender	*n*	*M*	*SD*	*t*	*p*	d_{cohen}
Depression	Women	807	5.15	4.27	4.84	0.001***	0.43
	Men	165	3.41	3.88			
Anxiety	Women	807	5.10	4.13	9.60	0.001***	0.72
	Men	165	2.56	2.84			
Stress	Women	807	9.55	4.39	7.48	0.001***	0.63
	Men	165	6.74	4.49			
Post-traumatic stress	Women	807	35.88	13.2	6.66	0.001***	0.55
	Men	165	29.11	11.6			
CS	Women	807	37.99	6.96	2.40	0.017*	0.21
	Men	165	36.58	6.65			
BO	Women	807	29.89	5.29	2.09	0.037*	0.18
	Men	165	28.95	4.92			
STS	Women	807	17.06	7.22	3.28	0.001**	0.29
	Men	165	15.06	6.67			

CS, Compassion Satisfaction; BO, Burnout; STS, Secondary Traumatic Stress.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.*

Differences in Symptomatology of the Participants Depending on Variables Associated With the COVID-19 Pandemic

We analyzed whether there were statistically significant differences in the variables under study between those who had been in direct contact with COVID-19 and those who had not. As can be observed in **Table 6**, those who had been in direct contact with the virus had higher levels of depression, anxiety, stress and post-traumatic stress, although no statistically significant differences were found in Compassion Satisfaction (CS), Burnout (BO), and Secondary Traumatic Stress (STS).

In relation to the professionals' perception of society's respect for health measures, there were statistically significant differences in the dimensions of depression, anxiety, stress and post-traumatic stress, showing a higher level of symptoms in those who indicate that health measures are not being respected (see **Table 7**).

DISCUSSION

The present research stems from a preliminary study on the stress of healthcare professionals in the Basque Autonomous Community and Navarre (Spain) during the first months of the COVID-19 pandemic. This study prompted the conclusion that it was important to treat possible cases of post-traumatic stress caused by this pandemic (Dosil et al., 2020). Therefore, in this second study, in addition to some of the previously studied factors (depression, anxiety, stress) post-traumatic stress disorder (PTSD) and Professional quality of life (ProQOL) were added. As has been the case in other pandemics (Mak et al., 2009), in this study there are numerous cases of health professionals reporting symptoms such as depression, anxiety and stress. Against what we thought, there are more symptoms among health professionals in the current study than those found in the previous study by the same team (Dosil et al., 2020) and also higher than those studied in the systematic review conducted by García-Iglesias et al. (2020). Therefore, it appears that although the questionnaire was conducted at a time when professionals did not have as much work as at the onset of the pandemic, symptoms were already accumulating since its beginning. However, people who have symptoms of stress are still fewer than those found among health workers in China. In the study by Lai et al. (2020), 73.4% of participants reported stress symptoms, a significantly higher percentage than those found in the present and previous studies (Dosil et al., 2020). On the contrary, compared to the study in

TABLE 4 | Differences in the means of the variables under study according to the age of the participants.

Dimensions	Age	*n*	*M*	*SD*	*F (gl)*	*p*	η2	*Post hoc*
Depression	18–25		4.81	4.50	4.68 (3)	0.003**	0.014	2–3
	26–35	42	5.74	4.28				2–4
	36–55	221	4.71	4.14				3–2
	>56	503	4.28	4.34				4–2
		207						
Anxiety	18–25	42	5.33	4.55	11.57 (3)	0.001***	0.035	1–4
	26–35	221	5.64	3.96				2–3
	36–55	503	4.70	4.10				2–4
	>56	207	3.42	3.65				3–2
								3–4
								4–1
								4–2
								4–3
Stress	18–25	42	8.81	4.83	12.98 (3)	0.001***	0.040	2–3
	26–35	221	10.37	4.07				2–4
	36–55	503	9.09	4.48				3–2
	>56	207	7.69	4.71				3–4
								4–2
								4–3
Post-traumatic Stress	18–25	42	32.74	13.26	4.54 (3)	0.004**	0.014	2–4
	26–35	221	36.57	12.60				3–4
	36–55	503	35.11	13.32				4–2
	>56	207	32.16	13.20				4–3
CS	18–25	42	37.55	8.55	4.72 (3)	0.003**	0.014	2–4
	26–35	221	38.19	6.52				3–4
	36–55	503	38.20	6.76				4–2
	> 56	207	36.14	7.42				4–3
BO	18–25	42	25.67	5.58	10.11 (3)	0.001***	0.030	1–2
	26–35	221	29.31	5.31				1–3
	36–55	503	30.10	5.18				1–4
	>56	207	30.01	5.05				2–1
								3–1
								4–1
STS	18–25	42	13.26	7.31	3.55 (3)	0.014*	0.011	1–2
	26–35	221	16.83	7.23				1–3
	36–55	503	16.76	7.05				1–4
	>56	207	17.14	7.24				2–1
								3–1
								4–1

CS, Compassion Satisfaction; BO, Burnout; STS, Secondary Traumatic Stress.
**p < 0.05; **p < 0.01; ***p < 0.001.*

Turkey (Elbay et al., 2020), more people in the present study have levels of stress, but far fewer have levels of depression. Therefore, it seems that there are many differences of symptoms among countries and future studies should study what factors could be affecting them.

With regard to post-traumatic stress, in a study conducted with frontline health professionals working with COVID-19 in China, the average PCL-C scores were very similar to those found in the present study (M = 33.73 ± 1.556) (Wu and Wei, 2020). As already mentioned, post-traumatic stress can be developed after exposure to exceptionally threatening events and its main symptoms are re-experiencing them, being on alert and having a continuous feeling of threat (Wang Y. X. et al., 2020). As many studies have shown, a critical situation such as the COVID-19 pandemic can intensify post-traumatic stress among health workers, and this stress level is higher than in the general population (Ozen and Sir, 2004; Fjeldheim et al., 2014; Wang Y. X. et al., 2020). In the present study, 28.9% of professionals showed low levels, 3.7% medium levels and 7.4% high levels of post-traumatic stress. These percentages are higher than those found during the 2003 SARS epidemic, where 25.8% of physicians had symptoms of post-traumatic stress (Xu et al., 2004), and also higher than in another study indicating that 20% of participants were diagnosed with PTSD 2 months after the epidemic outbreak (Chan and Huak, 2004).

In the case of the COVID-19 pandemic, more participants in this study also had symptoms of post-traumatic stress than those in a study in China (Yin et al., 2020) and participants in a Greek study in April (Blekas et al., 2020). Therefore, it could be said that there are more cases

of professionals with post-traumatic stress in this study than in most of the studies we have found in both the SARS and COVID-19 pandemics. These results show that Spanish healthcare professionals are experiencing greater suffering than professionals in other countries. This may be due to the fact that Spain is one of the countries most

TABLE 5 | Differences in the averages of the variables under study according to professional category.

Dimensions	Profession	*n*	*M*	*SD*	*F (gl)*	*p*	η*2*	*Post hoc*
Depression	Doctors	433	4.10	3.90	12.82 (2)	0.003**	0.026	1–2
	Nurses	318	5.36	4.34				1–3
	Auxiliaries/technicians	222	5.60	4.55				2–1
								3–1
Anxiety	Doctors	433	3.27	3.18	56.69 (2)	0.001***	0.011	1–2
	Nurses	318	5.35	4.12				1–3
	Auxiliaries/technicians	222	6.41	4.54				2–1
								2–3
								3–1
								3–2
Stress	Doctors	433	8.40	4.60	8.91 (2)	0.001***	0.018	1–2
	Nurses	318	9.49	4.28				1–3
	Auxiliaries/technicians	222	9.77	4.61				2–1
Post–traumatic Stress	Doctors	433	31.72	11.73	21.73 (2)	0.001***	0.043	1–2
	Nurses	318	36.54	14.21				1–3
	Auxiliaries/technicians	222	36.16	13.26				2–1
								3–1
CS	Doctors	433	36.16	6.79	25.88 (2)	0.001***	0.051	1–2
	Nurses	318	38.19	6.98				1–3
	Auxiliaries/technicians	222	40.11	6.57				2–1
								2–3
								3–1
								3–2
BO	Doctors	433	30.19	5.37	4.05 (2)	0.018*	0.008	1–2
	Nurses	318	29.09	5.21				2–1
	Auxiliaries/technicians	222	29.66	5.07				
STS	Doctors	433	16.78	7.04	0.123 (2)	0.885	0.001	–
	Nurses	318	16.54	7.39				
	Auxiliaries/technicians	222	16.80	7.12				

CS, Compassion Satisfaction; BO, Burnout; STS, Secondary Traumatic Stress.
**p < 0.05; **p < 0.01; ***p < 0.001.*

TABLE 6 | Results of univariate analysis of variance for different symptoms according to whether the participants had been in contact with COVID-19.

Dimensions	Contact with COVID-19	*n*	*M*	*SD*	*t*	*p*	d_{cohen}
Depression	Yes	829	5.04	4.30	3.58	0.001***	0.31
	No	144	3.79	3.76			
Anxiety	Yes	829	4.87	4.11	3.91	0.001***	0.37
	No	144	3.45	3.52			
Stress	Yes	829	9.30	4.48	3.75	0.001***	0.34
	No	144	7.77	4.66			
Post-traumatic Stress	Yes	829	35.43	13.27	4.15	0.001***	0.39
	No	144	30.53	12.03			
CS	Yes	829	37.66	7.03	–0.705	0.428	0.06
	No	144	38.10	6.69			
BO	Yes	829	29.76	5.27	0.746	0.456	0.07
	No	144	29.40	5.31			
STS	Yes	829	16.85	7.20	1.50	0.135	0.13
	No	144	15.88	7.34			

CS, Compassion Satisfaction; BO, Burnout; STS, Secondary Traumatic Stress.
****p < 0.001.*

TABLE 7 | Results of univariate analysis of variance for different symptoms according to the perception of whether society is respecting health measures.

Dimensions	Respect of measures	*n*	*M*	*DT*	*t*	*p*	d_{cohen}
Depression	Yes	440	4.09	4.03	5.16	0.001***	0.33
	No	533	5.48	4.34			
Anxiety	Yes	440	3.79	3.71	6.28	0.001***	0.40
	No	533	5.38	4.20			
Stress	Yes	440	8.14	4.55	5.93	0.001***	0.38
	No	533	9.85	4.39			
Post-traumatic stress	Yes	440	32.21	12.45	5.50	0.001***	0.35
	No	533	36.78	13.46			
CS	Yes	440	37.43	6.43	1.21	0.233	0.08
	No	533	37.97	7.39			
BO	Yes	440	29.40	5.03	1.66	0.101	0.11
	No	533	29.96	5.45			
STS	Yes	440	16.06	6.84	2.57	0.010*	0.17
	No	533	17.24	7.40			

CS, Compassion Satisfaction; BO, Burnout; STS, Secondary Traumatic Stress.
$^{*}p < 0.05$; $^{***}p < 0.001$.

affected by the health crisis caused by the COVID-19 (Ruiz-Fernández et al., 2020).

A positive finding of this study is that a high percentage of the participants have compassion satisfaction. In fact 90.6% of them showed a high compassion satisfaction. Healthcare work is a vocational job and that is why respondents could be so satisfied. Still, although there are many participants who experienced high compassion satisfaction, we cannot ignore that there are also many healthcare providers who suffer from secondary traumatic stress (STS) that may increase by knowing in detail the characteristics of the traumatic events of the patients (Morales et al., 2016). There are also respondents in the study who report symptoms of burnout. Several studies have shown that physicians who perform high-risk procedures are at increased risk of burnout (Lacy and Chan, 2018). The COVID-19 pandemic poses a high risk to physicians, many of whom are infected, so this could be a reason for burnout.

It may seem contradictory that participants in this study report moderate and high levels of compassion satisfaction as well as a variety of psychological symptoms. However, a study conducted with health professionals working in critical incident services revealed that participants were at risk of compassion fatigue whilst also showing high potential for compassion satisfaction (Wee and Myers, 2003). This could occur due to the fact that although professionals recognize the stress level associated with their work, it also provides significant rewards that somehow outweigh the stress and mitigate exhaustion. Future studies should explore the distinctive characteristics of these individuals (personality, resilience, attitude to death, etc.) who, under the same work circumstances as those with high levels of anxiety and depression, and despite the risks, fatigue and workload, continue to show high scores in compassion satisfaction.

With regard to gender, as has been the case in most studies carried out both in the general population (Ozamiz-Etxebarria et al., 2020) and with healthcare professionals (Dosil et al., 2020), women presented higher levels than men in all symptoms. This is why in this pandemic, special attention must be paid to women, who seem to be the ones suffering most in different parts of the world.

In terms of age, as in our preliminary study, younger health workers showed higher levels of stress, anxiety, depression and post-traumatic stress. In this second study, professionals between 26 and 35 years particularly stand out, which is in accord with the findings of various other studies (Lai et al., 2020). The same pattern of results was found with STS symptomatology in the recent study, with the highest levels reported among those in the 26–35-year age range. One possible explanation for this could be that these workers, who have less experience because they are young, are more impressionable and feel more impacted by situations that are perhaps more expected and known by their older counterparts.

With regard to compassion satisfaction, in our research people within the 35–55 years age range report the highest levels. This is consistent with the results of a recent study conducted in China where being aged 36 years or older was positively associated with compassion satisfaction (Wang J. et al., 2020). This could be because in this age range professionals have more stability at work, and could enjoy more helping patients.

In relation to burnout, a rather different trend can be observed with respect to age. In this case, professionals over the age of 35 (35–55 and <56) showed the highest levels. Older workers can face more barriers and stressors at work such as physical strength limitations and health concerns, gaps related to using new technology, and engagement in work (United Nations Economic Commission for Europe, 2014), which could even be exacerbated in the specific circumstances of this pandemic. Older workers also have their own expectations of retirement age, and the closer they are, the more likely they are to disengage from work (Damman et al., 2013) or to feel overwhelmed by their workload.

In addition, the results of the current study show that stress and anxiety levels are higher in nursing professionals,

particularly auxiliary technicians, although burnout is higher among doctors. Our hypothesis was that perhaps the doctors were more symptomatic since they are the professionals who make the final decisions. However, the results are in line with the findings of various studies indicating that healthcare providers such as critical care nurses are particularly affected by severe emotional distress (Alharbi et al., 2020; Denison and Baptiste, 2020). In fact, nurses and assistants have the most direct contact with patients and their families, so they are more likely to be emotionally involved, which can lead to higher levels of emotional problems, such as stress and anxiety as well as greater level of compassion satisfaction when the emotional demands are adequately addressed.

Finally, and as mentioned previously, the results reported here, as in the preliminary study, suggest that being in contact with COVID-19 is associated with higher levels of depression, anxiety and stress. Furthermore, PTSD levels are also higher in professionals who have been in contact with the virus. The presence of these symptoms is common in this situation where one may believe that he/she is vulnerable to infection, and the uncertainty of unknown infections could lead to this symptomatology (Chew et al., 2020; Dosil et al., 2020). Exactly the same pattern of symptoms is observed among those who perceive that security measures have not been respected. In fact, those who believe that society is not adequately complying with health measures, are probably afraid of new outbreaks, which may be increasing their levels of anxiety, depression, stress, post-traumatic stress levels and secondary traumatic stress. The feeling of lack of unity among the population could lead to psychological symptoms among the professionals.

Despite the interesting results found in the study, it is important to point out some limitations. First, the cross-sectional nature of the design employed here means that there was no longitudinal follow-up. It would be interesting to compare the results with others found previously or later, in order to observe the evolution of the symptoms at different moments in time with the same sample. Second, the voluntary nature of the survey may have introduced a response bias if the non-respondents were either too symptomatic to respond, or too relaxed, and therefore not interested in this survey. As for the professionals who answered the questionnaire, although they all answered at the same time, it must be taken into account that each professional could be living different life circumstances at the time of answering the questionnaire. Moreover, not all the autonomous communities have experienced the same number of infections by COVID-19 nor have they the same health resources, so the results obtained should be taken with caution. Future studies should include more basic socio-demographic data, such as marital status, housemate number or number of children, or perceived emotional/social support, that may have a role in moderating the impact of the work overload.

It is also important to mention that most of the people who have answered the questionnaire are women (82.9%). This may be due to the fact that currently the feminine gender is growing among health professionals (Ponce, 2006). In any case, this gender imbalance in the study should be considered as a limitation.

Lastly, future studies should include a control group to determine whether this symptomatology is associated with being a health professional or whether it occurs equally in the general population.

In any case, the findings of this study make a general contribution to existing knowledge regarding the psychological symptomatology of these professionals in the context of an unprecedented health emergency in the last century, and opens the door to further research in the near future.

CONCLUSION

The study shows that health professionals are suffering from psychological symptoms such as stress, anxiety and depression, compassion fatigue and post-traumatic stress, even after the most difficult times of the pandemic. We have exhausted workers with fear of new outbreaks. For this reason, we recommend the implementation of psychological support (Conversano et al., 2020; Petzold et al., 2020) and timely interventions for health workers who present psychological symptoms due to the work overload suffered amid the COVID-19 crisis.

Having psychologically healthy medical staff will be helpful for preventing employment losses due to emotional suffering and will improve the quality of patient care. It means providing more resources to society and specifically to health personnel. Among these measures it is important to support the professionals by expanding the staff with more professionals and more resources. Furthermore, emphasizing the areas of direct care and attention to family members could be of great interest. Another interesting measure would be to provide training to health personnel about the pandemic and to the population in general to raise awareness and prevent contagion. In addition, professionals should have protective uniforms and adequate space to carry out their work in dignified conditions.

Urgent action must be taken to protect the mental health of health professionals, especially for those who are at the frontline of the COVID-19 pandemic. This is not only necessary to maintain a robust health system to meet this challenge, but it is also something we certainly owe to health professionals for the tremendous sacrifices they are doing.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Comité de Ética para las Investigaciones relacionadas con Seres Humanos (CEISH) (University of the

Basque Country). The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

IR, MP, and NO-E were involved in the conceptualization of the project and in the acquisition and analysis of the data. MD and JJ were involved in the interpretation of the data. All authors were involved in the drafting and revising of the work for intellectual content, provided approval for submission of the contents for publication, and agreed to be accountable for the accuracy and integrity of the project.

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Impact of the COVID-19 Pandemic on Health-Related Quality of Life, Anxiety, and Training Among Young Gastroenterologists in Romania

Bogdan Silviu Ungureanu[1†], Catalina Vladut[2], Felix Bende[3], Vasile Sandru[2], Cristina Tocia[4†], Razvan-Aurelian Turcu-Stiolica[5], Andrei Groza[6], Gheorghe G. Balan[7] and Adina Turcu-Stiolica[8]*

[1] Research Center of Gastroenterology and Hepatology, University of Medicine and Pharmacy of Craiova, Craiova, Romania, [2] Clinical Emergency Hospital "Prof. Dr. Agrippa Ionescu," Bucharest, Romania, [3] Department of Gastroenterology, University of Medicine and Pharmacy "Victor Babes," Timisoara, Romania, [4] Faculty of Medicine, Ovidius University of Constanta, Constanta, Romania, [5] Trueman Consulting, Craiova, Romania, [6] Prof. Octavian Fodor Regional Institute of Gastroenterology and Hepatology, Cluj-Napoca, Romania, [7] Department of Gastroenterology, Faculty of Medicine, "Grigore T. Popa" University of Medicine and Pharmacy, Iasi, Romania, [8] Department of Pharmacoeconomics, University of Medicine and Pharmacy of Craiova, Craiova, Romania

The novel COVID-19 infection has spread all over the world and is still generating a lot of issues at different levels. There is a lack of control in disease early diagnosis and rapid evolution, which impacts both the medical and the economic system. Young gastroenterologists should adapt to overcome current difficulties and continue their life and general training. This is a multi-center national study, which aims to assess the general perspective of young gastroenterologists (residents and young specialists) from six university centers in Romania regarding their current training and the psychological effect the pandemic has on their life and job. An online survey with 58 items was distributed using Google Forms, and quality of life and anxiety were assessed. The validated instruments 15D (for assessing the health-related quality of life) and endler multidimensional anxiety scales (EMAS—for assessing anxiety) were used. All analyses were performed using SPSS 25. Of the 174 gastroenterologists approached, 96 (response rate of 55%) responded. A majority of the respondents were residents in gastroenterology (64%), and 40.6% were male. The pandemic influenced the number of examined patients as well as young gastroenterologists' endoscopy training. Health-related quality of life was negatively associated with the level of anxiety generated by the cognitive component of anxiety as a state, the new and ambiguity of the state, and how threatened the respondent felt. The level of anxiety was moderate (median = 51), and no difference was found between the physicians working in a designated hospital or not. General caution should be considered for young gastroenterologists' training, and continuous observation should be done to ensure better mental health on the current evolution. These findings would need to be verified in larger-sample studies and in different types of specialties.

Keywords: COVID-19, young gastroenterologists, anxiety, EMAS, quality of life, 15D instrument

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Maria Stefanova Kamusheva, Medical University of Sofia, Bulgaria
Ada Ghiggia, University of Turin, Italy

****Correspondence:***
Adina Turcu-Stiolica
adina.turcu@gmail.com

† These authors have contributed equally to this work

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INTRODUCTION

The outbreak of the new coronavirus disease (COVID-19), originating in Wuhan, China, has overwhelmed all countries over the world and became the top public health emergency nowadays. While the first cases were reported in December 2019, the World Health Organization declared COVID-19 as a pandemic on 11 March 2020 (Mahase, 2020). As of 24 June 2020, 9.3 million confirmed cases of COVID-19 (477,500 deaths) were recorded all over the world, with 24,826 confirmed cases (1,555 deaths) in Romania. The rapid implementation of control measures successfully prevented a wave in the number of COVID-19 cases in Romania (Dascalu, 2020).

The first confirmed case of COVID-19 has been reported in Romania on February 26, 2020. The COVID-19 pandemic is continuously changing the way we live our lives and also has a substantial influence on the medical staff. General measures were taken in Romania on the medical system, starting from reorganizing hospitals in designated and non-designated COVID-19 institutions to medical personnel redeployment in some situations as well as trying to assure their safety measures when treating patients. Since this is an ongoing process with unforeseen outcomes, medical training should be adapted along with the pandemic evolution. While interaction with tutors may not be encouraged due to social distancing, other alternatives are enrolled on a day-to-day basis. The healthcare system suffered on many fronts due to this unprecedented event.

Physicians are facing a high volume of patients with a contagious condition, which leads to high-risk exposure. This evolved into a stressful situation as many medical practitioners became positive for COVID-19. The contamination risk grew exponentially until protective personal equipment (PPE) became available, and the entire medical staff also learnt to use it. Moreover, university hospitals had to take containment measures by canceling or postponing non-emergency procedures. These sudden changes had to be installed also for residents in gastroenterology due to their typical clinical exposure as well as research activities, resident education, and endoscopy training, which is considered as a high-risk procedure. Moreover, young specialists have more clinical responsibilities on decision-making and are faced with a stressful situation. Young specialists were also affected and were facing a stressful situation since they had more clinical responsibilities.

There is a need of high-quality data on the mental health effect of the COVID-19 outbreak across young physicians also. A study shows that Chinese doctors in training are feeling the force of the COVID-19 pandemic, with increased scores for depression and anxiety (Li et al., 2020). Medical personnel had to be relocated and assigned to designated COVID-19 hospitals, a status which could have been perceived as threatening, with potential negative outcomes on personal lives and medical practice even among young practitioners. Our objective was to assess the pandemic impact on gastroenterology fellows and young specialists by an online survey, which included two validated questionnaires (15D and EMAS). The aims of this study were to examine the perception on gastroenterology training and to evaluate the effect of COVID-19 on the health-related quality of life (HRQoL) and anxiety in gastroenterology residents and young specialists during this pandemic.

MATERIALS AND METHODS

Ethical Issues

This research was approved by the Ethics Committee of the University of Medicine and Pharmacy of Craiova (registration no. 27/2020) according to the Declaration of Helsinki and the University Code of Ethics. The ethics committee approved the study protocol, and all physicians provided electronic informed consent starting with the first question of the survey.

Study Design

The questionnaire, which included 58 items, was developed and distributed using Google Forms. The participants were recruited from the gastroenterology departments from the public hospitals of major university centers in Romania, Bucharest, Craiova, Cluj-Napoca, Constanta, Iasi, and Timisoara (nine public hospitals). The inclusion criteria were as follows: resident or young specialist working in the gastroenterology department. Participants from designated COVID-19 hospitals and non-designated COVID-19 hospitals were enrolled in this survey to compare differences between the two types of hospitals. The survey was conducted from April 21, 2020 to May 9, 2020 at the request of the Young Romanian Gastroenterologists Organization.

The survey was anonymous and confidential. An introductory paragraph outlining the purpose of the study and the protection of respondents with regard to the processing of personal data (Regulation EU 2016/679) was posted along with the survey.

Outcomes

The questionnaire was structured in four sections. Section 1 had 18 items: five items collected the demographic information of the respondents (age, gender, marital status, year of training, type of hospital, and access to training) and 13 items were designed to evaluate the different aspects of the COVID-19 situation. In particular, the following aspects were evaluated: access to training, PPE, and personal safety procedure. Endoscopic training was evaluated with questions about the number of endoscopic procedures (upper and inferior) before and during the difficult time. Section 2 comprised the 15 questions from the 15D Instrument about HRQoL. Section 3 comprised five items from the EMAS- Perception (EMAS-P) questionnaire. Section 4 comprised 20 items from the EMAS-State (EMAS-S).

The physicians were grouped, according to their training level, into two groups: gastroenterology fellows group and young specialist group, and the outcomes were compared.

The respondents were also grouped, according to the hospital where they work, into two groups: designated hospital and non-designated hospital, and the outcomes were compared.

15D Instrument

The 15D instrument is a generic, multidimensional, self-administered evaluative tool for assessing HRQoL, with 15 dimensions: mobility, vision, hearing, breathing, sleeping, eating,

speech, excretion, usual activities, mental function, discomfort and symptoms, depression, distress, vitality, and sexual activity (Sintonen, 2001). The Romanian language version of the 15D was used (Subtirelu et al., 2019; Padureanu et al., 2020). The single score (15D score) was calculated representing the overall HRQoL on a 0 to 1 scale, where 0 = being dead and 1 = full health.

EMAS

Endler multidimensional anxiety scale is an instrument that measures the state and trait anxiety in people with and without anxiety symptoms (Endler et al., 1991). We administered the Romanian validated EMAS (Miclea et al., 2002), performing EMAS-S with 20 items and EMAS-P with five items. EMAS-S measures state anxiety in relation to autonomic–emotional (AE) and cognitive–worry (CW) components. The EMAS-P of the situation (COVID-19 in our study) is a measure of the subjective perception of the type of situation (that is, COVID-19) and the degree of threat evoked by this particular situation as experienced by the individual at the time of testing. EMAS-P gave five different scores: EMAS-P-ES (the scale evaluates the extent to which the respondent perceives the situation at the time of testing as a situation of social evaluation), EMAS-P-PF (the scale assesses the extent to which the respondent perceives the situation at the time of testing as a situation of physical danger), EMAS-P-AM (the scale evaluates the extent to which the respondent perceives the situation at the time of testing as a new and ambiguous situation), EMAS-P-RZ (the scale evaluates the extent to which the respondent perceives the situation at the time of testing as a daily routine situation), and EMAS-P-A (the scale assesses how threatened the respondent felt in the situation at the time of testing). Assessing the type and the intensity of the perceived threat, as measured by EMAS-P, is also important for understanding the respondent's specific pattern of anxiety responses. All EMAS scores were converted to standard T points from 0 to 100. The medium values are considered to be between 40 and 60. High scores indicate a high level of anxiety.

Statistical Analysis

Descriptive statistics and percentages were used to summarize the data. Continuous data are expressed as mean ± SD (for normally distributed variables) or median (interquartile range, for not normally distributed variables). Investigation of histograms and the Shapiro–Wilk test revealed if the continuous variables were normally distributed. When the variable was continuous, comparisons between two groups were performed using *t*-test (if normally distributed) or Mann–Whitney *U* test (if not normally distributed). We assessed the differences between residents vs. young specialists, designated hospital vs. non-designated hospital, and activities before COVID-19 vs. activities in the time of COVID-19. When the variable was categorical, χ^2 test was used. The correlation matrix was analyzed for assessing the significant correlations between HRQoL and anxiety scores. Spearman correlation coefficient was used in case of lack of normality in data. Statistical analysis was performed using SPSS software, version 25 (IBM SPSS, Armonk, NY, United States). A p-value < 0.05 was considered as statistically significant.

RESULTS

Of the 174 young gastroenterologists working at the time of the pandemic in the nine public hospitals, only 96 (response rate of 55%) have responded to our survey. The median time taken to complete the survey was 5.0 min. Among the respondents, 39 (40.6%) were male, and 64 (66.7%) were gastroenterology fellows. The average age was 29 years (SD = 3.27), with a range of 24–38 years. There were more females than males in the sample (59.4 vs. 40.6%). More than a half were not married (61.5%). **Table 1** shows the distribution of the survey participants by socio-demographics and their responses to the questions related to their activity before and in the time of COVID-19.

We asked the respondents to rate their activity during the outbreak, and 26% of them were practicing or have been redirected to COVID-19 patient-dedicated hospitals. Most of the residents (98%) stated that the COVID-19 outbreak did influence their status on gastroenterology training. The participants indicated that 57.3% had access to PPE and 79.2% know how to use the PPE. In terms of knowing the safety procedures in the workplace, 76 respondents responded that they had known of such, of which 48 were residents, without significant differences between residents and specialists (p = 0.2). However, 19.8% of them confirmed that they had infected colleagues.

When asked about their perception over medical training, they suggested that nearly half (49.5%) of the residency or clinic coordinators were less involved in their medical development and their apprenticeship.

The pandemic also influenced the number of patients examined by each physician as well as their endoscopy training

TABLE 1 | Demographics and initial answers of the survey participants.

Characteristics	Category	Number (percentages)
Age	24	2 (2%)
	25–29	60 (63%)
	30–34	26 (27%)
	35–39	7 (7%)
Gender	Female	57 (59.4%)
	Male	39 (40.6%)
Marital status	Married Not	33 (34.4%)
	married	59 (61.5%)
	Divorced	3 (3.1%)
Medical training	Residents	64 (66.7%)
	Specialists	32 (33.3%)
COVID-19 designated hospital	Yes	25 (26%)
	No	71 (74%)
Do you have colleagues infected with COVID-19?	Yes	19 (19.8%)
	No	77 (80.2%)
Do you think the pandemic influenced the training?	Yes	90 (93.8%)
	No	6 (6.2%)
Do you think that your coordinators were less involved in the training?	Yes	48 (50%)
	No	48 (50%)
Access to the PPE	Yes	55 (57.3%)
	No	41 (42.7%)
Knowing how to use the PPE	Yes	76 (79.2%)
	No	20 (20.8%)

PPE, protective personal equipment.

(**Table 2**). The number of patients and of endoscopies per month was assessed two times: before the World Health Organization declared the COVID-19 pandemic on March 2020 (before COVID-19) and upon applying the survey from April 21, 2020 to May 9, 2020 (now). We used the corresponding dates of the year 2019 for the period before COVID-19.

Investigation of normality for continuous variables revealed a significant difference in the sample distribution from the normal distribution. We used non-parametric statistics to describe the results of the study due to these issues.

The highest values for anxiety were found for EMAS-P-AM, higher than the medium values, with an average value of 57.50 (±10.2), without significant differences between residents and specialists.

Women did not present more intense state anxiety than men (EMAS-S-T score 53 vs. 50, $p = 0.319$), but they present more ambiguity anxiety than men (EMAS-P-AM score 61 vs. 53, $p = 0.011$). The physicians from non-designated hospitals believed more than the physicians from designated hospitals that involvement was less in training, but not statistically significant ($p = 0.07$). As **Table 3** shows, there are small differences between the analyzed characteristics from the designated hospital vs. those from the non-designated hospital.

The level of anxiety was not different between the physicians working in a COVID-19 hospital or not ($p > 0.05$, for EMAS-S-T). The component of anxiety EMAS-P-A (perception of threat situation) scores in the designated hospital group was higher than normal and, compared with the non-designated hospital group, the difference was statistically significant ($p < 0.05$), as shown in **Figure 1**. The physicians had the same moderate anxiety being involved in their daily routines ($p > 0.05$, for EMAS-P-RZ) and the same higher anxiety being in a new and ambiguous situation ($p > 0.05$, for EMAS-P-AM).

The number of upper and inferior endoscopies was less performed in the time of COVID-19 than before COVID-19 (**Table 4**).

HRQoL was negatively associated with the level of anxiety generated by the cognitive component of anxiety as a state (S-CW, S-T), the ambiguity of the state (P-AM), and how threatened the respondent felt (P-A) (see **Table 5** for the complete correlation matrix).

DISCUSSION

Focusing on fellows and young specialists in gastroenterology in Romania, our findings illustrate their very good level of HRQoL (the value is higher than 0.95) in the first wave of the COVID-19 pandemic, with no differences between designated hospitals and non-designated hospitals. Health-related quality of life was negatively associated with the level of anxiety generated by the cognitive component of anxiety as a state, the new and ambiguity of the state, and how threatened the respondents felt. However, the pandemic had a major impact on a psychosocial level. Understanding the impact of the COVID-19 outbreak is crucial in the development of policy guidelines and interventions

TABLE 2 | Characteristics of physicians for the two groups.

Characteristics	Gastroenterology fellow group (*n* = 64)	Young specialist group (*n* = 32)	*p*-value
Gender, male^	22 (34%)	17 (53%)	0.078
Age, years*	27 (2)	31 (3)	<0.01
Patients before COVID-19, number/month*	40 (40)	60 (110)	<0.05
Patients now, number/month*	15 (18)	20 (35)	0.077
Upper endoscopy before COVID-19, number/month*	10 (25)	30 (38)	<0.05
Upper endoscopy now, number/month*	0 (2)	5 (10)	<0.05
Colonoscopy before COVID-19, number/month*	5 (40)	20 (20)	<0.05
Colonoscopy now, number/month*	0 (0)	2 (5)	0.065
Influence, yes^	63 (98%)	27 (84%)	0.015
Less involved, yes^	37 (58%)	10 (31%)	0.035
Equipment, yes^	33 (52%)	22 (69%)	0.129
Correct use, yes^	48 (75%)	28 (88%)	0.298
HRQoL*	0.966 (0.055)	0.966 (0.036)	0.116
EMAS-S-AE*	50 (17)	50 (31)	0.562
EMAS-S-CW*	53 (17)	50 (9)	0.058
EMAS-S-T*	52 (17)	50 (10)	0.176
EMAS-P-ES*	54 (10)	46 (11)	0.078
EMAS-P-PF*	42 (7)	47 (7)	0.497
EMAS-P-AM*	61.5 (18)	55 (9)	0.304
EMAS-P-RZ*	42 (15)	43 (12)	0.875
EMAS-P-A*	52 (14)	58.5 (18)	0.728

**median (interquartile range); ^n (%); HRQoL, health-related quality of life; EMAS-S-AE, EMAS state from the autonomic–emotional component; EMAS-S-CW, EMAS state from the cognitive–worry component; EMAS-S-T, EMAS state total; EMAS-P, EMAS perception; ES, social evaluation threat perception; PF, physical danger threat perception; AM, ambiguous threat perception; RZ, daily routines threat perception; A, threat situation.*

TABLE 3 | Evaluation of characteristics from designated hospitals vs. non-designated hospitals.

Designated hospital (*n* = 25)		Non-designated hospital (*n* = 71)	*p*-value
Age*	28 (2)	28 (6)	0.395
Influence, yes^	23 (92%)	67 (94%)	0.65
Less involved, yes^	17 (68%)	30 (42%)	0.07
HRQoL*	0.957 (0.061)	0.966 (0.041)	0.888
EMAS-S-EF*	54 (15)	49 (13)	0.195
EMAS-S-CW*	52 (13)	51 (13)	0.352
EMAS-S-T*	53 (15)	50 (12)	0.406
EMAS-P-ES*	54 (10)	52 (10)	0.9
EMAS-P-PF*	42 (12)	47 (7)	0.948
EMAS-P-AM*	62 (15)	61 (18)	0.406
EMAS-P-RZ*	44 (13)	42 (14)	0.808
EMAS-P-A*	61 (20)	52 (16)	0.035

**median (interquartile range); ^n (%); HRQoL, health-related quality of life; EMAS-S-AE, EMAS state from the autonomic–emotional component; EMAS-S-CW, EMAS state from the cognitive–worry component; EMAS-S-T, EMAS state total; EMAS-P, EMAS perception; ES, social evaluation threat perception; PF, physical danger threat perception; AM, ambiguous threat perception; RZ, daily routines threat perception; A, threat situation.*

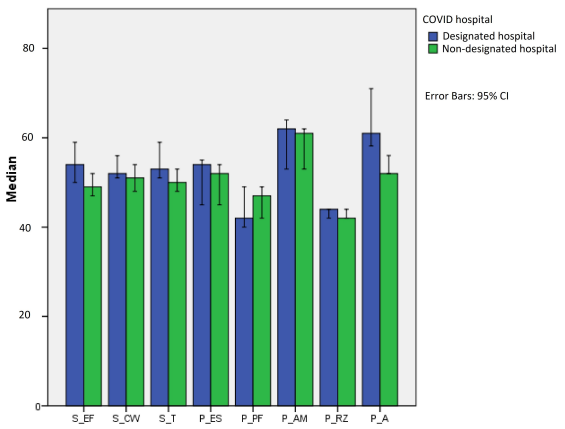

FIGURE 1 | The endler multidimensional anxiety scales anxiety scores' differences between the designated hospitals and non-the designated hospitals.

for future possible pandemics. We aimed to assess the anxiety of young gastroenterologists within the COVID-19 outbreak. The highest values for anxiety were the result of the new and the ambiguity of this period. The healthcare workers' lives were surrounded by fear during COVID-19 pandemic's phase 1 (Marton et al., 2020). The disease's frequent information changes generate fear and worry, a fact previously reported in prior outbreaks in 2003 in the case of severe acute respiratory syndrome (SARS) (Rambaldini et al., 2005). Shad et al. (2020) have suggested approaches in managing these challenges.

In another study exploring the psychological impact of SARS outbreak on physicians, younger doctors were more likely to have high posttraumatic stress symptoms associated with fear of SARS outbreak (Wu et al., 2009). Xiao et al. (2020) found that the stress level of young doctors during COVID-19 was higher than that during SARS.

The anxiety of physicians in the COVID-19 outbreak was also assessed by Wu and Wei (2020). They obtained the same moderate anxiety, without differences between physicians working at designated hospitals vs. non-designated hospitals, which is similar to our results. In this stressful COVID-19 outbreak, ambiguous was the dimension of trait anxiety which increased the total level of anxiety. All the physicians are facing a fast, new, moving, and ambiguous situation, with increasingly difficult-to-face challenges (Barello et al., 2020).

We found that being a woman was not associated with lower or higher anxiety than being a man, unlike other studies that have found that being younger and a woman, having less professional experience, and working in the frontline were associated with higher scores of anxiety (Elbay et al., 2020). Differences were found for perception of ambiguity when women presented more ambiguity anxiety than men.

The existing evidence of anxiety among healthcare workers was already done using random-effects meta-analysis (Pappa et al., 2020). The pooled prevalence rate of anxiety was found to be 23.2%, with female respondents exhibiting higher rates of anxiety compared to male respondents. A subgroup analysis with age criteria or with numbers of confirmed cases of COVID-19 per country should also be done. Giusti et al. (2020) found that 71.2% of health professionals working in Northern Italy had scores of state anxiety above the clinical cutoff in the COVID-19 pandemic period.

The mental well-being of all medical healthcare providers is still at stake, as some of them have been in the situation of treating their colleagues or face the fact that they may transmit the infection to their siblings. Our findings also suggest that the pandemic effect has an impact on their work quality on a daily basis, regardless of treating COVID-19-infected patients. All fellows in training should perform and be present in a number of endoscopic procedures, but during the pandemic this goal might not be achieved due to all general recommendations of limiting the interventions. Noteworthy are also the long-term effects that the pandemic will cause since

TABLE 4 | Characteristics of activities before and in the time of COVID-19.

Before COVID-19 Mean (SD)		Now Mean (SD)	*p*-value
Patients*	69.9 (77.5)	25.4 (34.5)	<0.001
Upper endoscopy*	23.1 (22)	3.4 (6.2)	<0.001
Colonoscopy*	12.9 (15.1)	2 (5.3)	0.001

**number per month.*

TABLE 5 | Correlations between the variables.

Variable	Age	HRQoL	S-AE	S-CW	S-T	P-ES	P-PF	P-AM	P-RZ	P-A
Age	1	0.12	0.03	−0.12	−0.07	−0.2	0.11	−0.11	−0.02	0.02
HRQoL		1	−0.15	−0.34**	−0.28**	−0.17	−0.04	−0.27**	0.22	−0.28**
S-AE			1	0.75**	0.93**	0.3**	0.44**	0.33**	−0.07	0.31**
S-CW				1	0.93**	0.35**	0.26*	0.35**	−0.09	0.32**
S-T					1	0.33**	0.35**	0.36**	−0.09	0.32**
P-ES						1	0.22*	0.28**	−0.07	0.41**
P-PF							1	0.15	−0.02	0.25*
P-AM								1	−0.34**	0.44**
P-RZ									1	−0.15
P-A										1

***correlation is significant at the 0.01 level; *correlation is significant at the 0.05 level; HRQoL, health-related quality of life; S-AE, EMAS state from the autonomic–emotional component; S-CW, EMAS state from the cognitive–worry component; S-T, EMAS state total; P-ES, social evaluation threat perception; P-PF, physical danger threat perception; P-AM, ambiguous threat perception; P-RZ, daily routines threat perception; P-A, threat situation.*

many patients will delay their clinical visits and how the medical system will reboot.

While only a quarter of the participants were working in designated COVID-19 hospitals, more than half of them were still supposed to continue their medical training. This became a problem all over the world and not only for medical faculties since all teaching programs became affected. Rotations for all medical staff started in all hospitals, even for fellows in gastroenterology. This made it difficult for them to interact with patients as well as to participate in endoscopic procedures. The restrictions were instated along with national emergency status, and the need for new training and teaching methods became necessary. The pandemic clearly affected their daily practice, with a very low rate of patients and endoscopic procedures daily. However, this encouraged telemedicine to step forward and draw them in new methods of interactions.

The gastroenterology fellows are well aware of e-learning and most of the available platforms that may improve their general training. However, this type of interaction should be more engaged in this period. Given the current situation, most of them are unsure of their medical evolution and their career development. This gap might be filled for now by the use of technology and also by a reorganization of the tutor's way of teaching. Moreover, 50% of the participants stated that their coordinator was not as involved as previously. Also, there was a lack of participation in and performing endoscopic procedures since a general decrease came along with the patients' admissions at the start of the pandemic. For endoscopy trainees, the lack of procedures represents the most important aspect, as they are required a specific number to complete their training and also to become proficient. This raises the question of whether their training period should be extended.

Our study included both fellows and young specialists because they represent two important steps in gastroenterology, and the pandemic could affect them at different levels. While fellows are eager to learn and improve their knowledge, which are now limited by the pandemic, the young specialists who are just beginning to develop their doctor life are confronted with a situation for which they were not trained during their residency and now have more responsibilities.

Questions are also to be answered as to how to restart gastroenterology training from this point on. While the focus will generally be on testing and access to PPE, endoscopy procedures will still need to be balanced and still assure high-quality training for young practitioners. Fellows should be well instructed on infection control and proper PPE use. Our survey revealed that only 57% had proper PPE equipment, which suggests that this might also have an emotional impact on some of them as they may not feel safe. Moreover, the use of PPE becomes even more stressful in the endoscopy rooms as there are procedures with potential contamination risks.

Senior fellows may face another issue as their graduation is at stake, and after finishing their fellowship, they may not feel as prepared as they should be since this period changed the healthcare system. Thus, their coordinators should help them focus on available telemedicine methods,

enhance their communication skills, and interact with other graduates so that this transition may be easier. Currently, gastrointestinal societies are encouraging online communication methods by different scheduled meetings and webinars and even try to keep their international congresses by broadcasting experts from their institution (Shad et al., 2020).

This study has several limitations. First, most participants (73.96%) were from non-designated hospitals. Romania has not been hit by the virus as hard as the other countries, and not too many residents in gastroenterology work in designated hospitals. Second, while the number of participants that answered the survey is not large, we believe that our results are relevant for the developments that are currently taking place in Romania. Third, the survey lasted 21 days and lacks longitudinal follow-up, but it caught the peak period and we used Romanian validated questionnaires.

Young gastroenterologists remain as some of the exposed part of the medical staff, especially with the need of performing endoscopies. The levels of distress (anxiety) in the time of COVID-19 are encouraging, though it should be monitored for a longer period according to the pandemic evolution.

In conclusion, the COVID-19 pandemic provides a major uncertainty for young gastroenterology practitioners. General caution should be considered for their current medical practice, and more attention should be focused on their training using technology since other methods are unavailable at this moment. We found a moderate level of anxiety during the first wave of COVID-19 pandemic in Romania among them, and we considered that a continuous observation should be done from different national institutions to provide a better psychological follow-up on the current developments.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee of the University of Medicine and Pharmacy of Craiova. The patients/participants provided their online informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

BU, CV, FB, VS, CT, AG, and GB: data curation. BU, R-AT-S, and AT-S: formal analysis. CT: investigation. R-AT-S and AT-S: methodology. BU and CT: project administration. R-AT-S: resources. BU: supervision. CT: visualization. BU and AT-S: writing – original draft, writing – review, and editing. All authors contributed to the article and approved the submitted version.

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Self-Oriented Empathy and Compassion Fatigue: The Serial Mediation of Dispositional Mindfulness and Counselor's Self-Efficacy

Lin Zhang[1], Zhihong Ren[1], Guangrong Jiang[1], Dilana Hazer-Rau[2], Chunxiao Zhao[1], Congrong Shi[1], Lizu Lai[1] and Yifei Yan[1]*

[1] Key Laboratory of Adolescent Cyberpsychology and Behavior, Ministry of Education, Key Laboratory of Human Development and Mental Health of Hubei Province, School of Psychology, Central China Normal University, Wuhan, China, [2] Department of Psychosomatic Medicine and Psychotherapy, Medical Psychology, Ulm University, Ulm, Germany

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***Correspondence:**
Zhihong Ren
ren@ccnu.edu.cn

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This study aimed to explore the association between self-oriented empathy and compassion fatigue, and examine the potential mediating roles of dispositional mindfulness and the counselor's self-efficacy. A total of 712 hotline psychological counselors were recruited from the Mental Health Service Platform at Central China Normal University, Ministry of Education during the outbreak of Corona Virus Disease 2019, then were asked to complete the questionnaires measuring self-oriented empathy, compassion fatigue, dispositional mindfulness, and counselor's self-efficacy. Structural equation modeling was utilized to analyze the possible associations and explore potential mediations. In addition to reporting confidence intervals (CI), we employed a new method named model-based constrained optimization procedure to test hypotheses of indirect effects. Results showed that self-oriented empathy was positively associated with compassion fatigue. Dispositional mindfulness and counselor's self-efficacy independently and serially mediated the associations between self-oriented empathy and compassion fatigue. The findings of this study confirmed and complemented the etiological and the multi-factor model of compassion fatigue. Moreover, the results indicate that it is useful and necessary to add some training for increasing counselor's self-efficacy in mindfulness-based interventions in order to decrease compassion fatigue.

Keywords: self-oriented empathy, compassion fatigue, mindfulness, counselor's self-efficacy, serial-mediation model

INTRODUCTION

Compassion fatigue (CF) is an empathetic reaction resulting from frequently witnessing the emotional or physical suffering of others or repeatedly listening to a person suffering from mental or physical dysfunction (Figley, 2002; Hamilton et al., 2016; Sinclair et al., 2017). It not only affects professional helpers' emotional and physical health, resulting in high turnover and absenteeism, but also influences the quality of client/patient care, leading to a decrease in clients/patients' trust and confidence (Udipi et al., 2008; Sorenson et al., 2016).

Professional helpers who are exposed to multiple stressors are susceptible to CF (Gleichgerrcht and Decety, 2014; Yu et al., 2016). During the COVID-19 outbreak, psychological counselors in China quickly established several service teams and voluntarily provided hotline professional psychological assistance for individuals impacted by the pandemic (Zhao et al., 2020). These hotline psychological counselors may experience CF when facing help-seekers from time to time, as the help-seekers were exposed to psychological stress or traumatic events.

Regarding the negative impact of CF on both hotline psychological counselors and help-seekers, investigating the factors that can affect CF is necessary and may help researchers design effective and evidence-based intervention programs to decrease CF. Empathy is considered to be an important factor influencing CF. Figley (2002) considered CF as a cost of empathy and developed a theoretical framework (i.e., the etiological and multi-factor model) to understand how other factors (e.g., exposure to client, disengagement, and sense of achievement) contributed to the effect of empathy on CF. However, Figley's model was criticized because it did not clearly explain the concept of empathy (Sabo, 2011). The multidimensional construct of empathy proposed by Davis (1983) allows researchers to better understand the concept of empathy. Davis (1983) considered that empathy should contain four components, namely, personal distress (i.e., self-oriented empathy), empathic concern (i.e., other-oriented empathy), fantasy, and perspective-taking. Personal distress and self-oriented empathy were used synonymously to describe negative emotional responses elicited by feeling others' suffering in many previous studies (Batson et al., 1987; Nagamine et al., 2018; Takamatsu, 2018). Based on the understanding of the multidimensional construct of empathy, many researchers explored the association between self-oriented empathy and CF, and found that self-oriented empathy was positively associated with CF among nurses (Duarte and Pinto-Gouveia, 2017b), social workers (Thomas, 2013), and healthcare professionals (Hunt et al., 2019). Moreover, a previous study found that compared with other components of empathy, self-oriented empathy of social workers had the strongest association with CF (Thomas, 2013). However, the association between self-oriented empathy and CF has not been investigated among psychological counselors so far. Besides, although researchers have investigated the role of mindfulness or context-specific self-efficacy in the association between self-oriented empathy and CF separately, they have not explored this association from both aspects of mindfulness and context-specific self-efficacy. Therefore, the present study aimed to investigate the association between self-oriented empathy and CF among hotline psychological counselors in the context of the COVID-19 outbreak, and further explore the roles of mindfulness and context-specific self-efficacy within the association.

Theoretical Background

The theoretical basis of the present study includes the etiological and multi-factor model of CF and the multidimensional construct of empathy.

The etiological and multi-factor model of CF was established based on the assumption that empathy was a prerequisite for CF. This model began with the exposure to clients/patients, followed by the motivation to respond to clients/patients in need (i.e., empathic concern) and the efforts to reduce the suffering of clients/patients (i.e., empathic response) based on the empathic ability of psychological counselors. In addition to empathy, some protective factors (e.g., disengagement and satisfaction with the efforts to help clients) and risk factors (e.g., prolonged exposure, traumatic memories, and the degree of life disruptions) for CF were also discussed in the model (Figley, 1995, 2002).

The multidimensional construct of empathy described that empathy could be divided into personal distress (i.e., self-oriented empathy), empathic concern (i.e., other-oriented empathy), fantasy, and perspective-taking (Davis, 1980). Researchers found that self-oriented empathy led to a series of problems in social interaction, such as a low level of counselor's self-efficacy (Butts and Gutierrez, 2018), and CF (Gleichgerrcht and Decety, 2014). In the present study, we focused on self-oriented empathy because its association with CF was needed to be examined among hotline psychological counselors, when its positive relationship with CF was found among nurses (Duarte and Pinto-Gouveia, 2017b), social workers (Thomas, 2013), and healthcare professionals (Hunt et al., 2019).

Self-Oriented Empathy and Compassion Fatigue

Figley (2002) noted that there was little or no CF without empathy. However, for decreasing CF, eliminating empathy was considered not practical because empathy was particularly important for psychological counselors to understand clients, establish a therapeutic alliance, and benefit clients (Wampold, 2015). Recent experimental and questionnaire-based studies have explored the potential roles of distinguishing between self-oriented and other-oriented empathy and the reduction of self-oriented empathy in the decrease of CF (Lamm et al., 2007; Kim and Han, 2018; Leonard et al., 2018). Researchers found that self-oriented and other-oriented empathy led to activations in different brain regions (Lamm et al., 2007). Other-oriented empathy worked on the good therapeutic alliance and outcomes, while self-oriented empathy often led to negative consequences (Kim and Han, 2018; Leonard et al., 2018; Talbot et al., 2019). These findings indicate that it may be practical to decrease CF by reducing a specific component of empathy, that is, self-oriented empathy.

Clarifying the similarity and differences between empathy and compassion may contribute to our understanding of the reason why self-oriented empathy could be the antecedent of CF. Empathy is the ability to recognize and understand other individuals' thoughts or emotions, that is, putting oneself in others' shoes, which may provoke emotional responses in caregivers (Davis, 1983). Moreover, caregivers with high self-oriented empathy are easier trapped in their negative emotional responses when addressing clients/patients who share similar experiences with them (Weller and Jowsey, 2020). These constant emotional responses could be emotionally exhausting and contributing to fatigue (Figley, 2002). Compassion begins with

the recognition of others' suffering, which is the same as empathy (Goetz et al., 2010). However, compassion is distinct from empathy regarding feelings and behavioral consequences (Goetz et al., 2010). Specifically, when caregivers provide compassionate care, they feel concern about clients/patients' suffering, but with some distance. That is, caregivers understand the suffering belongs to clients/patients rather than caregivers themselves, which may be beneficial for them to think clearly and better assist the clients/patients (Bloom, 2017; Weller and Jowsey, 2020). Therefore, self-oriented empathy, not compassion, is considered as the antecedent of CF.

Many previous studies have investigated the association between self-oriented empathy and CF. Neurobiological studies and questionnaire surveys proved that self-oriented empathy was positively associated with CF (Klimecki and Singer, 2012; Duarte et al., 2016). Specifically, functional magnetic resonance imaging (fMRI) studies showed that self-oriented empathy led to increased activations in the negative emotion-related brain areas (e.g., ventral premotor cortex, bilateral inferior parietal lobe, and bilateral somatosensory cortex), further reduced dopamine release, and finally caused CF or burnout (Klimecki and Singer, 2012; Ashar et al., 2017; Dowling, 2018). Correlation analysis based on questionnaire surveys also demonstrated the positive relationship between self-oriented empathy and CF among cancer healthcare professionals (Hunt et al., 2019), and registered nurses (Duarte et al., 2016). Therefore, we hypothesized that self-oriented empathy may lead to CF among hotline psychological counselors in the context of the COVID-19 outbreak.

The Mediating Role of Mindfulness

Mindfulness is the state of being conscious of what is taking place in the present without judgments (Brown and Ryan, 2003). Self-oriented empathy could decrease the level of mindfulness. Previous studies found that when empathetically responding to the clients/patients who experienced traumatic events, the caregivers with a high level of self-oriented empathy paid attention to the painful events, further generated unacceptable attitudes and negative judgments (Cohen and Collens, 2013; Duarte et al., 2016; Wahlberg et al., 2016). The unacceptable attitudes and negative judgments could indicate a low level of mindfulness (Brown and Ryan, 2003). Besides, previous studies provided substantial evidence supporting the negative association between mindfulness and self-oriented empathy (McArthur et al., 2017; Leonard et al., 2018; Campos et al., 2019; Fuochi and Voci, 2020), although a few studies found that the association varied depending on the measures employed (Dekeyser et al., 2008; Berry et al., 2018).

Moreover, mindfulness is effective at decreasing CF (Conversano et al., 2020). Previous studies found that Mindfulness-Based Stress Reduction (MBSR) effectively decreased CF (Duarte and Pinto-Gouveia, 2017a; Silver et al., 2018). Further, many cross-sectional studies have suggested that mindfulness is a protective factor against CF and burnout (Olson et al., 2015; Brown et al., 2017; Silver et al., 2018). Based on these findings, we hypothesized that mindfulness may mediate the empathy-CF linkage.

The Mediating Role of Context-Specific Self-Efficacy

Context-specific self-efficacy is the belief about the ability to deal with challenges in a specific context (Wahlberg et al., 2016). For a psychological counselor, context-specific self-efficacy is his/her professional self-efficacy in the context of counseling. Self-oriented empathy can predict context-specific self-efficacy. Previous studies found that psychological counselors, who had a low level of self-oriented empathy, were easier to establish better working alliances with their clients/patients (Leonard et al., 2018; Moreno-Poyato and Rodríguez-Nogueira, 2020), produce better outcomes (Horvath et al., 2011; Norcross and Wampold, 2011), further reinforce the belief of the ability to be good counselors (Reese et al., 2009).

Moreover, context-specific self-efficacy can predict CF. Social cognitive theory assumes both general and context-specific self-efficacy can predict many stress-related outcomes (Bandura et al., 2005), among which CF is a common one. A previous study found that caregivers with low context-specific self-efficacy were likely to hold pessimistic thoughts and experience emotional exhaustion (Shoji et al., 2015). A survey revealed that coping self-efficacy helped healthcare and emergency workers address stress and secondary trauma during the COVID-19 outbreak (Vagni et al., 2020). Thence, we hypothesized that the counselor's self-efficacy may mediate the self-oriented empathy-CF linkage.

The Serial Mediating Roles of Mindfulness and Context-Specific Self-Efficacy

A mindful psychological counselor is likely to focus on the present moment with a clear mind, can be fully aware of the happening during sessions, and deal better with the challenges in the context of counseling (Wei et al., 2015). Many cross-sectional surveys proved that mindfulness was positively associated with context-specific self-efficacy (Blecharz et al., 2013; Hanley et al., 2015; DiRenzo et al., 2018; Neace et al., 2020). However, these surveys did not reveal a causal relationship between these two variables. A recent randomized controlled trial explored the causal relationship and found that an increase in the level of mindfulness of undergraduate counseling trainees led to an increase in the level of context-specific self-efficacy of these trainees (Chan et al., 2020). Concerning the previous findings, especially the finding of the randomized controlled trial, we hypothesized that mindfulness may be an antecedent of the counselor's self-efficacy in the serial mediation model. In summary, we hypothesized that mindfulness and self-efficacy may serially mediate the self-oriented empathy-CF linkage.

The Current Study

Overall, the present study aimed to examine the association between self-oriented empathy and CF, and further investigate the mediating roles of mindfulness and counselor's self-efficacy. Specifically, our research hypotheses are as follows:

H1: Self-oriented empathy would be positively associated with CF.

H2: Mindfulness may play a mediating role in the self-oriented empathy-CF linkage.
H3: Counselor's self-efficacy may play a mediating role in the self-oriented empathy-CF linkage.
H4: Mindfulness and counselor's self-efficacy may play a serial-mediation role in the self-oriented empathy-CF linkage.

MATERIALS AND METHODS

Subjects

All subjects were recruited from the Mental Health Service Platform at Central China Normal University, Ministry of Education (MOE-CCNU-MHSP). The questionnaires were distributed online from April 10th to 15th, 2020. The online distribution had at least two advantages. First, it avoided face-to-face contact and was beneficial to curb the spread of the pandemic. Second, the setting of online background solved the problem of missing data and ensure the full completion of the submitted questionnaire, i.e., the questionnaires cannot be submitted successfully until all items were completed. A total of 712 hotline psychological counselors (577 females and 135 males: average age 42.6 ± 7.9 years) completed the questionnaires, accounting for 50.9% of the total counselors on the platform.

The study protocol was approved by the Life Science Ethics Committee of Central China Normal University. Participants were told that their participation in the study was voluntary and anonymous, and they could quit the study at any time without any disadvantage. Their data would be used only for research. All subjects gave their consent to participate after receiving the explanations.

Measures

Outcomes

Compassion fatigue was measured using the burnout and the secondary traumatic stress subscales of the Professional Quality of Life Scale (ProQoL), version 5 (Stamm, 2010). The ProQoL is a 30-item, self-report, and 5-point Likert scale (1 = *never* to 5 = *very often*). It is currently the most frequently used scale for CF measurement in research (Sinclair et al., 2017). CF cannot be measured directly but can be reflected indirectly by the burnout subscale and the secondary traumatic stress subscale (Stamm, 2010). Higher scores of the burnout or/and secondary traumatic stress subscales represent higher CF. In the current study, the internal consistencies for burnout and secondary traumatic stress subscales were acceptable (Cronbach's $\alpha = 0.76$ and 0.77, respectively).

Independent Variables

Self-oriented empathy was measured using the personal distress subscale of the Interpersonal Reactivity Index-Chinese Version (IRI-C) (Zhang et al., 2010). The IRI-C is a 22-item, 5-point Likert scale (0 = *does not describe me well* to 4 = *describes me very well*), which is adapted from the Interpersonal Reactivity Index (Davis, 1980). The IRI-C measures dispositional empathy, which consists of four subscales, namely, perspective taking, personal distress, fantasy, and empathic concern subscales. The personal distress subscale measures self-oriented empathy, that is, distress and discomfort elicited by witnessing another person's suffering. High scores of the personal distress subscale indicate a high tendency to experience self-oriented empathy when observing the suffering of others. In the present study, the internal consistency for personal distress subscale was acceptable (Cronbach's $\alpha = 0.77$).

Mediators

Dispositional mindfulness was measured using the Mindful Attention Awareness Scale-Chinese version (MAAS-C) (Chen et al., 2012). The MAAS-C is a 15-item, one-dimension scale, which is adapted from the Mindful Attention Awareness Scale (Brown and Ryan, 2003). Respondents were asked to rate how frequently or infrequently they had the mentioned experience from 1 (*almost always*) to 6 (*almost never*). High scores reflect more mindfulness. In the present study, the internal consistency for the scale was good (Cronbach's $\alpha = 0.85$).

The self-efficacy of hotline psychological counselors was measured using the Chinese version of the Counselor Self-Efficacy Scale (CSES-C) (Gao, 2013). The CSES-C is a 20-item, 5-point Likert scale (1 = *agree strongly* to 5 = *disagree strongly*) assessing knowledge and skill competencies used in the practice of individual and group counseling and therapy, which is adapted from the Counselor Self-Efficacy Scale (Melchert et al., 1996). High total scores correspond to a high degree of confidence in counseling abilities. In this study, the internal consistency for the scale was good (Cronbach's $\alpha = 0.89$).

Data Analysis

All statistical analyses were conducted using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp, Armonk, NY, United States). First, for acquiring the mean and standard deviations for continuous variables (i.e., age, work experience, the total number of cases received by the counselor on the platform, the number of traumatic cases received by the counselor on the platform) and percentages for categorical variables (i.e., gender, education level, and marital status), descriptive statistics were performed. Then, confirmative factor analysis was completed to verify the factor structure of the observed variables. Next, bivariate statistics were conducted to preliminarily explore the correlations between the observed variables. Furthermore, Harman's single-factor test was conducted to examine the common method bias. Finally, in order to examine possible direct and indirect effects of self-oriented empathy on CF, a structural equation modeling analysis was performed while controlling for age, gender, marital status, education level, work experience, the total number of cases received by the counselor on the platform, and the number of traumatic cases received by the counselor on the platform. We chose these control variables on the basis of the risk factors of CF summarized by a meta-analysis (Sinclair et al., 2017). In the structural equation modeling, self-oriented empathy, mindfulness, and counselor's self-efficacy were treated as manifest variables and were calculated by the subscale/scale scores. CF was treated as a latent variable and reflected by burnout and secondary traumatic stress subscale scores (Stamm, 2010). The covariance structure analysis with the maximum likelihood estimation method was used to analyze

the model. Indices of Goodness of Fit Index (GFI), Adjusted GFI (AGFI), Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), and Standard Root Mean-square Residual (SRMR) were calculated to assess the model fit. In addition to 95% CI of bias-corrected boot-strapped method based on 5000 samples, we also computed *p*-values of the likelihood ratio test in the model-based constrained optimization (MBCO) procedure. The MBCO procedure using non-linear constraints can offer a more robust Type I error rate, provide a continuous measure of compatibility of data with the null model, and be suitable for the application in latent variables. Tofighi and Kelley (2020) argued that in addition to reporting CI, using the MBCO procedure can outperform the existing methods. A full R-script of the MBCO procedure used in the present study can be seen in the **Supplementary Material**.

RESULTS

Descriptive Statistics

A total of 712 participants were included in the analysis, with an average of 42.6 years old (SD = 7.9). As shown in **Table 1**, the majority of participants are female (81%), with a master or Ph.D. degree (77.1%), and married (91.3%). The average of years doing psychological counseling is 12.5 (SD = 5.9). The average number of cases received by the counselor on the platform is 11.10 (SD = 15.60) and the average number of traumatic cases is 1.68 (SD = 3.57).

Correlation Analysis

Table 2 shows the correlations for all observed variables. Self-oriented empathy was positively correlated with both burnout and secondary traumatic stress, and negatively correlated with both mindfulness and counselor's self-efficacy. Moreover, mindfulness and counselor's self-efficacy were negatively correlated with both burnout and secondary traumatic stress, and positively related to each other. All associations were in the hypothesized directions. Additionally, age was negatively correlated with both burnout and secondary traumatic stress. Education level was positively correlated with secondary traumatic stress. Marital status was negatively correlated with burnout. Work experience was negatively correlated with both burnout and secondary traumatic stress.

TABLE 1 | Descriptive statistics of the participants.

Variable	Number (percent)/mean SD
Gender (female: male)	577 (81): 135 (19)
Age (years)	42.6 ± 7.9
Education level	
High school or below	1 (0.1)
Junior college	9 (1.3)
Bachelor	153 (21.5)
Master or Ph.D.	549 (77.1)
Marital status (married: unmarried)	650 (91.3): 62 (8.7)
Total number of cases	11.10 ± 15.60
Number of traumatic cases	1.68 ± 3.57
Work experience (years)	12.5 ± 5.9

Common Method Bias Test

The results of Harman's single-factor test showed that the variance of the first factor was 23.83%, less than the critical value of 40%. That is, there was no serious common method bias in the data.

Analysis of the Structural Equation Model

The structural equation model tested indirect effects via mindfulness, counselor's self-efficacy, and serially via mindfulness and counselor's self-efficacy for self-oriented empathy, in order to examine the pathways that may connect self-oriented empathy and CF. **Figure 1** describes the factor loadings to corresponding latent variables and the standardized path coefficient for the serial mediation model. **Table 3** presents the total and direct effects on mindfulness, counselor's self-efficacy, and CF. **Table 4** shows the indirect effect on CF via different pathways, bias-corrected 95% CI, and model-based constrained optimization for self-oriented empathy. All the fit indices suggested an acceptable fit for the model (GFI = 0.976, AGFI = 0.913, CFI = 0.982, RMSEA = 0.069, and SRMR = 0.034) (Hooper et al., 2008).

The self-oriented empathy was directly associated with CF with the standardized path coefficient of 0.316. This self-oriented empathy also had a direct and negative association with mindfulness (standardized path coefficient = −0.508, $p < 0.001$), and the counselor's self-efficacy (standardized path coefficient = −0.210, $p < 0.001$). The mindfulness was directly linked to the counselor's self-efficacy (standardized path coefficient = 0.304, $p < 0.001$), and CF (standardized path coefficient = −0.388, $p < 0.001$). The counselor's self-efficacy had a direct and negative association with CF (standardized path coefficient = −0.322, $p < 0.001$) (see **Table 3** and **Figure 1**).

With respect to the mediation analyses, **Table 4** shows that bias-corrected 95% CI precluded zero and *p*-values of MBCO procedure less than 0.05 for serial indirect effects, which suggests significant indirect effects. Significant indirect effects on CF via mindfulness and via counselor's self-efficacy were found for self-oriented empathy (Indirect effect = 0.197, 95% CI = 0.152–0.246, $LRT_{MBCO} = 7.18e + 18$; indirect effect = 0.067, 95% CI = 0.040–0.105, $LRT_{MBCO} = 1.16e + 16$). Significant indirect effects on CF via mindfulness and counselor's self-efficacy were found for self-oriented empathy (Indirect effect = 0.050, 95% CI = 0.032–0.071, $LRT_{MBCO} = 5.95e + 16$) (see **Table 4**).

Overall, the total effect of self-oriented empathy on CF was 0.630, of which, 50.2% (0.316) was direct and 49.8% (0.314) was indirect.

DISCUSSION

The present study tested the relationship between self-oriented empathy and CF among hotline psychological counselors during the COVID-19 outbreak and further explored the possible

TABLE 2 | Correlation for all observed variables.

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Gender	–											
2. Age	0.03	–										
3. Education level	−0.06	−0.30**	–									
4. Marital status	−0.02	0.37**	−0.01	–								
5. Total number of cases	0.00	0.04	−0.08*	−0.03	–							
6. Number of traumatic cases	0.00	0.06	−0.10**	−0.03	0.61**	–						
7. Work experience	−0.02	0.58**	0.01	0.26**	−0.04	−0.01	–					
8. SoE	0.01	−0.25**	0.15**	−0.09*	−0.07	−0.05	−0.16**	–				
9. MI	0.06	0.20**	−0.09*	0.07	0.00	−0.01	0.13**	−0.51**	–			
10. CSES	−0.08*	0.19**	0.00	0.13**	0.04	0.03	0.25**	−0.36**	0.41**	–		
11. BO	−0.04	−0.19**	0.07	−0.10*	−0.02	−0.02	−0.17**	0.44**	−0.52**	−0.53**	–	
12. SFS	0.04	−0.14**	0.08*	0.02	0.04	0.03	−0.13**	0.52**	−0.51**	−0.36**	0.57**	–

*SoE, self-oriented empathy; MI, mindfulness; CSES, counselor's self-efficacy; CF, compassion fatigue. *p < 0.05, **p < 0.01.*

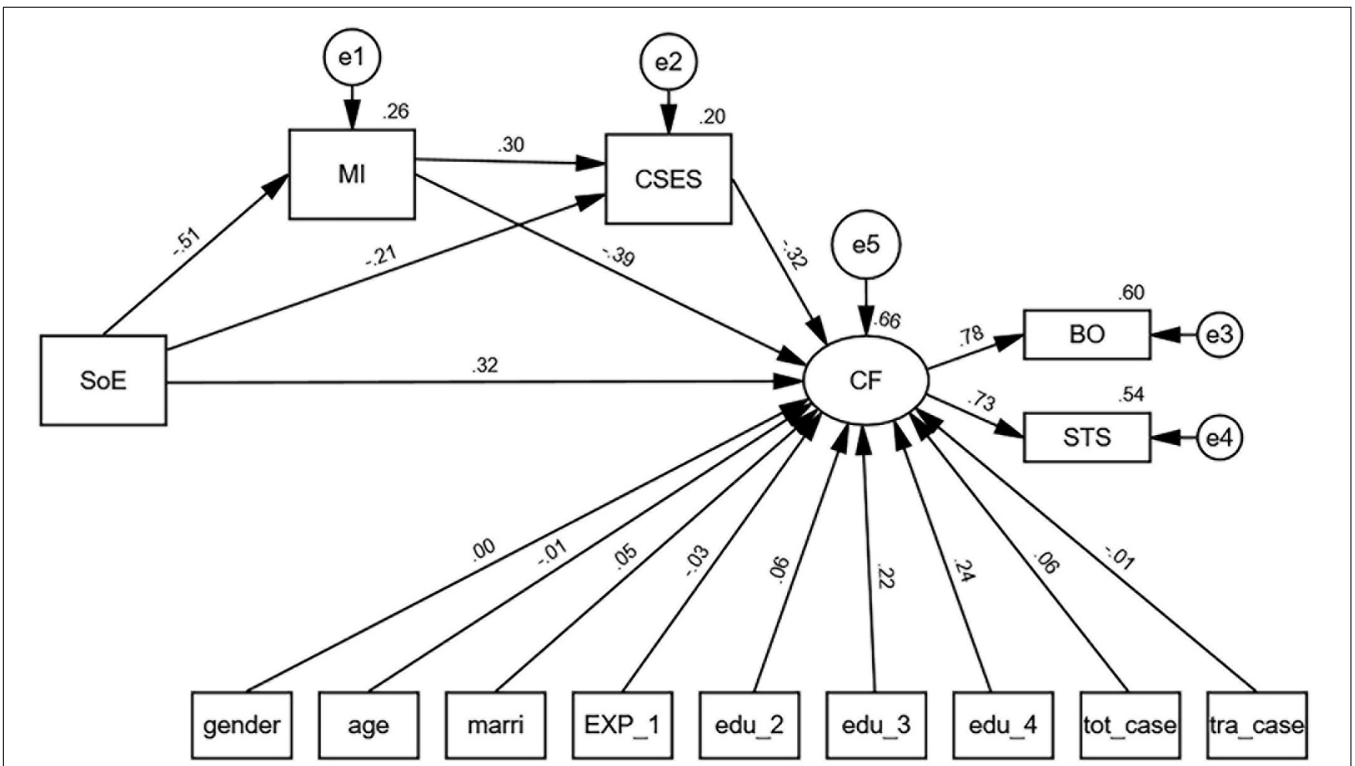

FIGURE 1 | The serial-mediation model showing self-oriented empathy, dispositional mindfulness, and counselor's self-efficacy on compassion fatigue.

pathways underlying this association with respect to mindfulness and counselor's self-efficacy by constructing a structural equation model. Understanding the CF of psychological counselors during COVID-19 and its underlying psychological mechanisms are crucial for the effective prevention and intervention of CF and are beneficial for establishing a high-quality psychological counselor team to fight future public health emergencies.

The present study has at least three strengths. First, the present study broadens the generalizability of previous findings. Specifically, the positive association between self-oriented empathy and CF among nurses or healthcare professionals is expanded to psychological counselors and reverified in the context of COVID-19. Second, the present study integrates the previous studies that considered only the role of mindfulness or self-efficacy in the relationship between empathy and CF, and offers a more comprehensive picture of the self-oriented empathy-CF pathway by constructing a serial mediation model. Last, the current study improves the inference in mediation analysis by conducting the MBCO procedure. The combination of CI and the MBCO procedure transcends existing methods (Tofighi and Kelley, 2020). In the **Supplementary Material**, we provide an R-script to process the new method of serial mediation

TABLE 3 | Standardized coefficients for total and direct effects on mindfulness, counselor's self-efficacy, and compassion fatigue in the serial mediation model.

Variable	MI	CSES		CF	
	Direct effect	Total effect	Direct effect	Total effect	Direct effect
SoE	−0.508***	−0.364***	−0.210***	0.630***	0.316***
MI			0.304***	−0.388***	−0.388***
CSES					−0.322***
R^2	0.258	0.201		0.661	

*SoE, self-oriented empathy; MI, mindfulness; CSES, counselor's self-efficacy; CF, compassion fatigue. ***$p < 0.001$.*

analysis, which is beneficial for researchers to replicate our results or adapt the script to their research.

This study revealed several valuable findings. We found a significantly positive association between self-oriented empathy and CF, with the association being mediated both independently and serially by mindfulness and counselor's self-efficacy.

Specifically, first, as hypothesized, our results showed that self-oriented empathy had a positive direct association with CF, which is consistent with many previous studies among nurses or cancer healthcare professionals (Duarte et al., 2016; Duarte and Pinto-Gouveia, 2017b; Hunt et al., 2019). Self-oriented empathy occurred when the helpers attributed aversive empathic responses to their own feelings, which was related to dysfunctional self-focus (Kim and Han, 2018). It can be predicted that CF of psychological counselors could be prevented or intervened by being aware of their own feelings and correcting negative self-thoughts. It is worthy to note that, in the context of the COVID-19 outbreak, hotline psychological counselors and help-seekers were exposed to a similar environment and faced similar events. These similarities may lead to more self-oriented empathy caused CF of counselors, which can be supported by previous research (Weller and Jowsey, 2020). This finding indicates that the self-oriented empathy of hotline psychological counselors deserves great attention during the COVID-19 pandemic in order to decrease CF. If psychological counselors cannot adjust themselves well during the COVID-19 pandemic, they should be cautious when helping clients/patients impacted by the pandemic.

Second, consistent with our hypotheses, mindfulness and counselor's self-efficacy independently mediated the self-oriented empathy-CF linkage. In line with previous studies, we found that self-oriented empathy could negatively predict dispositional mindfulness (Baer, 2004; Dekeyser et al., 2008; Fuochi and Voci, 2020) and context-specific self-efficacy (Aparicio-Flores et al., 2020). We also found that low levels of mindfulness and context-specific self-efficacy were associated with a high level of CF, which is consistent with previous studies (Olson et al., 2015; Shoji et al., 2015; Brown et al., 2017; Kind et al., 2020). Moreover, our results supported the hypotheses that self-oriented empathy would be associated with CF via dispositional mindfulness and counselor's self-efficacy, respectively, which suggests that self-oriented empathy could affect CF partially through awareness in the present and beliefs on the professional ability.

Finally, the serial mediating roles of mindfulness and counselor's self-efficacy were found in the present study, which could be supported by previous empirical findings (Brown et al., 2017; Conversano et al., 2020). Previous studies found that mindfulness had a negative association with self-oriented empathy, and a moderate, negative association with CF (Brown et al., 2017; Silver et al., 2018). However, studies undertaken so far have provided inconsistent evidence regarding the effectiveness of mindfulness-based interventions on CF (Duarte and Pinto-Gouveia, 2017a; Steinberg et al., 2017; Wylde et al., 2017; Conversano et al., 2020). This inconsistency indicates that in addition to mindfulness training, other factors should be added in interventions in order to improve the intervention effectiveness on CF. That is, there may be mediators or moderators between mindfulness and CF. Context-specific self-efficacy, which is a belief about an individual's capacity to execute behaviors for producing specific performance attainments in a specific context, could be one of the mediators.

Just from a statistical perspective, another serial-mediation model with the counselor's self-efficacy as an antecedent of mindfulness can be supported according to comparative criterion and statistical strategies for comparing equivalent models (see **Supplementary Figure 1**). However, considering the logical relationship between dispositional and context-specific variables (Wood and Roberts, 2006), with the finding of the randomized controlled trial that the change of mindfulness precedes that of counselor's self-efficacy (Chan et al., 2020), it is more reasonable to follow the hypothesized model where self-oriented empathy predicts CF through dispositional mindfulness and then counselor's self-efficacy.

Consequently, this study has some important implications. First, a theoretical implication is that the present study reveals

TABLE 4 | Total, individual, and serial indirect effects for self-oriented empathy on compassion fatigue, bias-corrected 95% confidence intervals, and model-based constrained optimization.

Pathway	Indirect effect	SE	Bias-corrected 95% CI			Model-based constrained optimization	
			Lower	Upper	*p*-value	LRT_{MBCO}	*p*-value
Total indirect	0.314	0.031	0.265	0.369	<0.001	NA	NA
SoE→MI→CF	0.197	0.024	0.152	0.246	<0.001	7.18e + 18	<0.001
SoE→CSES→CF	0.067	0.016	0.040	0.105	<0.001	1.16e + 16	<0.001
SoE→MI→CSES→CF	0.050	0.010	0.032	0.071	<0.001	5.95e + 16	<0.001

CI, confidence interval; SoE, self-oriented empathy; MI, mindfulness; CSES, counselor's self-efficacy; CF, compassion fatigue; NA, not applicable.

the underlying mechanism of the association between self-oriented empathy and CF. The serial-mediation model is a good supplement to the etiological and the multi-factor model of CF (Figley, 1995, 2002). Figley (2002) proposed the model, stated that empathy played an important role in predicting CF, further found some protective and risk factors for CF. However, according to Sabo (2011), Figley did not clarify which component of empathy can impact CF and did not explore the interrelationship between the risk or protective factors for CF in his etiological and the multi-factor model. The present study elucidated the important role of self-oriented empathy in CF, and found that mindfulness and counselor's self-efficacy independently and serially mediated the empathy-CF linkage. Second, a practical implication is that the present study provides a pathway to decrease the psychological counselor's CF. In order to decrease CF, intervention programs should involve mindfulness training to improve the level of mindfulness, as well as some training, supervision, or positive feedback to enhance the psychological counselor's professional self-efficacy. The reduction of CF cannot only improve professional satisfaction and workforce stability but also improves the quality of psychological counseling and clients' outcomes (Silver et al., 2018).

LIMITATIONS

Notwithstanding the above strengths and implications, we have to admit that this study has several limitations. First, the model fit indices of the present model were acceptable, but not excellent (Hu and Bentler, 1999; Hooper et al., 2008). Data with higher quality is necessary or a better fitted model needs to be constructed in future research. Second, the cross-sectional design in this study cannot assess the exact order of the variables' causal sequence. Although this study is based on the etiological and multi-factor model of CF, it is hard to ascertain which variables are causes and which are outcomes. Longitudinal studies are needed to further examine the causality of these variables in future research. Third, the self-report questionnaires may introduce recall and social desirability bias. Experiments should be designed to cross-validate our results in further studies. Last, other important factors, such as self-compassion and coping strategies, were not considered in the present study. Future research should integrate these important variables into the model and develop a better modification of the self-oriented empathy-CF mechanism.

CONCLUSION

The findings of this study highlight that self-oriented empathy plays a more important role in influencing CF by the serial mediation of mindfulness and the counselor's self-efficacy. This study contributes to our understanding of how self-oriented empathy operates through the psychological process and contributes to the occurrence of CF. These findings can be used to develop preventions and interventions aiming at decreasing CF, and further improving the psychological counselor's life quality and the quality of counseling.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethical Committee for Scientific Research of Central China Normal University. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

LZ: conceptualization, data analysis, and original draft writing. ZR and GJ: funding acquisition and review. DH-R: review, editing, and proofreading. CZ and CS: pre-testing and data preprocessing. LL and YY: conceptualization and data collection. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.613908/full#supplementary-material

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GENERAL COMMENTARY
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Commentary: Self-Oriented Empathy and Compassion Fatigue: The Serial Mediation of Dispositional Mindfulness and Counselor's Self-Efficacy

*Helen R. Chapman**

School of Psychology, University of Lincoln, Lincoln, United Kingdom

Keywords: compassion fatigue, Interpersonal Reactivity Index, self-oriented empathy, personal distress, empathy

A Commentary on

Self-Oriented Empathy and Compassion Fatigue: The Serial Mediation of Dispositional Mindfulness and Counselor's Self-Efficacy
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***Correspondence:**
Helen R. Chapman
hchapman@lincoln.ac.uk

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Zhang et al. (2021), in their recent article exploring "the association between self-oriented empathy and compassion fatigue" (p. 1) stated that

> "Compassion fatigue (CF) is an empathetic reaction resulting from frequently witnessing the emotional or physical suffering of others or repeatedly listening to a person suffering from mental or physical dysfunction" (p. 1).

The authors measured "self-oriented empathy" using Davis' original Interpersonal Reactivity Index (IRI) scale (Davis, 1983) and stated,

> "The personal distress subscale measures self-oriented empathy, that is, distress and discomfort elicited by witnessing another person's suffering. High scores of the personal distress subscale indicate a high tendency to experience self-oriented empathy when observing the suffering of others" (p. 4).

If one returns to Davis' original Interpersonal Reactivity Index (IRI) scale development (Davis, 1983), the following is stated about the subscales under consideration,

> "The Empathic Concern (EC) scale assesses "other-oriented" feelings of sympathy and concern for unfortunate others, and the Personal Distress (PD) scale measures "self-oriented" feelings of *personal anxiety and unease* in tense interpersonal settings" (p. 114) (emphasis added).

The Personal Distress subscale (Davis, 1980) contains items such as

> Being in a tense emotional situation scares me.
> I am usually pretty effective in dealing with emergencies (-).
> I tend to lose control during emergencies.
> When I see someone who badly needs help in an emergency, I go to pieces (p. 96).

These items do not reflect "empathy" or "self-oriented empathy." Empathy is defined in many ways throughout the literature, but is generally considered to have two components; cognitive empathy (intellectually understanding another person's emotions and perspective) and affective or emotional empathy (being affected by and sharing another's emotions, both positive and negative). In other words, empathy relates to feeling with another. Empathy is necessary for empathic concern and compassion (wishing to or acting to alleviate suffering) which are other-oriented; feeling for another (Klimecki and Singer, 2011; Strauss et al., 2016). Decety (2020), reviewing the use of the term "empathy" in medicine states,

> "Empathy is a broad construct that refers to the ability to sense other people's emotions, coupled with the ability to imagine what someone else might be thinking or feeling" (p. 563).

The author is unaware of any published definition of the concept of "self-oriented empathy" which appears to be a new term coined by Zhang et al. It should not be confused with "self-compassion" (Neff, 2003) which is associated with lower levels of both burnout (Gerber and Anaki, 2020; Hashem and Zeinoun, 2020) and secondary traumatic stress (Neff et al., 2020).

Compassion fatigue is defined by Stamm (2010) as having 2 components.

> "The first part concerns things such like exhaustion, frustration, anger and depression typical of burnout. Secondary Traumatic Stress is a negative feeling driven by fear and work-related trauma. Some trauma at work can be direct (primary) trauma. In other cases, work-related trauma be a combination of both primary and secondary trauma" (p. 8).

Decety (2020) summarizes this as,

> "Compassion fatigue is the physical and mental exhaustion and emotional withdrawal experienced by individuals who care for sick or traumatized people over an extended period of time" (p. 563).

In a very recent publication (Eng et al., 2021) which validated a new measure, The Compassion Fatigue Inventory, three factors were found to contribute to compassion fatigue:

1. Reduced Compassion—My will to help has declined; I feel irritated when patients complain
2. Social Life—I have started to withdraw from social interactions; I have noticed that my patience in personal relationships has dwindled
3. Workplace—I feel that my workplace provides care that is in accordance with my values (rev) (p. 13)

It did not include any items appearing to measure what one could consider to be self-oriented empathy or compassion. The authors concluded that,

> "Even though Compassion fatigue had a high correlation with both burnout and STS [Secondary Traumatic Stress], the results suggest a narrower conceptualization of compassion fatigue" (p. 1).

Therefore, it can be seen that personal distress is just that, personal distress, and not self- oriented empathy. In other words, it reflects a tendency to be emotionally overwhelmed because of poor emotional regulation of negative affective empathy (Hofmeyer et al., 2019), inadequate self-other differentiation (Klimecki and Singer, 2011), or the nature of top-down control not/used such as cognitive appraisal of the situation (Lamm et al., 2007a,b). This leads to the argument that compassion fatigue should be called "Empathic distress fatigue" (Klimecki and Singer, 2011; Hofmeyer et al., 2019) where high levels of inadequately modulated empathy for distress, or a lack of ability to respond prosocially with compassion (Duarte and Pinto-Gouveia, 2017), result in personal distress and *self-oriented attempts to reduce one's own suffering*. This is apparently different to being overwhelmed to the point of coping badly as implied by the nature of the IRI items.

Zhang et al. (2021) also found that, "Self-oriented empathy was positively associated with compassion fatigue" (p. 1). This makes absolute sense; *personal distress*, as measured by the IRI, not self-oriented empathy, is associated with compassion fatigue.

In summary, the use of the term "self-oriented empathy" in this paper (Zhang et al., 2021) is confusing and the paper would be enhanced if it were re-written to reflect the fact that it is personal distress that is associated with compassion fatigue.

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

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BRIEF RESEARCH REPORT
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Healthcare Workers Who Work With COVID-19 Patients Are More Physically Exhausted and Have More Sleep Problems

Henrico van Roekel[1], Irene M. J. van der Fels[2], Arnold B. Bakker[3] and Lars G. Tummers[1]*

[1] Utrecht School of Governance, Utrecht University, Utrecht, Netherlands, [2] IZZ, Apeldoorn, Netherlands, [3] Center of Excellence for Positive Organizational Psychology, Erasmus University Rotterdam, Rotterdam, Netherlands

In this survey study of 7,208 Dutch healthcare workers, we investigate whether healthcare workers dealing with COVID-19 patients experience lower general health, more physical and mental exhaustion and more sleep problems than other healthcare workers. Additionally, we study whether there are differences in well-being within the group of healthcare workers working with COVID-19 patients, based on personal and work characteristics. We find healthcare workers who are in direct contact with COVID-19 patients report more sleep problems and are more physically exhausted than those who are not in direct contact with COVID-19 patients. Mental exhaustion and general health do not significantly differ between healthcare workers who are in direct contact with COVID-19 patients and those who are not. Among healthcare workers in direct contact with COVID-19 patients, lower well-being on one or more indicators is reported by those who are female, living alone, without leadership role, or without sufficient protective equipment. Regarding age, physical exhaustion is more prevalent under healthcare workers older than 55 years, whereas mental exhaustion is more prevalent under healthcare workers younger than 36 years. These results stress the need of mental and physical support of healthcare workers during a pandemic, catered to the needs of healthcare workers themselves.

Keywords: COVID-19, healthcare workers, physical exhaustion, mental exhaustion, sleep problems, general health

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****Correspondence:***
Henrico van Roekel
h.vanroekel@uu.nl

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INTRODUCTION

The COVID-19 pandemic has presented great threats to the well-being of healthcare workers. Many of them risked infection with the virus while working longer hours in understaffed organizations (Adams and Walls, 2020; Mhango et al., 2020; Pearman et al., 2020; Wang et al., 2020). Since the outbreak, scholars have presented first results on what effects the crisis has had on healthcare workers. Studies show effects on attitudes and practices, like a high fear of self-infection (Zhou et al., 2020), an increase in mental health problems like job stress and anxiety (Cao et al., 2020; Spoorthy et al., 2020; Tan et al., 2020; Wei et al., 2020), and the development of physical problems like increased headaches due to wearing protective equipment (Ong et al., 2020). Similarly, a scoping review of 37 studies on how COVID-19 has impacted healthcare worker wellness showed COVID-19 was associated with,

among else, more stress, anxiety and poorer quality of sleep (Shreffler et al., 2020).

However, we know little about whether the effects of the COVID-19 outbreak on healthcare workers' well-being differ across groups of healthcare workers. We therefore firstly study whether healthcare workers dealing with COVID-19 patients experience more threats to well-being than other healthcare workers. For instance, is it truly the case that healthcare workers working with COVID-19 patients report more exhaustion? Second, we study whether there are differences within the group of healthcare workers who work with COVID-19 patients. Besides, studies on healthcare worker well-being are mainly conducted in Asian context (Cao et al., 2020; Shreffler et al., 2020; Spoorthy et al., 2020; Tan et al., 2020; Zhou et al., 2020). We present data on Dutch healthcare workers to address these gaps.

As healthy healthcare workers are crucial in the aftermath of the outbreak, and in prevention of further outbreaks, losing a substantial part of the workforce to psychological or physical threats is detrimental. Therefore, the results can fuel healthcare organization policies and human resource practices to sustain the mental and physical health of healthcare workers during and after COVID-19.

METHODS

We collected data in a May-June 2020 cross-sectional survey on work and health of Dutch healthcare workers. Healthcare workers were invited *via* email to voluntarily participate in the online survey and they were reminded after a few weeks. To protect their identities, respondents were not asked to give their names and contact information; other potentially identifiable data, such as gender, age, and job type were carefully protected. A total of 7,208 respondents completed our survey. Data used in this article is included as an **Supplementary Material**.

We use four employee well-being measures as dependent variables: a general health measure asking respondents to rate their general health [10-point scale ranging from 1 to 10 (Sullivan and Karlsson, 1998)], mental exhaustion [five items on a 5-point Likert scales ranging from 1 (never) to 5 (always) (daily), example item: I feel mentally exhausted because of my work (Schaufeli, 1996)], physical exhaustion [five items on a 5-point Likert scales ranging from 1 (never) to 5 (always) (daily), example item: I feel physically exhausted because of my work (Schaufeli, 1996)], and sleep problems [three items on a 5-point Likert scales ranging from 1 (no) to 5 (a lot), example item: I have a restless or disturbed sleep (Adriaenssens et al., 2012)].

For our independent variables, we compare the well-being outcomes between groups based on personal and work characteristics. First, we assess whether outcomes differ for healthcare workers who do and do not work in direct contact with COVID-19 patients. Next, within the group of healthcare workers who work with COVID-19 patients, we assess multiple variables to define risk groups of healthcare workers. To do so, we study three personal characteristics: gender, age, and whether the healthcare worker lives alone. For age, we divide our sample into three categories: younger than 36, between 36 and 55, and older than 55. This is a common division of younger, middle-aged and older employees used in academic research as well as governmental research on well-being. It also enables to assess non-linear relationships with well-being. Additionally, we study two important work characteristics: leadership role (whether the healthcare worker indicates to have a leadership role) and sufficient protective equipment (healthcare workers were asked: "do you have sufficient protective equipment at your disposal?"; they could answer with yes or no). In selecting these variables, we have not aimed to be exhaustive, but to constitute a broad picture of factors potentially related to well-being.

Our sample (N = 7,208) is representative for Dutch healthcare workers in terms of gender: our sample has 82% females, while for Dutch healthcare workers this is 84%. However, our sample is older ($\bar{x}$ = 51.5 versus $\bar{x}$ = 42.5) (CBS data from[1]). Furthermore, our respondents represent all healthcare industries: hospitals (36.2%), nursing homes and homecare (23.6%), mental health care (16.5%), disability care (17%) and other healthcare industries (6.7%).

For analyses, we conduct t-tests or ANOVA's, when appropriate. For the ANOVA's we conduct *post hoc* analyses (Tukey's HSD) to define which groups significantly differ. The level of significance is set at 0.05 and Cohen's d effect sizes are calculated (Cohen, 1988). Secondly, as additional analysis, multivariate regression analyses are performed for each of the four well-being variables to gain more understanding on the relative strength with which the variables are related to well-being. The defined groups are included as independent variables. We report adjusted R-squared values for the models and Beta-values to indicate the relative strength of each variable.

RESULTS

We start by contrasting healthcare workers who work in direct contact with COVID-19 patients versus those who do not (**Table 1**). Healthcare workers in direct contact with COVID-19 patients report significantly more sleep problems and physical exhaustion. No significant differences are found for mental exhaustion or general health.

Next, we zoom in within the group of healthcare workers in direct contact with COVID-19 patients (**Table 2**). First, female healthcare workers report more sleep problems and physical exhaustion than male healthcare workers, whilst there are no significant differences on mental exhaustion and general health.

Regarding healthcare workers' age, physical exhaustion is more prevalent among healthcare workers who are older than 55 compared to healthcare workers between 36 and 55 years old. In contrast, mental exhaustion is more prevalent among healthcare workers who are younger than 36, compared to healthcare workers between 36 and 55 years old. There are no significant differences between age categories on sleep problems and general health.

Additionally, we assess whether living alone or with family is correlated with well-being. We find that healthcare workers

[1]https://azwstatline.cbs.nl

who live alone report higher physical and mental exhaustion and lower general health. No significant differences are found for sleep problems.

Next, we consider work characteristics. Healthcare workers without a leadership role are found to be more physically exhausted than healthcare workers who have a leadership role. No significant differences of having a leadership role are found for sleep problems, mental exhaustion and general health.

Finally, is having sufficient protective equipment in working with COVID-19 patients correlated with well-being? We find significant differences for all outcomes: healthcare workers who do not have sufficient protective equipment report more sleep problems, more physical and mental exhaustion, and lower general health.

In additional analysis we conduct multivariate regression analyses per well-being outcome. The analyses yield similar results as above. For sleep problems, gender [reference = female; $\beta = -0.09$, $t(2,614) = -4.49$, $p < 0.05$] and having sufficient protective equipment [ref. = sufficient equipment; $\beta = 0.12$, $t(2,614) = 6.35$, $p < 0.05$] are significant predictors (Adj. $R^2 = 0.024$). For physical exhaustion, gender [$\beta = -0.05$, $t(2,614) = -2.40$, $p < 0.05$], living alone [ref. = not living alone; $\beta = 0.05$, $t(2,614) = 2.49$, $p < 0.05$], being older than 55 [$\beta = 0.07$, $t(2,614) = 3.61$, $p < 0.05$], leadership role [ref. = no leadership role; $\beta = -0.04$, $t(2,614) = -2.11$, $p < 0.05$], and having sufficient protective equipment [$\beta = 0.19$, $t(2,614) = 9.66$, $p < 0.05$] are significant predictors (Adj. $R^2 = 0.045$). For mental exhaustion, living alone [$\beta = 0.05$, $t(2,614) = 2.83$, $p < 0.05$], being younger than 36 [$\beta = 0.06$, $t(2,614) = 2.80$, $p < 0.05$], and having sufficient protective equipment [$\beta = 0.23$, $t(2,614) = 11.97$, $p < 0.05$] are significant predictors (Adj. $R^2 = 0.056$). Finally, for general health, living alone [$\beta = -0.04$, $t(2,614) = -1.97$, $p < 0.05$] and having sufficient protective equipment [$\beta = -0.14$, $t(2,614) = -7.40$, $p < 0.05$] are significant predictors (Adj. $R^2 = 0.021$).

DISCUSSION

In this brief research report we have investigated whether healthcare employees who work with COVID-19 patients report lower wellbeing and whether differences exist within that group.

TABLE 1 | More sleep problems and physical exhaustion for healthcare workers in direct contact with COVID-19 patients.

Direct contact COVID-19 patients		Sleep problems			Physical exhaustion			Mental exhaustion			General health		
	N	$\bar{x}$ (SD)	*t*(7,206)	*d*	$\bar{x}$ (SD)	*t*(7,206)	*d*	$\bar{x}$ (SD)	t(7,206)	*d*	$\bar{x}$ (SD)	*t*(7,206)	*d*
Yes	2,621	2.42 (0.97)	−6.45**	0.159	2.29 (0.82)	−9.21**	0.223	1.98 (0.76)	−0.64	–	7.61 (1.26)	−1.49	–
No	4,587	2.27 (0.91)			2.11 (0.79)			1.97 (0.74)			7.56 (1.31)		

*Cohen's d effect sizes are small (Cohen, 1988). **<0.01.*

TABLE 2 | Differences within the group of healthcare workers who are in direct contact with COVID-19 patients.

		Sleep problems			Physical exhaustion			Mental exhaustion			General health		
	N	$\bar{x}$ (SD)	*t*(2,619)	Cohen's *d*	$\bar{x}$ (SD)	*t*(2,619)	Cohen's *d*	$\bar{x}$ (SD)	*t*(2,619)	Cohen's *d*	$\bar{x}$ (SD)	*t*(2,619)	Cohen's *d*
Gender													
Female	2,201	2.46 (0.97)	4.73**	0.226	2.31 (0.81)	2.73*	0.145	1.98 (0.76)	0.41	–	7.60 (1.24)	−0.59	–
Male	420	2.21 (0.91)			2.19 (0.84)			1.96 (0.77)			7.64 (1.40)		
Age													
<36 years	277	2.36 (0.96)	1.09[c]	–	2.30 (0.80)	6.77**[c]		2.10 (0.83)^	4.41*[c]	0.191[b]	7.61 (1.21)	0.49[c]	–
36–55 years	1,347	2.41 (0.97)			2.23 (0.79)			1.95 (0.74)			7.63 (1.26)		
>55 years	997	2.45 (0.96)			2.36 (0.86)^		0.157[a]	1.98 (0.78)			7.58 (1.29)		
Living alone													
No	2,151	2.41 (0.97)	−1.24	–	2.26 (0.81)	−3.12**	0.158	1.96 (0.75)	−3.18**	0.155	7.64 (1.25)	2.20*	0.112
Yes	470	2.47 (0.95)			2.39 (0.84)			2.08 (0.80)			7.49 (1.32)		
Leadership role													
No	2,199	2.43 (0.96)	1.20	–	2.30 (0.82)	2.51*	0.121	1.98 (0.76)	0.36	–	7.59 (1.26)	−1.75	–
Yes	422	2.37 (0.99)			2.20 (0.83)			1.97 (0.77)			7.71 (1.31)		
Sufficient protective equipment													
No	507	2.67 (1.03)	−6.67**	0.314	2.60 (0.89)	−9.90**	0.466	2.33 (0.84)	−11.98**	0.562	7.24 (1.40)	7.48**	0.352
Yes	2,114	2.36 (0.94)			2.21 (0.78)			1.89 (0.72)			7.70 (1.21)		

*Cohen's d effect sizes are small to medium (Cohen, 1988). *p < 0.05; **p < 0.01. ^, significantly different from healthcare workers between 36 and 55 years; a, effect size between age categories 36–55 years and >55 years; b, effect size between age categories <36 years and 36–55 years; c, F-test (df = 2,618).*

Our results confirm that healthcare workers who treat COVID-19 patients experience more sleep problems and physical exhaustion compared to healthcare workers who do not treat COVID-19 patients. Furthermore, some personal and work characteristics present higher well-being risks.

In the light of the extant literature it should be acknowledged that in our study, effects are small to medium. In some of the other contexts, wellbeing appears to have decreased more drastically (Shreffler et al., 2020). What is more, mean scores still appear relatively acceptable (e.g., the lowest group score for general health is 7.24). This may point to the fact that the Netherlands has a relatively well organized healthcare system (Daley et al., 2013). Nevertheless, our study contributes to the literature by, firstly, comparing effects across groups of healthcare workers, and secondly, presenting data from a non-Asian context.

There are a few limitations to discuss. First, whilst we employ validated scales, due to practical constraints in executing our survey we were not able to use clinical validated scales. Second, our data is collected in May-June 2020, right after the "first peak," and the COVID-19 crisis as well as effects on well-being have developed since. Similarly, our cross-sectional design limits causal inference. Ergo, future research can improve on our current design by using validated tests, and employing longitudinal designs to track healthcare worker well-being over time.

Considering the practical implications of our study, we urge healthcare leaders, managers, and HR professionals to maintain healthcare worker well-being. Whilst a pandemic is hard to control, there are best practices on how to help healthcare workers deal with the consequences through, for example, job redesign, counseling, a behavioral health hotline, stress management webinars, respite rooms and creating celebratory rituals (Wei et al., 2020). Herein, our results show healthcare leaders should pay special attention to the groups of healthcare workers who appear disproportionally affected regarding either general health, physical or mental well-being, or sleep. Additionally, our results may fuel a number of questions to be discussed. For example, should more vulnerable healthcare workers (e.g., elderly female) be less actively deployed among COVID-19 patients? Which job resources help healthcare workers to deal with COVID-19 stressors including threats of infection, insecurity, work pressure, emotional demands, and work-family conflict (Foley et al., 2020; Kniffin et al., 2020)? How can healthcare workers be stimulated to share leadership to actively improve their own working conditions? The results also emphasize the grave importance of sufficient protective equipment. In conclusion, healthcare leaders are required to actively anticipate the evolution of this pandemic in order to maintain healthcare worker well-being; studies like these may help them to do just that (Torbay, 2020).

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included as **Supplementary Material**, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Faculty Ethical Review Committee of Utrecht University. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.625626/full#supplementary-material

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Assessing the Transitional Impact and Mental Health Consequences of the COVID-19 Pandemic Onset

Eamin Z. Heanoy[1], Liangzi Shi[2] and Norman R. Brown[1]*

[1]Department of Psychology, University of Alberta, Edmonton, AB, Canada, [2]Department of Psychology, College of New Caledonia, Prince George, BC, Canada

In this article, we report the results of a survey of North American adults (n = 1,215) conducted between March 24 and 30, 2020 at the onset of the COVID-19 pandemic. Respondents completed the COVID-TIS (Transitional Impact Scale-Pandemic version) and the 21-item Depression, Anxiety, and Stress Scale (DASS), indicated their level of COVID-infection concern for themselves and close others, and provided demographic information. The results indicated: (a) during its early stage, the pandemic produced only moderate levels of material and psychological change; (b) the pandemic produced mild to moderate levels of psychological distress; (c) respondents who lost their jobs as a result of the pandemic experienced more change and more psychological distress than those who did not, and (d) younger respondents and less well-educated ones experienced more psychological distress than older respondents. Unexpectedly, (e) respondents indicated that they were more concerned that friends and family members would become infected with COVID-19 than that they would be. We conclude by speculating that these results are driven less by the immediate changes brought about by the pandemic and more by uncertainty concerning its long-term economic and social impact.

Keywords: COVID-19, depression, anxiety, stress, mental well-being, transition theory

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****Correspondence:***
Eamin Z. Heanoy
heanoy@ualberta.ca

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INTRODUCTION

In this article, we report the results of a survey conducted between March 24 and 30, 2020, less than 2 weeks after the World Health Organization (WHO) officially labeled the COVID-19 as a pandemic on March 11, 2020, and within 3 days of the United States (US)–Canada border being closed to non-essential travel on March 21, 2020 (World Health Organization, 2020). This was also about the time, in North America, when learning and office work was moving on-line, retail establishments were closing, and the pandemic was coming to dominate the news cycle and social interactions. At that time, it was already clear that the pandemic was changing peoples' lives. What was less clear was *how* the pandemic was changing those lives. Thus, our survey was designed to assess: (a) the extent and nature of the changes caused by the pandemic, (b) the effect of the pandemic on people's mental health, and (c) the degree to which the two were related. We were also interested in understanding, at that early stage in the pandemic, (d) how concerned people were with becoming infected with the coronavirus

and whether they were more concerned for themselves than they were for their family and friends.

The project takes Transition Theory (Brown et al., 2012, 2016; Brown, 2016; Brown, unpublished) as its starting point. According to this theory, a transition is an event or series of events that causes fundamental changes in the "the fabric of daily life" – what people do, where they do it, and with whom. In addition to affecting their material circumstances, major life transitions also influence people's behavior, their mental states (e.g., their attitude, thoughts, and sense of self), and their physical and emotional well-being (Holmes and Rahe, 1967; Wyler et al., 1971; Sarason et al., 1978; Wheaton, 1990; Turner and Wheaton, 1995; Rutter, 1996; Tennant, 2002; Svob, et al., 2014). From this perspective, the pandemic, even during its early stages, could be seen as a potentially very important, possibly the largest collective transition, one that needed to be documented from its start and followed as it evolved.

In the past few years, researchers in the field have been using Transitional Impact Scale (TIS-12, Svob et al., 2014; Nourkova and Brown, 2015; Shi and Brown, 2016; Gu et al., 2017; Uzer, 2020; Uzer et al., 2020) to measure the impact of candidate transitional events on people's lives. TIS consists of 12 items, evaluating material and psychological impacts separately. In response to each item, such as "This event has changed the activities I engage in," participants rated their agreement on a five-point Likert scale. Theoretically, an event that scores higher than three (neutral) would indicate at least a moderate life impact. More generally, major transitions, i.e., ones that have been found to define important lifetime periods, elicit TIS scores of 4.0 or above (Nourkova and Brown, 2015; Uzer and Brown, 2015; Gu et al., 2017; Uzer et al., 2020; Uzer, 2020).

To measure transitional impacts, we need to also consider individual differences. For example, starting university might be a more impactful transition for "dormies" (university students who left home and came to live in a university dormitory) than for "homies" (university students still living with their parents). Relocation might be a more influential transition for people immigrating from one country to another than those who are relocating from one city to another city within the same state or province. Likewise, we expected that the pandemic would affect some people more than others. Specifically, one of the striking aspects of the pandemic, in its early phase, was widespread job loss. It seemed reasonable to expect that people who had lost their jobs would, on average, experience greater COVID-related change than those who had not and that this would be reflected in higher TIS ratings. We note that the data reported in this article were collected over the web from a large convenience sample (n = 1,215). It turned out that a relatively large number of respondents (n = 187; 15.4%) indicated that they had lost their jobs as a direct result of the pandemic. This made it possible to test the prediction that job loss would amplify the (negative) effects of the pandemic (Cobb and Kasl, 1977; Dooley and Catalano, 1980; Caplan et al., 1989).

In the present study, we intended to determine how the pandemic was affecting people's lives during its early stage. Intuitively, we expected that individuals, at least those who had not lost their jobs, would not produce high TIS scores for material change because the pandemic appeared to have altered their lives by narrowing them – by limiting what they could do and where they could do it. We had no firm prediction concerning the responses to the TIS questions used to assess the psychological impact of the pandemic. On the one hand, prior research had found that material change and psychological change were often positively correlated (Holmes and Rahe, 1967; Wyler et al., 1971; Sarason et al., 1978; Turner and Wheaton, 1995; Svob et al., 2014; Gu et al., 2017). On the other hand, the pandemic appears to be unprecedented in its scope and in the ways that societies have reacted to it (e.g., lockdowns, self-isolation, crashing financial markets, and historically high levels of unemployment). It seemed possible that people may have responded to these exceptional times by revising their beliefs about the world and themselves. If so, we should expect at least moderate levels of psychological change.

Prior studies have shown that major life transitions have a strong effect on mental health (Holmes and Rahe, 1967; Wheaton, 1990; Rutter, 1996; Tennant, 2002). During the pandemic, people were already facing economic uncertainty, fear of infection, social isolation, and school- and work-related disruptions, and that these issues are related to negative mental health outcomes (Fitzpatrick et al., 2020; Tull et al., 2020; Zandifar and Badrfam, 2020). Therefore, we anticipated that relatively high levels of depression, anxiety, and stress would be reported in our sample, especially from those whose lives were directly impacted by the pandemic (i.e., job loss).

In addition to the transitional impact of the pandemic and its effect on mental health, we were also interested in how concerned people were that they would be infected by the coronavirus and how concerned they were that others they know might be. We included infection-concerns questions to gauge the level of COVID-specific fear in our sample and to determine whether this form of fear was related to the psychological change experienced by our respondents and to their current levels of depression, anxiety, and stress.

To sum up, we measured the transitional impact of the COVID-19 pandemic, its relation to mental health, and people's concerns as functions of job status, age, and education. Job-status (job loss vs. no loss) served as a fixed factor in all the analyses. We selected age and education as covariates because older adults were the group at risk for COVID-19 (Bruine de Bruin, 2020; Salari et al., 2020; Swinford et al., 2020), and because people with higher education might have more resources to cope with stress and economic issues. Indeed, several recent studies (Ellett et al., 2003; Taylor et al., 2008; Westerhof and Keyes, 2010; Cheng et al., 2014; Bruine de Bruin, 2020; Hyland et al., 2020; Lopes and Jaspal, 2020; Qiu et al., 2020; Salari et al., 2020; Wang et al., 2020a,b) have found that young people and less educated people have experienced more COVID-related psychological distress than older people and better-educated people. We analyzed the DASS data with the expectation that they would provide a replication of the age and education effects.

MATERIALS AND METHODS

Participants

Overall, 1,506 individuals (from 37 countries) completed the survey. We restricted the analyses to Canadian (n = 942) and American (n = 273) respondents because we intended to investigate the pandemic at its early stage, and the pandemic had a different time course in different countries. In addition, the majority of the respondents were from Canada (62.5%) and the US (18.1%). The demographic characteristics of this Canada–U.S. sample are reported in **Table 1**.

Materials

Transitional Impact Scale (COVID-TIS)

We used a modified version of the TIS-12 (Svob et al., 2014), the COVID-TIS, to assess the type and degree of change brought about by the COVID-19 pandemic. We modified the original scale in two ways: First, we replaced "this event" in all the statements with "COVID-19 pandemic." Second, we removed two items, "This event has changed where I live," and "This event has impacted me psychologically." The first was dropped because respondents were asked the following question at the end of the survey: "Did you move from one residence to another as a direct consequence of the COVID-19 pandemic?" We removed the second item from the TIS because we were using a separate psychological measure, a 21-item DASS scale, to assess specific mental health consequences of the pandemic. The final COVID-TIS scale consists of 10 items (see **Table 2**); five items load on a material-change subscale, and five on a psychological-change subscale. Participants rated their agreement with each statement on a 1 (*strongly-disagree*)-to-5 (*strongly agree*) scale. The pandemic's overall material impact was calculated by averaging the ratings of the five material items and its overall psychological impact was calculated by averaging the ratings of the five psychological items.

TABLE 1 | Demographic characteristics of North American sample (N = 1,215).

Demographic variable	Statistics
Age (*M, SD*)	40.17 (15.83)
Gender (*n, %*)	
Female	930 (76.5%)
Male	272 (22.4%)
Other	13 (1.1%)
Education level (*n, %*)	
Less than high school	9 (0.7%)
Highschool or equivalent	212 (17.4%)
Associate	113 (9.3%)
Undergraduate	394 (32.4%)
Graduate or above	487 (40.1%)
Job (*n, %*)	
Job loss	187 (15.4%)
No job loss	1,028 (84.6%)

The factor of relocation was not included for analyses due to a small number of respondents in the relocated group (n = 87, 6.7%).

For the current sample, the internal consistency coefficient of COVID-TIS was 0.76 (Cronbach's $\alpha_{material}$ = 0.60; Cronbach's $\alpha_{psychological}$ = 0.81). Corrected item-total correlation for the TIS scale ranged between 0.30 and 0.60.

Depression, Anxiety, and Stress Scale

This 21-item scale consists of three self-report measures and assesses the negative related emotional states of depression, anxiety, and stress (Lovibond and Lovibond, 1996). Each of the three subscales contains seven items. Participants rated each item on a 0 (*did not apply to me at all*)-to-3 (*applied to me very much or most of the time*) scale. For the current sample, the internal-consistency coefficient of the DASS was 0.94 (Cronbach's $\alpha_{depression}$ = 0.90; Cronbach's $\alpha_{anxiety}$ = 0.83; Cronbach's α_{stress} = 0.88). Corrected item-total correlation for the 21-item DASS scale ranged between 0.40 and 0.75.

Also, data were collected to capture the demographic characteristics (e.g., gender, age, education, and residential location). We also asked respondents to indicate whether they had lost their job because of the pandemic.

In two separate questions, participants also rated the infection concerns for themselves (*I am concerned that I might become infected with the novel coronavirus.*) and people they know (*I am concerned that close friends and family members might become infected with the novel coronavirus.*) on a Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

At the end of the survey, respondents were provided with an opportunity to describe how they have been impacted by the pandemic. We mention this for the sake of completeness. However, these open-ended responses are not discussed further in this article.

Procedure

Only people who were 18 years and above were eligible to participate in the study. A snowball sampling strategy was used during participant recruitment. The online survey was disseminated over academic channels (e.g., institution email lists and websites) and social media. The recruitment advertisement contained an URL link to the questionnaire and participants could take the survey at their own pace. At the end of the survey, participants could choose whether they would take part in a follow-up. Participation was strictly voluntary; respondents were not compensated in any way for their cooperation. Only surveys that were completed in their entirety were included for the analysis. Expedited ethics approval was obtained from the Research Ethics Board of the University of Alberta (Pro00099336).

RESULTS

Transitional Impact

Table 2 shows the mean TIS ratings, DASS scores, and infection concern responses for the sample as a whole and presented as a function of job loss. These data make several

TABLE 2 | Average ratings on COVID-TIS and infection-concern (self and others) from 1 (Strongly Disagree) to 5 (Strongly Agree), and sub-scores of depression, anxiety, and stress scale (DASS) produced by participants with job loss (n = 187) and no job loss (n = 1,028).

	Job loss		No job loss		Overall	
	M	**95% *CI***	***M***	**95% *CI***	***M***	**95% *CI***
Material subscale* **	3.20	[3.09, 3.32]	2.94	[2.89, 2.99]	2.98	[2.93, 3.03]
I spend my time in difference places now than I did before the COVID-19 Pandemic.	3.36	[3.14, 3.59]	3.33	[3.23, 3.42]	3.33	[3.25, 3.42]
I own different things now than I did before the COVID-19 Pandemic.	2.01	[1.84, 2.17]	1.98	[1.91, 2.05]	1.98	[1.92, 2.05]
My material circumstances now are different than they were before the COVID-19 Pandemic* **	3.53	[3.35, 3.71]	2.62	[2.54, 2.71]	2.76	[2.68, 2.84]
The activities I engage in now are different from the ones I engaged in before the COVID-19 Pandemic.	4.08	[3.93, 4.23]	3.93	[3.86, 4.00]	3.95	[3.89, 4.01]
The people I spend time with now are not the same people I spent time with before the COVID-19 Pandemic.	3.04	[2.84, 3.25]	2.84	[2.76, 2.92]	2.87	[2.79, 2.95]
Psychological Subscale* **	3.40	[3.27, 3.53]	3.08	[3.02, 3.13]	3.13	[3.07, 3.18]
My current attitudes are different than the attitudes I held before the COVID-19 Pandemic* **	3.68	[3.50, 3.86]	3.31	[3.23, 3.39]	3.37	[3.30, 3.44]
I think about things differently now than I did before the COVID-19 Pandemic. **	3.98	[3.82, 4.14]	3.67	[3.59, 3.74]	3.71	[3.65, 3.78]
My emotional responses now are different than they were before the COVID-19 Pandemic **	3.68	[3.51, 3.86]	3.38	[3.31, 3.46]	3.43	[3.36, 3.50]
My sense of self now is different than it was before the COVID-19 Pandemic.* **	3.39	[3.20, 3.58]	2.92	[2.83, 3.00]	2.99	[2.91, 3.06]
My understanding of right and wrong now is different than it was before the COVID-19 Pandemic.	2.27	[2.09, 2.44]	2.10	[2.03, 2.17]	2.13	[2.06, 2.19]
TIS total* **	3.30	[3.20, 3.40]	3.01	[2.96, 3.05]	3.05	[3.01, 3.09]
Infection-concern (Self)	3.31	[3.13, 3.49]	3.43	[3.35, 3.50]	3.41	[3.34, 3.48]
Infection-concern (Others)	4.21	[4.06, 4.36]	4.15	[4.09, 4.23]	4.16	[4.10, 4.22]
DASS-Depression* **	8.99	[8.23, 9.75]	7.37	[7.05, 7.69]	7.62	[7.30, 7.93]
DASS-Anxiety* **	6.24	[5.60, 6.89]	4.59	[4.32, 4.86]	4.84	[4.58, 5.11]
DASS-Stress*	10.02	[9.23, 10.81]	9.07	[8.74, 9.40]	9.22	[8.90, 9.53]

Significant between-group effects are marked with. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.*

points. First, at least during its early stage, the pandemic did not appear to have produced a radical change in the lives of most respondents. Overall, the TIS scores were not very high; collapsing over groups, the average for the material TIS was 2.98, 95% *CI* = [2.93, 3.03] and the average psychological TIS was 3.13, 95% *CI* = [3.07, 3.18]. By way of comparison, Shi and Brown (2016) found that emigration from China to Canada produced mean material and psychological TIS scores of 4.52 and 4.05, respectively. Second, as predicted, people who lost their jobs as a result of the pandemic indicated that they had experienced more change than those who did not, and this was true for both material change and psychological change. That being said, except for the generic material-change item (see **Table 2**), between-group differences on the TIS-material items tended to be small or non-existent. In contrast, except for the right-and-wrong item, the job-loss group provided notably higher ratings on the individual TIS-psychological items than the no-job-loss group. Third, as implied by Cronbach's α and consistent with the types of adjustments required by a lockdown, the pandemic altered some aspects of people's lives more than others. In particular, the TIS-material ratings indicate that the pandemic affected people's activities and to a lesser extent changed where they spent their time. These item differences reflect the fact that the lockdown restricted the range of activities people could engage in and the locations they could visit. Finally, we note that the psychological TIS ratings indicated that the pandemic, even in this early stage, affected people's perceptions, attitudes, emotions, and to some extent their sense of self, but not their sense of right and wrong.[1]

These claims are supported by a set of analyses performed separately on the material TIS responses and psychological TIS responses. In both, we conducted a repeated-measures analysis of covariance (ANCOVA) with job status as the between-subject factor, item (i.e., the individual material and psychological TIS questions) as the within-subject factor, and age and education level as covariates. The ANCOVA on material TIS responses produced a reliable main effects of both job status, F (1, 1,213) = 17.16, $p < 0.001$, partial $\eta^2 = 0.01$, and item, F (4, 4,570) = 25.37, $p < 0.001$, partial $\eta^2 = 0.02$, and a reliable item × job status interaction, F (4, 4,570) = 12.51, $p < 0.001$, partial $\eta^2 = 0.01$. We examined the simple main effects regarding the significant interaction and found a reliable effect of job status on "material circumstances," F (1,1,213) = 73.34, $p < 0.001$, partial $\eta^2 = 0.06$. *Post hoc* pairwise comparisons with Bonferroni correction showed that the job-loss group rated the "activities" item the highest and the "things" item the lowest, all $p < 0.001$, except for the difference between 'places' and 'material circumstances' ($p = 1.00$) and between "places" and "people" ($p = 0.17$). Likewise, the ratings for the no-job-loss group, from the highest to the lowest, were "activities," "places," "people,"

[1]"The right-and-wrong" item is included to assess the impact of a target event on a personal ethical/moral believes, which is a part of people's psychological element.

"material circumstances," and "things," all $p < 0.001$. Neither covariate played a significant role in this analysis, $p > 0.05$ for both.

The ANCOVA on psychological TIS responses also produced a reliable main effect of job status, F (1, 1,211) = 10.61, p = 0.001, partial η^2 = 0.01, and a main effect for item, F (4, 4,352) = 37.10, $p < 0.001$, partial η^2 = 0.03. The item × job status interaction, however, was not significant, F (4, 4,352) = 1.90, p = 0.12, partial η^2 = 0.002. The job-loss group rated higher in each item than the no-job-loss group but job status difference (job-loss vs. no-job-loss) in overall psychological TIS score did not depend on the rating of each item; that being said, the same job status difference would be seen for all psychological TIS items. For both groups, the ratings of each item from the highest to the lowest were "thinking about things," "emotional responses," "attitudes," "the sense of self," and "right and wrong." *Post hoc* pairwise comparisons with Bonferroni correction indicate that all between-item differences were reliable ($p < 0.001$) except for the difference between the "emotional responses" item and the "attitudes" item.

The two covariates, age and education level, produced reliable effects on the psychological TIS responses, both $p < 0.05$. When we collapsed across items and divided respondents into a younger group (18–40 years old; n = 706), a middle age group (41–60 years old; n = 328), and older group (at least 61 years old, n = 181), we found that participants in the youngest group reported more psychology change (M = 3.23, 95% CI = [3.16, 3.30]) than the middle aged (M = 3.01, 95% CI = [2.91, 3.11]), $p < 0.05$, and older group (M = 2.93, 95% CI = [2.76, 3.08]), $p < 0.05$; the middle aged and older groups did not differ reliably from one another, p = 0.94. When we collapsed across items assigned respondents to groups based on education, we found that respondents who had less than a university/college degree (n = 334) reported more psychological change (M = 3.30, 95% CI = [3.20, 3.40]) than those who had at least finished university/college (n = 881, M = 3.06, 95% CI = [3.00, 3.12]), $p < 0.001$.

Infection Concern Ratings

Overall, infection concern ratings indicated people were less concerned that they would become infected themselves (M = 3.41, 95% CI = [3.34, 3.48]) than that their friends and family members would become infected (M = 4.16, 95% CI = [4.10, 4.22]; see **Table 2**). This observation was confirmed through a repeated measures ANCOVA, using job status as the between-subject factor, infection concern rating (self vs. others) as the within-subject factor, and age and education level as covariates. The analysis yielded a highly reliable main effect of the item (self vs. other), F (1, 1,211) = 96.69, $p < 0.001$, partial η^2 = 0.07. The main effect of job status was not significant, F (1, 1,211) = 0.13, p = 0.72, partial $\eta^2 < 0.001$, but the job status × item interaction was F (1, 1,211) = 5.08, p = 0.02, partial η^2 = 0.004. Nonetheless, we looked into the simple main effects of the interaction and found no significant effect of job status on the infection-concern items (all $p > 0.05$); both job-loss and no-job-loss group indicated greater infection concern for others than for self (both $p < 0.001$). Also, no reliable effects of age and education level were found for the infection concern items (both $p > 0.05$).

The bubble plot (see **Figure 1**) provides a perspective on this finding. The bubbles represent the percentage of respondents that provided a particular pair of ratings (1 = *strongly disagree*; 5 = *strongly agree*) for the self and other infection-concern items. For example, the bubble in the upper right-hand corner represents the percentage of individuals who provided a rating of 5 to both questions. What is striking about these data is how few respondents indicated greater concern for themselves than for others; only 4% of the responses fell below the diagonal (indicating greater concern for self). In contrast, 51% of the responses fell above the diagonal (indicating greater concern for others).

Depression, Anxiety, and Stress

Mean DASS scores for the job-loss and the no-job-loss groups are presented at the bottom of **Table 2**. Overall, these scores indicate that individuals who responded to our survey were moderately depressed, mildly anxious, and mildly stressed.[2] To investigate the effect of job-loss on peoples' mental health, we ran a multivariate ANCOVA on the ratings of depression, anxiety, and stress, with job status as the fixed factor, and age and education level as covariates. As predicted, and consistent with prior research (Cobb and Kasl, 1977; Dooley and Catalano, 1980; Caplan et al., 1989), respondents in the job-loss group indicated

[2]According to the manual for 21-item DASS (Lovibond and Lovibond, 1996), the cut-off score for normal, mild, and moderate depression are 0–4, 5–6, and 7–10, respectively. For anxiety the cut-offs are 0–3, 4–5, 6–7 representing normal, mild, and moderate; and for stress it is 0–7, 8–9, and 10–12 defining normal, mild, and moderate individually.

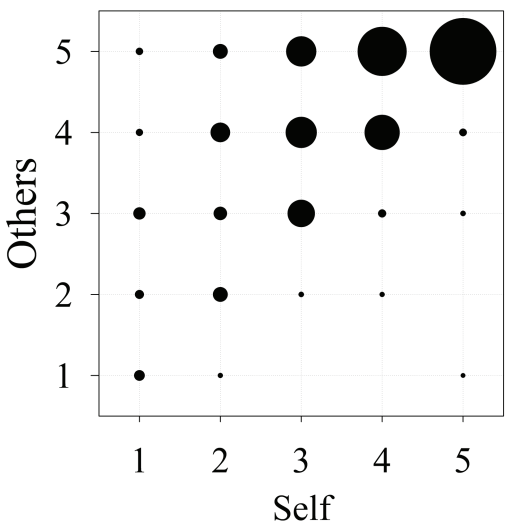

FIGURE 1 | Bubble size indicates percentage of respondents providing a specified pair of ratings for the concern-for-other question (Y-axis) and the concern-for-self question (X-axis).

that they were more depressed, F (1, 1,211) = 14.67, $p < 0.001$, partial $\eta^2 = 0.01$, more anxious, F (1, 1,211) = 21.23, $p < 0.001$, partial $\eta^2 = 0.02$, and more stressed, F (1, 1,211) = 4.68, $p = 0.03$, partial $\eta^2 = 0.004$, than respondents in the no-job-loss group.

Figure 2 illustrates the effects of age (Panel A) and education level (Panel B) on the three DASS variables. In Panel B, compared to better-educated individuals, less educated individuals were more depressed and more anxious, both $p < 0.001$, but not more stressed, $p = 0.35$. This general pattern replicates prior research (Ellett et al., 2003; Taylor et al., 2008; Lopes and Jaspal, 2020; Wang et al., 2020a,b), Also, as predicted and consistent with prior research (Taylor et al., 2008; Westerhof and Keyes, 2010; Cheng et al., 2014; Bruine de Bruin, 2020; Hyland et al., 2020; Lopes and Jaspal, 2020; Qiu et al., 2020; Salari et al., 2020), we found that younger respondents scored higher on the three DASS subscales than older respondents DASS (Panel A), all $p < 0.001$.

Predictors of DASS

Table 3 presents a correlation matrix that includes all the variables discussed above. The younger participants tended to have a low level of education, reported greater concerns about their family members and friends, have experienced greater material and psychological changes due to the pandemic and produced higher ratings of depression, anxiety, and stress. With higher education levels, participants indicated less psychological impact and fewer mental problems. Given that many of these correlations were in the moderate range and given our interest in understanding the relation between COVID-related factors and negative mental health outcomes, we conducted a set of regressions, one for each of the three DASS measures. Specifically, for each DASS variable, we fitted a multiple linear regression model, using the full set of available variables – age, education level, COVID-TIS material and psychological ratings, self, and other infection-concern ratings. These variables were entered hierarchically with age and education entered first as control variables. The output of these analyses is presented in **Table 4**. These regressions indicated that depression and stress were both predicted by material change, psychological change, and concern for others, but not by concern for self. Anxiety was also predicted by psychological change, concern for others, and concern for self, but not by material change.

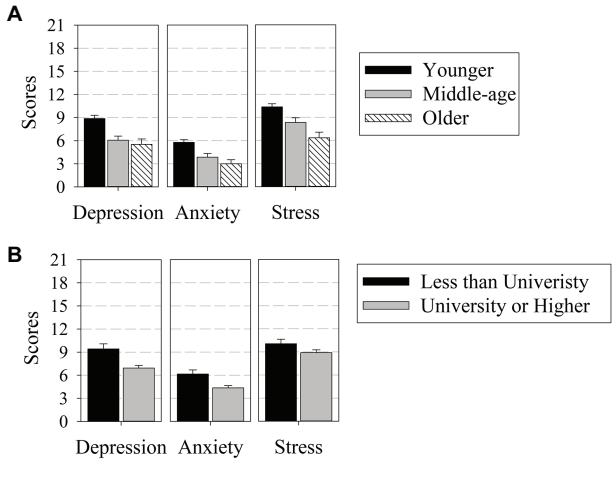

FIGURE 2 | Mean DASS ratings provided by participants of different age groups **(A)** and education level **(B)**. Error bars indicate 95% CIs.

DISCUSSION

This study examined the transitional impact of the COVID-19 pandemic and its effect on people's mental health during the initial stage of the outbreak in North America (i.e., Canada and US). As predicted, people who lost their job due to the pandemic experienced a greater change in their material and psychological condition, and higher levels of depression, anxiety, and stress than those who did not. Moreover, younger adults were more depressed, anxious, and stressed compared to middle-aged and older adults. Likewise, less well-educated people indicated that they were more troubled by the pandemic than better-educated people. Surprisingly, people showed more infection concern for their family and friends than for themselves, regardless of their job status, age, or level of education. Material and psychological change, and infection concern for close others were associated with depression and stress while anxiety was associated with psychological change and concern for both self and others contracting the and infection. These findings

TABLE 3 | Correlation matrix of age, education level, infection-concerns, COVID-TIS, and DASS.

	Education	Concern-self	Concern-others	TIS-material	TIS-psychological	TIS-total	DASS-depression	DASS-anxiety	DASS-stress
Age	0.35**	0.04	−0.12**	−0.07*	−0.15**	−0.13**	−0.31**	−0.26**	−0.25**
Education		0.002	−0.03	0.003	−0.17**	−0.08**	−0.22**	−0.19**	−0.10**
Concern-self			0.60**	0.16**	0.23**	0.24**	0.12**	0.26**	0.19**
Concern-others				0.17**	0.26**	0.27**	0.23**	0.31**	0.28**
TIS-material					0.32**	0.78**	0.18**	0.21**	0.20**
TIS-psychological						0.85**	0.41**	0.47**	0.44**
TIS-total							0.36**	0.42**	0.41**
DASS-depression								0.63**	0.68**
DASS-anxiety									0.73**

*Significant Spearman's correlation coefficients are marked with *. *p < 0.05; **p < 0.01; ***p < 0.001.*

TABLE 4 | Hierarchical regression results for DASS.

	B	95% CI		*SE B*	*β*	R^2	Δ R^2	*F*
		Lower bound	Upper bound					
Depression						0.24		63.15***
Step 1: control variables (demographic)							0.11***	
Age	−0.07	−0.08	−0.05	0.01	−0.19***			
Education	−0.74	−0.99	−0.48	0.13	−0.15***			
Step 2: TIS subscale							0.12***	
Material	0.37	0.01	0.73	0.18	0.05*			
Psychological	1.81	1.49	2.13	0.16	0.31***			
Step 3: Infection concern							0.01**	
Self	−0.21	−0.50	0.08	0.15	−0.05^{ns}			
Friends and Family	0.61	0.26	0.95	0.18	0.11**			
Anxiety						0.29		81.28***
Step 1: control variables (demographic)							0.08***	
Age	−0.05	−0.06	−0.03	0.01	−0.16***			
Education	−0.48	−0.69	−0.28	0.11	−0.12***			
Step 2: TIS subscale							0.18***	
Material	0.27	−0.03	0.56	0.15	0.05^{ns}			
Psychological	1.74	1.48	1.10	0.13	0.36***			
Step 3: Infection concern							0.03***	
Self	0.43	0.20	0.66	0.12	0.11***			
Friends and Family	0.40	0.12	0.68	0.14	0.09**			
Stress						0.28		69.79***
Step 1: control variables (demographic)							0.07***	
Age	−0.07	−0.10	−0.05	0.01	−0.20***			
Education	−0.04	−0.30	0.21	0.13	−0.01^{ns}			
Step 2: TIS subscale							0.17***	
Material	0.39	0.03	0.75	0.18	0.06*			
Psychological	2.12	1.80	2.43	0.16	0.36***			
Step 3: Infection concern							0.02***	
Self	0.11	−0.18	0.40	0.15	0.02^{ns}			
Friends and Family	0.63	0.29	0.98	0.18	0.12***			

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
^{ns}*not significant.*

raise two interesting questions: one concerns the relationship between the transitional impact of the pandemic and the distress it appears to have caused, and the other concerns the strong tendency for people to rate their concern for others higher than their concern for themselves. We take up these questions below.

First, it is clear from the TIS data that the pandemic, in its early stage, did not produce a marked change in people's material circumstances. In other words, at the time, people were not dealing with calamitous changes to their living situation.[3] Yet, we found elevated levels of depression, anxiety, and stress and a relatively strong link between these measures of psychological distress and the degree of psychological change caused by the pandemic. Perhaps, the simplest way to explain this pattern is to recognize that the pandemic has engendered a great deal of uncertainty and uneasiness about the future (McGinty et al., 2020; Zandifar and Badrfam, 2020) and to assume that this type of uncertainty can have a negative impact on people's mental health and their worldview (Torales et al., 2020). Consistent with this position, we found that the young, the unemployed, and the under-educated – groups with the least financial security – experienced the most psychological distress and reported the most psychological change. Going forward, at a minimum, we expect that current levels of psychological distress will persist for the duration of the pandemic. We can also predict that the level of psychological distress will increase sharply when programs like Canada Emergency Response Benefit (CERB), Canada Emergency Student Benefit (CESB), and Unemployment Insurance, Coronavirus Aid, Relief, and Economic Security (CARES), and Coronavirus Relief Fund (CRF) in the US are defunded and evictions, foreclosures, and bankruptcies become more common (Bloomberg Opinion Editorial Board, 2020; Goodman, 2020; Irwin, 2020).[4]

[3]When the survey was conducted in late March 2020, Canadians and Americans were being cushioned against the negative impact of the Pandemic by policies that provided economic support for the unemployed and deferred rent and mortgage payments.

[4]In terms of the measures collected in this present study, defunding federal financial support programs should produce a sustainably increase in material TIS ratings, the psychological TIS ratings and the DASS scores. It should also cause the two TIS scores to be more highly correlated. Importantly, the Material TIS rating should become a robust predictor of the DASS, indicating that the people are reacting to the negative consequences of their changing live circumstances rather than to their concerns about an uncertain future.

As in for the infection concern findings, we believe that there are two factors at play. First, people were likely to believe that they can control, to some degree, the risks they would take on. However, they might recognize that they cannot control the risk-taking behavior of others (Choi et al., 2020; Korajlija and Jokic-Begic, 2020). Therefore, they are less concerned for themselves than they are for others in their circle. Second, recall that respondents were asked to consider "close friends and family members" when rating the concern-for-others item; it seems likely that most people know people who fall into one of the high-risk categories (e.g., people in their 70s or older, people with pulmonary issues, etc.; Swinford et al., 2020). If the concern-for-other response is anchored by the status of the most vulnerable person in a person's social network, it follows that the concern-for-other responses should, on average, be higher than the concern-for-self responses.

Limitation

Due to the time-sensitive nature of the COVID-19 outbreak, we adopted a convenient sampling strategy. As a result, there was an oversampling of a certain network of peers (e.g., students and academics), leading to selection bias. Thus, caution is required when generalizing these findings, particularly the aggregate means. That being said, we have reason to believe that the relational findings (i.e., the strong correlations between the Psychological TIS scores and the DASS scores) would be generalized to a representative sample and as we have noted throughout the presentation of these data, a number of our findings are consistent with those reported by other research teams (e.g., the relation between age and depression). We also take a note that only age and education covariates have been included in the analysis and there might be other covariates such as- socioeconomic status, gender etc., that could have had a role on explaining the outcome. Finally, it would be useful, going forward, to collect data that would allow us to test the hypothesis that it is uncertainty about the future, rather than (or in addition to) changes in one's current living situation, which accounts for the COVID-related increases in depression, anxiety, and stress.

CONCLUSION

Looking back at the onset of the COVID-19 pandemic, we remember the early days of lockdown as a time of change and emotional upheaval. Yet our data paint a somewhat different picture. It is true, many people experienced a change in their routines, but these changes were not typically life-altering. Likewise, people reported elevated levels of psychological distress, but not extreme levels of psychological distress. The picture may well have been different had we been able to focus on hot spots (e.g., metropolitan New York) or particularly vulnerable populations (e.g., frontline healthcare workers). Nonetheless, we believe that it is important to recognize that there is often a gap, sometimes a very wide gap, between our immediate emotional response to a crisis and the way that crisis affects our lives (Brown et al., 2009; Brown and Lee, 2010). Therefore, we believe that it will be interesting and useful to follow the pandemic over time as some people habituate to a set of relatively minor adjustments to their routines and others contend with devastating life changes.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available after the authors have completed a multi-wave data collection protocol and have published their findings.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Research Ethics Board, University of Alberta (Pro00099336). Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

EH and NB were involved in developing the study design. EH oversaw data collection. The analysis was done by EH, LS, and NB. Manuscript preparation was done by EH, LS, and NB. All authors contributed to the article and approved the submitted version.

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Early and Mid-Term Implications of the COVID-19 Pandemic on the Physical, Behavioral and Mental Health of Healthcare Professionals: The CoPE-HCP Study Protocol

Mohammed Y. Khanji[1,2,3], Carmela Maniero[1,3], Sher NG[1,3], Imrana Siddiqui[4,5,6], Jaya Gupta[7], Louise Crosby[1,2], Sotiris Antoniou[1], Rehan Khan[1], Vikas Kapil[1,3] and Ajay Gupta[1,3]**

[1] Barts Heart Centre, St. Bartholomew's Hospital, Barts Health NHS Trust, London, United Kingdom, [2] Newham University Hospital, Barts Health NHS Trust, London, United Kingdom, [3] William Harvey Research Institute, Queen Mary University London, London, United Kingdom, [4] Woodgrange Medical Practice, London, United Kingdom, [5] Wellbeing Hub, Newham Training Hub, London, United Kingdom, [6] Waltham Forest and East London (WEL) CCGs, London, United Kingdom, [7] Barnet, Enfield and Haringey Mental Health Trust, London, United Kingdom

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Elena Vegni,
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University of Verona, Italy
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***Correspondence:**
Ajay Gupta
ajay.gupta@qmul.ac.uk
Mohammed Y. Khanji
m.khanji@qmul.ac.uk

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Introduction: The COVID-19 pandemic has led to unprecedented strain to healthcare systems worldwide and posed unique challenges to the healthcare professionals (HCPs) and the general public.

Objectives: The aim of this study is to evaluate the impact of COVID-19 on the mental health, behavioral, and physical wellbeing of HCPs in the early and mid-term periods of the pandemic in comparison to non-HCPs. Thus, facilitating and guiding optimum planning and delivery of support to HCPs.

Methods and Analysis: An observational cross-sectional survey and cohort study aiming to enroll over 1050 participants (minimum, 800 HCPs and 250 controls). Study questionnaires will be completed at baseline and after 6-weeks and 4-months. Recruitment initiated July 2020. The study was designed in London, United Kingdom, but open to participants worldwide. Baseline: Questionnaires comprising of validated self-administered screening tools for depression, anxiety, sleep-related issues, wellbeing, and burnout. The questionnaires also explore changes in behavior and physical wellbeing of the participants. In addition, associations of these mental health and behavioral factors with work-related factors and support will be explored. Six-weeks and 4-months follow-up: Follow-up questionnaires will assess change in symptoms of anxiety and depression, sleep disorders, use of alcohol and other substances, behavioral or interpersonal relationship changes. Physical wellbeing will be assessed through the presence of suspected or confirmed COVID-19 infection and absence from work. We will also evaluate the impact of variable provision of

personal protection equipment (supply and training), extended working hours, and concern for the wellbeing of family members, anxiety levels, and evidence of burnout.

Statistical Considerations: The study has 80% power to detect a 10% difference of combined depression and/or anxiety symptoms between the groups using two-sided type 1 error at 0.05 at baseline. Assuming that only 50% of these HCPs agree to be a part of a cohort survey, we will have 80% power to detect around 12% difference in the two groups in reported physical symptoms (20% vs. 32.3%), or prevalence of depression and/or anxiety at the end of the study.

Ethics: The study was approved by the Cambridge East, Research Ethics Committee (20/EE/0166).

Trial Registration Number: ClinicalTrials.gov, NCT04433260.

Keywords: COVID-19, healthcare professional, wellbeing, mental health, burnout, anxiety, depression, pandemic

INTRODUCTION

The United Kingdom and the rest of the world now face a pandemic caused by a novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV2). At the time of writing 1st October 2020) there were more than 34 million confirmed cases worldwide with over 1,000,000 deaths[1]. Healthcare professionals (HCPs) are at higher risk of developing life-threatening infectious diseases through exposure to respiratory droplets, aerosols, and contact with patients' blood or body fluids. This has also been demonstrated in previous epidemics such as the Ebola virus disease in 2014 and Severe Acute Respiratory Syndrome (SARS) a decade earlier, which were associated with very high fatality rates in HCPs (Styra et al., 2008; Forrester et al., 2014; Alfaraj et al., 2018). Whilst efforts to minimize the physical impact of infectious outbreaks take precedence, the potential mental health impact of such pandemics in the short-term and beyond should not be neglected (Barello et al., 2020; Galli et al., 2020; Siddiqui et al., 2021).

Previous studies conducted on the mental health impact of infectious outbreaks have found significant burden among healthcare workers and the general public. During the SARS outbreak, healthcare workers in a Beijing hospital who were quarantined, worked in a high-risk clinical setting or had family or friends infected with SARS, reported substantially more post-traumatic stress symptoms compared to those without (Xiang et al., 2020).

Increased exposure and unprecedented large-scale quarantine measures have a negative mental health impact on the public, in addition to the already tangible economic repercussions (Thompson, 2020; Weiss and Murdoch, 2020). Increased workload alongside a suboptimal working environment of inadequate personal protection equipment (PPE), risk of nosocomial transmission and constant changes in work structure can have detrimental effects on the mental wellbeing of HCPs. The need to isolate for fear of infecting friends and relatives results in loss of a social support network, further compromising the psychological resilience of HCPs.

Several studies exploring mental health impact of the current COVID-19 pandemic and risk factors for this have since been performed (Kisely et al., 2020). Whilst some individual studies have suggested an increased anxiety and risk of mental health problems in HCPs compared to non-HCPs (Zhang et al., 2020), subsequent meta-analyses have found a similar prevalence of anxiety and depression between healthcare workers and healthy controls from the general public (Krishnamoorthy et al., 2020; Luo et al., 2020; Pappa et al., 2020).

This observation can, in part, be explained by the different roles of HCPs. A study by Lu et al. (2020) demonstrated higher levels of psychological distress in HCPs working in hospital, compared to administrative staff. Work-related risk factors including close contact with infected patients, level of work experience and organizational support provided have also been shown to impact the psychological effect of emerging virus outbreaks (Kisely et al., 2020). These effects may be more prominent in junior or trainee doctors likely due to having to work in unfamiliar environment, with disrupted training and variable supervision (Kisely et al., 2020).

Healthcare professionals work under different schedules, including regular office hours, shift work, and swing shifts. Shift work and stressful work-related situations have been linked to poor mental health (Torquati et al., 2019). There is an established body of literature that has demonstrated the prevalence among physicians of a range of sleep-related issues, substance use and mental health disorders (Mihailescu and Neiterman, 2019; Petrie et al., 2019). These problems increase the risk of burnout or errors on the job. In those with pre-existing mental health disorders, there may be increased psychosocial problems, an increased risk of suicidal behavior, increased alcohol, or other psychoactive substance use, or a more severe form of the viral illness (Possamai, 2007; Greenberg et al., 2020).

Of note, most of these studies have evaluated only the immediate psychological impact of COVID-19 on HCPs and the general public. Moving forward, it is vital we identify the at-risk

[1]https://coronavirus.jhu.edu/

population and pre-disposing factors to higher psychological distress in order to design and target effective interventions to minimize the mental health impact of COVID-19. In the CoPE-HCP study, we aim to study the early and mid-term impact on mental and physical wellbeing in different cohorts of HCPs compared to the general population.

STUDY OBJECTIVES

Primary Objective

(1) To evaluate the prevalence of symptoms of anxiety and depression at the time of COVID-19 pandemic amongst HCPs in direct patient-facing roles, as compared to colleagues/participants in non-patient facing roles.
(2) To determine the change in symptoms of anxiety and depression during the follow-up period amongst HCPs in direct patient-facing roles, as compared to colleagues/participants in non-patient facing roles.
(3) To evaluate the change in proportion of those with suspected or confirmed COVID-19 during follow-up period amongst HCPs in direct patient-facing roles, as compared to colleagues/participants in non-patient facing roles.

Secondary Objective

(1) To assess the impact of COVID-19 pandemic on symptoms of anxiety and depression and behavioral changes in HCPs in comparison to the non-HCPs at baseline and follow-up.
(2) To assess the impact of COVID-19 related symptoms of anxiety and depression and behavioral changes on the subsequent physical wellbeing and absence from work due to illness.
(3) To study the relationship of perceived stressors, such as PPE provision, work hours, future vaccine introduction, staffing levels and support at work, on the physical and mental health of HCPs.
(4) To compare the differences in the prevalence of symptoms of anxiety and depression and behavioral changes, if any, by role and years of experience of HCPs.
(5) To assess the impact of COVID-19 pandemic on the symptoms of anxiety and depression and behavioral changes of HCPs in the United Kingdom compared with HCPs in Europe, Asia, Africa, America, and Australasia.

METHODOLOGY

Study Design

An observational cross-sectional survey and cohort study design. A minimum of 1050 participants will be enrolled (minimum of 800 HCPs and 250 controls). **Figure 1** shows the summary of the study scheme. The study recruitment was initiated on the 24th July 2020, just after the first peak of the pandemic (particularly in the United Kingdom and Western Europe), following formal ethical approval. The study is conducted as an online survey and can be complete by participants globally (see **Supplementary Data Sheet 1** for questionnaire). The study is designed in London, United Kingdom and we envisage that as a consequence a large proportion of the participants will be from this region.

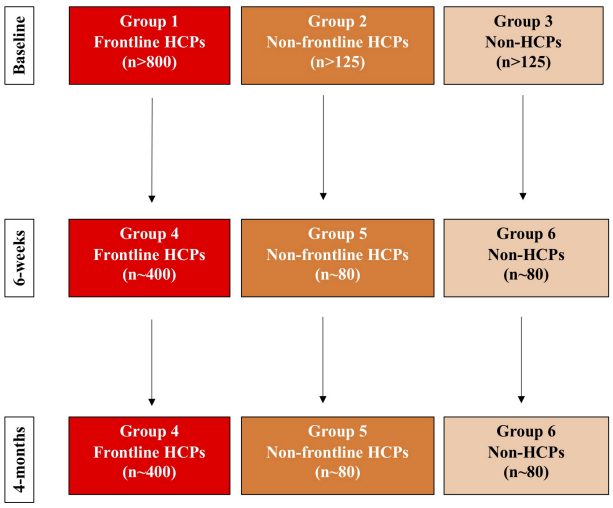

FIGURE 1 | Study protocol flow diagram.

Participant Selection

This is an international multicentric study enrolling three groups of participants.

Group 1

Healthcare professionals in direct contact with patients confirmed or suspected as having COVID-19 ($n > 800$).

Participants providing consent will be recruited for the follow-up questionnaire study (Group 4).

Group 2

Healthcare professionals in non-patient facing roles, not directly in contact with patients confirmed or suspected as having COVID-19 ($n = 125$, internal HCP control).

Participants providing consent will be recruited for the follow-up questionnaire study (Group 5).

Group 3

Non-Healthcare academic and research staff of Queen Mary University of London, and other professionals not working with patients confirmed or suspected as having COVID-19 ($n = 125$, population control).

Participants providing consent will be recruited for the follow-up questionnaire study (Group 6).

Inclusion Criteria

(1) Aged ≥18 years
(2) Electronic consent given
(3) Belonging to one to the following groups:

(a) HCPs with direct patient facing roles

(b) Healthcare staff with no direct patient contact
(c) Non-healthcare academic staff with no direct patient contact

Exclusion Criteria

(1) Those who are not able to understand written English will be excluded by the design and methodology of the study, as the study invitation and all other information is provided in English.

Study Time Points

The study questionnaire will be conducted at baseline, after 6-weeks and 4-months for follow-up. The COVID pandemic in the United Kingdom started in March 2020 and the initial survey therefore assesses the early phase (baseline) and the follow-up (after 6-weeks and 4-months) questionnaires assess the mid-term impact.

Baseline

Recruitment will be open for approximately 6-weeks, starting from launch study date (24th July 2020).

Follow-up study

All participants consenting for follow-up will be sent further questionnaires after 6-weeks (up to 8-weeks) and 4-months (up to 6-months), from date of completion of the baseline questionnaire, to assess for change from baseline. To improve the uptake, we will also send weekly reminders (no more than 3) to those who have not completed the survey at first request. We expect that about 60% from each of the three baseline groups will agree to take part in the follow-up study, and about two-third of those will respond to the follow-up surveys.

Endpoints

Primary Endpoints

(1) Prevalence of anxiety and/or depression at baseline.
(2) Change in prevalence of combined anxiety and depression from baseline.
(3) Change in proportion of those who report signs and symptoms, or evidence consistent with COVID-19 from baseline to the end of study.

Secondary Endpoints:

(1) Prevalence of combined anxiety, depression, or sleep disorder at baseline.
(2) Prevalence of those with sleep disorders at baseline.
(3) Change in prevalence of anxiety, depression, and sleep disorder from baseline to the two follow-up time points.
(4) Change in prevalence of burnout from baseline to the two follow-up time points.
(5) Proportion of those with low mental wellbeing at baseline and follow-up.
(6) Change in behavioral habits such as smoking and alcohol intake from baseline to follow-up.
(7) Proportion of those who report suspected or confirmed diagnosis of COVID-19.
(8) Proportion of those who report their working conditions adversely affecting their personal relationships.

DEFINITIONS OF VARIOUS ENDPOINTS: HOW WE WILL ASSESS THEM

Psychological

Presence of Anxiety

The presence of anxiety is screened using the Generalized Anxiety Disorder-7 (GAD-7) assessment. This is a validated self-administered patient questionnaire used as a screening tool and severity measure for generalized anxiety disorder (GAD). The minimum score is 0 and maximum score 21. The following scoring system will be employed (Kroenke et al., 2001):

Mild: 5–9; Moderate: 10–14; Severe: >15.

A score of $\geq$10 has a sensitivity of 89% and specificity of 82% for GAD. The GAD-7 scoring tool has also been shown to have acceptable sensitivity and specificity for other types of anxiety disorders such as panic disorder, social phobia, and post-traumatic stress disorder (sensitivity 68% and specificity 88% with a cut off score of 10, for any anxiety disorder).

Presence of Depression

The presence of depression is screened using the Patient Health Questionnaire-9 (PHQ-9). This is a validated nine-item questionnaire designed to screen for depression, often used in a primary care setting. A PHQ-9 score of $\geq$10 has an 88% sensitivity and specificity for major depression (Spitzer et al., 2006). The severity of depression is rated as follows:

None: 0–4; Mild: 5–9; Moderate: 10–14; Moderately severe: 15–19; Severe: 20–27.

Sleep-Related Issues

Sleep related issues are assessed through the Insomnia Sleep Index (ISI). This is a validated seven-item self-report questionnaire assessing the nature, severity and impact of insomnia, evaluating aspects such as severity of sleep onset, sleep maintenance, sleep dissatisfaction, and interference of sleep difficulties (Tennant et al., 2007). The score categories are as follows (Bastien et al., 2001):

0–7: No clinically significant insomnia; 8–14: Sub threshold insomnia; 15–21: Clinical; insomnia (moderate severity); 22–28: Clinical insomnia (severe).

"Mental Wellbeing"

Mental wellbeing is assessed using the Short Warwick-Edinburgh Mental Wellbeing Scale (SWEMWBS). This has been validated for use in the general population and facilitates monitoring mental wellbeing in the general population (Tennant et al., 2007):

Scores of 7–17 suggest probable depression or anxiety; Scores of 18–20 suggest possible depression or anxiety. Scores range from 7 to 35. Higher scores indicate higher positive mental wellbeing.

Burnout

Burnout was assessed using single Item measures for Emotional Exhaustion and Depersonalization (West et al., 2009). This 2-Question summative score has been shown to be

correlated with two items from the Maslach Burnout Inventory (Li-Sauerwine et al., 2020).

Lifestyle and Physical Health

Behavioral Habits, Such as Smoking, Alcohol Intake and Recreational Drug Use

Self-reported measures through responses to customized questions developed the research team (see **Supplementary Data Sheet 1**).

Diet and Physical Activity

Customized questions on diet, exercise levels and de-stressing activity.

Physical Health

Evidence consistent with probable diagnosis of COVID-19

This is self-reported and is assessed through questions regarding the presence of symptoms with the presence of either a self-reported positive test, or self-isolation for 7 days or more.

Customized questions on symptoms of COVID-19, swab and antibody status and days of absence/sick leave taken and potential need for hospitalization.

Relational and Support

Social/Relational

Customized questions on living arrangements and impact of the pandemic on personal relationship.

Concerns Related to Workplace and Support

Customized questions developed by the research team to assess self-reported responses to workplace related concerns including availability of support at work.

STUDY QUESTIONNAIRE AND DISSEMINATION

This will be achieved through a wide distribution of the electronic survey to HCPs and non-HCP controls. We will seek endorsement and support from professional societies and associations in the United Kingdom and other parts of the world to disseminate this widely. Distribution networks that will be considered include network email distribution lists and relevant social media platforms.

We expect to have a larger distribution of the questionnaire in the United Kingdom, but we are aiming at achieving an international cohort of participants. Within the United Kingdom, dissemination will be through different NHS Trusts, geographically distinct deaneries involving with overseeing medical training, scientific and medical societies and universities. On an international level we will involve international medical and allied health scientific societies and associations.

There will be an invitation to join the study including an explanation of the reasons of the survey. Any participant taking part in the survey based on the brief description of the study will be deemed to have consented for the study, and no other consent will be required. This cross-sectional survey will include basic information about the participant including demographics, living circumstances, education level and pre-existing physical and mental health conditions. It will also include questions regarding work experience and profession, work circumstances and exposure to COVID-19. **Table 1** provides a summary of the aspects assessed and the tools used.

Comparing Groups 1 and 2 with Group 3 allows us to study the effect of a high-risk working environment alone, whether in a patient-facing (Group 1) or non-patient facing role (Group 2), on physical and psychological health. Group 3 may also function as a control group for confounders such as education level and living conditions (external control).

We aim to structure each of the questionnaires such that most of these questions can be answered in no more than 20 min. We will try to incorporate strategies such that relevant sections (rather than the whole) survey can be completed in multiple sittings with previous responses being saved.

PATIENT AND PUBLIC INVOLVEMENT

As the study is aimed at HCPs, hospital workers, and academic staff, we have consulted with a range of different workers from these groups in refining the research questions, designing the survey and planning the follow-up.

Procedure for Collecting Data

Data will be collected directly from the web-based survey platform[2] using pre-defined questions using a combination of Likert scale, one of many tick options and free text etc. Participants will be free to withdraw (actively or by ceasing to

[2]www.surveymonkey.com

TABLE 1 | Study variables and respective assessment tools.

Variables	Assessment Tool
Psychological	
1. Anxiety	Generalized Anxiety Disorder-7 (GAD-7)
2. Depression	Patient Health Questionnaire-9 (PHQ-9)
3. Sleep-related issues	Insomnia Sleep Index (ISI)
4. "Mental wellbeing"	Short Warwick-Edinburgh Mental Wellbeing Scale (SWEMWBS)
5. Burnout	Abbreviated 2-Question Summative Score
Lifestyle and physical health	
6. Behavioral habits (smoking, alcohol intake and recreational drug use)	Customized questions on cigarette smoking and vaping status, alcohol and recreational drug use.
7. Diet and physical activity	Customized questions on diet, exercise levels and de-stressing activity
8. Physical health	Customized questions on symptoms of COVID-19, swab and antibody status and days of absence/sick leave taken or potential need for hospitalization
Relational and support	
9. Social/relational	Customized questions on living arrangements and personal relationship
10. Concerns related to work place and support	Customized questions regarding concerns related to workplace and available work-based support

complete any questionnaires at any time). Data collected up to the point of no further completion, or withdrawal will be kept for data analysis.

END OF STUDY DEFINITION

The end of study definition is hierarchical based on collection of completed surveys from $n > 400$ from group 4 AND $n > 80$ from group 5 and 6. If not achieved, then at the end of 12 months from study opening.

STATISTICAL CONSIDERATIONS

Sample Size

We aim to collect data from minimum of 800 HCPs, and minimum of 125 non-patient facing HCPs and 125 non-HCPs (total sample size of 1050). If minimum of 40% of HCPs report primary outcome (combined either depression and/or anxiety symptoms) compared with a maximum of 30% non-HCPs/non-patient facing HCPs, we will have just of over 80% power to detect significant difference using two-sided type 1 error at 0.05.

Assuming that only 50% of these HCPs agree to be a part of a cohort survey ($n = 400$), we will have at least 40% ($n = 160$) who have reported either depression or anxiety. We will have 80% power to detect around 12% difference in the two groups in reported physical symptoms (20% vs. 32.3%), or prevalence of depression and/or anxiety at the end of the study. We will also have about 80% power at two-sided alpha set at 0.05 to detect difference of 15% between baseline and the end-of study for all the primary and secondary objectives, amongst those who have reported anxiety or depression symptoms at baseline ($n = 160$). In the other arm, we have enough power to detect smaller changes from baseline.

Our assumptions here are based on most conservative estimates. If we are able to recruit more than the minimum numbers, our power will improve substantially, and we will be able to detect smaller differences too.

Method of Analysis

We will use the STATA 15 statistical software for analysis. Chi-square test will be used to compare the difference in prevalence of anxiety, depression and other variables between the groups at baseline. We will evaluate for changes in proportion of those outcomes at baseline to the end of the study using paired McNemar test. We will use logistic regression to assess the factors at baseline related to development of physical symptoms, overall, and in the HCPs group alone. Data will be described using appropriate descriptive statistics.

We will collect information for potential confounding factors such as age, gender, education level, and health conditions from both HCPs and their controls and adjust for these in the analysis. For all validated tools, we will use appropriate and previously published cut-offs to categorize them. For example, for the primary end point of anxiety, we will use the cut-off related to moderate anxiety, but also do a sensitivity analysis using cut-off using "mild" anxiety definition. Similar and consistent strategy will be followed for other validated tools. We will perform logistic regression for binary outcomes, such as those listed in our primary and secondary outcomes, after adjusting for pre-defined confounders including age, gender, and years of education. The choice of these *a priori* confounder is based on the significant association that exists for most of the study outcomes. We have also adjusted for time since the self-identified peak of the pandemic as this will impact on outcomes such as anxiety and depression. However, for the outcome of developing COVID-19 infection and change in prevalence of COVID-19 infection, we will also adjust for pre-existing medical conditions.

We will also stratify HCPs according to their roles (doctors, nurses, pharmacists, healthcare assistants etc.), and will evaluate and compare the endpoints by respective roles. Comparison between HCPs from the United Kingdom and outside will be undertaken adjusting for the self-identified peak of the pandemic in that region. We also will assess whether the years of experience (as a categorical variable) has any impact on the measured outcomes.

ETHICAL CONSIDERATIONS

Ethical Approval

NHS Research Ethics Committee (REC) approval has been obtained for the study (protocol, consent form, all written material to be provided to the participant and all advertisements that may be used for participant recruitment). Appropriate reports on the progress and any other notifications of this trial by the Investigator will be made to the REC and the Sponsor in accordance with the applicable governance regulations and in agreement with policy established by the Sponsor.

Risks, Burdens, and Benefits

There are no significant risks or benefits associated with participating in this survey.

There is an ethical concern about what we should do for participants in the cohort survey displaying mental or physical wellbeing concerns. We therefore clarify that our questionnaire remains a screening tool and does not provide final clinical diagnosis of any physical or psychiatric conditions. We emphasize the importance for participants to seek clinical advice from their occupational health department or GP, should they feel the need to. In addition, signposting or links to mental health support websites or services are provided on the survey platform and on our study website. These include (but not exclusive to): occupational health departments at workplace (general practitioner, Health Education England Professional Support Unit, FRONTLINE NHS helpline, MIND, health professional unions etc.).

Informed Consent

Participant information sheet and consent will be available electronically on the study website. All participants are required to provide informed consent prior to completing the questionnaire.

STUDY LIMITATIONS

This study has certain limitations. The online survey-based methodology relies on self-reported responses can be subjective. For example, survey responses may provide a one-sided interpretation of events and is dependent on participants' recall. Non-response to optional questions may also limit data interpretation. There is the potential for selection bias which is inherent in studies with voluntary participation.

Whilst the survey questions attempt to address predicted confounders such as participant demographics, education level and physical and mental health, we acknowledge that there may be unknown confounders, particularly in a study conducted internationally. Although we try to control for this, we acknowledge that by including participants from multiple countries, we will capture responses occurring at different phases of the COVID-19 pandemic. There may also be heterogeneity in responses as a result of different financial and health policies adopted worldwide. We hope to account for some of these differences by collecting basic information regarding the participant's demographics and characterizing these differences in our analysis.

Many of the limitations are inherent to the online questionnaire-based methodology, but we have chosen to balance the limitations against the benefits, which include easy accessibility and its ability to overcome geographical barriers.

DISCUSSION

As suggested by recent studies in this area, we expect that the COVID-19 pandemic will have a significant impact on the HCPs working on the frontline, and that this will have significant impact on their physical and mental health over the period of follow-up. Direct patient facing roles are expected to have negative impact on psychological and physical wellbeing, compared to non-patient facing roles or compared to the general public. In particular we expect that frontline HCP workers will have increased levels of anxiety, depression and sleep disorders compared to non-patient facing HCPs and control populations. We also hypothesize that, compared to controls, they will report significant behavioral changes regarding habits such as smoking, diet, and exercise, and that the pandemic will be likely to impact on their personal relationships. We also hypothesize significant changes in levels of burnout.

We surmise the adequate provision of appropriate PPE alongside necessary training will impact levels of anxiety as well as recorded absence from work. This stressful event may also have implications for the early and medium-term mental health of these workers and may also have an impact on their physical wellbeing.

Relevance of Finding for Clinical Practice/Prevention

The findings of this study will help to outline the impact of the COVID-19 pandemic on HCPs, identify the needs of HCPs and help to improve design and delivery of support systems. The wellbeing of HCPs is vital in order for them to be able to continue providing the vital services during the pandemic and beyond. We plan to share the findings with healthcare leaders, the scientific community and individual staff members to allow better understanding and support structures for maintaining wellbeing.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Cambridge East, Research Ethics Committee (20/EE/0166). The participants will provide their written informed consent to participate in the study via completion of the survey.

AUTHOR CONTRIBUTIONS

All authors listed above fulfill all three International Committee of Medical Journal Editors (ICMJE) guidelines for authorship, which are (1) substantial contributions to conception and design, acquisition of data or analysis, and interpretation of data; (2) drafting the article or revising it critically for important intellectual content and (3) final approval of the version to be published. All authors helped in the design of the study, were responsible for editing and providing guidance on the manuscript, critically revising the manuscript, and approved the final version of this protocol document for submission. MK, AG, and CM were responsible for coordinating the contribution of all authors to the manuscript. All were involved in the development of the protocol. MK, AG, CM, SN, and VK were responsible for drafting the manuscript.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.616280/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Hardships in Italian Prisons During the COVID-19 Emergency: The Experience of Healthcare Personnel

Ines Testoni[1,2]*, *Giada Francioli*[1], *Gianmarco Biancalani*[1], *Sandro Libianchi*[3] and *Hod Orkibi*[2]

[1] Department of Philosophy, Sociology, Education and Applied Psychology (FISPPA), University of Padova, Padova, Italy, [2] Emili Sagol Creative Arts Therapies Research Center, University of Haifa, Haifa, Israel, [3] Medical Director of the Operative Unit of the Male and Female Imprisonment House in Rebibbia, and as President of the National Coordination of Operators for Health in Italian Prisons (Co.N.O.S.C.I.), Rome, Italy

Background: The recent COVID-19 pandemic has highlighted the deficiencies that characterize the functioning of the Italian national health system. Prisons have always mirrored the most radical expressions of these weaknesses. During the early stages of the pandemic, prison facilities across Italy underwent a series of changes dictated by the need to ensure the safety of the prisoners and staff. The adoption of these rules contributed to a total or partial redefinition of many central facets of life in prison, such as intake procedures for new arrivals and the ways prisoners were allowed to communicate with their families.

Objectives: The aim of this qualitative study was to analyze the testimony of penitentiary healthcare workers in prisons throughout Italy to determine the impact of COVID-19 on their professional and personal lives.

Participants: Thirty-eight participants were contacted and 20 decided to participate in the interview. The sample was made up of 10 women and 10 men. All the participants were members of the healthcare staff of a penitentiary facility (psychologists, psychiatrists, physicians, and nurses). All were recruited through an Italian association whose mission is the development, promotion, and implementation of social solidarity projects including prisoners' social and health care. This study was facilitated through representatives serving in nine different regions of Italy. The participants were divided according to their professional roles in prisons.

Method: In-depth interviews were conducted by telephone or online using telecommunication platforms (e.g., Zoom, WhatsApp, and Skype). The transcribed texts underwent thematic analysis using the Atlas.ti software to identify patterns of meaning across the dataset.

Results: Four main themes emerged from the analysis: Interpersonal difficulties, management and operational difficulties, the personal distress and bereavement of healthcare workers, and the distress of inmates. The importance of relationship management skills when interacting with prisoners emerged as a key topic in many interviews, and the participants highlighted the need for adequate training. The increase in prisoners' anxiety made communication more difficult.

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***Correspondence:**
Ines Testoni
ines.testoni@unipd.it

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Conclusions: The findings suggest that healthcare workers in jails need emergency-oriented training. Participants described their feeling of loneliness and quasi-abandonment when carrying out their duties during the pandemic. In particular, they underscored the need for psychological guidance to better manage altered reactions with prisoners and colleagues as a result of heightened death anxiety and isolation.

Keywords: COVID-19, prison, burnout, working well-being, healthcare personnel, prison riots

INTRODUCTION

During the first months of 2020, the Italian health system was forced to grapple with the recent pandemic caused by the spread of COVID-19, which further undermined its endemic problems. The national health emergency significantly impacted life and work in prisons, including those of healthcare workers such as physicians, nurses, psychologists, and psychiatrists. In Italy, at the start of the pandemic, despite regional differences, the same solution was imposed throughout the country, including a systematic lockdown (Ministry of Health of Italy, 2020). These restrictive solutions negatively impacted specific sectors, including prisons, which are characterized by persistent and problematic overcrowding (Ristretti Orizzonti, 2020). To cope with the emergency, prevent infections in prison, and guarantee the safety of prisoners and personnel, the rules in force in prison communities were suddenly modified, including a ban on visits from relatives. Inmates could only contact their loved ones online by computer or tablet. These measures to reduce the risk of infection prompted a series of riots that broke out in many prisons on March 7–9, 2020. According to ANSA it (2020; an Italian news agency), in a single weekend, out of a total of 189 prisons, serious structural damage resulting from vandalism and arson affected over 70 prisons; in addition, 30 prisons held peaceful demonstrations (ANSA it, 2020). These riots in many cases enabled the inmates to gain access to restricted areas where drugs including certain lethal medications are stored. A total of 12 prisoners died during the uprisings. Roughly 70 prisoners escaped after internal attacks on structures and fires (Il Fatto Quotidiano, 2020). These dire events can be attributed to the abysmal conditions of Italian prisoners that stem from overcrowding, which makes for high constant stress levels of inmates and custodial workers. On the other hand, the prisoners' fear of being infected was linked to their frustration at being prevented from face to face encounters with their relatives.

These internal and external changes forced the healthcare professionals to rapidly modify their modes of intervention in the jails. In some cases, the personnel had to deal with the reactions of the inmates who had played a role (both major and minor) in these critical events.

We define a *critical event* as any situation that can severely challenge professionals who have to face a situation that requires skills they do not have, directly or indirectly, resulting in concern (Zamperini et al., 2015). A critical event is generally an unexpected event, given its low frequency (Gremler, 2004), which deprives professionals of the feeling of being in control of the situation and is characterized by a perception of danger for their psychological or physical well-being (Rotter, 1966). The term *critical service event* referred to any situation that could alter the rescuer's coping skills (Mitchell and Everly, 2001). This type of event constitutes a threat to the individual's well-being (Gremler, 2004; Testoni et al., 2019b). These factors are also classified by the Department of Penitentiary Administration at the Department of Justice and include calamities that can compromise the well-being of the prison community, such as the COVID-19 emergency (Ministry of Justice of Italy, 2011). This premise makes it possible to qualify the impact of a critical event based on the subjective perception of the people involved. Although the literature has dealt extensively with the level of stress of health professionals (Benedek et al., 2007) and critical incidents (e.g., Schluter et al., 2008; Brazil et al., 2010; Interculturel, 2017), there is no research on this specific issue. Half of the population considered the impact of the COVID-19 epidemic to be psychologically moderate or severe (Wang et al., 2020). However, the World Health Organization has identified healthcare workers as a job category that is at particular risk of developing a wide range of physical or psychological problems in the current pandemic situation (Koh et al., 2005). Stress, high workload, worries of contracting the infection or infecting one's family, the lack of adequate support in the workplace and the absence of effective supportive treatments, can negatively affect the well-being of healthcare workers (Moazzami et al., 2020; Vieta et al., 2020). Regarding the studies on the psychological effects of epidemics, a research by Salazar de Pablo et al. (2020) reports the most frequent symptoms in healthcare professionals, leaving, however, the prison context unexplored in this area. To respond to this need, the present study investigated the experiences and possible critical events in Italian prisons and their impact on healthcare personnel working in penitentiaries across Italy during the COVD-19 lockdown and emergency period.

METHOD

Aims

The purpose of this qualitative study (Seale et al., 2006) was to investigate the types of stressors, difficulties and the possible existence of critical events among health professionals in Italian prisons after the declaration of a state of emergency caused by the COVID-19 pandemic. Specifically, the goal was to determine the changes as perceived by the participants with respect to their own and the prisoners' well-being, the organizational climate, and the work done by these professionals to better understand the nature of the discomfort caused by the pandemic emergency.

TABLE 1 | Participants.

Pseudonyms	Age	Profession	Years of working in the prison context	Years of working in their prison
Rossella	41	Physician	16	9
Claudio	31	Physician	2	2 months
Donatella	54	Nurse	20	15
Andrea	34	Physician	5	1
Leonardo	31	Physician	2	2
Tiziana	36	Physician	6	6
Saverio	67	Healthcare Director	30	30
Livia	54	Psychologist	23	22
Silvia	48	Physician	23	3
Vittorio	61	Healthcare Director	35	30
Simona	35	Physician	7	4
Raffaella	57	Physician	4	3 months
Serena	55	Healthcare Director	35	10
Luca	56	Physician	30	10
Elio	49	Physician	20	11
Cristina	54	Nurse	21	15
Nicola	64	Healthcare Director	30	25
Sofia	60	Healthcare Director	33	4
Carlo	37	Physician	8	8
Ettore	55	Physician	28	6

Participants and Procedure

The sample was composed of 20 participants (50% female) working in prison facilities throughout Italy: 6 in the North, 5 in the Center, and 9 in the South (75 physicians, 15 nurses, 10 psychologists, and 25% healthcare directors). The average age of the participants was 49 (range = 31–67 years; SD = 12). The average work years in the prison health sector was 19 years and all names reported are pseudonyms (see **Table 1**).

The participants were contacted through a branch of the O.N.L.U.S.[1] which coordinates healthcare professionals who work in jails all over Italy. The participants were informed of the research objectives and gave their informed consent before the interview. After agreeing to a date, the data were collected by telephone or *via* Zoom, Skype, or WhatsApp. This study was approved by the Padova University Ethics Committee for Experimentation (#BB4DCE00A75F9-FC621E922D1B98E00AB).

Instruments and Data Analysis

The semi-structured in-depth interviews lasted about an hour. The aim was to explore prison healthcare workers' personal experiences, feeling, difficulties, strategies, and in particular the critical events they faced during the COVID-19 emergency. Participants described their lived experiences in the relational sphere, their perceptions of changes in the prisoners, and the ways the prison facility handled the emergency. A dialogue was developed by asking the participants to reflect on the effect of changes caused by the pandemic, the strategies implemented to face them, and the problems they could not solve.

After all the interviews had been recorded and transcribed, the texts underwent a thematic analysis (Braun and Clarke, 2006) to identify patterns of meaning regarding (Attride-Stirling, 2001) the difficulties faced by prison healthcare workers during the pandemic. The texts were processed using Atlas.ti, which made it possible to identify the logical connections in the texts. Atlas.ti optimizes the construction of a theoretical model based on text. The analysis of the text followed the six main phases outlined by Braun and Clarke (2006): preparatory organization; generation of categories or themes; coding data; testing emerging understanding; searching for alternative explanations; and writing up the report. Atlas.ti allows the development of a theoretical model firmly based on the text, to produce scientific knowledge by relating the researcher's categories of analysis with the meanings constructed by the subjects in the interview (Muhr, 1997). The analysis is conducted by attributing codes to significant portions of the text and the results are graphs of semantic networks, which describe the logical relationships between the narratives and categories identified by the researchers. As the analysis proceeded, the primary difficulties expressed by the participants emerged. The primary goal was to identify the changes prompted by the health emergency.

RESULTS

As shown in **Table 2**, the thematic analysis yielded four main themes: Interpersonal difficulties, management and operational difficulties, the personal distress and bereavement of healthcare workers, and the distress of inmates. Each theme was characterized by specific codes.

Interpersonal Difficulties

During the interviews, attention was paid to conflicts, clashes or interpersonal difficulties within the prison community during the pandemic, which was a significant source of distress for the interviewees. The interpersonal difficulties were delineated according to different dynamics that pointed to two main conflicts: interpersonal difficulties within the healthcare professionals, and clashes between the health professionals and the security (surveillance) personnel. With regard to the former, the onset of the pandemic generated conflicts within the health setting with colleagues. For example, Rossella, who is a physician, said "The climate has worsened a lot. I went back recently, but the climate is still very bad. Everything has gotten worse in the last two months. In short, a big mess!" (2:36). This perception was confirmed by Claudio, a continuity-of-care physician who reported "Perhaps the biggest difficulty I had was with my colleagues, I found it hard to collaborate with some, in the sense that a climate of fear had spread and some colleagues were highly affected. Discussions are unavoidable and it is not always possible to arrive at a consensus" (15:2) and Donatella, a nurse, "Some have been quite cowardly, because we have made choices in life

[1]ONLUS, organizzazione non lucrativa di utilità sociale: Non-profit Organization of Social Utility.

TABLE 2 | Themes and main codes.

Themes	Participants no. by region	Main codes
Interpersonal difficulties	North: 6	Interpersonal difficulties between the healthcare and security personnel
	Center: 6	Interpersonal difficulties among healthcare personnel
	South: 7	
Management and operation difficulties	North: 6	Vague regulations
	Center: 5	Lack of training
	South: 4	Lack of resources
		Workload
Personal distress and bereavement of healthcare workers	North: 6	Anxiety attributed to Covid-19
	Center: 5	Difficulties related to the riots
	South: 7	Critical events
Distress of inmates	North: 6	Ban on face to face interactions with family
	Center: 5	Misperception of the outside world
	South: 7	Anxiety attributed to Covid-19
		Salience of death

anyway and so, yes, we are afraid, but it is the job that we have chosen, no one forced us. It is not fair to complain when things get difficult with the inmates, as some colleagues do" (18:3).

In addition, overall, there were repeated references to incidents between health professionals and the security personnel. There was excessive authoritarianism on the part of the latter toward the former, who at certain times felt they were treated the same as the prisoners. Andrea, a physician, said during the interview "Yes, the arrogance of the guards who refuse to wear masks, problems in taking people's temperature at the entrance. The security personnel or their representatives avoided the temperature check because they thought it was useless, they did not wear a mask, they did not take their temperature or asked not to as a favor. They had a different interpretation of the situation, they took it very lightly. Every time I asked them to respect the rules of hygiene, inevitably the discussion became conflictual" (17:11) and "The aggressiveness of the security staff toward us, young healthcare workers, is constant, but they have increased the pressure to get us fired. They have leveraged the fact that physicians are potentially greedy. Obviously, being aware of the ways in which the virus is transmitted, we have always shown that we are able to handle the situation safely for ourselves and for others, and to discredit this type of recrimination. However, each time we experience these situations as violent attacks on our professionalism" (17:9). Leonardo, an on-call physician, confirmed "It is very difficult to stand up to the arrogance of security personnel. It's like fighting a shark in the ocean, you can't do it" (4:9). Rossella said "Despite the COVID emergency and the importance of our work in this situation, we know that we can never afford the luxury of getting into a controversy with them because it would be a fight we would lose all down the line" (2:26).

Management and Operational Difficulties

The failures in prison management due to the pandemic and the anxiety generated by the riots were hard for the participants. The initial lack of specific health and procedural guidelines for COVID-19 were mentioned by almost all the participants as a source of huge personal stress, given the impossibility of determining the responsibilities of the healthcare professionals and the penitentiary personnel (administrative officers and guards/wardens). The constant problems with management affected the participants' perceived self-efficacy and confidence in their job, as stated by Tiziana, a physician: "The greatest difficulty is… organizational mismanagement. We still don't have precise protocols defining the rules and the duties. Many issues between the health administration and the prison have not been resolved, so today we are in chaos. It is absolutely impossible to work serenely" (3:13). Saverio, a healthcare director, agreed, saying, "I felt very embarrassed, because there were times when I didn't know what to do, so I had to improvise, still thinking that it would very likely be wrong. The difficulties among colleagues and the other professionals made it impossible to find a solution through cooperation" (12:5). In some cases, this was associated with a perception of institutional inadequacy: Saverio said "Prisons depend on either the Ministry of Health or the Ministry of Justice. In Italy, neither ministry has defined specific steps to alleviate work-related stress. Maybe it is not easy, but it is important to show that the problem is being acknowledged" (12:13). Increased worries stemmed from the lack of health facilities for both professionals' and prisoners' detention, included quarantine areas. Livia, a psychologist, said: "What I felt as a health professional is that I did not feel protected. I, the physicians and nurses should have been the first to be checked and protected. This did not happen and we had to make do with it somehow" (5:24). Silvia, a physician, also stated "Throughout the month of February I worked with great anxiety and with great personal difficulties. I could not be effective, like many of my colleagues. We suffered for many reasons, and first of all because of the uncertainty caused by the lack of adequate health care facilities" (10:1). Vittorio, a healthcare director, stated "Prisons are increasingly overcrowded. The police made a whole series of arrests that they had left pending during the lockdown, so now there has been a sudden wave of new arrivals in the prisons, but the emergency is not over and we cannot think of handling them as we would have done before the pandemic" (7:20).

Many participants emphasized the lack of professional training, Rossella reported "We have had no training that prepares us to manage this kind of difficulty. Zero, zero, zero. Zero! We are always arguing about the usual bullshit, even about managing the actual risk of hepatitis. We are always talking about it, but in my opinion, we need to act in a more concrete way to understand the patients' diversity and how to manage it. There is no specific training here, either on a psychological level or at the level of emergency management!" (2:43); Vittorio said "I fought with the health company to ask for a certain amount of hours of specific professional training for people before putting them on their shift, but I am always rejected in the most absolute way. It

is clear that there is an absolutely "do-it-yourself" introduction, without anything formal" (7:11); Sofia, a healthcare director, said "We do not have this training, it is something that was not taken into consideration. Penitentiary medicine has been in the national health system for a decade, so the health system has no trained people, there is no university exam, no post graduate training, no specialization. Now, in my opinion, there should be, to be able to do the work that I do and to be able to work with a patient in prison, because the patient who is also an inmate is not the same as a simple patient who is not in prison. As concerns the doctors, none of those who enter the prison actually know the patient-inmate, they know him in the field, which is completely another thing" (8:16).

Personal Distress and Bereavement of Healthcare Workers

From a personal point of view, the participants' greatest concern was the fear of contracting COVID-19, which can be dangerous for themselves, their family members, and those who work or live inside the prison: Donatella "We were certainly afraid of getting sick, but also of a possible riot. I don't know what scared me more: the rebellion of the COVID infection. I didn't know how to manage this anguish" (18:4); Andrea "My fear was that the COVID outbreak would take everyone, including physicians, nurses, this was the thing that worried me the most" (17:1). Simona, a 35-year-old physician who has been working in prison for 7 years, said: "It has been difficult to manage the fear of infection, both as a physician and as a psychiatrist. I tried to make my fellow health professionals but also the inmates understand that this fear was normal and that knowing this could help us to manage it better. But it was really difficult and I don't know how effective it was. In addition, I also had to face my personal fear of the pandemic and its scale and the risk of infecting my family and loved ones" (9:13).

Participants who had been somehow involved in the riots reported that this experience severely impacted the climate of the entire facility. The testimony of Sofia also highlighted this change, "We have been experiencing precariousness in security, precariousness in conditions. Our offices were torched… we worked like we were in a war camp. We are still trying to adapt everything to these new conditions" (8:20); Sofia "Bad. It's something I prefer not to talk about, the worst thing that comes to my mind is the dead. The rest has been brought back, it has all returned slowly, the lights have been turned on again, the walls are being repainted, the carts have been bought back, a new armored car has been bought, but the dead are dead. They cannot return" (8:13).

The theme of death reappeared in the interviews, not only as it related to the pandemic, but also to the riots, as Sofia said: "No adequate measures were taken. If the authorities had come to see, they would have become aware of the seriousness of the situation. Instead they stayed outside, so they could not understand. Outside they only saw some of the events and certainly not as dramatically as we saw them, looking at the dead prisoners. From outside it was certainly not possible to perceive the levels of suffering that we had to endure inside. All the things that were destroyed in the uprising have been replaced, but they are things. And no one talks about those who died and what happened" (8:14). This argument also emerged in the testimony of Raffaella, a physician: "In my opinion, the revolt began because there were instigators who fomented the inmates. Thus, the prohibition of visits because of COVID was the spark. They broke through the grates, set fire to everything. They tore down the infirmary medicine cabinet, destroyed the radiology department. In a short time, they took over the whole prison. Luckily, they saved their medical records. Many died, some of them overdosed because they found psychotropic substances in the infirmary. Many were saved by physicians and nurses, who tried everything, had to improvise methods and instruments. But for many there was nothing anyone could do. And no one worked out any of this" (13:12). According to Simona, a physician: "All this happened because in prison there is no space to process fear, anxiety, loneliness, isolation. Here reigns the fear of dying of COVID separated from the rest of the world, the fear of dying alone. The most intense feeling is to be locked up and to die in a place isolated from the world" (9:10).

A perception of generalized mourning related to the prisoners who died during the riots appeared in all the narratives of those who worked in prisons where these took place. The generalized perception was that all the healthcare professionals had to manage their grief alone; however, Livia emphasized: "Generally, when I experience bereavement, I share my sadness with those with whom I have intimate relationships. In this pandemic, there was macro-social bereavement. I think it could have made people more capable of sharing their fears, worries, tragedies. This unstoppable series of tragedies increases solidarity or even just empathetic communication" (5:36).

Distress of Inmates

The difficulties with the security personnel were considered one of the main causes of suffering by some inmates, because they are subjected, in opinion of some healthcare professionals, to possible dehumanization, as Leonardo, a physician, affirmed, "In my opinion a prison, for someone who has a medical background, is misleading after a while. The relationship that the personnel has with the prisoners can turn into a man-animal relationship and at times we too are forced to change our attitude" (4:11). According to Raffaella, a physician, however, not all prison guards behave the same way. In her point of view, "There are some very smart young people who try to establish a relationship that respects the dignity of the prisoner. By contrast, the older ones still think that prisoners are despicable beings, different from normal people and therefore it is inevitable that they have to suffer. It is part of their condition" (13:7).

However, the greatest difficulty during the pandemic emergency was the ban on direct communication with family members. This was considered the main factor underlying the inmates' manifestations of unease, even more than the fear of the virus. The initial deprivation of contact with their families was critical for the well-being of the prisoners who often openly manifested their unhappiness at times through violent actions: Livia, a psychologist, said "Because they are inmates, the first feeling they probably had of instability was the ban on their only

contact with the outside world, the families, so much so that they did not realize, and we also had to contain them, which is why in our ward they did not riot… [we explained that] having a positive, asymptomatic person from their family come to the prison could create a problem for the whole prison" (5:7); Donatella said "They got very angry about these additional restrictions of not being able to see family members. So, then we had to work a lot with the reassurances for their many questions like 'what's going on?', 'How many deaths are there?' And trying to explain the situation. We had to work a lot on this issue. Some understood the situation, others absolutely did not and were angry" (18:1); Ettore, a physician, said "At first, I noticed an increase in anger and in some cases of self-harm, but with the arrival of news from the outside they realized that it was not an arbitrary thing only toward them, but that it was a very serious situation" (14:5). These reactions were associated with a different perception of the world outside the prison that often did not allow them to understand the gravity of the pandemic in Italy, Leonardo said: "They realized that this was the case and they could not get out, seeing that even people could not leave the house they understood that it was normal that they also could not receive visitors. At first they were a bit more turbulent but then they understood" (4:18). Among the inmates, death was also significant, especially in terms of end-of-life within a prison without their family and loved ones: "It is precisely the fear of death that is the most important issue. It is useless to avoid speaking about it. All of us avoid this theme, and then we avoid talking about it with the inmates, because here everything is very difficult, unmanageable" (9:14).

Once again, the issue of managing the needs of inmates was considered relevant but also problematic. The fear of infection dominated, especially in relation to inmates with immunodeficiencies, as noted by Luigi, "Yes, the anxiety was very intense especially among HIV inmates, who live constantly in fear of infection. We couldn't reduce their anxiety because we did not know exactly how to do so" (5:11). Andrea said something similar: "Some inmates were really anxious about getting COVID especially those who had previous pathological conditions. All the prisoners were afraid, but some of them felt particularly exposed to the risk of dying" (17:2). Beyond the physical fear the prisoners were also obsessed with not being able to be with their loved ones in their moment of danger to defend them, as described by Livia: "The most worried were the new inmates, who are attached to their families and have not been in prison long, since February [2020] or shortly before. They feel very guilty toward their relatives, because they fear that they have left their loved ones alone in their time of need. They fear that something will happen to them and that they will not be able to help them" (5:12).

DISCUSSION

This study examined the difficulties of health professionals in Italian prisons in different regions during the first phase of the COVID-19 outbreak. Although the situation of Italian prisons varies significantly, there were obvious similarities. Thus the pandemic revealed some generalized problems with respect to the prison issue, because there were no significant differences in the impact of the emergency across the three areas in the North, Center, and Southern Italy. The most significant difficulty presented by all participants was overcrowding, a phenomenon that existed before the pandemic (Ministry of Justice of Italy, 2011; Ristretti Orizzonti, 2020; Testoni et al., 2020a,b), but this was not the only one. Lack of competences, organization, and facilities were consistently denounced by almost all participants who considered that the hardships they faced are rooted in these institutional weaknesses. The sudden perception of lack of confidence on the job due to exposure to the risk, confusion related to rules and relational status, the absence of specific protocols undermined the perceived self-efficacy of participants, consistent with the literature on critical events (Testoni et al., 2018, 2019a).

One specific issue was the conflict between the healthcare professionals and the security personnel. The lack of clear behavioral guidelines led to hierarchical conflicts in terms of adhering to social distancing and mask rules. The lack of compliance on the part of the security personnel was paralleled by the inability of the healthcare professionals to enforce these rules. The participants considered that contradictory regulations added to their level of distress. These issues highlight the need for an organizational reformulation that defines more accurately the duties and the areas of competence of health workers and prison guards. It is hoped that the standardization of these aspects will contribute to improving the management methods, which are excessively general, which were reported as critical by the interviewees. Many stated that those who suffered the most from the situation were the inmates. The participants described the discomfort experienced by the inmates, including being cut off from their families, their distorted perception of the world outside, and their anxieties related to death. As noted in the literature, the relationship between prison guards and inmates is characterized by tensions that can result in dehumanization (Testoni et al., 2020b). Some participants, in interviews, referred to high levels of dehumanization in this relationship, comparing the relationship between guards and inmates with that between humans and animals.

Most respondents stated that one way of dealing with these uncertainties would be specific training courses. The perceived lack of competence permeated all four key themes. They stressed the need for adequate training and support to healthcare professionals, which would give them the means to cope with critical events during the pandemic and reduce the risk factors identified in this this study.

The analysis also revealed the need to deal coherently with the fear of death and mourning (Testoni, 2016). The lack of personal protective equipment was associated with the perception that the institution had abandoned its healthcare professionals. This was associated with the fact that the institution provided no support system for coping with anxiety, grief, and bereavement, which is crucial to processing the pandemic. In particular, the riots were interpreted as an expression of the prisoners' already high level of stress coupled with the frustration of not being able to speak and meet directly with relatives and friends. The lack of

specific competencies in this regard made the participants feel helpless, but also left alone to manage the trauma of mourning for those who died during the uprisings. A potential limitation of this qualitative study is the non-representativity of the results since it only involved a small number of penitentiary institutions in Italy. A further potential limitation is that the difficulties experienced by the security personnel in the same institutions were not taken into account or compared to those reported by the healthcare professionals. Future research could therefore be extended to all penitentiary institutions using validated distress-work-related scales accompanied by a questionnaire with open questions, involving both healthcare and security personnel. Intervention programs could include experiential workshops to promote self-control, perspective taking, personal strengths, and hope (Azoulay and Orkibi, 2015; Orkibi, 2019; Orkibi and Feniger-Schaal, 2019; Feniger-Schaal and Orkibi, 2020). Further future studies, in order to deepen the results that emerged from the research also on a higher number of interviewees, will help to make it possible to identify specific psychological interventions and management changes necessary to improve the well-being of the entire prison community.

CONCLUSION

This study was designed to pinpoint the issues that have had the greatest impact on the well-being of penitentiary healthcare workers during the COVID-19 emergency. The influence that each exerts on the others is undeniable, thus overall delineating the risk factors affecting prison healthcare staff. The lack of adequate-specific training in prison for health workers was crucial and was expressed in all four themes, as well as the management of detainee patients, whose specific needs, if not treated adequately, may exacerbate their already high distress, thus triggering episodes of revolt and violence. One of the main factors that may be related to prisoner aggression was the sudden deprivation of direct contact with family members, combined with their lack of perception of COVID-related events in the outside world.

The theme of death and the anxieties that affected all those in the prison impacted all the relationships. The healthcare professionals interviewed here perceived this, but felt ill-equipped to deal with this problem.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethical Committee for the Psychological Research of the University of Padova. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

IT: research design and project planning, supervision of the research, analysis of the texts, methodology, and article writing. GF: data collection, analysis of the texts, and article writing. GB: methodology, analysis of the texts, and article writing. SL: research design and project planning. HO: article writing. All authors contributed to the article and approved the submitted version.

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Lessons From the First Wave of COVID-19: Work-Related Consequences, Clinical Knowledge, Emotional Distress, and Safety-Conscious Behavior in Healthcare Workers in Switzerland

Marco Riguzzi and Shkumbin Gashi*

Careum School of Health, Zürich, Switzerland

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Edited by:
Federica Galli,
European Institute of Oncology (IEO), Italy

Reviewed by:
Seockhoon Chung,
University of Ulsan, South Korea
Sara Marelli,
San Raffaele Hospital (IRCCS), Italy

***Correspondence:**
Marco Riguzzi
marco.riguzzi@careum-hochschule.ch

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The coronavirus disease (COVID-19) imposes an unusual risk to the physical and mental health of healthcare workers and thereby to the functioning of healthcare systems during the crisis. This study investigates the clinical knowledge of healthcare workers about COVID-19, their ways of acquiring information, their emotional distress and risk perception, their adherence to preventive guidelines, their changed work situation due to the pandemic, and their perception of how the healthcare system has coped with the pandemic. It is based on a quantitative cross-sectional survey of 185 Swiss healthcare workers directly attending to patients during the pandemic, with 22% (n = 40) of them being assigned to COVID-19-infected patients. The participants answered between 16th June and 15th July 2020, shortly after the first wave of COVID-19 had been overcome and the national government had relaxed its preventive regulations to a great extent. The questionnaire incorporated parts of the "Standard questionnaire on risk perception of an infectious disease outbreak" (version 2015), which were adapted to the case of COVID-19. Clinical knowledge was lowest regarding the effectiveness of standard hygiene ($p < 0.05$). Knowledge of infectiousness, incubation time, and life-threatening disease progression was higher, however still significantly lower than regarding asymptomatic cases and transmission without physical contact ($p < 0.001$). 70% (95%-confidence interval: 64-77%) of the healthcare workers reported considerable emotional distress on at least one of the measured dimensions. They worried significantly more strongly about patients, elderly people, and family members, than about their own health ($p < 0.001$). Adherence to (not legally binding) preventive guidelines by the government displayed patterns such that not all guidelines were followed equally. Most of the participants were faced with a lack of protective materials, personnel, structures, processes, and contingency plans. An increase in stress level was the most prevalent among the diverse effects the pandemic had on their

work situation. Better medical equipment (including drugs), better protection for their own mental and physical health, more (assigned) personnel, more comprehensive information about the symptoms of the disease, and a system of earlier warning were the primary lessons to be learned in view of upcoming waves of the pandemic.

Keywords: COVID-19, healthcare workers, clinical knowledge, risk perception, mental health, stress, work situation, prevention

INTRODUCTION

Several types of human coronaviruses with low pathogenicity had been studied before the severe acute respiratory syndrome (SARS) emerged in 2002 in China (Drosten et al., 2003; Ksiazek et al., 2003; Peiris et al., 2003). SARS spread to at least 29 countries in Asia, Europe, and North and South America, with a total of 8,098 infections and 774 SARS-related deaths reported (Kahn and McIntosh, 2005). The virus that causes the presently spreading human coronavirus disease, named COVID-19, was first noticed in Wuhan, China, in December 2019, and it resembles the prior SARS (Ali S. A. et al., 2020; Liu et al., 2020; Wu et al., 2020). The infected typically experience symptoms similar to those of a common flu, with an estimated 80% showing only mild symptoms (Hafeez et al., 2020). As of 22nd December 2020, 76,023,488 cases and 1,694,128 deaths have been reported due to COVID-19 worldwide (World Health Organization, 2020a). For Switzerland, there have been 402,264 cases and 5,981 COVID-19-related deaths reported to this date (World Health Organization, 2020b) compared to a resident population of 8.606 million (by the end of 2019, Federal Statistical Office, 2020). The first COVID-19 case in Switzerland was registered on 25th February 2020 (Scire et al., 2020). The first wave of the pandemic took place in late March and early April 2020. By 23rd March, the effective reproductive number (Re)[1] had decreased below one (95%-confidence interval below one), as depicted in **Figure 1**, and the first wave was overcome by late May 2020, in the sense that daily new cases had decreased to single digits (Our world data, 2020). Shortly thereafter, the survey was conducted from 16th June until 15th July 2020. The subsequent second wave has recently grown significantly more severe than the first wave, with a maximum 7-day average of 8,064 daily new cases reported on 2nd November 2020, which equals 94 daily cases per 100,000 inhabitants (Swiss Federal Institute ETH, 2020).

The COVID-19 pandemic has induced a global crisis with unusual health-related and economic challenges. It has been claimed to have caused "a significant global shock" (Mishra, 2020) and has even been named "catastrophic" (Maliszewska et al., 2020). As a consequence, the psychological health of individuals and families has been greatly affected, particularly regarding issues such as stress, states of shock, fear, existential anxiety, and grief (Pawar, 2020). Switzerland is no exception. The first wave of the COVID-19 pandemic led to drastic measures by the Swiss federal government, including the mobilization of several thousand Swiss citizens through the militia system of the Swiss army (the greatest mobilization since World War II) (Federal Council, 2020a; Federal Office of Public Health, 2020). The most restrictive phase took place from 16th March until 26th April 2020, which has popularly been referred to in Swiss media as the "lockdown" (Abhari et al., 2020; Neue Zürcher Zeitung, 2020a). Registered unemployment increased from 121,018 to 153,413 people between January and April 2020 (+26.8%, State Secretariat for Economic Affairs, 2020a). After the precautionary measures had been gradually relaxed following 26th April, the Federal Council and the Federal Office of Public Health intensified the measures again in October 2020 in reaction to the second wave (Federal Office of Public Health, 2020). Several branches of the Swiss economy have been under considerable pressure (State Secretariat for Economic Affairs, 2020b), and prognoses for the near future remain unfavorable (State Secretariat for Economic Affairs, 2020c). By the end of November 2020, 153,270 people were registered as unemployed, amounting to an unemployment rate of 3.3% (State Secretariat for Economic Affairs, 2020a). Accordingly, the pressure on the economy is still high, as is the strain on the psychological health of the population, given this ongoing phase of restricted public and private life, economic uncertainty, health hazard, and loss.

Healthcare workers are a primary group on which the COVID-19 pandemic has imposed extraordinary challenges. This has clearly been recognized in the international literature. As first responders in providing care, they have been exposed to feelings of stress and uncertainty, while working long hours and often not being fully protected against an infection (Shaukat et al., 2020). The risk of testing positive for COVID-19 is high among healthcare workers (Nguyen et al., 2020), which, combined with the responsibility they bear for their patients, has exposed them to ethical dilemma (Menon and Padhy, 2020). As private citizens, they have also had to cope with posing an increased infection risk to their social environment. Even being depicted as "heroes" by the media can in fact be counterproductive, as it increases their perceived pressure (Cox, 2020). This situation can significantly affect their mental health and even lead to work-related trauma (Probst et al., 2020; Vagni et al., 2020). Many healthcare workers have been documented to have developed mental issues for which they require psychological support (Lai et al., 2020). This is a

[1] Average effective reproductive number over the last 3 days, as estimated by the Swiss Federal Institute of Technology (ETH) Zürich, which states: "Re values above 1 are not a consequence of an increased testing effort or of false positive test results. [. . .] the percentage of positive tests among all tests (i.e., the test positivity rate) has increased from 0.4% in June to around 15% at the moment. When correcting for the increase in testing effort in the statistical analyses, we still estimate Re significantly above 1 for most of the summer. Additionally, the specificity of PCR tests is very high, leading to essentially no false positive results which could bias our estimates." (ETH, October 27th 2020). Description of the estimation method: https://ibz-shiny.ethz.ch/covid-19-re/.

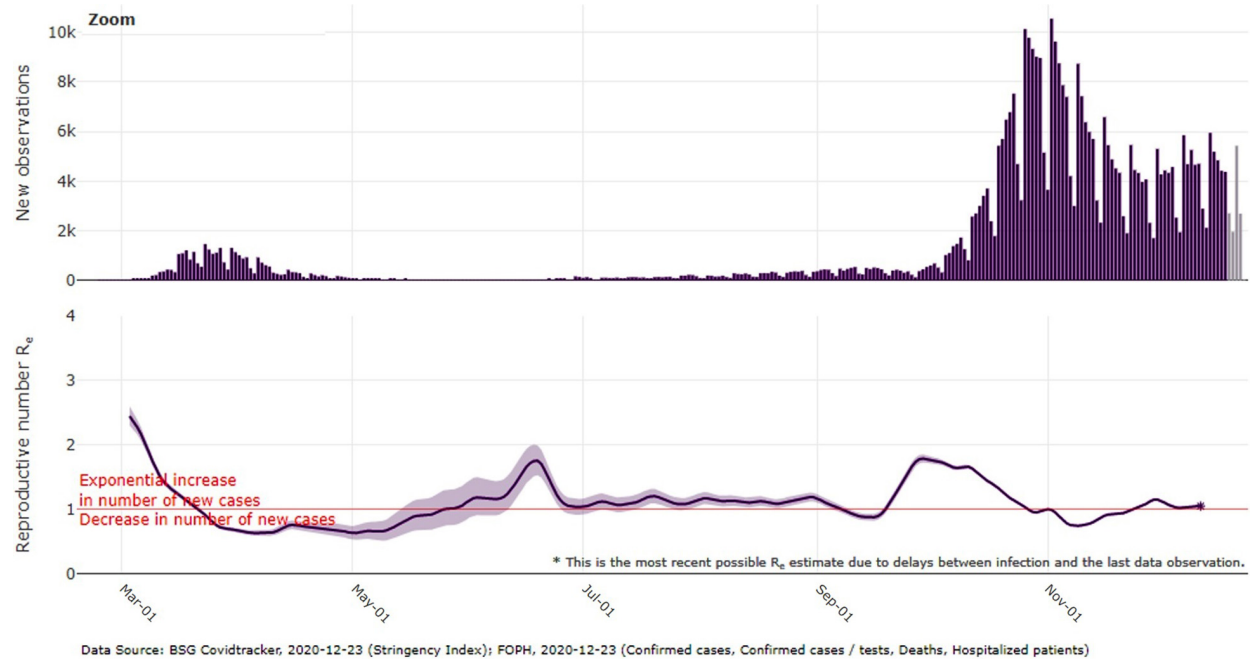

FIGURE 1 | Daily new confirmed COVID-19 cases for Switzerland and effective reproductive number (Re) as estimated and depicted by the Swiss Federal Institute (ETH) Zürich (1st March until 23rd December 2020). Graph retrieved from: https://ibz-shiny.ethz.ch/covid-19-re-international/ (ETH, 23rd December 2020).

clear indication that, besides infrastructural considerations, also the individual capacities of healthcare workers, including their psychological well-being, are a crucial ingredient in facing a pandemic of the magnitude of COVID-19.

Shortly before the first wave of COVID-19 in Switzerland, northern Italy, a direct neighbor, experienced a severe overload of the healthcare system due to COVID-19, particularly of hospitals and intensive care units (ICU). This provided an alarming example to Swiss healthcare workers. The International Council of Nurses (2020) documented both the high rate of infection among healthcare workers in northern Italy, who then needed to be isolated outside of the workforce for 14 days, as well as the physical and mental exhaustion of them and their colleagues who were still/again in service. In mid-October 2020, as the second wave of COVID-19 infections had already emerged, the Swiss Society of Emergency and Rescue Medicine, Switzerland Emergency Care, and the Swiss Association of Paramedics together issued an open call to the Swiss government for support. They stated that the health of Swiss healthcare workers, which had already deteriorated due to the first wave, was at considerable risk of getting worse, if the government did not apply consistent measures across the entire country (SwissInfo.ch, 2020a).

Beyond these challenges, the pandemic has exposed the vulnerability of people, among them also healthcare workers, towards receiving flawed information through popular media, which may affect their judgment. The conveyed information may be imprecise or even misleading, and it may originate within media outlets themselves or merely be transmitted by them. The notion of vast flows of information on a "hot topic" coming from all kinds of sources, of which it may not always be clear to the reader/listener which are proven facts and which are opinions, is known as *infodemics* (Lexico dictionary, 2020). Filtering information by assessing its source is therefore a necessity, particularly for healthcare workers.

With the physical and mental health of healthcare workers being at stake, insight on their perspective and identification of their crucial challenges, as they perceive them, are greatly needed. It is a first step towards sensibly protecting them for their own sake, as well as for them to remain effective and efficient in their services, during a time when they are most needed by society. A rapid and effective response, as well as healthcare staff that is still able to take leadership, are pivotal in successfully handling the pandemic (see e.g., Nagesh and Chakraborty, 2020). Lessons from the first wave of the pandemic are therefore needed, and first-hand empirical data is key. This study presents a quantitative survey of Swiss healthcare workers (n = 185) conducted shortly after the first wave of the pandemic. Its aim is to provide evidence of their clinical knowledge about COVID-19, their emotional reaction, their adherence to preventive guidelines, and the impact on their work situation. For such insight to be accurately drawn, understanding the context is essential. Therefore, the circumstances under which the first wave impacted the healthcare workers need to be considered, which to a large degree depend on how the government and the healthcare system were prepared for and reacted to the pandemic.

A few recent studies have provided quantitative evidence of the knowledge of healthcare workers on COVID-19.

Wahed et al. (2020) have studied Egyptian healthcare workers, showing that knowledge was higher among the more highly educated individuals, as well as among those below the age of 30 years. Zhang et al. (2020) in their survey of Chinese healthcare workers concluded that knowledge was sufficient in 89% of them. Honarvar et al. (2020) have provided evidence of the knowledge of the general public on certain COVID-19-related issues for the case of Iran. Similarly, Abdelhafiz et al. (2020) have assessed the knowledge of the Egyptian general population. To our knowledge, no study has been published so far specifically focusing on the clinical knowledge of Swiss healthcare workers and their media use. Our study therefore fills in this gap in the literature.

Several studies in the international literature have given insight on personal protective equipment (Park, 2020), specific work risks for healthcare workers related to COVID-19 (Ali S. et al., 2020), and psychological coping mechanisms (see e.g., Muller et al., 2020; Probst et al., 2020; Teo et al., 2020; Vagni et al., 2020). Further studies have shed light on risk perception and attitudes towards COVID-19 (see e.g., Führer et al., 2020; Hager et al., 2020; Honarvar et al., 2020; Zegarra-Valdvia et al., 2020). However, when considering risk perception and attitudes, many of the available studies refer to the general population instead of healthcare workers in particular. Exceptions are given as follows. Spiller et al. (2020), who focused specifically on a sample of Swiss healthcare workers, found no substantial changes in anxiety or depression over the course of the COVID-19 pandemic. Aebischer et al. (2020), who surveyed 227 resident medical doctors and 550 medical students through snowball sampling in Switzerland, found that those medical students who were involved in the COVID-19 response (30%) displayed higher levels of emotional distress than their non-involved peers, and lower levels of burnout compared to the residents. Dratva et al. (2020) analyzed Generalized Anxiety Disorder Scale-7 (GAD-7) in a sample of 2,429 Swiss university students, 595 of which (25%) were students of health professions. They found three classes of individuals regarding the perceived impact of the COVID-19 pandemic, with large differences in the odds of increased anxiety. They concluded that preventive/containment measures against COVID-19 had a selective effect on anxiety in students. However, these analyses were not differentiated across professions/fields, and therefore no results specific to healthcare workers or students of health professions were available. Puci et al. (2020) showed that the risk perception of getting infected with COVID-19 was high among Italian healthcare workers. They also reported sleep disturbances in 64% of the participants, and that 84% perceived a need for psychological support. Abolfotouh et al. (2020) in their survey of Saudi Arabian healthcare workers found that three in four respondents felt at risk of contracting COVID-19 at work, and that 28% did not feel safe at work given the available precautionary measures. Predictors of high concern were, among others, younger age, undergraduate education, and direct contact with patients. In a study of Ethiopian healthcare workers (Girma et al., 2020), risk perception due to the pandemic was measured by ten items on a five-point Likert scale. The mean score of perceived vulnerability was higher for COVID-19 than for the human immunodeficiency virus, the common cold, malaria, and tuberculosis. Wahed et al. (2020) studied a sample of Egyptian healthcare workers, finding that 83% were afraid of being infected with COVID-19. Therein, a lack of protective equipment, fear of transmitting the disease to their families, and social stigma were the most often named reasons. Two further studies are currently in their preprint phase: Firstly, Weilenmann et al. (2020) investigated mental health (depression, anxiety, and burnout) in physicians and nurses from Switzerland, considering work characteristics and demographics as explanatory factors. They concluded that support by the employer, as perceived by the physicians and nurses, was an important indicator of anxiety and burnout, while COVID-19 exposure was not strongly related with mental health. Secondly, Uccella et al. (2020) identified specific risk factors/groups among workers of public hospitals in Italy and Switzerland regarding psychological distress, such as being female and working in intensive care. Having both children and stress symptoms was associated with the perceived need to experience psychological support. Accordingly, while several studies are available regarding specific measures of psychological deterioration, such as anxiety or depression, and also regarding risk perception, quantitative evidence for the specific case of healthcare workers in Switzerland is still rare. Furthermore, the mentioned studies of risk perception referred to the situation at the time of the respective surveys during the pandemic, meaning that the available preventive measures and policies varied substantially. By contrast, the participants of our study were instructed to quantify the risk of COVID-19 independently of the specific precautionary measures that were in place at the time. That is, they answered for the scenario in which no other precautionary measures were taken during the first pandemic wave, other than the usual measures against common influenza. Albeit hypothetical, this allowed for a more general assessment of the threat imposed by COVID-19, making it more comparable to other health hazards.

The precautionary health behavior practices of Ethiopian healthcare workers were assessed by Girma et al. (2020) with a ten-item questionnaire. The items covered dimensions such as the frequency of wearing gloves or wearing a mask. Zhang et al. (2020) surveyed the implementation of four mandatory practices in hospitals among Chinese healthcare workers, concluding that 90% followed them correctly. Our survey contributes to the literature by using a different set of guidelines, which were legally non-binding and issued by the national government towards the general population. Thereby, the study covers the adherence of healthcare workers also in their private life, and is specific to the case of Switzerland.

Several studies have recently examined the responses to the COVID-19 pandemic in different countries. They adopted different perspectives, analyzing the effectiveness of governmental policies (Dergiades et al., 2020; Desson et al., 2020), epidemiological responses (Jefferies et al., 2020), testing, contact tracing and isolation (Salathe et al., 2020), lockdown policy (Faber et al., 2020), preparation of the

healthcare sector (Barro et al., 2020), as well as key learned lessons (Han et al., 2020). However, empirical studies of how such measures are perceived by the healthcare staff, and of how the pandemic has affected their work situation from their own perspective, are still scarce. Spiller et al. (2020) compared two demographics-matched samples of healthcare workers, which were collected at two different points in time: at the height of the pandemic (T1) versus two weeks after the healthcare system had started its transition back to usual operations (T2). They found that working hours were higher at T1 compared to T2, and still higher at T2 compared to pre-pandemic levels. Uccella et al. (2020) found that healthcare staff working in intensive care experienced an increase in working hours. The study by Wolf et al. (2020) investigated the effect of policies such as the Swiss "lockdown" on dental practices and social issues such as unemployment and practice closures, assuming on a more economic perspective. Abolfotouh et al. (2020) found broad approval among healthcare workers of the following: the suggestion that the national government in Saudi Arabia should mandate the isolation of COVID-19 patients in specialized hospitals, travel restrictions within the country, and curfew. Our study contributes by providing evidence of how the work situation of healthcare workers had been impacted from their own perspective, and of how they perceived the measures that were implemented by the government.

This study provides insight on several psycho-social factors that in combination are relevant to the role of healthcare workers in the current pandemic. They are not specific psychological diagnoses or concepts of psychological deterioration like depression, anxiety, or burnout, but concern a broader spectrum of issues relevant to the mental wellbeing and the capability to act of healthcare workers. This supports policymakers in pragmatically fostering their comprehensive view of the situation, and in designing policies to sustainably protect the wellbeing of healthcare workers. In addition, the healthcare workers named the specific lessons that needed to be learned from their perspective when facing further pandemic waves.

MATERIALS AND METHODS

Study Setting

This cross-sectional survey was conducted from 16th June to 15th July 2020 with Swiss healthcare workers who regularly worked in direct contact with patients. The healthcare workers were also pursuing a professional development course at Careum Weiterbildung or had attended such a course within recent years. Careum Weiterbildung, situated in Aarau, is one out of several institutions in Switzerland offering extra-occupational courses of professional development (/vocational training) to healthcare workers. These courses vary in duration from 1 day to several days per month over several years and cover a broad range of practice-oriented topics and specializations within healthcare and social sciences. They are often multidisciplinary, and they are aimed at improving care by teaching methods of caregiving, knowledge of practical procedures, communication and organizational skills. Attending such professional development courses is highly common among healthcare workers of all specializations and hierarchical positions in the Swiss healthcare system. Participation was strictly voluntary and anonymous[2]. According to Swiss regulations, no approval by an ethics committee was required for this study.

The participants were surveyed under the following circumstances: After the final day of the above-mentioned "lockdown" during the first wave in Switzerland on 26th April 2020 (see section "Introduction"), the preventive measures had been gradually eased by the national government (Neue Zürcher Zeitung, 2020b; Schweizer Radio und Fernsehen, 2020). From 27th April, businesses offering personal services with physical contact, such as hairdressers, beauty shops, and others, had been allowed to reopen, as well as florists and hardware stores (Federal Council, 2020b). From 11th May, primary and lover secondary school had resumed, and restaurants, markets (also others than food), museums and libraries had been allowed to re-open, along with sport events without physical contact (Federal Council, 2020c). From 28th May, religious events with larger groups of people could be held again (with a protection concept for the participants) (Federal Council, 2020d). From 6th June, private and public events with up to 300 people had been re-allowed, and touristic facilities (such as mountain railway, camping sites, etc.) could re-open. On 15th June, the borders with many countries within the EU/EFTA had been completely re-opened (SwissInfo.ch, 2020b). With the survey starting on 16th June, the participants answered the questionnaire after the first wave of COVID-19 had been overcome, and shortly after the government had relaxed preventive measures to a great extent.

Participants

All healthcare workers who were part of this study (n = 185) were directly attending to patients, with 22% (n = 40) of them either working with COVID-19 patients at the time of the survey or being scheduled to work with COVID-19 patients within the following 6 months. One in six individuals (17%, n = 31) indicated that because of their health condition, they themselves belonged to a risk group regarding COVID-19. The majority worked in a leading position (56%, n = 104) and roughly one in six had a technical lead position (18%, n = 33). They came from all major areas of the healthcare system, with 22% (n = 40) working in acute care (including psychiatric care), 54% (n = 100) in nursing homes, 16% (n = 30) in home care, and 12% (n = 22) in other areas such as rehabilitation and patient counseling[3]. The median age was 49 years, while the minimum was 23, and the maximum was 68. The vast majority were women (89%, n = 164). For further characteristics of the sample, see **Table 1**.

[2] Although participants could choose to name an e-mail address to which a message would be sent in the future providing information on where the results of the study would be published.

[3] Some individuals worked in more than one area.

TABLE 1 | Demographic and work-related characteristics of healthcare workers in a survey about COVID-19 in Switzerland, June 16th until July 15th 2020 (n = 185).

Works with COVID-19 patients[a] % (n)	
Yes	21.6 (40)
No	27.0 (50)
Still undetermined at the time	51.4 (95)
Health sector (multiple allowed) % (n)	
Acute care (incl. psychiatric acute care)	21.6 (40)
Nursing homes	54.1 (100)
Home care	16.2 (30)
Other	11.9 (22)
No answer	2.7 (5)
Specialized field (multiple allowed) % (n)	
Somatic care	19.5 (36)
Geriatrics	60.0 (111)
Psychiatry	9.2 (17)
Other	22.2 (41)
No answer	2.7 (5)
Hierarchical level % (n)	
Leading position	56.2 (104)
Technical lead	17.8 (33)
None of the above	22.7 (42)
No answer	3.2 (6)
Age (years)	
Mean ± SD	47.1 ± 9.7
Median (min-max)	49 (23-68)
Gender, children % (n)	
Female	88.6 (164)
Has children (of any age)	67.1 (110)
Has children (minors only)	45.7 (75)
Male	11.4 (21)
Has children (of any age)	47.6 (10)
Has children (minors only)	38.1 (8)
Lives by her-/himself % (n)	
Yes	15.7 (29)
No	84.3 (156)
Country[b] % (n)	
Switzerland	82.7 (153)
Germany	14.1 (26)
Other	3.2 (6)

[a]*Within 6 months following the survey.* [b]*In which most of education has been passed.*

Data Collection

The data were collected by two-stage cluster sampling, inviting all current and recent attendees (past 8 years) of Careum Weiterbildung for voluntary participation in the survey. A standardized online questionnaire was delivered to 1,747 attendees' addresses on 16th June via e-mail. 38.1% (n = 665) of the delivered messages were opened, and for 36.4% (n = 242) thereof the link to the survey was followed, as controlled by *Mailworx* software. A reminder was delivered to 1,684 attendees' addresses on 30th June, which was opened in 32.9% (n = 554) of the cases, and for 29.1% (n = 161) thereof the link to the survey was followed. A total of 194 participants completed the questionnaire, 185 of which directly attended to patients and therefore belonged to the population of main interest. Completion took 18.1 min at the median (minimum 9.3; maximum 54.6).

The questions were posed with given answer options, predominantly in multiple-answer form, and some in multiple-choice form (As the only exception, the participants entered their age as an integer). Thereby, parts of the "Standard questionnaire on risk perception of an infectious disease outbreak" by the Municipal Public Health Service Rotterdam-Rijnmond and the National Institute for Public Health and the Environment (Voeten, 2015) were adapted to the case of the COVID-19 pandemic. The answer option "other" was frequently included which, if selected, led to a request for text input for specification by the participant. Questions were posed across the different parts of the questionnaire as follows. (1) Knowledge about COVID-19: The participants were presented with eight claims about COVID-19 as stated in **Table 2** (labeled as items K1-K8). They were asked to choose for each claim whether it was correct, incorrect, or unknown to them (options "right"/"wrong"/"don't know"). The correct answers shown in **Table 2** ("true" or "false" in parenthesis) were taken from the following sources: Day (2020) (K1); Mullard (2020) (K2); Morawska and Cao (2020), World Health Organization (2020c) (K3); Satinder et al. (2020), World Health Organization (2020d), (K4); Osterholm et al. (2020) (K5); NCIRD (2020) (K6); Petersen et al. (2020) (K7); World Health Organization (2020e) (K8). In a second question, they chose from eight different topics (items I1-I8, as listed in **Table 2**) those on which they needed more detailed information than they had at the time (for the precise wording of the question see **Table 2**). (2) Sources of information and means of communication: A first multiple-answer question on who should provide them with the necessary information on COVID-19 (seven answer options, S1-S7), as well as a second multiple-answer question on how they preferred to receive this information (ten answer options, M1-M10), measured their preferred media use (see **Table 3** for the precise wording). Furthermore, the participants rated their use of each of five given types of media (U1-U5) on a six-point Likert scale ranging from "daily" to "never" (see **Table 4** for the precise wording). (3) Emotional distress and risk perception: The first question was "how worried do you feel because of the possibility of [the respective scenario]?" The three scenarios of "getting COVID-19 yourself," "family/friends getting COVID-19," and "numerous cases of death among elderly and sick people due to COVID-19" were each rated on a four-point Likert scale ranging from "very worried" to "not worried at all," as listed in graph A of **Figure 2**. For the questions on risk perception, a hypothetical scenario was introduced by the wording "please answer for the scenario in which no extraordinary measures were undertaken in Switzerland other than the usual measures against influenza (i.e., no prohibition of social gatherings/events, no lockdown, no extraordinary measures in hospitals)." For this scenario, the question "would COVID-19 be a threat to. . ." was asked in the five specific respects of ". . .your own life?", ". . .the life of your family members or friends?", "health professionals attending to COVID-19 patients?", ". . .the Swiss population?", and ". . .the global population?". The answers were given on a four-point Likert scale ranging from "very serious threat" to "no

TABLE 2 | Knowledge of healthcare workers regarding COVID-19 and their needs for information in a survey from Switzerland, June 16th until July 15th 2020 (n = 185).

No.	Item	Freq.	CI (Wilson)	
		% (n)	%	%
Correct indication provided on the following statements being true/false.				
K1	COVID-19 leads to symptoms in every case. (False)	92.4 (171)	87.7	95.4
K2	There currently (June/July 2020) is an effective vaccination against COVID-19. (False)	95.1 (176)	91.0	97.4
K3	COVID-19 is transmitted between people exclusively via physical contact. (False)	91.9 (170)	87.1	95.0
K4	If hygiene standards such as frequent washing of hands and sneezing only into tissues are met, an infection with COVID-19 is virtually impossible. (False)	57.3 (106)	50.1	64.2
K5	COVID-19 has a higher infectiousness than influenza. (True)	75.7 (140)	69.0	81.3
K6	COVID-19 has a shorter incubation time than influenza. (False)	72.4 (134)	65.6	78.4
K7	COVID-19 has a higher rate of life-threatening disease progression than influenza. (True)	68.6 (127)	61.6	74.9
K8	Vaccines against influenza are also effective against COVID-19. (False)	93.5 (173)	89.0	96.3
Question: On which COVID-19-related topics do you need more detailed information than you presently have?				
I1	Transmission between people.	14.6 (27)	10.2	20.4
I2	Incubation time.	33.5 (62)	27.1	40.6
I3	Symptoms.	10.8 (20)	7.1	16.1
I4	Preventive measures.	13.0 (24)	8.9	18.6
I5	Infectiousness.	26.5 (49)	20.7	33.3
I6	Severe disease progression.	29.2 (54)	23.1	36.1
I7	Treatment.	42.7 (79)	35.8	49.9
I8	Other.	8.1 (15)	5.0	12.9

TABLE 3 | Preferences of healthcare workers on sources of information and means of communication in a survey from Switzerland, June 16th until July 15th 2020 (n = 185).

No.	Item	Freq.	CI (Wilson)	
		% (n)	%	%
Question: Who should provide you with the necessary information on COVID-19?				
S1	Employer.	60.5 (112)	53.4	67.3
S2	General practitioner.	26.5 (49)	20.7	33.3
S3	Hospitals.	14.6 (27)	10.2	20.4
S4	Government (municipal, cantonal, federal).	81.1 (150)	74.8	86.1
S5	Journalists / publishers.	11.9 (22)	8.0	17.3
S6	Scientists / universities.	62.7 (116)	55.5	69.3
S7	Other.	3.2 (6)	1.5	6.9
Question: How do you prefer to receive the necessary information on COVID-19?				
M1	Postal delivery.	18.4 (34)	13.5	24.6
M2	Billboards.	28.6 (53)	22.6	35.5
M3	Public television.	74.6 (138)	67.9	80.3
M4	Advertisements in newspapers.	9.2 (17)	5.8	14.2
M5	Newspaper articles.	56.8 (105)	49.6	63.7
M6	Radio.	65.9 (122)	58.9	72.4
M7	Leaflets.	6.5 (12)	3.7	11.0
M8	Orally by employer.	16.2 (30)	11.6	22.2
M9	In writing by employer.	56.2 (104)	49.0	63.2
M10	Other.	5.9 (11)	3.4	10.3

threat at all," as listed in graph B of **Figure 2**. As a follow-up, the identical questions were asked a second time, with the answers on a discrete rating scale as described by Studer and Winkelmann (2017). The discrete rating scale ranged from zero to ten, and only the extremes were verbally labeled ("0 = no threat at all;" "10 = very serious threat"). This allowed for the

TABLE 4 | Regular media use of healthcare workers in a survey from Switzerland, June 16th until July 15th 2020 (n = 185).

No	Item	% (n) [CI %]	% (n) [CI %]	% (n) [CI %]	% (n) [CI %]	% (n) [CI %]	% (n) [CI %]
Question: How often do you usually (not only regarding COVID-19) use the following media to keep informed on recent news?		**Daily**	**≥ Several times a week**	**≥ Once a week**	**≥ Once a month**	**≥ Less than once a month[a]**	**Never**
U1	Daily newspapers requiring subscription (also digital).	38.4 (71) [31.7; 45.6]	53.5 (99) [46.3; 60.6]	61.1 (113) [53.9; 67.8]	65.4 (121) [58.3; 71.9]	68.1 (126) [61.1; 74.4]	31.9 (59) [25.6; 38.9]
U2	Free daily newspapers without subscription (also digital).	33.5 (62) [27.1; 40.6]	56.2 (104) [49.0; 63.2]	73.0 (135) [66.2; 78.9]	79.5 (147) [73.1; 84.7]	88.1 (163) [82.7; 92.0]	11.9 (22) [8.0; 17.3]
U3	TV programs (also via internet).	36.2 (67) [29.6; 43.4]	71.9 (133) [65.0; 77.9]	88.1 (163) [82.7; 92.0]	93.5 (173) [89.0; 96.3]	96.8 (179) [93.1; 98.5]	3.2 (6) [1.5; 6.9]
U4	Radio programs (also via internet).	41.1 (76) [34.2; 48.3]	71.9 (133) [65.0; 77.9]	82.7 (153) [76.6; 87.5]	87.0 (161) [81.4; 91.1]	93.0 (172) [88.3; 95.8]	7.0 (13) [4.2; 11.7]
U5	News automatically suggested by Google or other web browsers.	13.5 (25) [9.3; 19.2]	38.9 (72) [32.2; 46.1]	51.4 (95) [44.2; 58.5]	60.0 (111) [52.8; 66.8]	73.5 (136) [66.7; 79.3]	26.5 (49) [20.7; 33.3]

[a] *"Less than once a month" excluded "never." "≥Less than once a month" encompasses all individuals who answered "less than once a month," "once a month," "once a week," "several times a week" or "daily." "CI" stands for Wilson's confidence interval.*

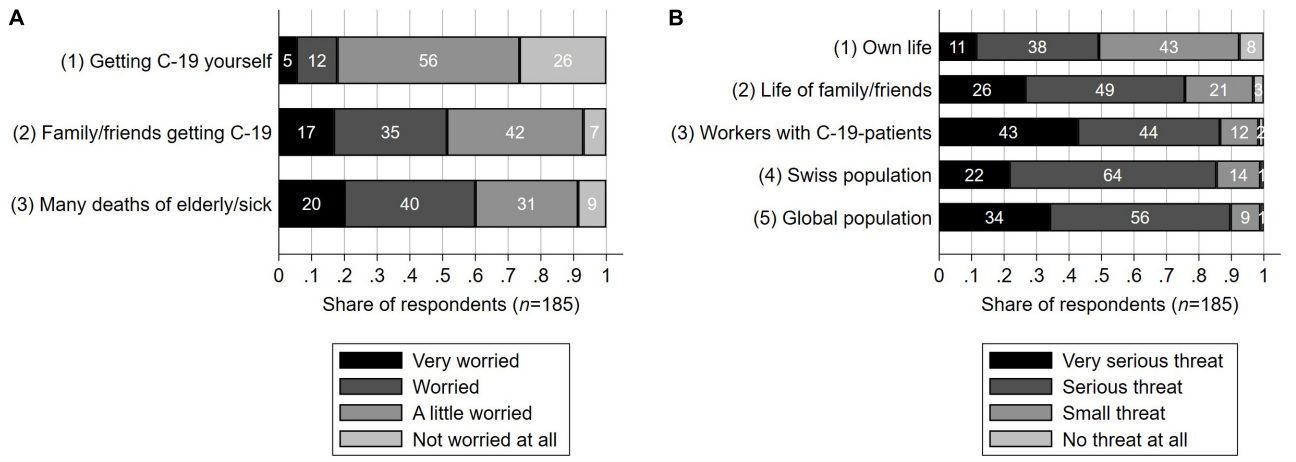

FIGURE 2 | Emotional distress and risk perception of healthcare workers in a survey from Switzerland, June 16th until July 15th 2020 (n = 185). **(A)** Emotional distress as measured on a four-point Likert scale in response to the question "how worried do you feel because of the possibility of [the respective scenario]?". **(B)** Risk perception as measured on a four-point Likert scale. The participants were asked "would COVID-19 be a threat" in the respective regard "if no extraordinary measures were undertaken in Switzerland other than the usual measures against influenza (i.e., no prohibition of social gatherings/events, no lockdown, no extraordinary measures in hospitals)?" **(A,B)** C-19 stands for COVID-19.

application of different methods of analysis, as described in the section "Data Analysis." (4) Perception of and adherence to preventive guidelines: The participants rated the likelihood of a second wave of COVID-19 in Switzerland before the end of 2020 on a six-point Likert scale ranging from "certainly" to "certainly not." They also rated the likelihood of a different pathogen causing another pandemic of equivalent or greater magnitude within the upcoming 20 years on the same scale. **Table 5** lists the precise wording of the question and the answer options. Note that for the intermediate levels of the Likert scale, the resulting frequencies are presented in cumulative form, as described in the section "Results." In the questionnaire, the Likert scale was included in typical fashion without cumulative meaning (i.e., no "≥" or "≤" signs). The participants repeated the assessment of the same two questions, but this second time with the answer options being on a discrete rating scale ranging from one to ten with only the extremes having a verbal label ("0 = certainly not;" "10 = certainly"). They were then shown six preventive guidelines (A1 and A3-A7 in **Table 6**). These guidelines were in place in Switzerland during the "lockdown" phase (with A3 and A4 formulated slightly less strictly/clearly), and some of them were relaxed afterwards. However, they had the status of recommendations by the federal government, not of legally binding rules. The participants indicated how strictly they followed them on a six-point Likert scale ranging from "always" to "never." The precise wording is given in **Table 6**. Like in **Table 5**, while the resulting frequencies for the intermediate levels are presented in their cumulative form, this was not the case in the questionnaire, where the ordinary Likert scale was used (without "≥" or "≤" signs). The participants were

TABLE 5 | Likelihood of further pandemic waves after the first wave of COVID-19 according to healthcare workers in a survey from Switzerland, June 16th until July 15th 2020 (n = 185).

No	Item	% (n) [CI %]	% (n) [CI %]	% (n) [CI %]	% (n) [CI %]	% (n) [CI %]	% (n) [CI %]
Question: How likely is the following to take place?		**Certainly**	**≥Very likely**	**≥ Rather likely**	**≤Rather unlikely**	**≤ Very unlikely**	**Certainly not**
F1	A second wave of COVID-19 infections in Switzerland beginning before the end of the year 2020.	11.4 (21) [7.5; 16.7]	36.8 (68) [30.1; 43.9]	77.8 (144) [71.3; 83.2]	22.2 (41) [16.8; 28.7]	2.2 (4) [0.8; 5.4]	0.5 (1) [0.1; 3.0]
F2	A different pathogen causing another pandemic of equivalent or greater magnitude than COVID-19 within the next 20 years.	12.4 (23) [8.4; 18.0]	43.2 (80) [36.3; 50.4]	88.6 (164) [83.3; 92.5]	11.4 (21) [7.5; 16.7]	2.7 (5) [1.2; 6.2]	0.5 (1) [0.1; 3.0]

The six answer options were "certainly," "very likely," "rather likely," "rather unlikely," "very unlikely," and "certainly not;" "≥Rather likely" encompasses all individuals who answered "rather likely," "very likely," or "certainly;" "≤Rather unlikely" encompasses all individuals who answered "rather unlikely," "very unlikely," or "certainly not." "CI" stands for Wilson's confidence interval.

further asked to indicate how strictly they expected to follow the same guidelines in the future, as listed in the lower part of **Table 6** (A11 and A13-A17). There, the six-point Likert scale ranged from "presumedly forever" to "0 to 1 month," and the alternative option of "don't know" was added. To evaluate these guidelines, the participants were asked "which of the following claims apply to the above-mentioned guidelines?" referring to guidelines A1 and A3 through A7. They were presented with the multiple answer options "most of them are exaggerated for persons *not* working with patients or elderly people," "most of them are exaggerated for persons working with patients or elderly people," "most of them are ineffective," and "none of the answers above apply." Finally, the participants indicated whether they currently had any plans of traveling abroad for private reasons before the end of the year 2020 (multiple-choice options "yes"/"no"/"undetermined yet"), and whether they would have had such plans if the COVID-19 pandemic had not occurred (see the precise wording in **Figure 3**). (5) impact on work situation: For each of four claims regarding preparation (P1-P4 as shown in **Table 7**) it was asked whether the claim was true or not. By item P5 the choice was offered that none of the claims P1 through P4 were true, which, if chosen, implied that P1 through P4 could not be selected as well. The question "how has/had COVID-19 affected your work situation?" was then asked with eleven answer options (W1-W11 as listed in **Table 7**) of which the last option excluded all other ten. (6) Reaction by the government: The sentence "the measures implemented by the government between 17th March and 26th April ("lockdown") were. . ." could be completed with either ". . .exaggerated," ". . .adequate," or ". . .not strict enough / too late / too short in duration." The follow-up question was "which of the following claims applies to the gradual steps of relaxation of these measures, which are in place since 27th April and which are planned for the future?". The multiple-choice answer options were "the measures should have been relaxed earlier / more strongly," "the relaxation plan is adequate," and "the measures should have been relaxed later / less strongly." (7) Key lessons: The question "which lessons need to be learned and what should be different in case another pandemic should happen in the future?" was asked with ten answer options (L1-L10 as listed in **Table 7**) of which the last one excluded all other options. (8) Presumed cause of the pandemic: The participants were presented with a multiple-choice question phrased as shown in **Figure 4**. At the end of the questionnaire, the participants could enter any comments, regardless of their previous answers.

Data Analysis

Confidence intervals (CIs) of proportions, as shown in **Table 2** through **Table 7**, as well as referred to in the text of the "Results" section, were calculated by Wilson's method (for a comparison of methods, see Newcombe, 1998). Fisher's exact test was used for testing the equality of proportions (see section "Emotional Distress and Risk Perception"). Pair-wise rank correlation was calculated by Spearman's method (see **Table 8**) and classified according to Cohen (1992). For any tests of hypotheses, whether univariate or within a multiple regression model, a type-one error probability (p) < 0.05 was considered as "statistically significant." In the same regard, alternative hypotheses were two-sided. By binary logistic regression, the effects of multiple predictors on a binary outcome were modeled. The results were computed as average marginal effects (AME) representing percentage-point differences in the probability of the outcome being positive. By fractional logistic rating scale regression, the effects of multiple predictors on an outcome on an eleven-point discrete numeric rating scale (0-10, with labeled extremes) were modeled. The results were represented as AME representing differences on the 0-10 scale. For an explanation of this method, see e.g., Studer and Winkelmann (2017). Each regression model was optimized such that systematic factor elimination minimized Bayes' information criterion (BIC)[4]. The following models were

[4]The initial set of predictors for which factor elimination was performed comprised the following items, for which one-sided causality could be assumed : W2 through W5 (see **Table 7**), health sector, specialized field, hierarchical level, gender, children, living by oneself, country, works with COVID-19 patients (see **Table 1**), education (none / healthcare assistant / nurse with regular diploma / nurse with diploma of Swiss "höhere Fachschule, HF" / Bachelor's degree in nursing / Master's degree in nursing / other), health condition making the

TABLE 6 | Adherence to preventive guidelines of healthcare workers after the first wave of COVID-19 in a survey from Switzerland, June 16th until July 15th 2020 (n = 185).

No	Item	% (n) [CI %]	% (n) [CI %]	% (n) [CI %]	% (n) [CI %]	% (n) [CI %]	% (n) [CI %]	% (n) [CI %]
Question: How strictly do you follow these guidelines?		**Always**	**≥Almost always**	**≥ Predominantly**	**≤Sometimes**	**≤ Almost never**	**Never**	**-[b]**
A1	Make no use of public transportation during rush hour.	55.7 (103) [48.5; 62.6]	74.6 (138) [67.9; 80.3]	82.2 (152) [76.0; 87.0]	17.8 (33) [13.0; 24.0]	10.3 (19) [6.7; 15.5]	8.1 (15) [5.0; 12.9]	-
A3[a]	Keep a physical distance of at least two meters from everyone except your closest family.	8.1 (15) [5.0; 12.9]	50.3 (93) [43.1; 57.4]	80.5 (149) [74.2; 85.6]	19.5 (36) [14.4; 25.8]	5.4 (10) [3.0; 6.7]	0.5 (1) [0.1; 3.0]	-
A4	Disinfect or wash your hands with soap for 20 seconds after each physical contact, except with family.	35.7 (66) [29.1; 42.8]	66.5 (123) [59.4; 72.9]	89.2 (165) [83.9; 92.9]	10.8 (20) [7.1; 16.1]	3.8 (7) [1.8; 7.6]	0 (0) [0; 2.0]	-
A5	Do not shake hands.	82.2 (152) [76.0; 87.0]	95.7 (177) [91.7; 97.8]	97.3 (180) [93.8; 98.8]	2.7 (5) [1.2; 6.2]	1.6 (3) [0.6; 4.7]	0.5 (1) [0.1; 3.0]	-
A6	Cough and sneeze only into a tissue or the inside of your elbow if no tissue is available.	89.2 (165) [83.9; 92.9]	96.8 (179) [93.1; 98.5]	98.9 (183) [96.1; 99.7]	1.1 (2) [0.3; 3.9]	1.1 (2) [0.3; 3.9]	0 (0) [0; 2.0]	-
A7	In case of a cough or fever, do not leave your home and contact the hotline or a physician via phone.	80.5 (149) [74.2; 85.6]	89.2 (165) [83.9; 92.9]	91.9 (170) [87.1; 95.0]	8.1 (15) [5.0; 12.9]	3.2 (6) [1.5; 6.9]	2.7 (5) [1.2; 6.2]	-
Question: How strictly do you expect to follow these guidelines in the future with the same intensity as you indicated above?		**Presumedly forever**	**≥ Until vaccine available**	**≥ 7 to 12 months**	**≥ 4 to 6 months**	**≥ 2 to 3 months**	**0 to 1 month**	**Don't know**
A11	Make no use of public transportation during rush hour.	16.2 (30) [11.6; 22.2]	34.6 (64) [28.1; 41.7]	44.3 (82) [37.4; 51.5]	55.1 (102) [47.9; 62.1]	63.2 (117) [56.1; 69.9]	8.1 (15) [5.0; 12.9]	28.6 (53) [22.6; 35.5]
A13[a]	Keep a physical distance of at least two meters from everyone except your closest family.	7.6 (14) [4.6; 12.3]	30.8 (57) [24.6; 37.8]	38.4 (71) [31.7; 45.6]	50.8 (94) [43.7; 57.9]	61.6 (114) [54.4; 68.3]	14.6 (27) [10.2; 20.4]	23.8 (44) [18.2; 30.4]
A14	Disinfect or wash your hands with soap for 20 seconds after each physical contact, except with family.	34.6 (64) [28.1; 41.7]	54.6 (101) [47.4; 61.6]	63.8 (118) [56.6; 70.4]	71.9 (133) [65.0; 77.9]	80.0 (148) [73.7; 85.1]	5.4 (10) [3.0; 9.7]	14.6 (27) [10.2; 20.4]
A15	Do not shake hands.	23.8 (44) [18.2; 30.4]	44.9 (83) [37.9; 52.1]	54.6 (101) [47.4; 61.6]	63.2 (117) [56.1; 69.9]	70.8 (131) [63.9; 76.9]	7.0 (13) [4.2; 11.7]	22.2 (41) [16.8; 28.7]
A16	Cough and sneeze only into a tissue or the inside of your elbow if no tissue is available.	85.4 (158) [79.6; 89.8]	91.9 (170) [87.1; 95.0]	93.0 (172) [88.3; 95.8]	95.1 (176) [91.0; 97.4]	95.1 (176) [91.0; 97.4]	1.1 (2) [0.3; 3.9]	3.8 (7) [1.8; 7.6]
A17	In case of a cough or fever, do not leave your home and contact the hotline or a physician via phone.	26.5 (49) [20.7; 33.3]	46.5 (86) [39.4; 53.7]	58.9 (109) [51.7; 65.8]	67.0 (124) [60.0; 73.4]	73.0 (135) [66.2; 78.9]	6.5 (12) [3.7; 11.0]	20.5 (38) [15.3; 26.9]

[a]Items A2 and A12 of the questionnaire were not included in this survey. [b]"Don't know" was not given as a response option for items A1-A7. For items A1-A7, the six answer options were "always," "almost always," "predominantly," "sometimes," "almost never," and "never;" "≥Predominantly" encompasses all individuals who answered "predominantly," "almost always," or "always;" for items A11-A17, the seven answer options were "presumedly forever," "until vaccine available," "7 to 12 months," "4 to 6 months," "2 to 3 months," "0 to 1 month;" "≥Until vaccine available" encompasses all individuals who answered "until vaccine available" or "presumedly forever;" "≥2 to 3 months" encompasses all individuals who answered "2 to 3 months, ""4 to 6 months," "7 to 12 months," "until vaccine available," or "presumedly forever;" "0 to 1 month" encompasses all individuals who answered "0 to 1 month;" "CI" stands for Wilson's confidence interval.

estimated for the different parts of the questionnaire. (1) Knowledge about COVID-19: A binary logistic model of item K4 (**Table 2**) being answered correctly (versus wrongly or by the answer option "don't know"). (3) Emotional distress and risk perception: Three binary logistic models, one for each of the three dimensions depicted in graph A in **Figure 2**, of the respective outcome being at least "worried" (i.e., ("worried" or "very worried") versus ("a little worried" or "not worried at all")). A fractional logistic model of the perceived threat to one's own life on the 0-10 discrete rating scale, as well as another fractional logistic model of the perceived threat to the life of family members and friends on the same scale. (4) Perception of and adherence to preventive guidelines: Three binary logistic

individual part of a COVID-19 risk group, answered the questionnaire before 20th June 2020 (see the final paragraph of the "Data Analysis" section for explanation). In some cases, minimization of BIC led to a reduction of the model to a single predictor, as reported in the "Results" section.

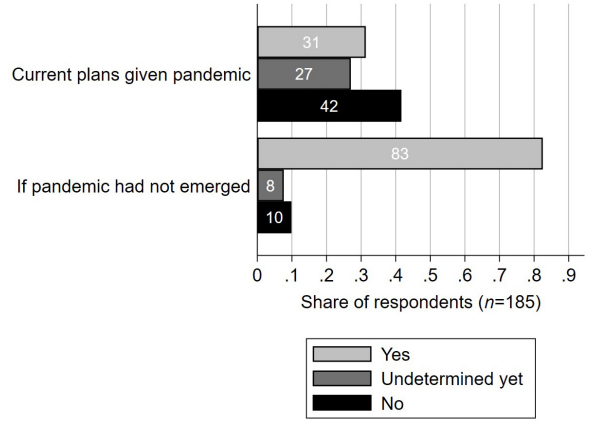

FIGURE 3 | Travel plans given the first wave of the COVID-19 pandemic compared to without the pandemic according to healthcare workers in a survey from Switzerland, June 16th until July 15th 2020 (n = 185). Participants were asked "will you travel abroad for private reasons before the end of 2020?" and "would you have traveled abroad for private reasons before the end of 2020 if the COVID-19 pandemic had not occurred?", respectively.

models, one each for the items A1, A3, and A4 (**Table 6**), of the respective outcome being at least "almost always" (i.e., "almost always" or "always" versus all other answer options). Three binary logistic models, one each for the items A13, A14, and A15 (**Table 6**), conducted for those participants who claimed to adhere to the respective guideline at least "predominantly" at the time of the survey (as measured by items A3, A4, and A5). Thereby, the probability of continuing the individual level of adherence at least until a vaccine would be available was modeled (i.e., "until vaccine available" or "presumably forever" versus all other answer options, except for "don't know" in which case the respective individual was excluded). A binary logistic model of currently having plans of traveling abroad before the end of 2020 given the pandemic, as described in **Figure 3** (i.e., "yes" versus the other two answer options). (6) Reaction by the government: A binary logistic model of the question "which of the following claims applies to the gradual steps of relaxation of these measures, which are in place since 27th April and which are planned for the future?" being answered by "the measures should have been relaxed later / less strongly" (versus the other two answer options). For each of these BIC-optimized models, all of the predictors and their estimated effects are reported in the "Results" section.

One of the tested predictors in the above-mentioned models concerned a specific public announcement by the Swiss Federal Council, which requires specific explanation. It was made shortly after the start of the survey: During the day of 19th June 2020, the Federal Council announced that most of the national preventive measures in place at that time would be abolished or relaxed on June 22nd. In particular, organized events with up to 1,000 people would be legalized again, the recommended physical distance between people would be reduced from 2 to 1.5 meters, masks would not be mandatory in public transportation (yet recommended), and home office would no longer be a recommendation (Federal Council, 2020e). The Federal Council further announced that the handling of a potential second wave would be the duty of the Swiss cantons, which are the member states of the Swiss Federation. It thereby undertook a fundamental change of policy, which it underlined by suspending the national coronavirus task force (KSBC). Notably, these steps were not known to the broad public before 19th June. Hence, the government's future plans changed on the 19th of June to being significantly more liberal than before, as far as public knowledge is concerned. From 16th June until 19th June, 107 of the total of 185 participants had already answered the survey. Naturally, by the time the survey had started on 16th June, no question specifically referring to the announcement of 19th June could have been included in the questionnaire. For reasons of consistency, the questionnaire was not altered after the start. Therefore, the day of participation in the survey (i.e., whether it was after 19th June or not) was used as a predictor of the answer to whether the participants agreed with the steps of relaxation "undertaken since 27th April and planned for the future" (see section "Reaction by the Government").

RESULTS

Knowledge About COVID-19

Knowledge was high regarding the unavailability of a COVID-19 vaccine (item K2), the ineffectiveness of influenza vaccines against COVID-19 (K8), the occurrence of symptoms (K1), and transmission without physical contact (K3), with over 92% (confidence intervals (CIs) over 87%) answering correctly (see **Table 2**). 76% of the participants answered correctly that COVID-19 was more infectious (K5) and 72% that it had a longer incubation time (K6) than common influenza. 69% correctly indicated that COVID-19 cases more often had a life-threatening disease progression than common influenza (K7). However, 36% (CI 29-43%) falsely believed that if hygiene standards such as frequent washing of hands and sneezing only into tissues were met, an infection with COVID-19 would be virtually impossible. Another 7% (CI 4-12%) answered that they did not know the answer to this question. Hence, knowledge on the latter item (K4) was significantly lower than on any other tested item. It was even *lower* among participants who as a result of the pandemic worked more hours than usual (AME = –17.7 percentage points, $p < 0.05$, binary logistic regression).

Additional information on treatment was most frequently desired (43%, I7 in **Table 2**), followed by incubation time (34%, I2), severe disease progression (29%, I6), infectiousness (27%, I5), transmission between people (15%, I1), preventive measures (13%, I4), and symptoms (11%, I3). 28% (CI 22-35%) claimed not to be needing any further information on COVID-19-related topics (i.e., none of the items I1 through I8 were selected).

Even though knowledge was comparably low regarding the effectiveness of standard hygiene (K4), the topics of preventive measures (I4) and transmission (I1) were rarely named as topics for which further information was perceived to be needed. In fact, among those participants who did not provide the correct

TABLE 7 | Assessment of the preparation for a viral pandemic, the work situation due to COVID-19, and the lessons to be learned from the first wave of COVID-19, according to healthcare workers in a survey from Switzerland, June 16th until July 15th 2020 (*n* = 185).

No	Item	Freq.	CI (Wilson)	
		% (n)	%	%
Question: Which of the following claims are true? Ahead of the outbreak of COVID-19, the government and the healthcare system were sufficiently prepared for a viral pandemic with. . .				
P1	Disinfectant and protective masks.	9.2 (17)	5.8	14.2
P2	Personnel.	13.5 (25)	9.3	19.2
P3	Structures.	22.7 (42)	17.3	29.3
P4	Processes and contingency plans.	30.3 (56)	24.1	37.2
P5	None of the above claims are true. In none of these four areas were the government and the healthcare sector sufficiently prepared.	58.4 (108)	51.2	65.2
Question: How has/had COVID-19 affected your work situation?				
W1	I feel more stressed than usual.	44.3 (82)	37.4	51.5
W2	I have to work more than usual.	32.4 (60)	26.1	39.5
W3	I am more often pressed for time than usual.	17.8 (33)	13.0	24.0
W4	I have to do tasks which are unusual to me.	37.8 (70)	31.2	45.0
W5	I work for a department/division (at least in part) which I do not usually work for.	8.1 (15)	5.0	12.9
W6	My employer shows less consideration for my needs than usual.	18.4 (34)	13.5	24.6
W7	The material and structures necessary to effectively protect the staff from an infection with COVID-19 are available.	71.9 (133)	65.0	77.9
W8	The decisions necessary to effectively protect the staff from an infection with COVID-19 are taken.	81.1 (150)	74.8	86.1
W9	A relevant share of nurses does not strictly abide to the hospital-/institution-specific regulations regarding protective masks, washing of hands, and physical distancing.	22.7 (42)	17.3	29.3
W10	Other.	9.7 (18)	6.2	14.9
W11	Not at all.	0.5 (1)	0.1	3.0
Question: Which lessons need to be learned and what should be different in case another pandemic should happen in the future?				
L1	Earlier warning.	31.9 (59)	25.6	38.9
L2	More personnel available/assigned.	36.8 (68)	30.1	43.9
L3	More detailed/accurate information about the symptoms caused by the virus.	35.7 (66)	29.1	42.8
L4	More/better medical equipment (including drugs).	57.8 (107)	50.6	64.7
L5	Keep work schedules as usual ("business as usual").	13.5 (25)	9.3	19.2
L6	Increased hourly wages due to the exceptional circumstances.	36.8 (68)	30.1	43.9
L7	Better protection for own physical health.	40.0 (74)	33.2	47.2
L8	Better protection for own mental health.	43.8 (81)	36.8	51.0
L9	Other.	13.5 (25)	9.3	19.2
L10	No lessons to be learned or changes needed, as preparation and handling of COVID-19 was appropriate.	6.5 (12)	3.7	11.0

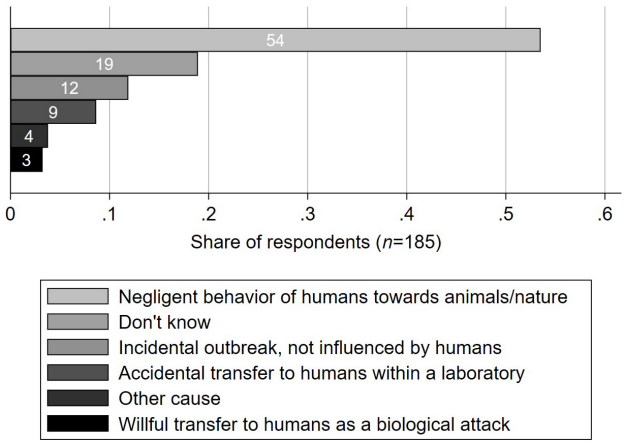

FIGURE 4 | Cause of the outbreak of the COVID-19 pandemic according to healthcare workers in a survey from Switzerland, June 16th until July 15th 2020 (n = 185). Participants were asked "what is the cause of the outbreak of the COVID-19 pandemic?"

TABLE 8 | Pairwise rank correlation among items of present adherence to preventive guidelines (n = 185) and among items of expected future adherence to preventive guidelines (n = 95) according to healthcare workers after the first wave of COVID-19 in a survey from Switzerland, June 16th until July 15th 2020.

Item-No	**A1**	**A3[a]**	**A4**	**A5**	**A6**
Item-No	*A11*	*A13[a]*	*A14*	*A15*	*A16*
A3[a]	0.160*				
A13[a]	*0.696***				
A4	0.128	0.502***			
A14	*0.552***	*0.707***			
A5	0.126	0.402***	0.306***		
A15	*0.585***	*0.662***	*0.760***		
A6	0.005	0.218**	0.226**	0.265***	
A16	*0.376***	*0.341***	*0.465***	*0.392***	
A7	0.068	0.207**	0.230**	0.201**	0.188*
A17	*0.702***	*0.603***	*0.614***	*0.585***	*0.412***

[a]*Items A2 and A12 of the questionnaire were not used in this survey. Top row within each cell shows pairwise correlation of items A1-A7, referring to present adherence at the time of the survey (June 16th until July 15th 2020); Bottom row within each cell (italics) shows pairwise correlation of items A11-A17, referring to expected duration of adherence (for the n = 95 individuals who did not answer "don't know"); The meaning of the items is listed in* ***Table 6****. *p < 0.05, **p < 0.01, ***p < 0.001.*

answer to this item (K4) (n = 79), 85% (CI 75-91%) claimed to be needing no further information on preventive measures (I4), and 86% (CI 77-92%) claimed to be needing no further information on transmission between people (I1). Similar results were found for other topics: Of the participants who did not answer correctly on life-threatening disease progression (K7) (n = 58), 74% (CI 62-84%) claimed to be needing no further information on the topic (I6). Of the participants who did not answer correctly on incubation time (K6) (n = 51), 45% (CI 32-59%) claimed to be needing no further information on the topic (I2). Of the participants who did not answer correctly on infectiousness (K5) (n = 45), 73% (CI 59-84%) claimed to be needing no further information on the topic (I5). This is clear evidence that, although knowledge was fairly high on some topics, many participants overestimated their knowledge (or for other reasons thought that no further information was needed).

Sources of Information and Means of Communication

The vast majority of the participants (81%) expected the government to be their source of necessary information on COVID-19, as shown in **Table 3** (S4), while 63% (also) wished for scientists/universities (S6), and 61% (also) wished for their employer to take on that role (S1). Any other sources were significantly less often named. The most preferred means of communication by which to receive the information were public television (75%, M3), radio (66%, M6), and newspaper articles (57%, M5). Of those participants who wished to receive the information by their employer (n = 112, S1), 93% (CI 87-96%) required to receive it in writing (M9), and only 27% (19-36%) orally (also) (M8). Accordingly, television (72%, U3) and radio (72%, U4) were the most popular media in order to keep informed ("several times a week" or "daily") on recent news in general, not only related to COVID-19 (see **Table 4**). Still, more than half of the participants read articles by daily newspapers at least "several times a week" (54% for newspapers requiring subscription, U1; 56% for free newspapers, U2). News automatically suggested by web browsers (U5) were significantly less popular than the other mentioned media.

Emotional Distress and Risk Perception

Merely 18% (CI 13-24%) of the participants felt at least worried (i.e., "worried" or "very worried") about getting infected with COVID-19 themselves (see graph A in **Figure 2**). By contrast, 52% (CI 44-58%) felt at least worried about possibly the same happening to their family/friends. 60% (CI 53-68%) felt at least worried about the possibility of numerous deaths among elderly or sick people (people not necessarily personally known to them). Hence, the participants were significantly more often at least worried (i.e., "worried" or "very worried") about other people being at risk than about themselves ($p < 0.001$, for both bivariate comparisons, Fisher's exact test). Participants working in long-term care were *more* likely to feel at least worried (i.e., "worried" or "very worried") about contracting COVID-19 themselves (AME = 0.335, $p < 0.05$, binary logistic regression), participants who had passed the majority of their education in Germany were *more* likely to feel at least worried about their family/friends contracting it (AME = 0.263, $p < 0.01$), and both participants working in somatic care (AME = 0.258, $p < 0.001$) and participants working in nursing homes (AME = 0.284, $p < 0.001$) were *more* likely to feel at least worried about deaths among elderly or sick people.

The provided answers on how severe of a threat COVID-19 was for specific groups are illustrated by graph B in **Figure 2**. This pertains to the hypothetical scenario without precautionary measures because of COVID-19 other than the usual ones against a common flu ("business as usual"). 90% (CI 85-93%) claimed

an at least serious (i.e., "serious" or "very serious") threat for the global population, and 86% (CI 81-91%) claimed so for healthcare workers who directly attended to COVID-19 patients. 85% (CI 80-90%) claimed an at least serious threat for the Swiss population, and 76% (CI 69-81%) claimed so for the life of their family members and friends. Only 49% (CI 42-56%) claimed an at least serious threat for the global population. Again, a pattern showed according to which the participants significantly more often saw other groups than themselves as threatened ($p < 0.001$, for all four bivariate comparisons, Fisher's exact test), which is analogous to the observed pattern of emotional distress. The results of the assessment on the discrete 0-10 rating scale were consistent with those on the Likert scale. The proportion of participants who estimated a *strictly lower threat* of COVID-19 *to their own life* was 65% (CI 59-73%) compared to the global population, 64% (CI 56-71%) compared to healthcare workers directly attending to COVID-19 patients, 57% (CI 50-65%) compared to the Swiss population, and 51% (CI 44-59%) compared to their own family and friends. Vice versa, the proportion of participants who estimated a higher threat to their own life than to another group was a single-digit percentage (for any of the four comparisons). Furthermore, 38% (CI 31-46%) claimed that there was a greater threat to the global population than to the Swiss population, and only 4% (CI 2-8%) claimed vice versa. The observation that healthcare workers who directly attended to COVID-19 patients were predominantly estimated to be more threatened than one's own life calls for closer consideration. It applied even among those participants who themselves attended to COVID-19 patients (n = 40, therein: 58% with CI 41–73%; vice versa 3% with CI 0–13%). This is remarkable, as the majority therein claimed a lower threat for themselves individually than for others, even though they belonged to the very group they were comparing themselves to. While this may appear somewhat paradoxical at first glance, it is another occurrence of the above-mentioned pattern, this time within the group of their peers. Participants who themselves were part of a risk group regarding COVID-19 because of their health condition estimated the threat to their own life to be *higher* (AME = 2.43 points, $p < 0.001$, with a mean outcome over all individuals of 5.47 points on the 0-10 scale), which is unsurprising (as derived by the fractional logistic regression model). The same participants also estimated the threat to the life of their family members and friends to be *higher* (AME = 1.31 points, $p < 0.001$, with a mean outcome over all individuals of 6.80 on the 0-10 scale).

Perception of and Adherence to Preventive Guidelines

Table 5 tabulates the cumulative distribution of the perceived likelihood of a second wave of COVID-19 and of another pandemic in the future. Note that this is the cumulative distribution over the Likert scale, which is split in its middle such that the left side of the table cumulates frequencies from high to low likelihoods, starting on the left with the highest ("certainly"), and the right side of the table cumulates frequencies from low to high likelihoods, starting from the right with the lowest ("certainly not"). 78% (CI 71-83%, F1) estimated a second wave of COVID-19 to be at least rather likely (i.e., "rather likely," "very likely," or "certain"), and 89% (CI 83-93%, F2) estimated such a likelihood of another pandemic in the future. On the discrete 0-10 rating scale, 39% (CI 32-47%) estimated the likelihood of another pandemic (with another pathogen) to be *strictly higher* than that of a second wave of COVID-19. Vice versa, only 23% (CI 17-30%) estimated the likelihood of a second wave of COVID-19 to be *strictly higher*.

Table 6 shows how strictly the participants claimed to be following certain preventive guidelines *at the time of the survey* (A1-A7 in **Table 6**). Like **Table 5**, the upper part of **Table 6** is split in its middle, such that the left side of the table cumulates frequencies from high to low likelihoods, starting on the left with the highest ("always"), and the right side of the table cumulates frequencies from low to high likelihoods, starting from the right with the lowest ("never"). Strict adherence (answer option "always") was most frequent regarding coughing and sneezing only into a tissue or the inside of one's own elbow (89%; 97% at least "almost always;" A6), not shaking hands (82%; 96% at least "almost always;" A5), and not leaving home in case of a cough or fever and contacting the hotline or a physician via phone (81%; 89% at least "almost always;" A7). 56% (75% at least "almost always") claimed to always refrain from public transportation during rush hour (A1), while 8% did not refrain from public transportation during rush hour at all. 36% (67% at least "almost always") disinfected or washed their hands with soap after each physical contact (except with family, A4). Only 8% were able to always (50% at least "almost always") keep a physical distance of at least two meters all the time (except their closest family, A3), which is not surprising, given that all of the participants regularly worked with patients. For each of the five covered preventive guidelines, the proportion of participants who followed them at least "predominantly" lay above 80% (CIs above 74%). Participants in leading positions were *more* likely to refrain from public transportation during rush hour (at least "almost always," AME = 18.5 percentage points, $p < 0.01$, binary logistic regression), participants living by themselves were *less* likely to keep a physical distance of two meters from people except their closest family (at least "almost always," AME = –33.7 percentage points, $p < 0.001$), and participants who were part of a risk group regarding COVID-19 because of their health condition were *more* likely to disinfect or wash their hands with soap after each physical contact (excepting their family) (at least "almost always," AME = 19.4 percentage points, $p < 0.05$).

The lower part of **Table 6** shows for how long the participants expected to continue to follow the guidelines with the same intensity *in the future*, that is, following the survey. The following proportions of participants expected to continue indefinitely or until a vaccine would be available: 92% with coughing and sneezing only into tissue or inside their elbow (A16), 55% with disinfecting or washing their hands with soap after each physical contact (except with family, A14), 47% with not leaving home in case of a cough or fever and contacting the hotline or a physician via phone (A17), 45% with not shaking hands (A15), 35% with not using public transportation during rush hour (A11), and 31% with keeping a physical distance of at least

two meters from everyone except their closest family (A13). While not leaving home in case of a cough or fever and not shaking hands were both followed with high adherence at the time of the survey, roughly half of the participants expected to keep it up for a year or less only, and to not necessarily wait until a vaccine would be available. These two guidelines concern socially and culturally relevant behaviors. Staying at home may be perceived as an act of social isolation, depending on the situation, and shaking hands is a common gesture of greeting in Switzerland. Refusing an offered handshake without providing a reason, such as a health hazard, can be considered as a sign of disrespect. The analysis of those participants who claimed to adhere to the guidelines at least "predominantly" at the time of the survey showed that participants of age 45 to 54 were *more* likely to continue keeping a physical distance of two meters until a vaccine would be available (AME = 24.6 percentage points, $p < 0.01$), and that participants of age 55 and above were *even more* likely to continue keeping a physical distance of two meters (AME = 42.0 percentage points, $p < 0.001$), with both age groups being compared to participants of age below 45. Furthermore, participants who had passed the majority of their education outside of Switzerland were *more* likely to continue disinfecting or wash their hands (AME = 27.5 percentage points, $p < 0.01$). Finally, participants of age 55 and above were *more* likely to continue not shaking hands (AME = 25.6 percentage points, $p < 0.01$), and participants who answered the survey on 20th June or later (see section "Data Analysis" for explanation) were *more* likely to continue not shaking hands (AME = 27.5 percentage points, $p < 0.01$).

Table 8 lists the pair-wise rank correlation of the reported adherence to the guidelines. Within each cell of the table, the upper coefficient refers to adherence *at the time of the survey* (A1-A7), and the lower coefficient refers to continued adherence *in the future following the survey* (A11-A17). Correlation across the different guidelines was rather low *at the time of the survey*. Even though mostly significantly different from zero, the effects were of *small* or *moderate* size according to the classification by Cohen (1992), except for the two pairs of A3/A4 and A3/A5. This means that an individual typically did not follow all guidelines to a uniform extent, but instead differentiated between the guidelines, and followed some of them more strictly and others less strictly. By contrast, correlation was high among continuation in *in the future*. Here, the effects were mainly *strong,* with coefficients up to 0.707, and only a few of them were moderate (those involving A16, which is the dimension with the highest expected *future* adherence by a large margin). Hence, an individual typically differentiated her/his behavior across the guidelines initially, and then intended to continue the pattern for a certain duration, without strongly readjusting it over time by relaxing on a part of the guidelines earlier than on others. Please note that the correlations regarding continuation *in the future* (A11-A17) were calculated for the subsample of the 95 participants who did not answer with "don't know." If the correlations regarding adherence *at the time of the survey* were computed for the same subsample ($n = 95$), the effects were even smaller than the ones shown in **Table 8** (all but two of them).

Of the mentioned preventive guidelines (as listed in **Table 6**), two participants (2%, CI 1-5%) claimed that "most of them are exaggerated for persons working with patients or elderly people," and 14% (CI 9-19%) claimed that "most of them are exaggerated for people *not* working with patients or elderly people."

Figure 3 depicts the participants' plans of traveling abroad before the end of the year 2020. Had the pandemic not emerged, 83% (CI 76-87%) would have traveled abroad. Given the pandemic, only 31% (CI 25-38%) still had plans of traveling abroad at the time of the survey. Unsurprisingly, participants who had passed most of their education in Germany (rather than in Switzerland) were *more* likely to still have plans of traveling abroad given the pandemic (AME = 44.2 percentage points, $p < 0.001$, binary logistic regression). One participant commented that she/he had elderly relatives abroad and therefore had to follow a "familial obligation."

Impact on Work Situation

Table 7 shows the participants' assessment of the initial preparation for a viral pandemic before the outbreak (items P1-P5), how COVID-19 had affected their work situation (W1-11), and which lessons should be learned from its first wave (L1-L10). The participants largely indicated that before the COVID-19 pandemic had broken out, the preparation by the government and the healthcare sector for a viral pandemic had been insufficient. 91% deemed preparation insufficient regarding the availability of disinfectant and protective masks (P1), 86% regarding personnel (P2), 77% regarding structures (P3), and 70% regarding processes and contingency plans (P4). More than half of the participants (58%, CI 51-65%) claimed that in none of these four areas preparation had been sufficient (P5).

Following the outbreak, 44% of the participants felt more stressed than usual because of the pandemic (W1 in **Table 7**). 38% worked unusual tasks as a result of the COVID-19 pandemic (W4), and 32% worked more hours than usual (W2). 28% indicated that not all materials and structures necessary to effectively protect the healthcare staff from an infection with COVID-19 were available (W7), and 19% thought that not all the decisions necessary to do so were being taken (W8), respectively. 92% (CI 88-95%) of the participants reported multiple effects of the pandemic on their work situation (W1-W10). Only one participant concluded that the first wave of the pandemic had no effect on her/his work situation at all (W11). If a participant selected the item labeled "other" (W10), they were asked to specify these other effects. Among these text answers ($n = 18$), the most frequently mentioned issue was the handling of visitors of patients (four mentions), which grew more challenging due to more restrictive preventive measures and visitor hours, as well as due to visitors not abiding to them and even verbally abusing the staff. Three participants again emphasized a severe lack of protective equipment, one of them described "chaotic" circumstances, in which masks had been forbidden to be used by nurses until the first confirmed case had occurred within the institution, and with no measures of isolation afterwards. Three times it was claimed that wearing the protective material, particularly masks, made work more difficult or more exhausting. Three reports were given of increased psychological strain among

the staff and the patients. Another three statements were made that organizational challenges were high, because changes needed to be implemented within very short time and without a test run. Single mentions were the introduction of tracking, a lack of personnel, economical aspects dominating the healthcare system, and employers threatening employees with consequences in case they should introduce COVID-19 into the institution. One participant reported to actually have less work because fewer patients were present in her/his institution due to the pandemic.

Reaction by the Government

The vast majority of 72% (CI 65-78%) found the preventive measures implemented by the federal government between 17th March and 26th April 2020 (i.e., the "lockdown" during the first wave) to be "adequate." Another 17% (CI 13-23%) found them to be "not strict enough / too late / too short in duration," and 10% (CI 7-15%) found them to be "exaggerated." 56% (CI 48-63%) concluded that the relaxation schedule from 27th April onward was "adequate," while 32% (CI 26-39%) would have preferred the preventive measures to be relaxed "later / less strongly," and 11% (CI 8-17%) claimed that the measures should have been relaxed "earlier / more strongly." The above-mentioned date of 19th June (see section "Data Analysis") was predictive of the evaluation the participants made. Participants who completed the survey after that date were significantly *more* likely to deem the relaxation plan as too liberal (i.e., relaxation should be done "later / less strongly"), compared to participants who completed the survey up to 19th June (AME = 0.281, $p < 0.001$, binary logistic regression). In addition, participants who had children were *less* likely to evaluate the relaxation plans as too liberal (AME = –0.185, $p < 0.01$), and participants who had passed the majority of their education in Germany were *more* likely to evaluate them as too liberal (AME = 0.285, $p < 0.01$).

Key Lessons

More than half of the surveyed healthcare workers (58%, CI 51-65%) claimed the need for more/better medical equipment (including drugs) than it was available during the first wave of the COVID-19 pandemic (L4 in **Table 7**). 40% required better protection of their own physical health (L7), and even 44% called for better protection of their mental health (L8). 37% asked for more (assigned) personnel (L2). 37% thought that hourly wages should be higher due to the exceptional circumstances (L6). 36% required more detailed/accurate information about the COVID-19 symptoms (L3), and 32% called for an earlier warning next time (L1). Only 14% indicated that the work schedule should be left unchanged due to the pandemic ("business as usual," L5). 7% claimed that no lessons needed to be learned, as preparation for and handling of the pandemic had been appropriate in their view (L10).

Presumed Cause of the Pandemic

Half of the participants (54%, CI 46-61%) identified negligent behavior of humans towards animals/nature as the cause of the COVID-19 pandemic, as depicted in **Figure 4**. Six participants (3%, CI 1-7%) concluded that it was instead a willful transfer to humans as a biological attack. Among "other causes" (4%, CI 2-8%), mutation of SARS, improper hygiene in the food sector, politics, economics, overpopulation of the planet and overconsumption of natural ressources, ignorance, and denial were specified.

DISCUSSION

Key Findings

This survey explored the knowledge of Swiss healthcare workers on COVID-19, how the first pandemic wave impacted their work situation, and how they reacted both emotionally and regarding their adherence to preventive guidelines.

Assessed after the first wave of COVID-19 had been overcome, clinical knowledge of COVID-19 was high among healthcare workers on several main topics, but not on all of them. In particular, a large proportion (more than a third) overestimated the effectiveness of standard hygiene (namely frequent washing of hands and sneezing into tissues) as a regime that would virtually exclude any transmission of COVID-19. This proportion was even higher among those who had worked more hours than usually during the pandemic. This misjudgment was prevalent, despite most of the respective healthcare workers knowing that COVID-19 was not only transmitted via physical contact. Also, and this may be critical, the vast majority of them nevertheless believed not to be needing any further information on the topics of preventive measures and transmission. Another topic where knowledge was limited, however to a lesser degree, was the comparison of COVID-19 with the common flu regarding infectiousness, incubation time, and life-threatening disease progression. Again, a pattern showed according to which the majority of those participants who did not provide the correct answer believed not to be needing any further information (except for incubation time, where the proportion was slightly smaller than half). This clearly shows that even after the first wave of the pandemic, healthcare workers had still not received comprehensive or uniform education on certain essential topics. It also reflects the circumstance that COVID-19 had not only been present in media of specific focus and readership, such as scientific media from which to be absorbed by the healthcare institutions, but that it had also been dominating the popular media since shortly after the outbreak. In this ever-present flow of information from most heterogeneous outlets, the distinction of scientific facts, or also a lack of scientific facts when it was the case, from speculation and opinion became significantly more challenging (see e.g., notion of *infodemics*, Lexico dictionary, 2020). This raises the question of by whom, and through which processes, the provision of comprehensive and uniform clinical information to healthcare workers can and should be ensured when managing a pandemic of global relevance. According to the healthcare workers, they most often expected the government to provide them with the necessary information, followed by scientists/universities, and their employer. Any other possible sources (e.g., journalists) should play a smaller role according to them. They preferred to receive the information by public television (and to a slightly lesser extent by radio and newspaper articles). In case the employer should provide them with

according information, they had a clear preference for it to be in writing rather than orally.

The healthcare workers reported considerable emotional distress caused by the pandemic, with more than half of them feeling worried about their family or friends possibly getting infected, and about numerous deaths among elderly and sick people, respectively. About one in five reported to be feeling very worried because of these possibilities, while less than ten percent were not worried at all. By contrast, they were significantly less worried about themselves possibly contracting the disease. They were also asked to estimate the threat COVID-19 posed to different groups, irrespective of preventive measures, meaning for the hypothetical case in which no other precautionary measures would have been taken than the usual ones against the common flu. Again, they were significantly more concerned about the global and Swiss population than about themselves. Interestingly, they were also significantly more concerned about healthcare workers working with COVID-19 patients than about themselves. The latter was true even among healthcare workers who themselves attended to COVID-19 patients. While this finding may appear as a paradox, it is in line with the repeating pattern of them being more worried/concerned about others than about themselves, even if they are in the same situation. Even though this manifests as an altruistic trait, which may be lauded as "heroic" by society or patients (Cox, 2020), it ought not to be forgotten that this attitude serves the short-term interest of the patients, but could be detrimental to the physical and mental health of the healthcare worker.

The vast majority of the healthcare workers (three in four) estimated another wave of COVID-19 in Switzerland, after the first one that took place in March/April 2020, to be "rather likely." A different pathogen causing another pandemic of equivalent or greater magnitude than COVID-19 within the next 20 years was considered to be even more likely. This provides the relatively clear picture that healthcare workers expected global pandemics to repeatedly be a part of human society in the future, and not a once-in-a-lifetime event.

The self-reported adherence to preventive guidelines was such that at least four in five healthcare workers followed them at least "predominantly." The guidelines of refraining from shaking hands, no uncovered coughing or sneezing, and staying at home in case of a cough or fever, were followed strictly (meaning "always") by at least four in five healthcare workers. All of the tested guidelines were official recommendations by the Swiss government during the "lockdown" phase of the first wave (however not legally binding, and relaxed after the "lockdown"). Interestingly, the pair-wise correlation across these guidelines was insignificant to moderate (with two exceptions), meaning that most healthcare workers displayed a pattern in which they did not follow all guidelines with the same commitment. Only between roughly a third and half of the healthcare workers expected to continue their pattern of adherence until a vaccine would be available in case that this would take longer than a year. This excluded the guideline of only covered coughing and sneezing, where the overwhelming majority expected to keep their adherence until a vaccine would be available (without a time limit). With increasing age, healthcare workers were more likely to expect to keep their adherence to both social distancing (two meters) and hand hygiene for a longer period of time. After eight in ten healthcare workers had plans of traveling abroad before the pandemic emerged, three in ten still kept such plans after the first wave.

The overwhelming majority of the healthcare workers stated, that the preparation by the government and the healthcare sector for a viral pandemic had been insufficient at the time COVID-19 emerged, especially regarding the availability of disinfectant and protective masks (nine in ten), but also clearly so regarding personnel (six in seven), structures (four in five), processes, and contingency plans (seven in ten). The majority even claimed that preparation had been insufficient in all of these areas. It is therefore not surprising that the reported effects of the pandemic on the work situation of the healthcare workers were rather diverse. Roughly one in three had worked more hours than usual. This finding was confirmatory of Spiller et al. (2020), who further found that hours worked were sluggish in converging back to previous levels. Even before the pandemic, excessive labor of healthcare workers had been an often-discussed topic in the literature, particularly regarding its effect on psycho-social function, productivity, and working errors in an industry, where the margin for error often is small (see e.g., Caruso, 2006; Griffiths et al., 2014). Another one in three healthcare workers had worked usual tasks. One in four reported that not all materials and structures necessary to effectively protect the healthcare staff from an infection with COVID-19 were available during the first wave. One in six (each) were more pressed for time, had an employer showing less consideration for their needs than usual, or observed a relevant share of nurses not strictly abiding to the hospital-/institution-specific regulations regarding protective masks, washing of hands, and physical distancing, respectively. Further, less frequently named effects were working for another department/division, challenging situations with visitors of patients due to increased precautionary measures (and some visitors not abiding and even being verbally abusive), physical exhaustion due to wearing a mask while working, increased pressure by the employer, increased psychological strain, and implementing new processes within short time and without testing. The most frequently reported effect, however, was an increase in emotional stress level as a result of the COVID-19 pandemic (almost half of the healthcare workers).

The vast majority of the healthcare workers found the reaction by the Swiss government, specifically the "lockdown" during the first wave, to be adequate, while one in six found it to be not restrictive enough (or too late/short), and one in ten found it to be exaggerated. The relaxation plan following the "lockdown" received significantly less approval, with one in three healthcare workers claiming that the preventive measures should have been relaxed later (or less strongly), and one in ten claiming the opposite. The policy change announced by the national government on 19th June, according to which many restrictive measures would be relaxed or abolished, the national coronavirus taskforce (KSBC) would be suspended, and the management of further pandemic waves in the future would be mainly the duty of the cantons, was deemed as too liberal by a significant proportion of healthcare workers. A similar result showed in the analysis of their adherence to preventive guidelines, in which

the healthcare workers who participated in the survey after this change of policy were significantly more likely to expect to continue not shaking hands at least until a vaccine was available, compared to healthcare workers who had participated before this change of policy.

Lessons to Be Learned

Key lessons were drawn which should be learned according to healthcare workers themselves. They should be seen as recommendations for the management of further pandemic waves which have recently developed in Switzerland and many other countries.

According to the surveyed healthcare workers, the lesson most often claimed as needed to be learned was the requirement of more/better medical equipment (including drugs) than during the first wave. This again reflects the lack of protective materials at the beginning of (and also during) the first wave in Switzerland, as well as the globally ongoing efforts in research for vaccination and therapeutics. This can be seen as the first aim of improvement according to healthcare workers. While their personal physical and mental wellbeing, as well as their ability to fulfill their tasks effectively and efficiently, are affected by other factors as well, progress towards this first aim can be expected to yield most significant improvement. The healthcare workers' second priority was better protection for their own mental and physical health (with mental health being named more frequently, however with a statistically insignificant difference compared to physical health). A proportion of more than four in ten stated this need. This is in accordance with the above-mentioned group of medical organizations, which together recently issued an open call to the Swiss government for support in order to prevent further deterioration of the state of Swiss healthcare workers (see section "Introduction"). In addition to practical challenges, a viral pandemic can cause a moral dilemma of being responsible for patients, but thereby also risking getting infected and infecting others, which may impose additional mental and emotional strain and even affect decision-making. Irrespective of the COVID-19 pandemic however, the literature has suggested that healthcare workers find themselves in a difficult industry, as far as emotional, communicational, and decision-making challenges are concerned (see e.g., Wulf, 2012; Joseph and Joseph, 2016), which can be psychologically depleting. In this sense, the COVID-19 pandemic can be seen as an event which has not only caused new challenges for healthcare workers, but which has also emphasized shortcomings that were prevalent beforehand. Solutions therefore should address both the pandemic-specific as well as the underlying long-term challenges of the industry. The third lesson was the need for more personnel to be available (and assigned) to handling the pandemic, as well as increased hourly wages during the exceptional circumstances. It needs to be kept in mind that during a pandemic, healthcare workers getting infected themselves is a twofold risk, as it not only threatens the health of the individual, but also isolates her/him from the workforce at least for a period of quarantine. Fourthly, more detailed information about the symptoms of the disease was required, as well as a system of earlier warning in order to provide room for preparation. Each of these lessons were named by more than three in ten healthcare workers (some significantly more). Nevertheless, there was a small minority of healthcare workers (one in fifteen), who claimed that no lessons needed to be learned from the first wave of the pandemic, as preparation for and handling of it had been appropriate in their view. Given all of these results, the fifth lesson to be learned is that healthcare workers and their individual situations are considerably heterogeneous. They have faced a variety of different consequences and challenges during the pandemic, and some have been affected more strongly than others. Therefore, solutions must be specific to varying circumstances and remain adjustable over time.

Limitations

The population of healthcare workers who directly attend to patients during the present COVID-19 pandemic is at the center of the topic. To date, no randomized sample with mandatory participation (or complete survey) has been drawn from this population in Switzerland. Therefore, clustered sampling was conducted for this survey, contacting the attendees of extra-occupational professional development courses at Careum Weiterbildung in Aarau. The vast majority of healthcare workers in Switzerland repeatedly attend such courses, and most of the institutions offering these courses follow a similar scheme. Careum Weiterbildung encompasses a wide range of attendees from different institutions, areas of healthcare, and geographical regions across Switzerland. The sample of this survey therefore was drawn from a very broad population of Swiss healthcare workers. It needs to be noted however, that participation was not mandatory within the cluster of Careum Weiterbildung. Therefore, randomness cannot be ascertained, nor excluded. Also, despite the teaching institutions being of a similar scheme, and despite the regions from which they attract students overlapping, homogeneity of the clusters is unproven. The sample size is limited. A larger sample, although not necessarily related to unbiasedness, could decrease the error probabilities on inferential statistical tests. Causal effects of the pandemic were assessed by directly asking the participants to do so themselves, whenever considered to be expedient, e.g., by asking "how has the COVID-19 pandemic affected your work situation?" Within the cross-sectional design of the study, concepts such as emotional distress and risk perception could not be tracked over time before/during the pandemic, as a panel or follow-up study could have. Moreover, all data was self-reported by the participants. Emotional distress was measured by four items. These were derived by three questions on how worried they were, as shown in **Figure 2**, referring to three different groups (/oneself) which the pandemic may threatened by the pandemic, with answer options on a four-point Likert scale. Also, the participants indicated whether they felt more stressed during work because of the COVID-19 pandemic, by answering a yes/no question (item W1 in **Table 7**). A seven-item validated scale of the fear of COVID-19 has been published by Ahorsu et al. (2020), which aims at differentiating emotions more strongly (feeling "afraid," "uncomfortable," "nervous," having clammy hands, a racing heart, losing sleep) and could yield more detailed insight. Since this study was conducted for Swiss healthcare workers, understanding their specific situation at the time was crucial. Consequently, the findings may only be applicable

to nations/healthcare systems, in which the first wave of the pandemic followed a comparable pattern.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because of requirements of anonymity. However, the raw data supporting the conclusions of this article will be made available by the authors to any qualified researcher, excluding the demographic data and the free text answers, such that any inference that would breach the anonymity of an individual remains ruled out. Requests to access the datasets should be directed to MR, marco.riguzzi@careum-hochschule.ch.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

MR contributed to the quantitative methodology, data curation, and formal analysis. SG performed the literature research. Both authors contributed to the conceptualization, composing and online implementation of the questionnaire, writing and editing, project administration, and article. Both authors approved the submitted version.

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Depression, Anxiety, and Stress Among Healthcare Workers During the COVID-19 Outbreak and Relationships With Expressive Flexibility and Context Sensitivity

Vittorio Lenzo[1,2], Maria C. Quattropani[3], Alberto Sardella[3], Gabriella Martino[3] and George A. Bonanno[4]*

[1] Department of Social and Educational Sciences of the Mediterranean Area, University for Foreigners "Dante Alighieri" of Reggio Calabria, Reggio Calabria, Italy, [2] Sisifo – Consortium of Social Cooperatives, Catania, Italy, [3] Department of Clinical and Experimental Medicine, University of Messina, Messina, Italy, [4] Teachers College, Columbia University, New York, NY, United States

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***Correspondence:**
Vittorio Lenzo
v.lenzo@unidarc.it

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This study aimed at investigating depression, anxiety, and stress symptoms among healthcare workers and examine the role of expressive flexibility and context sensitivity as key components of resilience in understanding reported symptoms. We hypothesized a significant and different contribution of resilience components in explaining depression, anxiety, and stress. A total sample of 218 Italian healthcare workers participated in this study through an online survey during the lockdown, consequently to the COVID-19. The Depression Anxiety Stress Scales-21 (DASS-21) was used to measure depression, anxiety, and stress; the Flexible Regulation of Emotional Expression (FREE) scale was used to measure the ability to enhance and suppress emotional expression; the Context Sensitivity Index (CSI) was used to measure the ability to accurately perceive contextual cues and determine cue absence. Demographic and work-related data were also collected. DASS-21 cut-off scores were used to verify the mental status among the respondents. Correlational analyses examined relationships between DASS-21, FREE, and CSI, followed by three regression analyses with depression, anxiety, and stress as dependent variables, controlling for age, gender, and work experience. Enhancement and suppression abilities, cue presence, and cue absence served as independent variables. The results showed a prevalence of moderate to extremely severe symptoms of 8% for depression, 9.8% for anxiety, and 8.9% for stress. Results of correlational analysis highlighted that enhance ability was inversely associated with depression and stress. Suppression ability was inversely associated with depression, anxiety, and stress. The ability to perceive contextual cues was inversely associated with depression and anxiety. The regression analysis showed that the ability to enhance emotional expression was statistically significant to explain depression among healthcare workers. In predicting anxiety, age, and the ability to accurately perceive contextual cues and determine cue absence made substantial contributions as predictors. In the last regression model, age, work experience, and

the ability to suppress emotional expression were significant predictors of stress. This study's findings can help understand the specific contributions of enhancement and suppression abilities and sensitivity to stressor context cues in predicting depression, anxiety, and stress among healthcare workers. Psychological interventions to prevent burnout should consider these relationships.

Keywords: COVID-19, clinical psychology, depression, anxiety, stress, emotion regulation, flexibility, context sensitivity

INTRODUCTION

Since the end of February 2020, the number of confirmed cases of coronavirus disease 2019 (COVID-19) has dramatically ascended in Italy causing 78.755 deaths as of 10th January 2021 (Italian Ministry of Health, 2021). On March 9, the Italian Government adopted a massive lockdown to decrease the spread of the virus. Early studies have documented the psychological impact of this unprecedented decision concerning the Italian population. A study involving a sample of 6,314 Italian people showed that about a third of participants reported moderate to extremely severe depression, anxiety, and stress (Lenzo et al., 2020b). Another study found that more than half of the Italian population suffered impaired sleep quality during the restrictive measures following the COVID-19 lockdown (Franceschini et al., 2020). During the lockdown, the Italian National Health Service was severely struck with healthcare workers facing an overwhelming burden. In Italy, until January 5, the more recent estimate of healthcare workers deaths was 198, and 95.451 have been infected (Italian National Institute of Health, 2021). Healthcare workers are involved with infected patients' care faced with an unknown threat to their own life. Excessive workload, fear of contagion, feeling of being under pressure, lack of specific drugs, and isolation of community were the major issues faced by healthcare workers during the time of the COVID-19 outbreak. Healthcare workers assisting patients infected with the COVID-19 may face further stress due to the stigma (Ramaci et al., 2020). On the other hand, fear of COVID-19 seems to be positively related to depression and job insecurity (Gasparro et al., 2020). However, there is still a paucity of studies investigating mental health among healthcare workers. This is surprising because the presence of mental health complaints is related to a higher reporting of insufficient workability (Ruitenburg et al., 2012). To date, many efforts by health care authorities have addressed the mental health of healthcare personnel, even though little is known on the psychological impact of the COVID-19 outbreak. Previous studies related to the 2003 outbreak of severe acute respiratory syndrome (SARS) have found a prevalence rate of severe posttraumatic stress symptoms ranging from 5 percent to 10 percent, with an increased risk for healthcare workers who had been quarantined or had worked in frontline (Bai et al., 2004; Wu et al., 2009). Although evidence on the long-term psychological impact of the COVID-19 remains unknown, early studies have provided some important results. A study involving a sample of 1257 Chinese healthcare workers reported a prevalence rate of 50.4% for depression, 44.6% for anxiety, and 71.5% for distress, with a higher risk for frontline work with COVID-19 patients in Wuhan (Lai et al., 2020). In regard to the Italian context, healthcare workers assisting patients with COVID-19 showed work-related psychological pressure, emotional exhaustion, and somatic symptoms (Barello et al., 2020). Results of a recent study highlighted the need for psychological aid interventions with anxiety and fear of contagion representing the main concern for both healthcare workers and the general population (Maldonato et al., 2020). Another study comprising a sample of 1379 Italian healthcare workers found that 49.38% expressed posttraumatic stress symptoms, 24.73% symptoms of depression, 19.80% symptoms of anxiety, and 21.90% high perceived stress (Rossi et al., 2020). High psychological distress, anxiety, and depression accounted for the need for psychological support among professionals (Conti et al., 2020). It was argued that promoting resilience should protect people from stress and psychopathological symptoms during the COVID-19 outbreak (Khan et al., 2020). Although individual characteristics could be related to mental health outcomes, no evidence is still available for healthcare workers. Bonanno (2004) described a well-consolidated theoretical and research framework that directly addressed the issue of resilience. Resilience can be defined as a stable trajectory of healthy functioning follow highly adverse and stressful events (Bonanno, 2004). In other words, resilience entails the ability to maintain a stable equilibrium while exposing to stressful and traumatic situations. Resilience is strictly related to flexibility in emotional regulation as required by the situational context (Bonanno et al., 2004). In contrast, previous theories and studies have mistakenly assumed that coping and emotion regulation strategies are always beneficial or maladaptive (Bonanno and Burton, 2013). To date, several studies have widely demonstrated that mental health depends on one's ability to modulate emotional response under situational demands (Bonanno et al., 2004, 2018; Gupta and Bonanno, 2011; Levy-Gigi et al., 2015; Birk and Bonanno, 2016; Burton and Bonanno, 2016). Therefore, adaptation depends on one's ability to flexibly enhance or suppress emotional expression in accordance with the contextual demands (Burton and Bonanno, 2016). The sensitivity to correct perceive contextual cues represents a key component of adaptive emotional regulatory strategies (Bonanno and Burton, 2013). Therefore, the extent to which people possess the ability to modulate emotional expression according to the context could explain how people respond to stressful events. The most of people exposed to potentially traumatic events, including the threat of an outbreak, show to be resilient and so to gain psychological adjustment (Bonanno et al., 2008). To better understand the psychological impact of the COVID-19 outbreak among healthcare workers, it is necessary to investigate

resilience factors such as flexibility in emotion regulation and context sensitivity in perceive cues abilities. It could be reasonable to assume that the extent to which healthcare workers hold these characteristics could influence how they respond to stressful events such as the COVID-19 outbreak. In this perspective, a study among palliative care practitioners found that the ability to being flexible in modulating emotional response is associated with a lower risk of burnout (Lenzo et al., 2020a). Nowadays, however, no data are available about the roles of expressive flexibility and context sensitivity in the mental outcomes of healthcare workers during the COVID-19 outbreak.

The first aim of this study was to examine the prevalence of depression, anxiety, and stress among a sample of Italian healthcare workers. Consistent with other preliminary data available, we hypothesized a relevant prevalence rate for moderate to severe psychological distress. The second aim of this study was to explore the relationships between emotion regulation ability, context sensitivity, depression, anxiety, and stress. We hypothesized to find inverse relationships between emotion regulation abilities and depression, anxiety, and stress. Similarly, we expected that the ability to identify the presence and absence of stressor context cues was associated with lower levels of depression, anxiety, and stress. Finally, the third aim of this study was to investigate the role of emotion regulation ability and context sensitivity in predicting depression, anxiety, and stress. We hypothesized a significant contribution of the emotion regulation abilities and context sensitivity.

MATERIALS AND METHODS

Participants

A sample of 218 Italian health care workers participated in this study through an online survey system without any form of compensation. Four cases were excluded for incomplete data and therefore, the final sample consisted of 214 participants. All the participants are comprised in the Sicilian Region Health Unit of the Italian National Health Service (INHS) and were recruited from April 27 to May 4, when the Italian Government has reduced restrictive measures associated with the lockdown. The inclusion criteria were being at least 18 years old and employed during the lockdown consequent to the COVID-19 outbreak with a full-time contract. *A priori* power analysis (Cohen, 1988), conducted using G*Power v. 3.1.9.7 (Faul and Erdfelder, 1992), ensured the adequacy of the sample size. Hence, the sample size was computed as a function of population effect size, significance level α, statistical power, and a number of tested predictors. For these reasons, we selected the *F*-test and linear multiple regression, fixed model, and R2 increase. Therefore, we obtained a total sample size of 130 individuals (with a critical F of 2.08) by inserting a medium effect size (Cohen's $d = 0.15$), a significant finding (at the 0.05 level), the statistical power of 0.90, and a number of 7 tested predictors.

As shown in **Table 1**, the final sample consisted of 130 females and 84 males working both in hospital and home care services during the COVID-19 outbreak. Participants ranged in age from 23 to 72 years ($M = 39.58 \pm 11.40$). With regard to marital status, 77% was married or in a steady relationship. Twenty-five percent of the respondents were nurses ($n = 54$), 24% were physicians ($n = 51$), 16% were physiotherapists ($n = 35$), 14% were healthcare assistants ($n = 30$), 7% were clinical psychologists ($n = 15$), 5% were speech therapists ($n = 10$), 3% were social workers ($n = 7$), 5% were other health professions ($n = 12$). Also, 20% ($n = 42$) of the healthcare workers assisted COVID-19 patients.

TABLE 1 | Demographic and work-related characteristics of the sample.

Variable	*M*	*SD*	*n*	*Percentage*
Age (in years)	39.80	11.39		
Gender				
Male			84	39.3%
Female			130	60.7%
Marital status				
Married or in a steady relationship			165	77.1%
Single, widowed, or divorced			49	22.9%
Work experience in years	11.90	10.32		
Working position				
Front-line			42	19.6%
Second-line			172	80.4%

N = 214.

Procedure

Participants were recruited through an online advertisement promoted by the Local Health Unit of the Italian National Health Service (INHS). The advertisement connected participants who were interested to an external page with information and consent to participate to this study. All participants completed the survey anonymously and gave informed consent electronically before participate. The informed consent form showed two options (yes or no). Subjects who selected "yes" accessed the survey page. Moreover, subject could leave the survey at any time. Privacy of the participants was guaranteed in accordance with the European Union General Data Protection Regulation 2016/679. The study was conducted in accordance with the 1964 Declaration of Helsinki and its later amendments. The online survey included a self-report questionnaire to collect data on age, gender, relationship status, profession role, work experience, and contact with patients with COVID-19. The study was approved by the Research Ethics Committee for Psychological Research of the University of Messina (no. 38518).

Measures

Depression, Anxiety, and Stress

The Depression Anxiety Stress Scale – 21 (DASS-21) (Lovibond and Lovibond, 1995) was used to measure depression, anxiety, and stress. The DASS-21 is a 21-item self-report instrument using a four-point Likert scale ranging from "never" (0) to always (3). It consisted of three scales as follows: depression (DASS-21 Depression), assessing dysphoria, low self-esteem, anhedonia, lack of interest, and passivity (e.g., "I felt that life was meaningless"); anxiety (DASS-21 Anxiety), comprising somatic and subjective symptoms of anxiety (e.g., "I felt scared without any good reason"); stress (DASS-21 Stress), evaluating persistent

arousal, irritability, psychological tension, and agitation (e.g., "I felt that I was rather touchy"). In the present study, the Italian version of DASS-21 showing excellent psychometric properties was used (Bottesi et al., 2015). Adequate levels of reliability were detected in this sample for all the three subscales (Depression, $\alpha = 0.83$; Anxiety, $\alpha = 0.78$; Stress, $\alpha = 0.87$).

Emotion Regulation Ability

The Flexible Regulation of Emotional Expression (FREE) (Burton and Bonanno, 2016) scale is a 16-item self-report and scenario-based questionnaire assessing an individual's perceived ability to modulate emotional expressions and being flexible. Regulatory flexibility is a central component for adjusting to stressful life events. The FREE Scale consisted of two relatively independent factors, which one measures the ability to enhance emotional expression (FREE Enhance ability), and the other one measures the ability to suppress emotional expression (FREE Suppress ability). Also, overall expressive flexibility (FREE Flexibility score) is calculated from the FREE Enhancement and FREE Suppression scales. All the items are rated on a 6-point Likert scale ranging from 1 (unable) to 6 (very able). Higher FREE scores are associated with greater flexibility in modulating emotional expressions.

Context Sensitivity

The Context Sensitivity Index (CSI) is a 20-item self-report and scenario-based questionnaire measuring context sensitivity, which is the ability to perceive cues to contextual demands across different situations (Bonanno et al., 2018). The items are rated on a 7-point Likert scale ranging from 1 (not at all) to 7 (very much). Previous studies have shown that context sensitivity is a crucial component of successful self-regulation. The CSI consists of two indices assessing the ability to capture sensitivity to the presence of contextual cues (CSI Cue Presence index) and sensitivity to the relative absence of cues (Cue Absence index). An overall CSI score (CSI Overall index) is calculated by averaging the Cue Presence and Cue Absence indices.

Statistical Analyses

Statistical analysis was performed using IBM SPSS Statistics version 22 (IBM Corporation, Armonk, NY, United States). Data obtained from this study were checked, and descriptive and inferential statistical analyses were then carried out. Internal consistency was calculated for the DASS-21 but not for the FREE and the CSI measures because they are scenario-based indices (Bonanno et al., 2018). Indeed, each item/scenario of the FREE and the CSI measures is a unique aspect of the latent construct. An independent was used to compare the DASS-21 Depression, the DASS-21 Anxiety, and the DASS-21 Stress in the second-line healthcare workers and the front-line healthcare workers. Also, the effect size (Cohen's *d*) was computed to quantify the difference between the second-line and front-line healthcare workers. Relationships between FREE, CSI, and DASS-21 were performed with Pearson product-moment correlation coefficients. To explore the relationship between depression, anxiety, and stress with emotion regulation ability and context sensitivity, three hierarchical regression analyses were conducted, each consisting of two steps. The DASS-21 Depression, the DASS-21 Anxiety, and the DASS-21 Stress scales were the dependent variables in all three regressions. Age, gender, and work experience were put in as covariates in both steps. In the second step, the FREE Enhance and the FREE Suppress abilities, the CSI Cue Presence and the CSI Cue Absence indices were inserted for testing if they can predict the DASS-21 Depression, the DASS-21 Anxiety, and the DASS-21 Stress scales scores among healthcare workers during the COVID-19 outbreak.

RESULTS

Prevalence of Depression, Anxiety, and Stress

Table 2 shows the percentage of healthcare workers falling into each of the five categories, such as normal, mild, moderate, severe, and extremely severe based on the Lovibond and Lovibond's percentile cut-offs (1995). The overall prevalence of moderate-to-extremely severe depression (DASS-21 Depression), anxiety (DASS-21 Anxiety), and stress (DASS-21 Stress) among participants was 8, 9.8, and 8.9%, respectively. Healthcare workers assisting patients with COVID-19 obtained scores significantly much higher than other participants on the three DASS-21 scales. We found a prevalence of moderate-to-extremely severe ranging from 21.5% for anxiety to 33.4% for stress. Moreover, **Table 3** displays the result of the independent *t*-tests for the front-line healthcare workers assisting patients with COVID-19 and second-line healthcare workers. Results indicated that there were significant differences in the DASS-21 Depression [$t(212) = 4.04$, $p < 0.001$], the DASS-21 Anxiety [$t(212) = 2.60$, $p = 0.010$], and the DASS-21 Stress [$t(212) = 4.50$, $p < 0.001$]. Lastly, based on benchmarks suggested by Cohen (1988), results showed a medium effect size ranging from 0.436 for the DASS-21 Anxiety scale and 0.664 for the DASS-21 Stress scale.

Correlational Analysis

Table 4 displays descriptive statistics and correlation coefficients among the observed variables. The FREE Enhance ability was negatively associated with the DASS-21 Depression scale ($r = -0.25$; $p < 0.01$) and the DASS-21 Stress scale ($r = -0.23$; $p < 0.01$). The FREE Suppress ability was negatively associated with the DASS-21 Depression scale ($r = -0.23$; $p < 0.01$), the DASS-21 Anxiety scale ($r = -0.15$; $p < 0.01$), and the DASS-21 Stress scale ($r = -0.27$; $p < 0.01$). Also, FREE Flexibility score was negatively associated with the DASS-21 Depression scale ($r = -0.46$; $p < 0.01$), the DASS-21 Anxiety scale ($r = -0.33$; $p < 0.01$), and the DASS-21 Stress scale ($r = -0.54$; $p < 0.01$). The CSI Cue Presence index was negatively associated with the DASS-21 Depression scale ($r = -0.14$; $p < 0.01$) and the DASS-21 Anxiety scale ($r = -0.18$; $p < 0.01$). There was no significant correlation between the CSI Cue Absence index and the DASS-21 Depression, the DASS-21 Anxiety, and the DASS-21 Stress scales. Finally, the CSI Overall index was negatively associated with the DASS-21 Anxiety scale ($r = -0.26$; $p < 0.01$) but not with the DASS-21 Depression and the DASS-21 Stress scales.

TABLE 2 | Prevalence of depression, anxiety, and stress.

DASS-21 category	DASS-21 Depression		DASS-21 Anxiety		DASS-21 Stress	
	Second-line HCWs	Front-line HCWs	Second-line HCWs	Front-line HCWs	Second-line HCWs	Front-line HCWs
Normal	83.6%	71.4%	85.5%	78.6%	85.5%	66.7%
Mild	8.4%	9.5%	4.7%	0%	5.6%	2.4%
Moderate	5.1%	7.1%	7.9%	19.0%	6.1%	23.8%
Severe	2.4%	11.9%	1.0%	2.4%	1.4%	2.4%
Extremely severe (98–100)	0.5%	0%	0.9%	0%	1.4%	4.8%

N = 214; The prevalence in each category is based on the percentiles corresponding to Lovibond and Lovibond's cut-offs (1995).

TABLE 3 | Results of the *t*-tests and effect size for depression, anxiety, and stress.

Variable	Second-line HCWs (*n* = 172)		Front-line HCWs (*n* = 42)		*t*(212)	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*			
DASS-21 Depression	3.90	4.39	7.49	7.55	4.04	0.001	0.581
DASS-21 Anxiety	2.78	4.14	4.67	4.52	2.60	0.010	0.436
DASS-21 Stress	7.69	5.72	12.71	9.02	4.50	0.001	0.664

TABLE 4 | Descriptive and correlational analyses FREE, CSI, and DASS-21.

Variable	*Min*	*Max*	*M*	*SD*	1	2	3	4	5	6	7	8
1. FREE enhance ability	4	24	16.57	3.53								
2. FREE suppress ability	7	24	14.84	3.57	0.50**							
3. FREE flexibility score	16	48	30.59	6.36	0.80**	0.81**						
4. CSI Cue presence index	12	56	33.69	7.53	0.30**	0.33**	0.32**					
5. CSI cue absence index	11	60	39.18	7.95	−0.29**	−0.27**	−0.27**	−0.45**				
6. CSI overall index	24	49	36.43	4.07	−0.01	0.04	0.03	0.49**	0.56**			
7. DASS-21 depression	0	24	4.60	5.33	−0.25**	−0.23**	−0.46**	−0.14*	0.04	−0.09		
8. DASS-21 anxiety	0	26	3.15	4.27	−0.11	−0.15*	−0.33**	−0.18**	−0.09	−0.26**	0.64**	
9. DAS-21 stress	0	34	8.67	6.77	−0.23**	−0.27**	−0.54**	−0.12	0.04	−0.08	0.72**	0.67**

N = 214; FREE, Flexible Regulation of Emotional Expression; CSI, Context Sensitivity Index; DASS-21, Depression Anxiety Stress Scale – 21; Min, minimum value; Max, maximum value; M, mean; SD, standard deviation.
**p < 0.05, **p < 0.01.*

Regression Analyses

Table 5 shows the results of the effects of FREE Enhance ability, FREE Suppress ability, CSI Cue Presence, and the CSI Cue Absence indices controlling for age, gender, and work experience on the DASS-21 Depression, the DASS-21 Anxiety, and the DASS-21 stress scales. In predicting the DASS-21 Depression scale, only age was significant at first step ($\beta = -0.30$; $p < 0.05$). In step 2, the effect of age did not persist. Also, FREE Enhance ability ($\beta = -0.19$; $p < 0.05$) was statistically significant to explain the DASS-21 Depression scores among healthcare workers with R^2 reaching 0.10.

The second regression analyses examined the same model event though considering the DASS-21 Anxiety scale as the dependent variable. Only age ($\beta = -0.35$; $p < 0.01$) was statistically significant at step 1 and this effect persisted at step 2 ($\beta = -0.27$; $p < 0.05$). In step 2, the CSI Cue Presence index ($\beta = -0.21$; $p < 0.01$) and the CSI Cue Absence index ($\beta = -0.23$; $p < 0.01$) gave a substantial contribution in explaining the DASS-21 Anxiety scores.

Finally, the third regression analyses considered the DASS-21 Stress scale as the dependent variable. In step 1, age ($\beta = -0.48$; $p < 0.01$), gender ($\beta = 0.17$; $p < 0.05$), and work experience ($\beta = 0.35$; $p < 0.01$) were all statistically significant even though gender did not maintain this effect at step 2. In addition, FREE Suppress ability ($\beta = -0.16$; $p < 0.05$) was statistically significant with the model reaching a R^2 of 0.14.

DISCUSSION

Summary of the Main Findings

This study examined depression, anxiety, and stress in a sample of Italian healthcare workers facing the COVID-19 outbreak. Expressive flexibility and context sensitivity were accounted for explain depression, anxiety, and stress. During the most critical months of the COVID-19 outbreak, healthcare practitioners experienced a higher workload due to the emergency, with unknown consequences for their mental health. Although a conceivable higher impact on healthcare workers who are assisting patients with COVID-19, it is could expect a relevant psychological impact for those who are involved in the everyday assistance of patients with a chronic medical condition

TABLE 5 | Regression results of the effects of demographic and work-related variables, FREE, and CSI on depression, anxiety, and stress.

Predictor of DASS-21 Depression	***B***	***b* 95% CI [LL, UL]**	***Beta***	***sr*²**	***r***	**Fit**	**Difference**
(Intercept)	7.17**	[3.11, 11.23]					
Age	−0.14*	[−0.26, −0.02]	−0.30	−0.15	−0.09		
Gender	0.92	[−0.56, 2.40]	0.08	0.08	0.06		
Work experience	0.12	[−0.01, 0.25]	0.23	0.12	−0.02		
						R^2 = 0.027	
(Intercept)	17.99**	[9.69, 26.28]					
Age	−0.10	[−0.22, 0.21]	−0.21	−0.11	−0.09		
Gender	0.29	[−1.18, 1.76]	0.03	0.03	0.06		
Work experience	0.08	[−0.05, 0.22]	0.16	0.08	−0.02		
FREE enhance ability	−1.16*	[−2.10, −0.21]	−0.19	−0.16	−0.25**		
FREE suppress ability	−0.67	[−1.61, 0.26]	−0.11	−0.09	−0.23**		
CSI cue presence	−0.05	[−0.15, 0.06]	−0.06	−0.05	−0.14*		
CSI cue absence	−0.05	[−0.15, 0.05]	−0.08	−0.07	0.04		
						R^2 = 0.098**	ΔR^2 = 0.070
Predictor of DASS-21 Anxiety	***B***	***b* 95% CI [LL, UL]**	***beta***	***sr*²**	***r***	**Fit**	**Difference**
(Intercept)	5.72**	[2.49, 8.95]					
Age	−0.13**	[−0.23, −0.04]	−0.35	−0.18	−0.13*		
Gender	0.92	[−0.26, 2.09]	0.11	0.10	0.08		
Work experience	0.10	[−0.00, 0.21]	0.25	0.13	−0.05		
						R^2 = 0.042*	
(Intercept)	16.76**	[10.15, 23.37]					
Age	−0.10*	[−0.20, −0.00]	−0.27	−0.13	−0.13*		
Gender	0.57	[−0.60, 1.74]	0.07	0.06	0.08		
Work experience	0.08	[−0.03, 0.18]	0.19	0.10	−0.05		
FREE enhance ability	−0.27	[−1.03, 0.48]	−0.06	−0.05	−0.11*		
FREE suppress ability	−0.41	[−1.16, 0.34]	−0.09	−0.07	−0.15**		
CSI cue presence	−0.12**	[−0.20, −0.03]	−0.21	−0.18	−0.18		
CSI cue absence	−0.13**	[−0.21, −0.05]	−0.23	−0.20	−0.09		
						R^2 = 0.108**	ΔR^2 = 0.066
Predictor of DASS-21 Stress	***B***	***b* 95% CI [LL, UL]**	***beta***	***sr*²**	***r***	**Fit**	**Difference**
(Intercept)	13.67**	[8.66, 18.68]					
Age	−0.29**	[−0.44, −0.14]	−0.48	−0.25	−0.17**		
Gender	2.29*	[0.47, 4.11]	0.17	0.16	0.13*		
Work experience	0.23**	[0.06, 0.39]	0.35	0.18	−0.06		
						R^2 = 0.082**	
(Intercept)	24.59**	[14.30, 34.87]					
Age	−0.24**	[−0.39, −0.09]	−0.41	−0.21	−0.17**		
Gender	1.63	[−0.20, 3.45]	0.12	0.11	0.13*		
Work experience	0.19**	[0.02, 0.35]	0.28	0.14	−0.06		
FREE enhance ability	−1.08	[−2.26, 0.09]	−0.14	−0.12	−0.23**		
FREE suppress ability	1.22*	[−2.38, −0.06]	−0.16	−0.13	−0.27**		
CSI cue presence	−0.01	[−0.14, 0.13]	−0.01	−0.01	−0.12*		
CSI cue absence	−0.05	[−0.17, 0.07]	−0.06	−0.05	0.04		
						R^2 = 0.141**	ΔR^2 = 0.059

N = 214; FREE, Flexible Regulation of Emotional Expression; CSI, Context Sensitivity Index; DASS-21, Depression Anxiety Stress Scale – 21. A significant b-weight indicates the beta-weight and semi-partial correlations are also significant.
sr^2 represents the semi-partial correlation squared.
r represents the zero-order correlation.
LL and UL indicate the lower and upper limits of the confidence interval for B.
**p < 0.05.*
***p < 0.01.*

(Lenzo et al., 2020c; Sardella et al., 2020). First evidence indicates that a relevant percentage of healthcare workers reported mood and sleep symptoms during the COVID-19 outbreak (Pappa et al., 2020). Both medical staff and the population have experienced high levels of depression, anxiety, and stress (Lenzo et al., 2020b; Liu et al., 2020). In this perspective, the first aim

of this study was to investigate the depression, anxiety, and stress levels among healthcare workers involving in the COVID-19 outbreak. Results of descriptive statistics revealed prevalence rates of moderate to extremely severe symptoms ranging from 8 percent for depression to about 10 percent for anxiety. Participants of this study had lower levels of depression, anxiety, and stress than the prevalence reported by early studies involving healthcare workers (Conti et al., 2020; Lai et al., 2020; Rossi et al., 2020). These findings could have depended on assisting patients with COVID-19 leading to an increased fear of being infected. A further exploratory analysis was performed to examine depression, anxiety, and stress among healthcare workers who assisted patients infected. We detected higher prevalence rates of moderate-to-extremely severe when considering healthcare workers assisting patients with COVID-19, even though we assumed these results as explored. Although encouraging due to the paucity of studies on this topic, future research involving a well-balanced sample should examine in deep the results we obtained. In contrast, other studies have found lower prevalence rates. One study involving a large sample of healthcare workers reported prevalence rates of moderate to very severe symptoms of 5 percent for depression, 9 percent for anxiety, and 2 percent for stress (Chew et al., 2020). Resilience factors could be useful to understand the difference in prevalence rates among these largely cross-sectional studies investigating depression, anxiety, and stress among healthcare workers during the COVID-19 outbreak (Chen and Bonanno, 2020). Since the efficacy of coping strategies varies across the different contexts, it is worthwhile to point out the importance of flexibility (Bonanno et al., 2004; Bonanno and Burton, 2013). Indeed, it was demonstrated that mental health depends on one's ability to flexibly enhance or suppress emotional response under situational demands (Burton and Bonanno, 2016). A prerequisite for efficacious self-regulation and adaption consists in the ability to correctly perceive cues to contextual demands across different situations (Bonanno et al., 2018). We examined these key components of resilience using the FREE Scale and the CSI in a sample of Italian healthcare workers facing the COVID-19 outbreak.

In this context, the second aim of this study was to examine the relationship between emotion regulation ability, context sensitivity, depression, anxiety, and stress. Previous research involving healthy subjects found inverse relationships between emotion regulation ability, depression, and anxiety (Burton and Bonanno, 2016; Chen et al., 2018). Our study's findings confirmed these relationships and added evidence to the fallacy of uniform efficacy when considering the efficacy of coping and emotion regulation strategies (Bonanno and Burton, 2013). However, regulatory flexibility is subsequent to the ability to perceive or not perceive contextual cues named as "context sensitivity" (Bonanno, 2004). Specifically, the ability to perceive contextual cues when appropriate was found to be associated with emotion regulation and flexibility in coping response (Bonanno et al., 2018). Consistent with these findings, we found positive associations between cue presence ability and flexibility in emotional response among healthcare workers. We also found that cue presence was inversely associated with depression and anxiety highlighting its role in psychopathology. Conversely, cue absence ability was related to cue presence but not with flexibility. It is worthwhile to point out that the ability to decide when a contextual cue is not present is less clearly associated with the cue presence ability and flexibility in emotional response (Bonanno et al., 2018).

The third aim of this study was to explore the role of enhancement and suppression abilities, and cue presence and cue absence abilities on depression, anxiety, and stress. Although the considerable amount of evidence on flexibility and context sensitivity, there is still a paucity of studies taking into account these factors among healthcare workers. This is surprising because understanding the role of flexibility and context sensitivity can help to explain the prevalence rates of depression, anxiety, and stress, and so implement interventions to prevent them. Recently, a study found that the ability to flexibility enhance or suppress emotional response decreases burnout risk in the context of palliative home care (Lenzo et al., 2020a). We hypothesized that these abilities would significantly influence depression, anxiety, and stress among a sample of healthcare workers are facing the COVID-19 outbreak. Our study's findings revealed that being flexible in emotional response and context sensitivity are differently associated with depression, anxiety, and stress. It is worthwhile to highlight that demographic and work-related factors had a relevant role only in predicting stress among healthcare workers. More specifically, our results showed a significant effect of the perceived individual's ability to enhance emotional expression on depression. Lower levels of enhancement ability are related to social functioning deficits but not to depression among health subjects (Burton and Bonanno, 2016). This result could have partially depended on the sample characteristics. Another study involving a small sample of combat veterans pointed out that enhancement ability, but not suppression ability, was associated with greater symptoms of depression and posttraumatic stress disorder (Rodin et al., 2017). Nonetheless, we found different results when considering anxiety. In predicting anxiety, we found a significant role in the ability named context sensitivity (Bonanno and Burton, 2013). The ability to correctly perceive contextual cues represents a prerequisite for efficacious self-regulation and adaptation. Findings from a recent study reported that cue presence and cue absence were associated with anxiety (Bonanno et al., 2018). Interestingly, the authors argued that psychopathology may concern the failure to read key contextual cues in a specific situation, as well as what to do not consider in other situations. An analogous point of view can be adopted to consider anxiety among healthcare workers, even though more research is needed in this context. Finally, our findings pointed out a significant role for suppression ability in predicting stress. This finding adds evidence for the different role enhancement and suppression abilities for psychological health. While enhancement ability allows emotional signals, which may favor better interpersonal relationships, suppression ability may be central for decrease psychological distress since a deficit in response inhibition has been involved as a risk factor for a wide array of psychopathology, comprising anxiety and depression (Warren et al., 2013). Although the three regression models revealed a significant role for flexibility and context sensitivity in predicting reported

symptoms of depression, anxiety, and stress, a considerable number of aspects have been demonstrated to enhance resilience, such as personality factors and social support (Bonanno, 2004). Future research including these variables in the regression analyses could explain a higher percentage of variance for psychological distress among healthcare workers. Nonetheless, taken together these findings emphasized the interplay of expressive flexibility and context sensitivity with depression, anxiety, and stress. Consequently, relevant clinical implications of this study concern the possibility to implement prevention interventions decreasing the psychological impact of working in adverse conditions as during the COVID-19 outbreak. In this vein, our results have shown higher depression, anxiety, and stress levels in front-line healthcare workers than in second-line healthcare workers. Findings of this study could also help to implement psychological interventions for healthcare workers assisting patients with the COVID-19 and to mitigate its psychological consequences.

Limitations

This study has some limitations that should be addressed by future research and considered in understanding the results. First, this study adopted a cross-sectional design that did not allow us to determine causal relationships between the investigated variables. Longitudinal studies would better clarify the long-lasting impact of resilience components on depression, anxiety, and stress development among healthcare workers who faced the COVID-19 outbreak. The authors are currently carrying out this kind of research. Second, this study involved convenience sample recruitment that could have limited the generalizability of the results. The oversampling of some characteristics (i.e., gender or occupation) may not be representative of the Italian healthcare workers population. Thus, some characteristics among the respondents (i.e., profession type) could influence the results obtained. In fact, collecting data through an online survey did not permit to assess for preexisting psychiatric disorders. Nonetheless, our choice was the only solution to collect data during the Italian lockdown. The third limitation regards the use of self-assessment measures of depression, anxiety, and stress. Although the DASS-21 is a reliable and widely used instrument, social desirability could affect results. Conversely, the FREE scale and CSI are scenario-based indices that did not presuppose respondents to possess an exact awareness of their own abilities. It should be noted that both the use of self-report measures and the collection of data through an on-line survey gave us information on depression, anxiety, and stress symptoms, as reported by the participants to this study. However, in no case it is possible to state of psychiatric diagnoses that require other sources of data, as the clinical judgment.

CONCLUSION

Healthcare workers were deeply involved in contrasting the COVID-19 during the Italian lockdown. Although the psychological impact of restrictive measures among the population is well documented, there is still a lack of studies focused on the consequences for healthcare workers. Our study's results highlighted that about ten percent of participants reported moderate to extremely severe symptoms of depression, anxiety, and stress during the COVID-19 lockdown. Flexibility in emotional response and the ability to correctly perceive or not perceive contextual cues seem to explain differences in the experienced severity of these symptoms. Given these results, prevention intervention based on these resilience components could help reduce depression, anxiety, and stress among healthcare workers are facing the COVID-19 outbreak. However, there are some limitations such as the cross-sectional design that should be addressed by future research to clarify the long-term effects of flexibility and context sensitivity.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Research Ethics Committee for Psychological Research of the University of Messina (no. 38518). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

VL and MQ provided contributions to the conception of the work, deep analysis of the literature, study design, and final approval of the manuscript. VL contributed to data analysis and writing the first draft. AS and GM contributed to the revision of the work and agreement for final approval of the manuscript. MQ and GB contributed to supervision and approved the final version of the manuscript. All authors contributed to the article and approved the submitted version.

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Dealing With COVID-19 Patients: A Moderated Mediation Model of Exposure to Patients' Death and Mental Health of Italian Health Care Workers

Igor Portoghese[1], Maura Galletta[1], Federico Meloni[1], Ilenia Piras[2,3], Gabriele Finco[4], Ernesto D'Aloja[1] and Marcello Campagna[1]*

[1] Department of Medical Sciences and Public Health, University of Cagliari, Cagliari, Italy, [2] PhD School in Biomedical Sciences (Public Health), University of Sassari, Sassari, Italy, [3] Emergency Department SS. Trinità Hospital, Azienda Tutela Salute Sardegna, Cagliari, Italy, [4] Pain Therapy Service, University of Cagliari, Cagliari, Italy

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United Kingdom

Reviewed by:
Valentina Sommovigo,
University of Pavia, Italy
Cristina Monforte-Royo,
International University of
Catalonia, Spain

***Correspondence:**
Maura Galletta
maura.galletta@unica.it

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Introduction: The COVID-19 pandemic is asking health care workers (HCWs) to meet extraordinary challenges. In turn, HCWs were experiencing tremendous psycho-social crisis as they have had to deal with unexpected emotional requirements (ERs) arising from caring for suffering and dying patients on a daily basis. In that context, recent studies have highlighted how HCWs working during the COVID-19 outbreak manifested extreme emotional and behavioral reactions that may have impacted their mental health, increasing the risk for developing post-traumatic stress symptoms.

Purpose: The aim of the study was to investigate post-traumatic stress symptoms, such as intrusion symptoms, as a potential mediator of the link between ERs and crying at work, and whether rumination moderates the relationship between ERs and intrusion-based PTS symptoms among HCWs who have had to deal with patients dying from COVID-19.

Methods: An online cross-sectional study design was performed. A total of 543 Italian HCWs (physicians and nurses) participated in the study. Participation was voluntary and anonymous. We used the SPSS version of bootstrap-based PROCESS macro for testing the moderated mediation model.

Results: ERs had an indirect effect on crying at work through the mediating role of intrusion symptoms. Results from the moderated mediation model showed that rumination moderated the indirect effect of ERs on crying at work via intrusion symptoms, and this effect was significant only for high rumination. Furthermore, when we tested for an alternative model where rumination moderates the direct effect of ERs on crying at work, this moderation was not significant.

Conclusions: As the second wave of the COVID-19 pandemic is ongoing, there is an urgent need for decision-makers to rapidly implement interventions aimed at offering timely psychological support to HCWs, especially in those contexts where the risk of emotional labor associated to patients dying from COVID-19 is higher.

Keywords: COVID-19 pandemic, healthcare workers, emotional requirements, rumination, intrusion symptoms, crying at work, patients' deaths

INTRODUCTION

According to Kniffin et al. (2021), "the impacts of COVID-19 on workers and workplaces across the globe have been dramatic" (p. 2). The pandemic rapidly transformed normal work routines, forcing numerous organizations to move to virtual environments. However, a significant proportion of the workforce, such as health care workers (HCWs), continued in their daily routines as "essential professionals" (Kniffin et al., 2021) and had to meet unprecedented challenges. Around the world, HCWs have been highly celebrated as heroes by the popular media and national governments (Taylor et al., 2020), but since the mode of transmission of the COVID-19 was not clear in the early phases of this pandemic, they had to work in highly uncertain environments, exposing themselves to a higher risk of being infected.

In fact, from the moment the World Health Organization (World Health Organization, 2020) declared the Coronavirus Disease (COVID-19) outbreak to be a global pandemic, demands on health services were drastically increased, requiring HCWs to work beyond their limits. To tackle the pandemic effectively, HCWs had to be prepared in terms of knowledge, skills, and the emotional capability to cope with extraordinarily overwhelming negative emotions (Maunder et al., 2003; Lin et al., 2007; Son et al., 2019).

Globally, the first challenge for Health Care Systems was to reduce the risk of infection among HCWs. For this reason, the World Health Organization (2020), the Interim U.S. (2020), and The European Union information agency for occupational safety and health (EU-OSHA) (2020) published extensive guidelines aimed at protecting HCWs. In spite of this, a recent meta-analysis by Sahu et al. (2020) reported that during the first 3 months of the pandemic, ∼10% of all COVID-19 patients were HCWs. The risk of infection among HCWs gradually decreased and brought under control as several critical measures were introduced in many health care systems. These included obligatory rules for mask wearing and social distancing measures for HCWs (Wang et al., 2020). Subsequently, as the infection risk for HCWs was brought under control, what rapidly emerged was the fundamental challenge to preserving mental health of HCWs. Unadkat and Farquhar (2020) suggested that "the paradox is that the more pressured things become, the more important it is to pay attention to the wellbeing of our staff." In fact, an increasing number of studies have highlighted the tremendous psycho-social crisis HCWs were experiencing (Hu and Chen, 2020; Pfeferbaum and North, 2020) and the risk of a second pandemic concerning health and well-being of HCWs. Studies investigating the mental health of HCWs during previous pandemics (i.e., MERS and SARS) showed that these professionals were at high risk due to increased job demands, psychological distress, fatigue, and social stigma. Several recent studies have highlighted how HCWs working during the COVID-19 outbreak manifested fatigue, worries, frustration, isolation, depression, anxiety, stress, post-traumatic stress, and insomnia (Kang et al., 2020a,b). Additionally, in their systematic review and meta-analysis of the mental health of HCWs during the COVID-19 pandemic, Pappa et al. (2020) considered 13 studies, finding an overall anxiety incidence of 24.6%, an incidence of depression of 22.8%, and an insomnia incidence of 34.3%. In their review on psychological impact of epidemic and pandemic outbreaks, Preti et al. (2020) reported a prevalence of PTSD-like symptoms among HCWs of between 11 and 73.4%. The exposure to a traumatic or stressful event may result in post-traumatic stress symptoms that, in turn, may hinder HCWs' ability to cope with that experience. According to Raudenská et al. (2020), "the experience of a global pandemic like COVID-19 has the potential of being considered a mass traumatic event" (p. 555). There are three main PTS symptoms: (a) intrusive thoughts, which refer to the re-experiencing of the traumatic event; (b) avoidance, which refers to avoiding places/activities that can evoke intrusive memories; (c) and hyperarousal, which refers to symptoms of anger, irritability, hypervigilance, and difficulty concentrating (Horowitz et al., 1979; Weiss and Marmar, 1997). According to Ehlers et al. (2002), intrusive thoughts could be considered a core symptom of post-traumatic stress. Specifically, Taylor et al. (2020) suggested that COVID-related intrusive thoughts may be at the root of the COVID stress syndrome. In this sense, emotional distress in response to the COVID-19 pandemic may play an important role in exposing HCWs to PTS (Taylor et al., 2020). In fact, as COVID-19 compelled HCWs to deal with having to reassure suffering and dying patients on a daily basis, it took an extra emotional and psychological toll on them (Chevance et al., 2020). As reported on March 23, 2020, by Onder et al. (2020), the early case-fatality rate of patients dying from COVID-19 in Italy was 7.2%. During the early weeks of the pandemic, the clinical course of the COVID-19 was not yet clear, though there was high likelihood that patients would deteriorate rapidly into a critical condition or ultimately die (Chen et al., 2020). Globally, most health care systems were not prepared to manage a rapidly evolving pandemic. The sense of helplessness experienced by HCWs in seeing patients rapidly worsening and dying demanded huge emotional efforts on their part in offering psychological support to patients, such as exhibiting positive emotions and encouraging and sustaining suffering patients.

Such strategies are common rules in many clinical contexts and are considered to be in-role job requirements (Diefendorff et al., 2006, 2011). However, these kinds of emotional requirements (ERs) have been shown to induce traumatic responses (Aghili and Arbabi, 2020; Cai et al., 2020), and it has been shown that dealing with traumatic events, such as providing lifeline services to patients with life threatening conditions, has led to HCWs manifesting PTS symptoms (Figley, 1995). In the large-scale emergency created by this pandemic, HCWs have had to deal with unforeseen emotional turmoil arising from both contact with patients and the pressure on themselves (Barello and Graffigna, 2020). HCWs have been exposed to extreme and severe conditions that have threatened their ability to cope, resulting in unusual and extreme emotional reactions (Meichenbaum, 1994).

In their narrative research, Daphna-Tekoah et al. (2020) investigated traumatic situations encountered by HCWs facing the COVID-19 pandemic. During their interviews, HCWs emphasized traumatic events related to patient's death and the high level of emotional intensity associated with it. Specifically, HCWs described "the pervading presence of death in the hospital, as particularly manifested in the agony of seeing people dying without their families beside them and in the procedures for preparing the deceased for burial by special, double wrapping of the dead body as a precaution against contagion" (Daphna-Tekoah et al., 2020, p. 7).

Pappa et al. (2020) reported that HCWs working in COVID-19 scenarios showed high rates of PTS symptoms, and these results were in line with previous studies during and after the MERS and SARS epidemics. For example, especially in the first phase of the COVID-19 pandemic, newspapers and social networks offered the first (indirect) picture of the psychological impact of this pandemic on HCWs. There were a number of stories reporting these dramatic experiences and extreme reactions (Maben and Bridges, 2020):

> "*I broke down and cried today. I cried of exhaustion, of defeat. Because after 4 years of being an ER nurse, I suddenly feel like I know nothing*" (Sydni Lane, USA, Instagram and Facebook).
>
> (Fick, 2020)

According to Lyon (2000), crying at work is among the most commonly reported behavioral manifestations of distress. It is considered to be an ineffective strategy for coping with personal difficulties to accomplish emotional labor (Soares, 2003), although many authors have reported that, in health care context, it is not uncommon that HCWs have cried at work due to being overwhelmed (Pongruengphant and Tyson, 2000; Wanzer et al., 2005). From an organizational and professional viewpoint, not crying at work in front of patients is cited among the emotion "display rules" health professionals should follow as it is seen as being professionally inappropriate. Hochschild (1983) has suggested that among the attributes required of caring, "emotional labor" requires HCWs to display positive emotions as part of their professional profile. In this sense, when HCWs are not able to cope with these ERs, there is a risk of developing distress. Also, pandemics are known to induce worries and rumination among HCWs, which, in turn, can trigger PTS (Bardeen et al., 2013; Boyraz and Legros, 2020).

Rumination is common after traumatic events (Watkins, 2008), and it has been hypothesized that in response to extraordinary continued or increased emotional distress, people may develop adaptative emotion-focused coping strategies, such as crying (Ehlers and Clark, 2000; Taku et al., 2008; Elwood et al., 2009). In the literature there are many different definitions of rumination (Siegle et al., 2004). In this context, in line with Cropley and Zijlstra's (2011) conceptualization of affective rumination, we define rumination as repetitive, intrusive thoughts with a negative focus, which includes post-event rumination (Jones et al., 2013). According to Conway et al. (2000), rumination on negative events "does not facilitate problem resolution, is a solitary activity, and is intrusive if the person is pursuing either self- or situationally imposed task-oriented goals" (p. 404). According to the effort-recovery theory (Meijman and Mulder, 1998), individuals invest mental and physical resources to deal with work-related demands. Rumination may activate a state of arousal, which may precipitate a depletion of resources and then inhibiting the recovery process (Brosschot et al., 2006). Kinnunen et al. (2019) showed that rumination may affect cardiovascular, autonomic, and endocrine nervous system activity, suggesting a pathogenic pathway to long-term disease outcomes (Ottaviani et al., 2016). In general, many authors have suggested that rumination may lead to a worsening of stressor–strain relationships (Jostmann et al., 2011; Jones et al., 2013). For example, the cognitive activation theory of stress (Ursin and Eriksen, 2010; Meurs and Perrewé, 2011) and the stressor-detachment model (Sonnentag and Fritz, 2015) emphasized that perseverative cognition such as ruminating (or psychological detachment) on job stressors may prolong workers' experience of stressful events. In this sense, rumination on the pandemic could be considered as sustained activation that may moderate the harmful effects of ERs on PTS symptoms.

The main purpose of this study was to examine whether PTS symptoms is a potential mediator of the link between ERs and crying at work, and whether rumination is a moderator of the link between ERs and PTS symptoms among HCWs who have had to deal with patients dying from COVID-19 (**Figure 1**):

Hypothesis 1: the relationship between emotional requirements and crying at work will be mediated by PTS symptoms.

Hypothesis 2: rumination on the pandemic will moderate the strength of the relationship emotional requirements and crying at work will be mediated by PTS symptoms, such that the mediated relationship is stronger under high rumination than under low rumination.

METHOD

Data Collection

An online survey was conducted using LimeSurvey and disseminated by sharing the link of the survey through social networking platforms. The inclusion criteria were as follows: (1) being a nurse or physician in Italy, and (2) having worked with patients who died from COVID-19. The link contained an

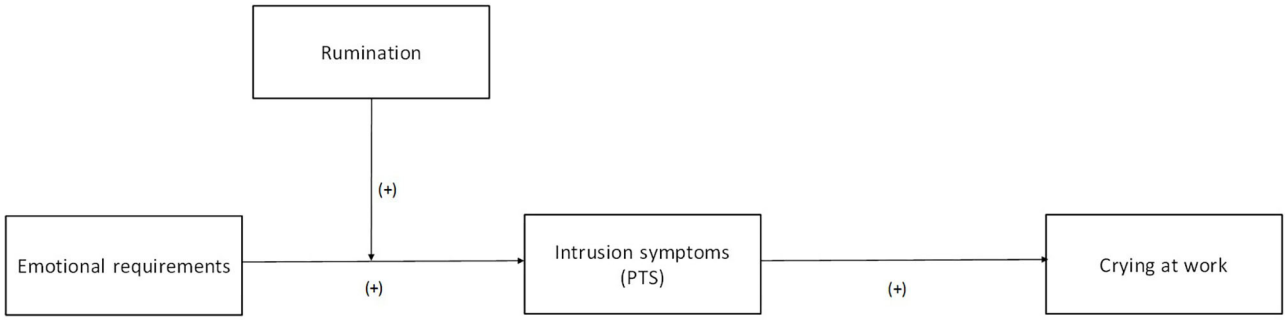

FIGURE 1 | Hypothesized moderated mediation model.

invitation to join an online survey entitled "Health professionals and the Coronavirus SARS-COV-2 pandemics: an explorative study." On the first page, we described the study's objectives, the time necessary to complete the survey (<10 min), the inclusion criteria, and the ethical issues behind the study. Participants received information about their involvement in the study together with a guarantee (1) that it was voluntary, (2) that it was anonymous, and (3) that no information that could identify respondents would be collected. Only individuals who agreed to the study's conditions completed the survey. The survey was available online from March 27 to May 31, 2020.

Based on previous studies of PTS symptoms and distress, an effect size of $f^2 = 0.15$ ($R^2 = 0.30$) was expected in this study. Assuming an alpha level of 0.05, using a two-tailed test for multiple regression random effects model, seven predictors, and a desired power of 0.95, a power analysis using G*Power 3.1.9 (Faul et al., 2009) indicated that a minimum sample size of 89 participants was required.

Measures

We measured ERs, mainly displaying positive emotions ("Reassuring patients who are distressed or upset"), by adapting one item from the Emotion Work Requirements (Best et al., 1997). PTS symptoms were measured by using the intrusion subscale (two items; inter-item correlation = 0.82) from the Italian validation of the brief Impact of Event Scale (IES-6; Horowitz et al., 1979; Thoresen et al., 2010; Giorgi et al., 2015). Rumination about the pandemic was measured by adapting two items (inter-item correlation = 0.76) from the Rumination on Sadness Scale (Conway et al., 2000). Finally, we measured the frequency of crying at work due to the difficulty in handling the situation by adapting one item ("I have been crying at work because I felt like I could not take it anymore"). Items were answered on a five-point Likert scale from one (strongly disagree) to five (strongly agree).

Control Variables

In order to lessen problems related to spurious relationships, age, sex, working region, tenure, and number of patients who had died from COVID-19 were statistically controlled in hypotheses testing. Recently, Williams and Williams (2020) suggested that personal and occupational characteristics may represent important risk factors in developing PTS symptoms. Specifically, Williams and Williams (2020) reported that younger age, being male, and a high job tenure appear to lower workers' risk of developing PTS. Furthermore, many scholars suggested that women appear more likely than men to engage in behavioral expression of emotions, such as crying (Nolen-Hoeksema and Jackson, 2001). Finally, as in the first wave of the pandemic where 70.2% of positive cases and 79.4% of deaths occurred in Northern Italy (Goumenou et al., 2020), we considered working region and number of patients who had died from COVID-19 (1 = 1 patient, 2 = 2–5 patients, 3 = 6–10 patients, 4 = more than 10 patients) as control variables in rumination and ERs.

Data Analyses

We tested our hypotheses using path analytic procedures (Preacher et al., 2007) and conducted bootstrapping analysis to assess the significance of both mediation and moderated mediation models (Shrout and Bolger, 2002; Hayes, 2015). We used the SPSS version of Hayes' (2018) bootstrap-based PROCESS macro for testing the multiple mediation model (release 3.5). Specifically, mediation and moderated mediation analyses were performed using models 4 and 7, respectively, in the PROCESS macro for SPSS developed by Hayes (2013, 2017).

We used the bootstrap confidence intervals (CIs) to determine the significance of the effects based on 5000 random samples (Hayes, 2013). When the CIs do not include zero, then the effect is significant. All variables were mean-centered in the mediating and moderating analyses. Simple slope analysis was carried out to examine the nature of the moderation effect.

RESULTS

A total of 2759 Italian HCWs agreed to participate in the survey with 1621 (59%) completing the survey (answering all items in the survey). As our main inclusion criteria were being nurses/physicians in Italy and working with patients who died from COVID-19, a total of 543 were included in the study.

The study population consisted of 353 (65.0%) females and 190 (35.0%) males. Participants ranged from 22 to 71 years of age, $M = 42.87$, $SD = 10.94$. Concerning profession,

381 (70%) were nurses and 162 (30%) were physicians. Regarding working region, 329 (60.59%) reported working in Northern Italy (Piemonte, Liguria, Lombardia, Trentino-Alto Adige, Veneto, Friuli-Venezia Giulia, and Emilia-Romagna). Concerning patient's death, 113 (20.81%) reported that one of their patients had died from COVID-19, 202 (37.20%) reported that from two to five patients had died from COVID-19, 94 (17.31%) reported that six to 10 patients had died from COVID-19, and 134 (24.68%) reported that more than 10 patients had died from COVID-19.

Means, standard deviations, kurtosis, skewness, and intercorrelations between all variables are presented in **Table 1**.

Direct and Indirect Effects

To test the hypothesis that ERs have an indirect association with crying at work as a result of intrusion symptoms, we conducted a simple mediation analysis in line with the procedures presented by bib30 (2017; model 4). Bootstrapping was set to 5,000 resamples. After controlling for age, sex, working region, tenure, and number of patients who had died from COVID-19, we found significant indirect [$\beta = 0.11$, BootSE = 0.02, 95% Boot CI (0.06, 0.16), $p < 0.001$] and direct [$\beta = 0.19$, BootSE = 0.05, 95% Boot CI (0.09, 0.30), $p < 0.001$] effects of ERs on crying at work. Therefore, these results partially confirmed an indirect effect of ERs on crying at work through the mediating role of intrusion symptoms. This model explained 19% of variance in crying at work (**Table 2**). Concerning control variables entered into the model, age, sex, working region, tenure, and number of patients who had died from COVID-19 explained 1% of variance in crying at work.

Tests of Moderated Mediation

Next, we tested for moderated mediation (**Table 3**) where rumination moderates the indirect effect of ERs on crying at work via intrusion symptoms (PROCESS model 7; Preacher et al., 2007; Hayes, 2017). Specifically, rumination moderated the indirect effect from ERs on crying at work via intrusion symptoms [$\beta = 0.07$, BootSE = 0.03, 95% Boot CI (0.01, 0.13), $p < 0.05$]. Furthermore, as we found that ERs had a direct effect on crying at work, we tested for an alternative model (PROCESS model 8; Preacher et al., 2007; Hayes, 2017) where rumination is supposed to moderate the direct effect of ERs on crying at work. Results showed that this moderation was not significant [$\beta = 0.06$, BootSE = 0.05, 95% Boot CI (−0.03, 0.15), $p > 0.05$]. Furthermore, our results were confirmed by the significant index of moderated mediation [$\beta = 0.03$, BootSE = 0.01, 95% Boot CI (0.002, 0.056), $p < 0.001$], which suggested that the indirect effect of ERs on crying at work was linearly related to rumination (Hayes, 2015). This moderated mediational model explained 23% of variance in intrusion symptoms and 24% in crying at work. Concerning control variables entered into the model, age, sex, working region, tenure, and number of patients

TABLE 1 | Means, standard deviations, kurtosis, skewness, and Pearson's correlations among variables.

		M	SD	Kurtosis	Skew	1	2	3
1	Emotional requirements	3.96	1.05	0.85	−1.12	-		
2	Intrusion symptoms (PTS)	3.02	0.79	−0.04	−0.40	0.21*	-	
3	Rumination	3.37	1.03	−0.57	−0.39	0.12*	0.44*	-
4	Crying at work	2.36	1.37	−1.05	0.55	0.24*	0.44*	0.35*

PTS, Post-Traumatic Stress; M, mean; SD, standard deviation.
*N = 543. *p < 0.01.*

TABLE 2 | Test of the mediational model.

	Intrusion Symptoms (PTS)			Crying at Work		
Predictor	**β**	**BootSE**	**95% Boot CI (LL;UL)**	**β**	**BootSE**	**95% Boot CI (LL;UL)**
Constant	1.42	0.51	(0.43;2.42)	−0.61	0.74	(−2.07;0.85)
Age	0.01	0.01	(−0.001;0.02)	0.00	0.01	(−0.01;0.02)
Sex	0.13	0.08	(−0.02;0.28)	0.15	0.11	(−0.07;0.37)
Tenure	−0.001	0.01	(−0.01;0.01)	0.01	0.01	(−0.01;0.02)
Working region	−0.01	0.01	(−0.03;0.01)	−0.02	0.01	(−0.05;0.002)
NPD COVID-19	0.16*	0.04	(0.09;0.23)	0.03	0.05	(−0.07;0.13)
ERs	0.20*	0.04	(0.13;0.27)	0.19*	0.05	(0.09;0.30)
Intrusion symptoms (PTS)				0.52*	0.06	(0.40;0.65)
R^2	0.12			0.19		
ΔR^2				0.07		

BootSE, bootstrapped standard error; Boot CI, bootstrapped confidence interval; NPD COVID-19, Number of patients who had died from COVID-19.
**p < 0.001.*

TABLE 3 | Test of the moderated mediational model.

	Intrusion Symptoms (PTS) (Model 7)			Crying at Work (Model 8)		
Predictor	**β**	**BootSE**	**95% Boot CI (LL;UL)**	**β**	**BootSE**	**95% Boot CI (LL;UL)**
Constant	2.16	0.46	(1.26;3.06)	0.42	0.7	(−0.96;1.80)
Age	0.01	0.00	(−0.00;0.02)	0.00	0.01	(−0.01;0.001)
Sex	0.13	0.07	(−0.01;0.28)	0.15	0.11	(−0.07;0.37)
Tenure	0.00	0.01	(−0.01;0.01)	0.01	0.01	(−0.01;0,02)
Working region	−0.01	0.01	(−0.02;0.01)	−0.02	0.01	(−0.05;0.001)
NPD COVID-19	0.12**	0.03	(0.06;0.19)	0.03	0.05	(−0.07;0.13)
ERs	0.18**	0.03	(0.11;0.25)	0.19**	0.05	(0.09;0.30)
Rumination	0.29**	0.03	(0.22;0.35)	0.32**	0.05	(0.22;0.43)
Intrusion symptoms				0.38**	0.07	(0.25;0.51)
ERs × Rumination	0.07*	0.03	(0.01, 0.13)	0.06	0.05	(−0.03;0.15)
R^2	0.23			0.24		
ΔR^2				0.01		

*BootSE, bootstrapped standard error; Boot CI, bootstrapped confidence interval; NPD COVID-19, Number of patients who had died from COVID-19. N = 543. Unstandardized regression coefficients are reported. Bootstrap sample size = 5000. *p < 0.05, **p < 0.001.*

TABLE 4 | Estimates and bias-corrected bootstrapped 95% confidence intervals.

	Levels of Rumination	β (BootSE)	95% Boot CI (LL;UL)
Direct effect		0.19 (0.05)	(0.089;0.294)
Indirect effect	−1 SD	0.05 (0.03)	(−0.013;0.108)
	+1 SD	0.13 (0.03)	(0.071;0.195)

Conditional indirect effect of ERs on crying at work at values of the rumination (model 7). BootSE, bootstrapped standard error; Boot CI, bootstrapped confidence interval; LL, lower 95% level confidence interval; UL, upper 95% level confidence interval.

who had died from COVID-19 explained 3.5% of variance in intrusion symptoms and 0.5% in crying at work.

As shown in **Table 4**, the examination of the conditional effect of ERs on crying at work at low (−1 SD) and high (+1 SD) rumination revealed that this effect was significant only for high rumination [$\beta = 0.13$, SE = 0.03, 95% Boot CI (0.07, 0.20), $p < 0.001$].

Finally, we performed the simple slope analysis, plotting the relation between ERs and intrusion symptoms in HCWs at low (−1 SD) and high (+1 SD) rumination in **Figure 2**. When rumination was low, the relationship between ERs and intrusion symptoms was significant [$\beta = 0.14$, BootSE =0.06, 95% Boot CI (0.19, 0.27)]. This relationship was significantly stronger among HCWs with high rumination [$\beta = 0.27$, BootSE = 0.07, 95% Boot CI (0.13, 0.45)].

DISCUSSION

Patient death can be an emotionally stressful event that may increase the risk of experiencing mental health problems (Harder et al., 2020). Our study was aimed to investigate the experiences of HCWs during the first 2 months of the COVID-19 pandemic in Italy. Specifically, we analyzed whether intrusion symptoms mediated the relationship between ERs and crying at work, and whether rumination about the pandemic moderated the relationship between ERs and intrusion symptoms among HCWs who have had to deal with patients dying from COVID-19. Specifically, our findings suggested that, the emotional involvement in reassuring patients who were distressed or upset for their health, as well as seeing patients dying without their families beside them (Daphna-Tekoah et al., 2020), had the potential to trigger trauma and thus increase the risk of developing intrusion symptoms. This is in line with previous studies that showed how exposure to patient-related stressful situations makes HCWs susceptible to PTS (Kerasiotis and Motta, 2004; Adriaenssens et al., 2012; de Wijn and van der Doef, 2020; Portoghese et al., 2020). Furthermore, our results confirmed that, during pandemics, HCWs are exposed to different kinds of job and emotional demands that may reduce their well-being and expose them to intrusion thoughts (PTS symptom) (Aghili and Arbabi, 2020; Blanco-Donoso et al., 2020; Cai et al., 2020; Chevance et al., 2020; Daphna-Tekoah et al., 2020; Pappa et al., 2020).

Among outcomes relating to intrusion symptoms, we considered an emotional reaction such as crying at work due to the difficulty of handling situations at work. Specifically, we observed that intrusion symptoms were a significant predictor of crying at work and that it significantly mediated the relationship between ERs and crying at work. However, we found that ERs had a significant effect on crying at work. Therefore, since we considered crying at work to be an indication of great difficulty in dealing with emotional labor (Figley, 1995), it is an important sign of emotional distress that should be considered. In general, our findings supported previous studies that showed how emotional demands are an antecedent of PTS symptoms (Park et al., 2018) and how HCWs may develop adaptive emotion-focused coping strategies, such as crying (Ehlers and Clark, 2000; Taku et al., 2008; Elwood et al., 2009) in response to emotional distress generated by the pandemic.

Furthermore, the present study highlights the role of rumination (on the pandemic) as a moderator of the relationship between ERs and intrusion. To our knowledge, the moderating

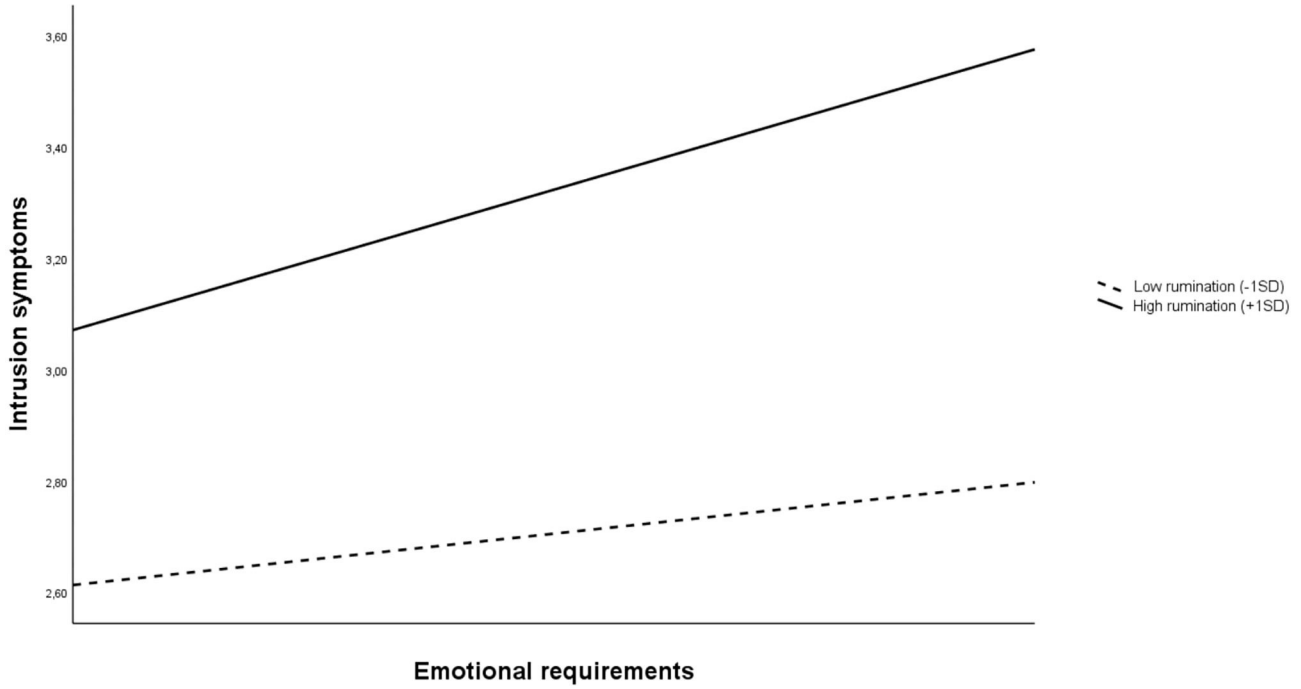

FIGURE 2 | Plot of the relationship between ERs and intrusion symptoms at low (−1 SD) and high (+1 SD) rumination.

role of rumination is still understudied in pandemic literature, and it suggested that rumination about the pandemic may exacerbate the effect of ERs on PTS symptoms. Specifically, we found that among HCWs exposed to patient death, the relationship between ERs and intrusion symptoms was stronger when rumination was higher. Our results are in line with the general assumption that rumination plays a significant role in worsening stressor–strain relationship (Takano et al., 2011; Jones et al., 2013). According to Lee (2019), rumination has been considered as a maladaptive coping strategy to traumatic events that may be a significant risk factor for PTS. In particular, our results should be considered in light of the stressor-detachment model proposed by Sonnentag and Fritz (2015) where rumination is considered as a concept that overlaps with lack of psychological detachment. In this sense, the less HCWs show psychological detachment (high rumination), the stronger is the relationship between stressors and intrusive symptoms.

Our study has important practical implications for mental health of HWCs in this pandemic context. During the early weeks of the COVID-19 pandemic, Greenberg (2020) suggested that "it is imperative that managers of [health-care workers] take measures to protect the mental health of staff." According to a recent meta-analysis, trauma-exposed organizations, such as health care organizations, should provide rapid support to their staff, implementing early post-trauma interventions. Until the pandemic ceases, health care organizations should consider to implement early interventions based on psychological debriefing that are aimed "to prevent the development of adverse reactions" before they arise (Richins et al., 2020). Among these interventions, there are (1) debriefing within a group setting, (2) focusing on narrative construction, and (3) social cohesion to support post-incident recovery. In their meta-analysis, Richins et al. (2020) found that those interventions were linked to reduced PTSD symptom severity. Furthermore, leaders play a crucial role in the implementation of these early interventions. In fact, Mitchell and Stevenson showed that when supervisors show support to the staff, it reduced the likelihood of psychological problems (Mitchell and Stevenson, 2000).

Recently, Chen et al. (2020) investigated mental health of medical staff in China during the COVID-19 outbreak, suggesting that it was crucial for health care systems providing timely personalized support through hotline teams, media, or multidisciplinary teams. However, their study highlighted that "the implementation of psychological intervention services encountered obstacles, as medical staff were reluctant to participate in the group or individual psychology interventions provided to them" (p. e15). Accordingly, adopting a bottom-up approach helped in adjusting and tailoring specific interventions aimed to satisfy specific staff's needs. Among those needs, the medical staff requested specific training on psychological skills to deal with emotional demands. As the high likelihood of a second wave of COVID-19 in autumn, health care managers should consider to rapidly implement interventions to strengthen staff's resilience. In fact, in literature, there is evidence that those interventions showed

positive effects in the immediate or short term (Delgado et al., 2017).

Finally, Ornell et al. (2020) argued that it would be crucial that organizational interventions should be aimed to offer coping strategies to deal with intrusive thoughts. Furthermore, they suggested that hospital managers should promote emotional interventions aimed to "facilitate intra-team support, empathy, and compassion toward more fragile colleagues" (p. 4).

Some limitations of the present study should be addressed. The first concerns the generalizability of our results as we used an online cross-sectional study from a convenience sample. The impact of this pandemic on HCWs' mental health should be investigated across time. Thus, future studies should consider longitudinal data to overcome cross-sectional limitations. Secondly, we assessed ERs and crying at work using a single-item measure for both. As we began collecting data in the middle of the first COVID-19 wave in Italy (March 27), we followed a practical criterion, keeping our survey short (<10 min). However, single-item measures are very common in occupational health psychology and epidemiological studies, and there is general agreement that they are valid and reliable (Fisher et al., 2016). Future research should consider the use of reliable multi-item measures. Third, we investigated only intrusion symptoms, neglecting avoidance, and hyperarousal symptoms. Future research should consider measuring all PTS symptoms and their relationship in the proposed model. Fourth, the frequency of crying at work asking participants to indicate to what extent they agree or disagree with the statements. Future research should consider measuring the frequency of crying adopting a daily perspective as it would be possible that we were not able to assess if participants cried many times per day. Fifth, we did not measure health status of participants, such as depression, anxiety, or other health-related quality of life indicators. In this sense, future research should consider using both valid clinical measure of health status and self-rated health measures. Finally, we did not consider any personal or organizational resource in our model. Further research is necessary for understanding how HCWs' personal/organizational resources, such as resilience, self-efficacy, and peer/supervisor support, could moderate/buffer the negative impact of ERs and rumination and, eventually, facilitate post-traumatic growth.

CONCLUSIONS

As a third wave of the COVID-19 pandemic represents an imminent global risk, government and hospital management should consider to rapidly implement regional and national interventions for protecting HCWs' well-being. The lessons learned from this pandemic should help decision-makers to promote readiness in offering timely psychological support to HCWs treating patients with COVID-19. In this phase, it is crucial that decision-makers developed awareness of the impact of this pandemic on the HCWs' mental health. Inefficacious and/or late interventions may represent a point of no return for many health care work force.

DATA AVAILABILITY STATEMENT

The raw data pertaining to analyses performed in this study are available from the authors upon reasonable request.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. This study was developed in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments. No treatments or false feedbacks were given, and no potential harmful evaluation methods were used. Participation was completely voluntary, and participants could drop out at any time without any negative consequences. All data were stored only using an anonymous ID for each participant. Written online informed consent to participate in the survey was obtained by clicking on "I accept".

AUTHOR CONTRIBUTIONS

IPo, MG, FM, and IPi designed the study, developed the survey, and managed the online survey and the data. IPo wrote the methods. IPi and FM helped to prepare the references and helped with first draft of the manuscript. IPo and MG supervised the analysis. FM, IPi, ED'A, GF, and MC revised the final version of the manuscript. All authors read and approved the final version of the manuscript.

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Stress, Sleep and Psychological Impact in Healthcare Workers During the Early Phase of COVID-19 in India: A Factor Analysis

Seshadri Sekhar Chatterjee[1*†], *Madhushree Chakrabarty*[1†], *Debanjan Banerjee*[2*], *Sandeep Grover*[3], *Shiv Sekhar Chatterjee*[4] *and Utpal Dan*[5]

[1] *Department of Psychiatry, Diamond Harbour Government Medical College and Hospital (DHGMC), Diamond Harbour, India,* [2] *Department of Psychiatry, National Institute of Mental Health and Neurosciences (NIMHANS), Bengaluru, India,* [3] *Department of Psychiatry, Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, India,* [4] *Department of Microbiology and In-charge, COVID Testing Unit, Diamond Harbour Government Medical College and Hospital (DHGMC), Diamond Harbour, India,* [5] *Department of Anatomy and Principal, Diamond Harbour Government Medical College and Hospital (DHGMC), Diamond Harbour, India*

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Juan Gómez-Salgado, University of Huelva, Spain

***Correspondence:**
Debanjan Banerjee
dr.djan88@gmail.com
Seshadri Sekhar Chatterjee
drsschatterjee@gmail.com

[†] *These authors share first authorship*

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Background: Risks to healthcare workers have escalated during the pandemic and they are likely to experience a greater level of stress. This cross-sectional study investigated mental distress among healthcare workers during the early phase of Coronavirus disease-2019 (COVID-19) outbreak in India.

Method: 140 healthcare workers of a tertiary care hospital in India were assessed for perceived stress and insomnia. A factor analysis with principal component method reduced these questions to four components which were categorized as insomnia, stress-related anxiety, stress-related irritability, and stress-related hopelessness. Further statistical analyses were done on these factor scores to identify the predictors and investigate the differences between the different categories of healthcare workers.

Result: Doctors had the highest level of anxiety among the healthcare workers. Both doctors and nurses perceived a greater level of irritability than the other HCWs. Compared to doctors and nurses, other HCWs were more likely to experience insomnia. Lower age, higher education, female gender, and urban habitat were associated with greater perception of anxiety. Older age, being quarantined, and single marital status were the significant predictors of irritability. Female gender, single marital-status, and higher number of medical ailments contributed to perceived hopelessness. Quarantine significantly predicted insomnia.

Conclusion: Different categories of healthcare workers are experiencing varied mental health problems owing to their heterogeneous socio-demographic backgrounds. Tailored and personalized care, as well as policies, might help in alleviating their problems. Further research is warranted to explore the psychological distress and remedies among these frontline workers during and after the ongoing pandemic crisis.

Keywords: COVID-19, healthcare workers, physicians, perceived stress, sleep, psychological wellbeing

INTRODUCTION

Coronavirus disease-2019 (COVID-19) has created an unprecedented situation worldwide and has set forth an array of challenges before us—medical, ethical, social, and organizational (Mukherjee et al., 2020). Health care workers (HCWs) are bound by ethics to provide support to patients (Neto et al., 2020). Adhering to medical ethics, HCWs across the world are putting their fullest effort to cope with the pandemic and save lives. However, they are not immune to infection risk. Consequently, HCWs are equally vulnerable to infection as the rest of the population. In fact, the frontline workers are at a greater risk than the general population. Previous statistics clearly indicate that HCWs make a significant portion of the infected cases (Simonds and Sokol, 2008).

Owing to increased risk of infection, duty toward patients might tussle with self-preservation and protection of loved ones thereby increasing stress and anxiety of HCWs (Tam et al., 2004; Ehrlich et al., 2020). Increased duty hours and disrupted biological rhythm during the quarantine might lead to insomnia (Liu et al., 2020). Inadequate supply of personal protective equipment, problematic media coverage and stigma might exacerbate stress (Lai et al., 2020; Malathesh et al., 2020; Menon et al., 2020). In a recent review of six studies, Spoorthy et al. (2020) reported that "HCW are encountering a considerable degree of stress, anxiety, depression, insomnia due to the COVID-19 pandemic." Apart from doctors, people working in healthcare facilities such as nurses, ward staff, cleaning staff, porters, and administrative staff are also variably vulnerable (Que et al., 2020) and might face mental health problems. People working in certain specialties such as a respiratory ward, infectious diseases ward or critical care ward are subject to greater risk and might be under greater stress.

In a recent review of 43 studies on the psychological impact of COVID-19, Vindegaard and Benros (2020) stated that several factors might be associated with a higher risk of psychological distress among healthcare workers as well as the general public. In fact, the female gender (Mazza et al., 2020; Zhang et al., 2020b), lower educational level (Gao et al., 2020; Mazza et al., 2020), lack of family/social support (Cao et al., 2020; Du et al., 2020), living in urban areas (Gao et al., 2020; Özdin and Bayrak Özdin, 2020), poor social capital and/or unstable income (Cao et al., 2020; Xiao et al., 2020), higher social media exposure (Gao et al., 2020), previous experience of distressful life events (Mazza et al., 2020), lack of preparedness (Du et al., 2020), not adhering to safety or precautionary measures (Wang et al., 2020a), poor self-rated health (Gao et al., 2020; Wang et al., 2020a,b), having a history of chronic illness including psychiatric disorder and substance abuse (Mazza et al., 2020; Özdin and Bayrak Özdin, 2020; Wang et al., 2020b), having a COVID-19 infected friend or relative (Cao et al., 2020; Du et al., 2020; Mazza et al., 2020; Özdin and Bayrak Özdin, 2020), poor sleep quality (Du et al., 2020), higher perceived stress (Du et al., 2020), working in frontline (Giorgi et al., 2020; Lai et al., 2020; Lu et al., 2020), working in a secondary hospital (Lai et al., 2020), intermediate position in job (Lai et al., 2020), seniority in the workplace (>10 years) (Lai et al., 2020) etc. were frequently associated with increased risk of psychological distress. However, there are several inconsistencies and researchers are still not unequivocal regarding these associations. For, example, while several studies identified living in urban areas as a potent risk factor for psychological distress (Gao et al., 2020; Özdin and Bayrak Özdin, 2020), few others reported that living in rural areas could increase the risk (Cao et al., 2020; Zhang et al., 2020b). It may be noted here that Gao et al. (2020) studied the general Chinese population and Zhang et al. (2020b) studied the health care workers of China. Thus, risk factors may vary in different populations and studies focused on different target populations are needed for proper identification of the risk factors and subsequent redemption.

India with its several densely populated states, shortage of medical professionals, inadequate equipment, scarcity of health centers, the paucity of testing facilities, sparse surveillance, and poor awareness among masses, failed to contain the disease (Kumar et al., 2020). Consequently, the pressure on the health system mounted. The Government of India ordered a nationwide lockdown for 21 days On March 24, 2020. The lockdown was further extended with conditional relaxations. The pandemic coupled with lockdown made a deep impact on the socio-economic fabric as well as the mental health conditions of the people. Apprehensions and anguish transformed into fear and stigma toward COVID-19 patients as well as fighters (Bagcchi, 2020). In India, HCW dealing with COVID-19 patients faced considerable social rejection and ostracism. Forceful eviction from temporary residence by house owners, discrimination, violent attacks in public places, and public transports posed threat to their lives. Social stigma against COVID-19 made the difficult situation worse for HCWs. Inadequate numbers of public health care centers along with the escalating COVID-19 treatment expenses in the private health care centers worsened the situation (Mitra, 2020). The already dwindling patient-doctor relationship (Tripathi et al., 2019) reached a worrying level of distrust. Health care workers in general and public health care workers, in particular, suffered acute helplessness. Stigma, work overload, shortage of equipment, dying patients, distrust, concern for personal safety, and safety of the family members pushed them into mental turmoil.

Recent studies on Indian doctors reported significant mental health problems due to COVID-19 (Chatterjee et al., 2020; Khanam et al., 2020; Podder et al., 2020). 52.8% of the health care workers in India were reported to have COVID-19 pandemic-related burnout (Kulkarni et al., 2020). In another study, 73.9 and 30% of the dermatologists in India were found to experience stress and insomnia, respectively due to the pandemic (Bhargava et al., 2020). This is quite in line with Zhang et al. (2020a) who found insomnia in more than one-third of the health care workers working during the COVID-19 pandemic. Burnout can be caused due to insomnia. In fact, Metlaine et al. (2017) stated that job strain represents a burnout risk factor only if associated with insomnia. Banerjee et al. (2020a) in a systematic review of the impact of COVID-19 on psychosocial and mental well-being in the South Asian countries highlighted the increasing stress, anxiety and sleep-related problems in India, especially among the frontliners and health workers. The authors in their advocacy

guidance mentioned the need for psychosocial interventions tailored to these needs of the healthcare staff.

Insomnia is a sleep disorder in which one can have trouble falling and/or staying asleep. Good sleep is important for both physical and mental well-being. According to Hess (1965) sleep is "…. the expression of a predominance of the trophotropic component of the autonomous nervous system and a preventive measure against exhaustion …" The present-day notion of a circadian rest-activity or sleep-wake rhythm resonates with his concept of alternating trophotropic and ergotropic states. The trophotropic state and the circadian rest state predominantly involve physiological processes that promote energy conservation and restoration as distinguished from the physiological processes and the functional status of the nervous system that help organisms to expend energy (Borbély, 1982; Colten and Altevogt, 2006). During sleep, the arousal systems are shut down allowing the brain to fall asleep. The arousal systems include the thalamus, posterior hypothalamus, neuronal aggregates within the brainstem reticular formation, and basal forebrain. The arousal systems stimulate cortical activation through ascending projections to the cortex and this is characterized by high-frequency gamma and low-frequency rhythmic theta activity. The descending projections to the spinal cord stimulate muscle tonus as well as sensory-motor responsiveness and activity (Jones, 2003). Proper functioning of the arousal systems helps us stay alert and awake. Sleep-wake homeostasis keeps track of the body's requirement of sleep and maintains the sleep-wake cycle.

Stress is a state of disrupted homeostatic balance. It is triggered by intrinsic or extrinsic stressors or situations that are perceived as a threat to one's well-being. The body counteracts by a range of complex physiological and behavioral responses to reestablish eustasis — the optimal body equilibrium (Tsigos et al., 2000). The adaptive stress response involves an intricate network of neuroendocrine, cellular, and molecular infrastructure. Hypothalamic-pituitary-adrenal (HPA) axis and the autonomic nervous system (ANS) work in tandem with other vital centers in the central nervous system (CNS) and tissues/organs in the periphery to yield a successful adaptive stress response. Dysregulation of the stress system can disrupt the body homeostasis leading to a state of cacostasis (adverse effects) or allostasis (achieve stability). Stress and insomnia are not unitary constructs but these two aspects of mental health are intricately intertwined. Sleep and stress response share a common pathway – the hypothalamic-pituitary-adrenal (HPA) axis. Sleep, especially deep sleep, has an inhibitory influence on the HPA axis whereas, activation of the HPA axis can lead to arousal and sleeplessness (Nicolaides et al., 2000). The HPA axis is also responsible for the neuroendocrine adaptation of the stress response (Smith and Vale, 2006). The production of the stress hormone cortisol is triggered by stress-induced activation of the HPA axis. Cortisol is an essential steroid hormone and like many other physiological processes like sleep has a circadian rhythm. In healthy individuals, cortisol levels reach a nadir at midnight and then build up overnight to peak in the morning and then again decline slowly throughout the day. However, when we are under stress the HPA axis gets activated and the adrenal glands release the hormone cortisol into the bloodstream. This prepares the body for the "fight or flight" response which is important for survival. Therefore, on one hand, stress-related activation of the HPA axis might decrease sleep eventually leading to burnout. On the other hand, sleep deprivation can lead to maladaptive changes in the HPA axis and result in neuroendocrine dysregulation. Thus, stress and insomnia might exacerbate each other and create a vicious cycle impacting long term mental health (Basta et al., 2007).

As already discussed, stress and insomnia are common mental health issues among HCWs battling the COVID-19 pandemic in India and the rest of the world. Most studies investigating stress among health care workers have reported global stress scores. Stress, however, is not a unitary construct. It is multifaceted and complex. Various physiological, psychological, social, and emotional factors may contribute to stress. In fact, the items of the PSS-10 were designed to "tap how unpredictable, uncontrollable, and overloaded respondents find their lives" (Cohen et al., 1983). These different aspects of stress might have different predictor variables and might be differently associated with insomnia. Moreover, different components of stress and insomnia might affect different categories of HCWs differently.

In this study, we conducted a factor analysis on the items obtained from the PES-10 and the ISI-7 to investigate the inter-correlation between these measures and extract different factors of these two mental health parameters. We hypothesized that some measures of sleep will significantly relate with stress measures as these two aspects of mental health influence each other. We also hypothesized that different categories of HCWs will score differently on different factors. We expected different socio-demographic and clinical-professional predictors for different factors. Most studies on Indian HCWs have acquired data through online surveys that have inherent limitations such as lack of focus groups and selection bias. To overcome these shortcomings, we conducted a pen and paper survey. Stratified random sampling was attempted to overcome sampling bias.

MATERIALS AND METHODS

Ethics

The study was approved by the institutional ethics committee (DHGMC/2020/349/10). All participants signed an informed consent form approved by the above committee.

Settings

The study was conducted from 20th April to 20th May at Diamond Harbour Medical College & Hospital (DHGMC), West Bengal, India. During this time COVID-19 was gradually spreading across India thereby mounting pressure on the health care system. DHGMC was converted into a COVID-19 treatment center, well-equipped with an isolation ward, quarantine center, fever clinic, and COVID-19 testing facility.

Sampling

Approximately, 612 (235 doctors, 259 nurses, 80 ward staff, and 40 non-clinical staff) employees were working at the hospital when this study was carried out. So, the percentages of doctors, nurses, ward staff, and non-clinical staff working during that time were 38.27, 42.18, 13.02, and 6.5%, respectively. We did

a stratified random sampling, and the questionnaires were randomly distributed among 308 HCWs (∼50% of the total workforce). The 308 HCWs comprised of 118 doctors (38.31%), 130 nurses (42.2%), 40 ward staff (13.0%), and 20 clinical staff (6.5%). Responses were received from only 250 HCWs. Participants having any history of neurological or psychiatric illness were excluded from the study based on self-reports and their scores on the general health questionnaire. After eliminating participants not meeting the inclusion criteria ($n = 44$), incomplete data ($n = 52$), and spurious data ($n = 14$), finally 140 participants were selected for the study. These 140 participants comprised of 56 doctors (40.0%), 46 nurses (32.9%), 20 ward staff (14.3%), and 18 non-clinical staff (12.9%). Thus, the proportion of HCWs included in the final analyses did not match the distribution of HCWs working in the hospital. We, however, did not exclude participants from these final 140 to meet the exact proportion of HCWs working in the hospital as that would have further reduced the sample size. Strict lockdown protocol, social distancing, the growing pressure of COVID-19 patients in the hospital, and the all-pervading fear of death and loss proved to be detrimental for the collection of data, especially through offline forms. HCWs were too preoccupied to focus on research participation. Consequently, we could not follow the stratified random sampling protocol very strictly despite our best efforts.

Participants

One hundred forty (56 doctors, 46 nurses, 20 ward staff, and 18 non-clinical staff) were selected for the study. Doctors comprised of trained professionals who had at least a bachelor's degree in medicine and surgery (MBBS). Nurses included qualified professionals with at least a diploma in nursing. Ward staff members included trained medical technicians and attendants. Non-clinical staff members included the administrative staff and office workers who were not directly involved in patients' care. All the nurses were females, and all the ward staff members were males (**Tables 1**, **2**).

TABLE 1 | Socio-demographic details of the participants.

Variable name	Sample size ($N = 140$)
Age	37.67 ± 9.847
Gender	
Male	61 (43.6%)
Female	79 (56.7%)
Marital status	
Married	82 (58.6%)
Unmarried	56 (40.0%)
Separated	2 (1.4%)
Habitat	
Urban	84 (60.0%)
Rural	56 (40.0%)
Education	
Diploma	2 (1.4%)
Graduate	82 (58.6%)
Postgraduate	56 (40%)
Family (living with)	
Children	25 (17.9%)
Parents	63 (45.0%)
Spouse	49 (35.0%)
Single	3 (2.1%)
Occupation	
Doctor	56 (40.0%)
Nurses	46 (32.9%)
Ward staff	20 (14.3%)
Non-clinical staff	18(12.9%)
Media exposure	
<1 h	14 (10.0%)
<2 h	26 (18.6%)
<3 h	43 (30.7%)
Above 3 h	57 (40.7%)
Disease	
None	87 (62.1%)
Diabetes	12 (8.6%)
Hypertension	22 (15.7%)
COPD	11 (7.9%)
Multiple complications	8 (5.7%)

Key: COPD-Chronic obstructive pulmonary disease.

Measures

Demographic Information

Demographic information was obtained using a customized demographic data sheet. A questionnaire was designed to assess the participant's level of exposure to patients with COVID-19 infection. Based on the information they were categorized into four groups—severe risk (specimen collection unit, and isolation ward), high risk (chest/medicine outdoor, fever clinic, and emergency), moderate risk (specialist outpatient and inpatient department), and low risk (administrative work).

The Perceived Stress Scale

The Perceived Stress Scale (PSS – 10) (Cohen et al., 1983) has 10 questions/statements and the respondents indicate their levels of agreement (0 = Never; 1 = Almost; 2 = Sometimes; 3 = Fairly Often 4 = Very Often). It includes items measuring reactions to stressful situations as well as measures of stress. The PSS-10 scale has acceptable reliability measures for Indian population (internal consistency-Cronbach's $\alpha = 0.731$; Spearman-Brown split-half reliability coefficient = 0.71) (Pangtey et al., 2020).

Insomnia Severity Index

Insomnia severity index (ISI-7) (Morin et al., 2011) contains seven items that assess the severity of both nighttime and daytime components of insomnia. The first three items assess trouble in initiating, maintaining sleep, and early morning awakening. Other items address dissatisfaction with sleep, daytime functions, recognition of insomnia by others, and finally, distress caused by insomnia. These are scored on a five-point scale ranging from 0 = no problem to 4 = very severe problem. The score of 0–7 depicts the absence of insomnia, 8–14 indicates subthreshold insomnia, 15–21 represents moderate, and 22–28 suggests severe insomnia. ISI has high internal consistency (Cronbach's $\alpha = 0.84$) test-retest reliability [ICC (2, 1) = 0.84] and validity (correlation with

TABLE 2 | Clinical-professional details of the participants.

Variable name	Sample size ($N = 140$)	Stand deviation/ percentage
Duration of Service	10.7	±9.52
Level of risk of posting		
Severe risk	35	25.0%
High risk	65	46.4%
Moderate risk	25	17.9%
Low risk	15	10.7%
Prophylaxis taken		
Yes	36	25.7%
No	104	74.3%
Using of mask		
Always when outdoors	109	77.9%
Even in home	15	10.7%
Only when in workplace	16	11.4%
Perceived stress severity		
Low	29	20.7%
Moderate	102	72.9%
High	9	6.4%
Insomnia severity		
No (0–7)	73	52.1%
Sub threshold (8–14)	30	21.4%
Moderate (15–21)	24	17.1%
Severe (22–28)	13	9.3%

Pittsburgh Sleep Quality Index- $r = 0.45$) for Indian population (Veqar and Hussain, 2020). We have used the original English versions of the above tests as all participants in this study had at least 12 years of formal education.

Procedure

The participants self-administered the questionnaires at their leisure in their preferred place without the intervention of the researchers. They were requested to return the questionnaires within a week of receiving them. A follow up was initiated if any participant failed to return the questionnaires within the stipulated time. This being a cross-sectional study, the participants responded only once.

Statistical Analyses

The data were manually entered into Microsoft Excel (Microsoft Corporation, Washington, USA, 2016) after removing all the identifiable information. Statistical analyses were performed using Statistical Package for Social Sciences (SPSS) Statistics for Windows, Version 20.0 (IBM Corp., USA, 2011).

We obtained 17 measures per patient: Insomnia (7 questions) and Perceived Stress (10 questions). A Factor Analysis (FA) using the principal component method with a varimax rotation was conducted on data obtained from 140 patients to reduce the number of variables. It may be noted here that the factor structure of a particular tool may vary due to sampling differences (Gaskin et al., 2017). Existing factor analysis data on PSS-10 are based on samples from different cultures and were collected under different socio-economic and health conditions. So, instead of confirmatory factor analysis based on previous studies, a data-driven approach was taken. "Eigenvalues greater than one" was considered as factor extraction criteria since this is considered to be a reliable technique for factor extraction in exploratory factor analysis (Field, 2009).

Shapiro-Wilk test for normality was done on the total factor scores and it revealed that the data are not normally distributed. After excluding the three outliers (6, 64, and 125) the data conformed to the normality criteria. Hence rest of the analyses were done on these 137 participants.

A mixed-design ANOVA was conducted to test for an interaction between the groups (of HCWs) and the mental health components. This analysis was followed by independent sample *t*-tests to determine how the groups differed across the four mental health components.

Stepwise regression was conducted to test if socio-demographic (age, gender, habitat, marital status, education, family, diseases, and media exposure) and clinical-professional variables (duration of service, quarantine, level of risk, contact with confirmed COVID cases, prophylaxis, and use of mask) could predict the mental health components.

RESULTS

Descriptive Analyses

47.9% (67/140) of the HCWs suffered from insomnia. The mean insomnia scores of doctors, nurses, ward staff, and non-clinical staff were 8.7 ± 6.5, 8.1 ± 5.8, 8.9 ± 2.4, and 10.3 ± 5.9, respectively. 79.3% of the HCWs perceived moderate to severe levels of stress. The mean perceived stress scores of doctors, nurses, ward staff, and non-clinical staff were 19.8 ± 4.5, 18.6 ± 4.3, 12.9 ± 3.6, and 16.2 ± 9.5 respectively.

Group Characteristics

The four groups (Doctors: 34 Male, 22 Female; Nurses: 0 male, 46 Female; ward staff: 20 Male, 0 Female; and Non-clinical staff: 7 Male, 11 Female) were not comparable in age ($p = 0.006$), education ($p < 001$) and gender ratio. Doctors ($M = 39.23 \pm 9.3$) and nurses (39.46 ± 11.5) did not have any significant difference in age. The ward staff members had the lowest mean age (31.45 ± 4.8) followed by the non-clinical staff members (35.17 ± 8.4) however, this difference was not statistically significant. The age difference between the nurses and the ward staff members was significant ($p < 0.05$) but, the difference between non-clinical staff members and the nurses was not significant. Doctors were significantly more educated than other health care workers ($p < 0.05$). Nurses, Ward staff, and non-clinical staff did not differ significantly in their levels of education. 64.3% of doctors did not have any comorbidity, 5.4% had diabetes, 23.2% had hypertension, and 7.1% had COPD (chronic obstructive pulmonary disease). Among the nurses, 50% did not have any comorbidity, 15.2% had diabetes, 17.4% had hypertension, and 17.4% had multiple comorbidities. Seventy-five percentage of the ward staff did not have any comorbidity but 25% had COPD. 72.2% of the non-clinical staff did not have

any comorbidity, 11.1% had diabetes, 5.6% had hypertension, and 11.1% had COPD. Only 3.6% of the doctors and 5.6% of the non-clinical staff lived alone. The rest of the participants stayed with their families.

Exposure to media was assessed on a scale ranging from 1-(<1 h) to 4 (above 3 h. Mean scores of doctors, nurses, ward staff, and non-clinical staff were 3.3 ± 0.90, 2.5 ± 1.0, 3.3 ± 0.44, 3.2 ± 1.2, respectively. The nurses were significantly less exposed to media compared to other doctors, ward staff, and non-clinical staff. The other three groups did not have any significant differences in media exposure scores. 76.8, 34.7, 50, and 72.2% of the doctors, nurses, ward staff, and non-clinical staff, respectively, were married; 1.7% of doctors and 2.2% of nurses were separated; the rest of the participants were unmarried. 87.5% doctors, 47.8% nurses, 0% ward staff, and 72.2% of the non-clinical staff lived in urban areas. 42.9% doctors, 21.7% of nurses, 0% of ward staff, and 11.1% of non-clinical staff used prophylaxis. All the participants used masks. However, the profuseness of use varied across groups. Seventy-five percentage of doctors, 78.3% nurses, 100% ward staff, and 61.1% of non-clinical staff used masks always when they went out of their home; 21.4% of doctors, 6.5% nurses, and 5.6% of non-clinical staff used masks only while at work; and 3.6% of doctors, 15.2% of nurses, and 33.3% of non-clinical staff used masks even at home. 17.8% of doctors, 6.5%nurses, 100% of ward staff, and 38.9% of non-clinical staff had the habit of smoking. Doctors (12.82 ± 8.4) and nurses (13.1 ± 11.5) did not differ significantly in "duration of service." The ward staff members (4.5 ± 3.4) and non-clinical staff members (5.6 ± 6.7) did not differ significantly in "duration of service." However, the doctors and nurses had a greater "duration of service" than the ward staff members and the non-clinical staff members. The level of risk for infection was assessed on a scale ranging from 1– low to 4–Very high. The mean scores of doctors, nurses, ward staff, and non-clinical staff were 3.21 ± 0.76, 2.98 ± 0.72, 2.75 ± 0.44, 1.56 ± 1.1, respectively. There was no significant difference between doctors, nurses, and ward staff in levels of risk for infection, but the non-clinical workers had a significantly lower risk for infection compared to the other three groups ($p < 0.05$). Among the participants, 17.9% of doctors, 15.2% of nurses and 5.6% of non-clinical staff members were quarantined. None of the ward staff was quarantined.

Factor Analysis

The Initial Factor Analysis

A factor analysis with the principal component method was conducted on the 17 measures that were obtained from the ISI-7 and PSS-10. KMO value indicated that the sample was factorable (KMO = 0.768). Homogeneity of variance was confirmed by Bartlett's test [x^2 (136) = 926.7, $p < 0.001$]. The diagonals of the anti-image correlation matrix were over 0.5 for all items except the PSS (Q4). This item was dropped from the final analysis.

The Final Factor Analysis

The final factor analysis was done on 16 items. KMO of the final model was 0.786 and Bartlett's test was significant [x^2 (120) = 877.4, $p < 0.001$] confirming that the data were factorable (Field, 2009). The diagonals of the anti-image correlation matrix were above 0.5 for all items. Communalities were above 0.5 for all items in the final analysis except P-6 (0.42). We extracted four factors with eigenvalues above 1. The four components explained 29.6, 16.0, 10.0, and 6.6% of the variance, respectively. The cumulative percentage of variance explained by the five components was 62.2%. The rotated component matrix with the communalities of the items is given in **Table 3**. After scrutinizing the individual items of these four factors, we

TABLE 3 | Rotated component matrix.

Items	Sleeplessness	Anxiety	Irritability	Hopelessness	Communalities
Insomnia_6	0.872				0.778
Insomnia_7	0.85				0.735
Insomnia_5	0.792				0.697
Insomnia_2	0.768				0.651
Insomnia_4	0.651				0.563
Insomnia__1	0.618				0.522
Insomnia_3	0.602				0.502
PS_1		0.835			0.711
PS_3		0.792			0.654
PS_2		0.737			0.589
PS_9		0.721			0.655
PS_5			0.84		0.697
PS_7			0.74		0.735
PS_8			0.705		0.544
PS_10				0.725	0.59
PS_6				0.517	0.423

PS, Perceived stress; INS, Insomnia; SUP, Stress-due-to-unpredictability; SOL, Stress-due-to-overload; SUC, Stress-due-to-uncontrollability.

named them: (1) Insomnia (2) Stress-related Anxiety (3) Stress-related Irritability, and (4) Stress-related Hopelessness. Hereafter these four factors will be referred to as Insomnia, Anxiety, Irritability, and Hopelessness, respectively. Factor *hopelessness* had less than three-item loadings, but we retained it as a separate factor because irritability and hopelessness are different aspects of stress. Further analyses were done on these four factor-scores.

Hypothesis Testing

After factor analysis, factor scores were scanned for outliers. Shapiro-Wilk test for normality was done on the total factor scores and it revealed that the data are not normally distributed. After excluding the three outliers (6, 64, and 125) the data conformed to the normality criteria. Hence rest of the analyses were done on these 137 participants.

These 137 participants were divided into four groups based on their profession. There were 55 doctors (Age: $M = 39.22 \pm 9.3$, 33 Male and 22 Female), 45 nurses (Age: $M = 39.60 \pm 11.6$; 0 Male and 45 Female), 20 ward staff (Age: $M = 31.45 \pm 4.8$; 20 Male and 0 Female), and 17 non-clinical staff (Age: $M = 34.06 \pm 7.2$; 6 Male and 11 Female).

The mixed design ANOVA was carried out with groups of HCWs (Doctor, $N = 55$; Nurse, $N = 45$; Ward staff (WS), $N = 20$; and Non-Clinical staff (NCS), $N = 17$) as a between-subject variable and the four mental health components obtained from the factor analysis (Insomnia, Anxiety, Irritability, and Hopelessness) as a within-subject variable. The test did not yield any significant main effect of mental health factors [$F_{(3, 399)} = 0.84$, $p = 0.47$, observed power = 0.24]. However, there was a significant main effect of group [$F_{(3, 133)} = 9.7$, $p < 0.001$; observed power = 0.99] and significant Factor scores x Group interaction [$F_{(9, 399)} = 3.63$, $p < 0.001$; observed power = 0.99]. Thus, different categories of HCWs responded differently to the different mental health factors (**Figure 1**).

Mean Scores of Healthcare Workers in Four Components of Mental Health

Independent sample *t*-tests revealed that compared to the ward staff, doctors were significantly more anxious ($p = 0.005$), irritable ($p < 0.001$), and hopeless ($p = 0.001$). Nurses were more irritable ($p < 0.001$), and hopeless ($p < 0.001$) than the ward staff. Doctors were more irritable than the non-clinical staff ($p = 0.027$). Nurses were also more irritable than the non-clinical staff ($p = 0.010$).

Non-clinical staff members were more hopeless than the ward staff ($p = 0.008$). Ward staff members experienced more insomnia than the nurses ($p = 0.01$). There were no significant differences between the doctors and the nurses (**Table 4**).

Exploratory Analyses

Stepwise linear regression with the socio-demographic variables (age, gender, habitat, marital status, education, family, diseases, and media exposure) as predictors were conducted for all the four factors (Insomnia, anxiety, irritability, and hopelessness). Age ($\beta = -0.431$, $t = -6.1$, $p < 0.001$), education ($\beta = 0.358$, $t = 4.4$, $p < 0.001$), gender ($\beta = 0.202$, $t = 2.7$, $p = 0.008$), and habitat ($\beta = -0.201$, $t = -2.6$, $p = 0.011$) predicted anxiety [$F_{(4, 132)} = 18.27$, $p < 0.001$, $R^2 = 0.356$, Cohen's $f^2 = 0.552$] indicating lower age, higher education, female gender and urban habitat were associated with higher anxiety. Age ($\beta = 0.480$, $t = 6.3$, $p < 0.001$) and marital status ($\beta = 0.247$, $t = 3.2$, $p = 0.002$) predicted irritability [$F_{(2,134)} = 22.3$, $p < 0.001$, $R^2 = 0.249$, Cohen's $f^2 = 0.331$]. Older age and single marital status predicted irritability. Gender ($\beta = 0.412$, $t = 5.2$, $p < 0.001$), marital status ($\beta = -0.203$, $t = -2.5$, $p = 0.012$) and disease ($\beta = 0.175$, $t = 2.3$, $p = 0.025$) predicted hopelessness [$F_{(3,133)} = 11.4$, $p < 0.001$, $R^2 = 0.205$, Cohen's $f^2 = 0.257$]. Female gender, married status, and higher number of ailments contributed to perceived hopelessness. None of these variables predicted insomnia (**Table 5**).

Stepwise linear regression with the clinical-professional variables (duration of service, quarantine, level of risk, contact with confirmed COVID cases, prophylaxis, and use of mask) as predictors were conducted for all the four factors (insomnia, anxiety, irritability, and hopelessness). Quarantine ($\beta = -0.206$, $t = -2.4$, $p = 0.016$) significantly predicted insomnia [$F_{(1, 135)} = 5.95$, $p = 0.016$, $R^2 = 0.042$, Cohen's $f^2 = 0.043$]. People who were quarantined were more prone to suffer from insomnia. Duration of service ($\beta = -0.467$, $t = -5.88$, $p < 0.001$) and use of prophylaxis ($\beta = -0.197$, $t = -2.5$, $p = 0.015$] predicted anxiety [$F_{(2, 134)} = 17.78$, $p < 0.001$, $R^2 = 0.210$ Cohen's $f^2 = 0.265$]. Fewer years in service and use of prophylaxis was associated with anxiety. Duration of service ($\beta = 0.462$, $t = 6.45$, $p < 0.001$), quarantine ($\beta = -217$, $t = -2.98$, $p = 0.003$] and level of risk ($\beta = -0.165$, $t = -2.3$, $p = 0.024$) predicted irritability [$F_{(3, 133)} = 21.58$, $p < 0.001$, $R^2 = 0.327$, Cohen's $f^2 = 0.485$]. Greater duration of service, quarantine, and a greater level of risk contributed to irritability. None of these variables predicted hopelessness (**Table 6**).

DISCUSSION

Our study aimed to investigate the different components of perceived stress and insomnia experienced by the HCWs and how different socio-demographic and clinical-professional factors influenced these components. The factor analysis of insomnia and stress scales yielded four factors which were identified as – (1) Insomnia, (2) Stress-related Anxiety, (3) Stress-related Irritability and (4) Stress-related Hopelessness. The four factors explained 62.2% of the variance. Perceived stress yielded three factors and this is consistent with Pangtey et al. (2020) who validated the Hindi version of PSS-10 in the adult urban population of Delhi.

All the 7 questions of the insomnia scale loaded on the first factor. Insomnia was found to be the most important factor and it explained 29.6% of the variance. There was no significant correlation between the insomnia factor and the other three factors of perceived stress. This is consistent with Gupta et al. (2020) who found no significant differences in perceived stress among three different groups with varying levels of nighttime sleep duration after lockdown due to COVID-19. It may be noted that insomnia can be caused by several other factors apart from stress. In this study, quarantine significantly predicted insomnia.

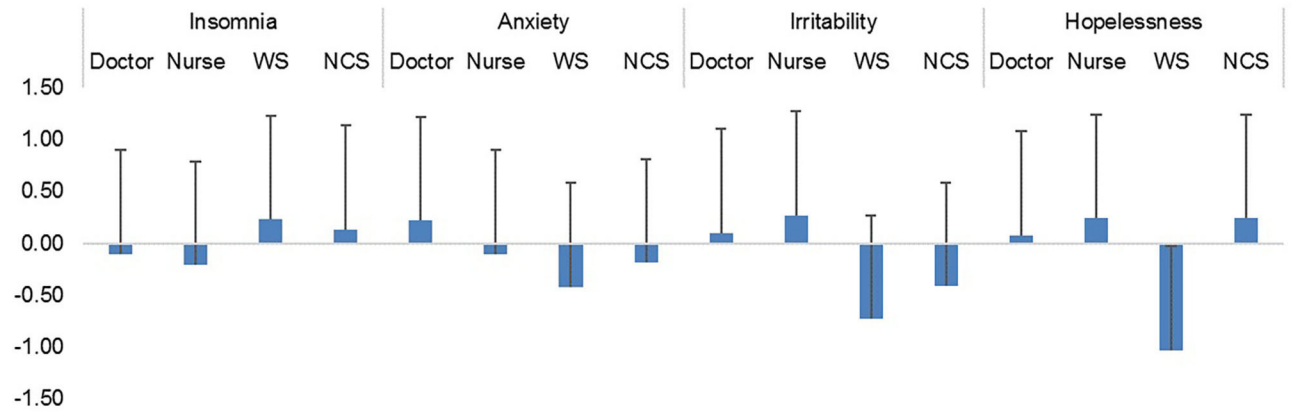

FIGURE 1 | Mean scores of different categories of health care workers.

TABLE 4 | Result of independent sample *t*-tests.

Factor	Group	Mean	(SD)	Pairs compared	*T*-value	df	*P*-value	Cohen's *d*
Insomnia	Doctor	−0.10	(1.10)	Doctor - Nurse	0.528	98	0.599	0.107
	Nurse	−0.21	(0.94)	Doctor - WS	−1.923	72.989	0.058	0.399
	WS	0.23	(0.39)	Doctor - NCS	−1.179	53.143	0.244	0.273
	NCS	0.14	(0.57)	Nurse - WS	−2.66	62.785	0.01*	0.611
				Nurse - NCS	−1.422	60	0.16	0.450
				WS - NCS	0.578	35	0.567	0.184
Stress-related	Doctor	0.22	(0.83)	Doctor - Nurse	1.715	85.199	0.09	0.346
anxiety	Nurse	−0.10	(1.01)	Doctor - WS	2.917	73	0.005*	0.752
	WS	−0.42	(0.87)	Doctor - NCS	1.184	19.992	0.25	0.358
	NCS	−0.18	(1.34)	Nurse - WS	1.23	63	0.223	0.339
				Nurse - NCS	0.267	60	0.79	0.067
				WS - NCS	−0.625	26.696	0.537	0.531
Stress-related	Doctor	0.10	(1.05)	Doctor - Nurse	−0.833	98	0.407	0.168
irritability	Nurse	0.27	(0.96)	Doctor - WS	4.131	55.736	0.000*	0.724
	WS	−0.73	(0.64)	Doctor - NCS	2.299	39.219	*1 0.027*1	0.566
	NCS	−0.41	(0.72)	Nurse - WS	4.939	53.303	<0.001*	1.22
				Nurse - NCS	2.66	60	0.01*	0.801
				WS - NCS	−1.418	35	0.165	0.469
Stress-related	Doctor	0.08	(0.79)	Doctor - Nurse	−1.224	96.425	0.224	0.232
hopelessness	Nurse	0.24	(0.57)	Doctor - WS	3.914	25.556	0.001*	1.111
	WS	−1.03	(1.17)	Doctor - NCS	−0.418	18.623	0.681	0.129
	NCS	0.24	(1.56)	Nurse - WS	4.626	23.037	<0.001*	1.380
				Nurse - NCS	0.007	17.627	0.994	0.000
				WS - NCS	−2.832	35	0.008*	0.921

WS, Ward staff; NCS, Non-clinical staff; SD, Standard deviation; df, Degree of freedom; Statistically significant after FDR correction; *1Statistically not significant after FDR correction.*

More screen time, reduced physical activity, change in daily routine, and staying away from home in a quarantine center could contribute to insomnia. Concern for one's own health, apprehensions for their loved ones, financial worries, etc. could exacerbate anxiety and stress during the quarantine. In response to the stress the cortisol level may shoot up and disrupt the sleep-wake cycle increasing sleep fragmentation, dreaming and insomnia (Basta et al., 2007). Similarly, the blue-wavelength light from the electronic screen may force the brain into confusing between day-night cycle and suppress the production of the sleep hormone melatonin (Tähkämö et al., 2019). Reduced physical activity (PA) may decrease total energy expenditure and affect sleep quality. Exercise is reported to significantly decrease REM sleep (Wang and Boros, 2019) thereby expounding the mechanism of PA effect on sleep. Prevalence of Insomnia was quite high (49.7%) among the HCWs who participated in this

TABLE 5 | Results of stepwise linear regressions with the demographic variables.

Dependent variable	Predictors	*β*	*t*-value	*p*-value	*F*-value	df	*p*-value	*R*-square	Cohen's(f2)
Insomnia	None	–	–	–	–	–	–	–	–
Stress-related	Age,	−0.431	−6.084	0.000	18.268	4,132	0.000	0.356	0.552
anxiety	Education	0.358	4.384	0.000					
	Gender	0.202	2.7	0.008					
	Habitat	−0.201	−2.574	0.011					
Stress-related	Age	0.48	6.316	0.000	22.257	2,134	0.000	0.249	0.331
irritability	Marital-status	0.247	3.241	0.002					
Stress-related	Gender	0.412	5.177	0.000	11.428	3,133	0.000	0.205	0.257
hopelessness	Marital-status	−0.203	−2.55	0.012					
	Disease	0.175	2.262	0.025					

TABLE 6 | Results of stepwise linear regressions with clinical-professional variables.

Dependent variable	Predictors	*β*	*t*-value	*p*-value	*F*-value	df	*p*-value	*R*-square	Cohen's(f2)
Insomnia	Quarantine	−0.206	−2.44	0.016	5.956	1,135	0.016	0.042	0.043
Stress-related	Duration of service	−0.467	−5.878	0.000	17.777	2,134	0.000	0.21	0.265
anxiety	Prophylaxis	−0.197	−2.474	0.015					
Stress-related	Duration of service	0.462	6.453	0.000	21.581	3,133	0.000	0.327	
irritability	Quarantine	−0.217	−2.983	0.003					0.485
	Level of risk	−0.165	−2.277	0.024					
Stress-related hopelessness	None	–	–	–	–	–	–	–	–

study. This percentage is slightly higher than that reported by Lai et al. (2020) and Bhargava et al. (2020). Ward staff members were most likely to experience insomnia. Compared to doctors and nurses, other HCWs were more prone to suffer from insomnia. Smoking could be the possible reason for the elevated insomnia scores in these groups. One-hundred percentage of the ward staff members and 38.9% of the non-clinical staff members had the habit of smoking. The percentages of smokers among the doctors and nurses were much lower. The stimulating effect of nicotine may prevent smokers from falling asleep and later on as night evolves they may have sleep disturbance due to withdrawal from nicotine (Zhang et al., 2008).

Stress due to unpredictability has been referred to as "*anxiety*" in this study. HCWs with lower age, higher education, female gender, and urban habitat experienced higher levels of anxiety. In fact, doctors who formed the most educated group among the HCWs were the most anxious of all. As we have seen in several patients, better knowledge and understanding of the disease can engender stress and anxiety (Selinger et al., 2013; Zhang et al., 2014). Doctors are not an exception to this rule. Female HCWs and HCWs with lower age experienced greater anxiety. This is in line with Matud (2004) who reported significantly more stress in women even after adjusting for sociodemographic variables. In fact, our result is consistent with studies that report sexual dimorphism in stress reactivity and increased female vulnerability to stress-related disorders (Bangasser and Wicks, 2017; Novais et al., 2017). For example, research reports that female sex hormones attenuate the sympathoadrenal and HPA responsiveness leading to sluggish cortisol feedback on the brain and less or delayed containment of the stress response (Verma et al., 2011). Moreover, human female hypothalami have increased corticotropin-releasing hormone (CRH) content relative to male hypothalami and plasma adrenocorticotropin hormone responses to the ovine CRH are found to be significantly greater among women as compared to men (Gallucci et al., 1993). Consequently, women have greater sensitivity and lower tolerance to negative emotions and are reported to have two to three times higher risk of developing post-traumatic stress symptoms than men (Kessler et al., 2005; Tolin and Foa, 2006). Our results are also in line with the American Psychological Association (APA)'s report of 2019 (Stress in America 2013, Are Teens Adopting Adults' Stress Habits? 2013), which states that younger adults and women are more stressed out. This is partly consistent with Remes et al. (2016) who stated that the prevalence of anxiety disorder is higher in women and young adults. However, it may be noted that anxiety referred to here is an aspect of stress and we have not used any tool to measure anxiety *per se*. Nonetheless, these two psychobiological states are reported to have neural as well as behavioral overlaps (Daviu et al., 2019). Our result is consistent with several other studies that report higher levels of stress in people living in cities compared to rural areas (Srivastava, 2009; Gruebner et al., 2017). Fewer years in service and use of prophylaxis was associated with anxiety.

HCWs with junior titles were probably less adapted to handle such crises and consequently had higher levels of stress. Higher stress levels could result from the use of prophylaxis (Juurlink, 2020). Additionally, people who are more stressed could be more inclined to use prophylaxis.

Stress due to overload has been referred to as "*irritability*". Doctors and nurses scored high on this factor compared to other HCWs. This is consistent with recent studies examining the mental health status of HCWs during COVID-19 (Lai et al., 2020). Older and single HCWs were more irritable. This result is quite intuitive. Older people are more likely to succumb to tiredness due to overwork and single HCWs were probably more stressed because they were handling their emotional and physical burden single-handedly. The result is consistent with a recent study that found lower levels of stress hormones in healthy married adults (Chin et al., 2017). Greater duration of service, quarantine, and a greater level of risk contributed to irritability. This result again is quite expected. Greater duration of service indicates higher age and as already explained older people might capitulate to fatigue and exhaustion more easily than younger people. Moreover, apart from emotional turmoil, quarantine might impose a physical burden as well. Middle-class salaried Indians usually have the privilege of domestic help to take care of household chores. Quarantine could inadvertently repeal this privilege thereby escalating unwonted physical burden and hence stress. This is partly consistent with a study in the general population (Stress, Stigma and Sleep loss: COVID-19 Takes a Heavy Toll on mental Health- The New Indian Express, 2020) that was covered by the *New Indian Express*. HCWs posted in specialties such as a respiratory ward, infectious-diseases ward, or critical-care ward, where there is a high risk, are plausibly sharing the greatest workload during this pandemic. Consequently, they are probably under greater stress than other HCWs. Wearing the heavy PPE in this hot and humid climate might add to their distress which has been highlighted among the physicians in India repeatedly during the pandemic (Banerjee et al., 2020b).

Stress due to uncontrollability has been denoted as "*hopelessness*" in this study. Female gender, single marital-status, and greater ailments contributed to perceived hopelessness. Ward staff members were found to be the most hopeful among the HCWs. Incidentally, all the ward staff members were males. This is in line with the linear regression result that indicated gender as the most important predictor of perceived hopelessness. Female HCWs were more likely to be perturbed with the feeling of hopelessness. Our result is consistent with studies that report a feeling of powerlessness among HCWs. Females, being more empathetic, are perhaps more likely to feel hopeless when they witness people suffering and dying. Our findings are also in line with Podder et al. (2020), who reported higher levels of perceived stress in female physicians. In contrast to irritability, married HCWs were found to be more hopeless. Concern for family members and their well-being could contribute to their feeling of hopelessness. The result is somewhat similar to Hacimusalar et al. (2020), who found that the proportion of people who reported increased anxiety was significantly higher in married people compared to single ones. The authors also reported that increase in anxiety levels explained 28.9% of the increase in hopelessness levels. HCWs with a greater number of ailments had greater perceived hopelessness. Numerous scientific journals and social media platforms are continuously reporting that patients with lung diseases, diabetes, and heart diseases are at increased risk for severe complications from COVID-19 (Guan et al., 2020a,b; Sanyaolu et al., 2020). This awareness and a focus on the uncontrollable could worsen the feeling of hopelessness in HCWs with these ailments (Lai et al., 2020).

In sum, this study revealed that the HCWs working in India during the first phase of the pandemic experienced significant mental health symptoms. Several factors contributed to their psychological distress. Most of these factors such as higher age, female gender, higher education, urban habitat, single status, having comorbidities, longer duration of service, a greater level of risk, and quarantine were found to affect the mental health status of HCWs from other countries as well (Vindegaard and Benros, 2020). Quarantine emerged as the predictor of insomnia and this is consistent with several other studies that reported "sense of isolation" as a relevant stressor in quarantined HCWs (Carmassi et al., 2020). However, in this study perceived Stress was considered as a multidimensional construct and the three different components of perceived stress were found to have different predictive factors. In some cases, the factors were differently correlated with different components of perceived stress. For example, age and duration of service were negatively correlated with stress-related anxiety but positively correlated with stress-related irritability. Similarly, while single status predicted irritability, married status predicted hopelessness. The result emphasizes the pressing need to look beyond the global (perceived stress) scores. As in several other studies (Buselli et al., 2020), female HCWs were found to have higher stress-related anxiety and hopelessness. Doctors and nurses had higher levels of stress-related anxiety and irritability. The results of this study make a case for personalized mental health care for HCWs working in different capacities and under different circumstances.

LIMITATIONS AND FUTURE DIRECTIONS

Small sample size, sampling from a particular region of India, cross-sectional design, and unequal and disproportional groups limit the scope of generalizability of the findings of this study. Albeit we have applied FDR (false discovery rate) correction for the *t*-tests and reported effect sizes to reveal the strength of the statistical results, multiplicity of testing is another factor that might affect the statistical power of the tests conducted. Moreover, this study might not represent the mental health issues of HCWs working across India or throughout the world. Culturally diverse populations having different psychological make-ups may respond differently in similar situations. For example, while the study from Kashmir (Khanam et al., 2020) reported higher levels of stress among male HCWs, we found the female HCWs more stressed. Different socio-political situations in these two states of India could be responsible for these contrasting results. The female employment rate in Jammu

and Kashmir is abysmally low (7.9%) compared to that of West Bengal (20.5%) (Agarwal, 2018) from where the data was collected for the present study. Kashmiri women who finally get to join the workforce after braving the adverse socio-political situation are perhaps psychologically stronger and more resilient than Bengali women who enjoy a relatively safe and liberal environment. Socio-cultural differences therefore might influence the intensity and modulate the predictive factors of mental health components. So, in order to strategically target therapeutic interventions and to establish the possible impact of the pandemic on the mental health of HCWs, confirmation with a larger sample size covering diverse populations will be an important next step. Since this study is cross-sectional it has predictive limitations as exposure and outcome have been assessed simultaneously. Well-designed longitudinal studies in the future might help track the long-term effects of the pandemic on the mental health of HCWs. Further, qualitative studies grounded in the perspectives of healthcare workers and their perceived challenges during COVID-19 will have important implications for policy changes related to their welfare and safety. However, despite these limitations, the results of this work appear to be substantially in line with previous studies investigating the impact of Covid-19 on the mental health of HCWs. For example, gender differences in the prevalence of stress-related symptoms and quarantine as a predictor of higher stress levels in HCWs have been reported in previous studies (Buselli et al., 2020; Carmassi et al., 2020) that investigated HCWs from other parts of the world. Considering the paucity of research on mental health issues of HCWs fighting COVID 19 in India, this study investigates important and interesting data which will help lend deeper insight into the problems of the HCWs working in different socio-cultural environments.

CONCLUSION

The study revealed that the HCWs were working with enormous stress and sleep difficulty during the early phase of the pandemic. Different categories of HCWs were affected differently on different factors of perceived stress. While doctors scored higher on stress-related anxiety, nurses scored higher on stress-related irritability, and both nurses and non-clinical staff members scored high on stress-related hopelessness. Different factors modulated insomnia, stress-related anxiety, stress-related irritability, and stress-related hopelessness. For example, duration of service, and use of prophylaxis predicted stress-related anxiety, while the duration of service, quarantine, and level of risk predicted stress-related irritability. More importantly, the duration of service was negatively correlated with stress-related anxiety but positively correlated with stress-related irritability. Thus, this study emphasizes the fact that perceived stress is a multifactorial construct, and reporting global perceived stress scores might result in an oversimplification of the complex and intricate psychological disorder. Impoverished assessment may subsequently lead to inadequate and inappropriate treatment plans. Personalized treatment for different categories of HCWs should be maneuvered appropriately to grapple with the mental health issues of the HCWs in this difficult time. Advanced healthcare work-place strategies and tailored policies will help fight the stress and preserve this "frontline workforce" during the COVID-19 and post-pandemic aftermath.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by DGHMC, West Bengal University of Health Sciences. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SeC: concept, design, data collection, data curation, data interpretation, drafting the manuscript, and reviewing and editing. MC: statistical analyses, data interpretation, data visualization, drafting the original manuscript, and editing and revising it critically for important intellectual content. DB: concept, literature review, data curation, drafting the manuscript, organization, reviewing and editing, and revising. SG: design, supervision, editing, and reviewing. ShC: concept, design, data collection, and data preprocessing. UD: design, supervision, editing, and reviewing. All authors have read and approved the final version of the manuscript.

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Benefits of Expressive Writing on Healthcare Workers' Psychological Adjustment During the COVID-19 Pandemic

Rossella Procaccia[1], Giulia Segre[1], Giancarlo Tamanza[2] and Gian Mauro Manzoni[1]*

[1] Faculty of Psychology, eCampus University, Novedrate, Italy, [2] Department of Psychology, Catholic University of Milan, Milan, Italy

COVID-19 outbroke in Wuhan, China, in December 2019 and promptly became a pandemic worldwide, endangering health and life but also causing mild-to-severe psychological distress to lots of people, including healthcare workers (HCWs). Several studies have already showed a high prevalence of depression, anxiety, and post-traumatic symptoms in HCWs but less is known about the efficacy of psychological interventions for relieving their mental distress. The aims of this study were: (1) to evaluate the psychological adjustment of Italian HCWs during the COVID-19 pandemic; (2) to investigate the efficacy of an expressive writing (EW) intervention, based on Pennebaker's paradigmatic protocol, on their psychological adjustment; (3) to analyze if outcomes of EW vary in function of individual differences (age, gender, marital status, and baseline values of symptoms). Fifty-five HCWs were randomly assigned to one of two writing conditions: EW (n = 30) or neutral writing (NW; n = 25). Psychological adjustment (in terms of ptsd, depression and global psychopathology's symptoms, perceived social support, and resilience) was assessed before and after three writing sessions. Participants who received the EW intervention showed higher improvements in ptsd, depression, and global psychopathology symptoms. Improvements in EW group varied in function of age, gender, marital status, and baseline values: young, men, married participants and those who had higher baseline scores showed a higher reduction of psychological distress symptoms while women, single and those who had lower baseline value showed increased social support, and resilience. In conclusion, the EW intervention had positive effects which varied in function of individual differences on HCWs' psychological health.

Keywords: COVID-19, healthcare workers, psychological adjustment, expressive writing, distress

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Elena Vegni,
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Andrea Sabrina Hartmann,
University of Osnabrück, Germany
Giorgia Margherita,
University of Naples Federico II, Italy

****Correspondence:***
Rossella Procaccia
rossella.procaccia@uniecampus.it

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INTRODUCTION

Since December 2019, a pneumonia epidemic caused by the 2019 novel coronavirus (SARS-COV-2) outbroke in Wuhan and spread across China rapidly; it became a global pandemic within the following 2 months [World Health Organization (WHO), 2020]. Italy was, after China, the second in time country most affected by the COVID-19 outbreak.

Although higher levels of psychological distress have been reported among the general population (Serafini et al., 2020), healthcare professionals, given their crucial role in managing these emergency situations, seem to be more vulnerable. Overall, pandemic requires intense and prompt responses in terms of healthcare: healthcare workers (HCWs), either directly or indirectly, are involved in delivering care to patients, fighting at the frontline against the virus. Medical staff and affiliated HCWs are under both physical and psychological pressures. Considering that, at a normal time, nearly half of physicians report burnout, or emotional burden due to work-related stress (West et al., 2018), supporting their mental health in such an overwhelming COVID-19 sanitary emergency is a critical part of the public health response.

Self-reported psychological problems are prevalent in HCWs during the COVID-19 pandemic. A recent review (Preti et al., 2020) analyzed the effects of epidemic and pandemic outbreaks on HCW's mental health: anxiety (45%), depression (27.5–50.7%), general psychiatric symptoms (17.3–75.3%), post-traumatic stress disorder (11–73.4%), insomnia (34–36.1%), and work-related stress symptoms (18.1–80.1%) are the most common symptoms. In particular, it has been stated that female healthcare professionals and nurses exhibited higher rates of affective symptoms compared to male and medical staff, respectively (Pappa et al., 2020).

Moreover, Chew et al. (2020) demonstrated a possible bi-directional association between the physical and psychological symptoms among HCWs during the COVID-19: timely psychological interventions for HCWs with physical symptoms should be considered, once an infection has been excluded.

Healthcare workers should be aware of the early signs of mental fatigue, avoiding those to affect their emotional well-being. Recent studies (Kinman et al., 2020; Polizzi et al., 2020) have shown the importance of individual coping strategies: acceptance, behavioral activation and mindfulness could foster resilience and recovery by increasing tolerance to distress, enhancing feelings of connectedness and support, and encouraging actions that are goal-directed and value-driven. Reduced morbidity has been associated with both practical and psychological support (Kisely et al., 2020; Pappa et al., 2020). Less is known about interventions to mitigate the emotional impact of epidemics on HCWs (Gold, 2020). Health care professionals could benefit from different resources such as helplines, online therapy and group counseling sessions to reduce anxiety, distress, and insomnia symptoms.

Although evidence-based effective interventions and treatments in the healthcare system and among healthcare providers are available, stigma and lack of time limit their uptake, even in normal times (Knaak et al., 2017).

Many barriers limit the implementation of conventional evidence-based interventions in this emergency situation. Not all HCWs are willing to receive psychological treatment, individually or as a group therapy (Chen et al., 2020).

Secondly, traditional face-to-face psychotherapy is not recommended during quarantine, switching most of the therapies to remote sessions.

Moreover, another issue that has arisen is that during this emergency situation people tend to experience a wide range of mental health problems, while evidence-based interventions usually focus on a single disorder (Yang et al., 2020).

People particularly benefit from confiding about traumas (Vrij et al., 2002). Disclosing information may allow people to release their mind from unwanted thoughts, help them to make sense of upsetting events and improve their emotion regulation, all of which can have positive consequences on mental and physical health (Frattaroli, 2006).

Expressive writing (EW) is a simple and straightforward exercise. The reference model is based on Pennebaker (2004), which states that expressing deeper thoughts and feelings can alleviate the individual's physical and psychological health. Over the past 25 years (see Frattaroli, 2006; Pennebaker and Chung, 2007), several researchers have examined the effects of writing about traumatic life events. Pennebaker's EW task involves writing about a traumatic experience for a controlled period of time (usually between 15 and 30 min), on consecutive days (usually from 2 to 4 days, Pennebaker, 1997). Although this technique has been compared to exposure-based therapies for posttraumatic stress disorder (Sloan et al., 2005, 2007), research on reducing posttraumatic stress symptoms through EW has shown inconsistent results (see Frisina et al., 2004). While some studies did not find strong links between posttraumatic stress symptoms and EW (Pennebaker and Chung, 2007), several studies have shown the benefits of writing across different sessions about personal experiences with stressful life-events. This procedure has been associated with the reduction of physical and mental symptoms both in clinical and normal simples (Pennebaker and Beall, 1986; Pennebaker and Francis, 1996; Smyth, 1998; Smyth et al., 1999). In addition, researchers have explored various individual difference indices to identify those subgroups for whom EW is most beneficial (Baikie and Wilhelm, 2005; Stickney, 2010). Smyth et al.'s (1999) meta-analysis found that it had a greater impact on males than on females. Results of other studies (Paez et al., 1999; Baikie, 2003; Solano et al., 2003) showed that EW is more beneficial for those high in alexithymia and high in dissociation. It is essential to understand the conditions under which EW works and how to maximize its benefits (Lu and Stanton, 2010). A recent study found that EW positively impacted on HCWs' adaptive coping strategies and work relational communication satisfaction. Similarly, EW was found to be a useful tool for nurses in high-stress areas: coping strategies are vital to fight against burnout and depression (Sexton et al., 2009).

Starting from these considerations, the first study hypothesis (H1) is that Italian HCWs have high levels of psychological distress during the COVID-19 pandemic. The second study hypothesis (H2) is that the EW intervention is effective in reducing psychological distress in Italian HCWs. The third hypothesis (H3) is that the outcomes of the EW intervention vary in function of individual differences (age, gender, marital status, and baseline value).

MATERIALS AND METHODS

Study Design

This study is a randomized and controlled trial with two conditions [EW vs neutral writing (NW)] and two repeated measurements (before and after the writing intervention).

Participants

One hundred HCWs who worked in two hospitals settled respectively, in middle and south Italy were asked to participate to the study.

To be included in the study healthcare professional have to work 24 h a week continuously for at least 6 months in the same hospital and they have to work from the pandemic outbreak in the frontline with COVID-19 patients, specifically in COVID-19 Intensive Care Unit (ICU) or COVID-19 hospital ward. Professionals were excluded if they have been working in the same structure for shorter periods of time (less than 6 months), or were not directly working in COVID-19 wards.

Fifty-five out of them accepted to participate and were included in the study. Data were collected between April and June 2020. Participants were mainly females; the median age was 46.42 years old (SD = 9.9) and the majority were married or cohabiting in a stable way. Nurses comprised more than half of the sample, followed by physicians and allied HCWs. Majority had a degree (**Table 1**).

Procedure

Participants were randomly assigned to one of two writing conditions: EW (n = 30) or NW (n = 25). EW is a tool through which subjects describe their deepest thoughts and feelings about emotional events. NW is a comparison instrument, through which participants describe an event in a more objective way, without focusing on emotions, thoughts, or feelings (see **Figure 1** for instruction).

TABLE 1 | Demographics.

Total number	**55**	
Occupational status		
Nurse	30	54.54%
Physicians	15	27.27%
Allied HCWs	10	18.18%
Gender		
Male	14	25.45%
Female	41	74.54%
Marital status		
Married or cohabiting	42	76.36%
Single	13	23.64%
Age (years)		
Mean (SD)	46.42 (9.9)	
Min-max	28	61
Education		
Degree	31	56.36%
Post-graduate degree	24	43.64%

This study was carried out in keeping with the Ethics Code of Italian Psychologists and approved by the Ethics Committee of e Campus University. Informed written consent was obtained from participants. The data were handled in keeping with General Data Protection Regulation (GDPR), Regulation UE 2016/679. All participants received an envelope including the information about the aims of the study, consent forms, a socio-demographic questionnaire, and all the other study questionnaires (Time 1). They completed them individually at home and then they received another envelope with writing instructions. Three days after filling in those questionnaires, participants were asked to write at their home for three consecutive days for 20 min each time according to the two writing conditions and, after 1 week, they were asked to fill in again the study questionnaires (Time 2). Literature has shown contradictory results for the spacing of disclosure sessions. Smyth (1998) conducted a meta-analysis and showed larger effect sizes in studies with weekly disclosure sessions (7 days intervals between each writing session) than studies with daily sessions; number and length of writing sessions were unrelated to improvement. On the contrary, no significant differences between daily and weekly treatment groups were found in a study which manipulated the spacing of disclosure sessions (Frattaroli, unpublished). For what concerns the amount of time dedicated to writing sessions, it has been reported (Frattaroli, 2006) that writing for longer than 15 min is more effective. The present study followed the standard EW protocol, in which participants are usually asked to spend 15–30 min writing for three to five consecutive days (Pennebaker, 1997).

Measures

Demographic characteristics: Each participant was asked to indicate sex, age, marital/relationship status, level of education, years of practice, and role currently held.

The Beck Depression Inventory (BDI-II; Beck et al., 1996; Italian validation by Ghisi et al., 2006): The BDI-II was used to assess depressive symptoms. This measure includes 21 items, focused on cognitive, affective, motivational, and behavioral components of depression. For each item, this instrument uses a scale ranging from "0," corresponding to a negative response (e.g., 0 = "I do not feel sad"), to "3," positive response. Items are summed up to yield a total score. Each item was scored on a four-point scale, with a total score of 63. Based on the Italian validation, a cut-off score $\geq$12 identified the presence or the absence of depression. Scores were categorized as 13–19, mild depression; 20–28, moderate depression; and 29–63, severe depression. The Cronbach's α coefficient in normative or clinical samples has ranged from 0.80 to 0.87 (Beck et al., 1996). In this study, the α coefficient was respectively, 0.82 at Time 1, and 0.83 at Time 2.

Los Angeles Symptom Checklist (LASC; King et al., 1995). The *LASC* is a self-report instrument. It includes 43 items and measures overall global distress related to trauma exposure, overall PTSD symptomology severity, and PTSD symptoms on three subscales (re-experiencing, avoidance/numbing, and hyperarousal). The instrument was shown to possess high internal consistency with α coefficients ranging from 0.88 to 0.95 (King et al., 1995). In this research α coefficients were 0.92

Expressive writing instructions:
"*Over the next three days, we would like you to write about your most profound thoughts and feelings about the stressful experiences you have had in your job during this time of pandemic emergency. It is very important that you describe the most secret thoughts and feelings that you have not said and that you would not tell anyone. Write for 20 consecutive minutes, without removing the pen from the paper. Do not worry about the grammar, spelling or structure of the writing. We would like, in your text, for you to examine your moods and deeper thoughts about this experience. It is essential that you let yourself go and come into contact with your emotions and deeper thoughts. You can write about different experiences during each session, or about the same experience for all three days. If you wish you can also talk about how you felt, of what you have thought and felt about your present, past or future life. The only rule is that once you start writing, continue until the end of 20 minutes for 3 consecutive days*.".
Neutral writing instructions:
"*We would like you to write for the next 3 days for 20 minutes continuously, without removing the pen from the paper, about what happened to you and what you did in this time of pandemic emergency. In this writing we would like you to be as objective as possible. We are not interested in your emotions or opinions. We want you to be completely objective. Feel free to be as detailed as possible. In today's writing we would like to describe what you did yesterday since you got up, until you went to bed. Do not worry about spelling, grammar, or sentence structure. The most important thing in this writing is to describe your days as accurately and objectively as possible. All the writings will be completely confidential. The only rule is that once you start writing, continue until the end of 20 minutes for 3 consecutive days*".

FIGURE 1 | Expressive and neutral writing instructions.

(Time 1) and 0.93 (Time 2). That's there is not yet an Italian validation, LASC items were translated in Italian following back translation procedure.

Symptom Check List – 90 Revised (Derogatis, 1994; SCL-90: Italian version by Prunas et al., 2012). The SCL-90R is a 90 question self-report inventory that is made up of 90 items on disorders that may have been tried in the last week. Subjects give a rating from 0 (not at all) to 4 (very much) on a Likert scale. Items converge in 10 symptomatic subscales of different significance (somatization, obsessive-compulsive disorder, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, psychoticism, and sleep disturbances). For each scale, the relative score is calculated as the average of the answers. A global index is also calculated (GSI-Global Score Index) as the average of all answers. Cronbach's α coefficients higher than 0.70 were considered acceptable (Peterson, 1994). In this study, the α coefficient was 0.97 at Time 1 and at Time 2 both.

Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988; Italian validation by Prezza and Principato, 2002). The MSPSS is a self-report instrument; it includes 12 items that converge in three dimensions: family, friends, and significant others. Each item is rated on a seven-point Likert-type response format (1 = very strongly disagree; 7 = very strongly agree). A total score is calculated by summing up all the answers. The possible score range is between 12 and 84, the higher the score the higher the perceived social support. The possible score range for the subscales/dimensions is between 4 and 28. Any mean scale score ranging from 1 to 2.9 could be considered low support; a score of 3–5 could be considered moderate support; a score from 5.1 to 7 could be considered high support. Cronbach's α coefficients range from 0.85 to 0.91 (Zimet et al., 1988). In this research α coefficients were 0.95 (Time 1) and 0.86 (Time 2).

Resilience Scale for Adult (RSA; Friborg et al., 2003; Italian validation by Di Fabio and Busoni, 2008). The RSA is a 33-items self-report instrument for evaluating six protective dimensions of resilience in adults: (1) perception of the self, (2) planned future, (3) social competence, (4) family cohesion, (5) social resources, and (6) structured style. Item-response ranges from one to seven and scores vary between 33 and 231, with higher scores indicating higher levels of resilience. Previous research showed Cronbach's α from 0.67 to 0.81 and total score 0.88. In this study α coefficients were 0.87 at Time 1 and 0.89 at Time 2.

Statistical Analysis

Descriptive analysis was carried out computing baseline values for every variable, considering total score and subscales to include a wide range of distress dimensions.

Specifically, we analyzed ptsd (reexperiencing, avoidance, and hyperarousal), depression and global psychopathology's symptoms (Global Severity Index) (somatization, obsessive-compulsive disorder, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, psychoticism, and sleep disturbances), perceived social support (significant other, family, and friend), and resilience.

Differently, since the small size of the sample, to improve the power of the statistics, we considered for hypothesis 2 and 3 only the total scores of each investigated variable (ptsd symptoms,

depression symptoms, Global Severity Index, perceived social support, and resilience).

Repeated-measure ANOVAs were employed to test the effects of the EW intervention in comparison to NW on the study outcomes. All ANOVA models included a within-subject factor (pre scores and post scores), a between-subjects factor (EW vs NW) and their interaction, which was probed by means of plots in case of statistical significance. All ANOVA models also included the baseline value as a covariate variable, to control the effects of any significant differences in scores between EW and NW groups in pre-writing time.

Finally, delta values (Δ) were computed for the total scores as differences between pre-scores and post-scores, and were then regressed in EW group on age, gender (male-female), marital status (unmarried vs married or cohabiting), and baseline values in hierarchical multiple regression models. The SPSS 21 software was used.

RESULTS

Psychological Conditions of Italian HCWs During the COVID-19 Pandemic

Baseline descriptive statistics (**Table 2**) show a high level of PTSD according to the LASC cut-off for the PTSD Severity Index (see King et al., 1995, p. 14) as well as high symptoms of hyperarousal, avoidance, and reexperiencing. A high level of psychopathology was also observed on the SCL 90R Global Severity Index, which resulted to be higher than the suggested cut-off (T-value $\geq$ 63; Derogatis, 1994). In particular, high scores were found in the somatization, depression, obsessive-compulsive disorder, anxiety, sleep disturbances, and interpersonal sensitivity scales, while lower scores were found in the phobic anxiety, paranoid ideation psychoticism and hostility scales. With respect to depression symptoms assessed through the BDI II (**Table 3**), 45.45% of participants were in the minimal range, 32.73% in the mild depression range, 10.91% in the moderate depression range and 10.91% in the severe depression range. Participants perceived a moderate level of total social support according to Zimet et al. (1988). In sub-scales, high levels of perceived support from significant others and from family were observed, while a moderate level of perceived support from friends was found. Finally, they showed moderate level of resilience, according to Di Fabio and Busoni (2008).

The EW Effects

Statistically significant interaction effects were found for ptsd symptoms, depression symptoms, and Global Severity Index. No effects for social support and resilience were found (see **Figure 2** and **Table 4**).

Plots showed that: (1) ptsd symptoms reduced significatively only in EW group (ptsd $\times$ writing condition F = 13.725, p = 0.002) (2) depression symptoms reduced in EW group while it increased in NW group (depression $\times$ writing condition: F = 6.123, p = 0.02); (3) the SCL-90R Global Severity Index reduced in EW group, while it increased in the NW group (GSI $\times$ writing condition: F = 5.232; p = 0.03).

TABLE 2 | Baseline descriptive statistics of psychological variables in the whole samples.

Variable	*N*	Mean	Standard deviation	Minimum	Maximum
Reexperiencing	55	4.04	2.08	1	7
Avoidance	55	5.4	2.22	3	10
Hyperarousal	55	11.53	5.34	5	23
Ptsd	55	20.96	7.97	10	36
Depression (BDI-II)	55	16.36	9.78	5	45
Somatization	55	15.84	9.78	1	37
Obsessive-compulsive disorder	55	10.33	8.11	1	28
Interpersonal sensitivity	55	4	2.61	0	9
Depression (SCL90R)	55	14.84	10.23	4	35
Anxiety	55	9.67	9.91	2	31
Hostility	55	2.33	1.93	0	7
Phobic anxiety	55	3.56	5.88	0	17
Paranoid ideation	55	3.47	2.38	0	10
Psychoticism	55	3.18	2.69	0	12
Sleep disturbances	55	5.58	4.49	0	12
GSI	55	75.13	51.42	19	172
Significant others	55	5.14	1.14	1	6
Family	55	5.09	0.90	1	6
Friend	55	3.98	0.93	1	6
Support	55	4.74	0.89	1	6
Resilience	55	116.29	10.53	95	144

TABLE 3 | Depression scores distribution.

Depression level	*N*	Frequency percent
Minimal range	25	45.45
Mild depression	18	32.73
Moderate depression	6	10.91
Severe depression	6	10.91

Predictors of Changes

Multiple regression analyses were then performed in the EW group with Δ values of ptsd symptoms, depression symptoms, Global Index Severity, perceived social support, and resilience entered as dependent variables and age, gender, marital status, and baseline values as predictors. Results (**Table 5**) show that change in ptsd symptoms is predicted firstly by marital status and then by baseline value. In particular, married participants and the ones who presented higher levels of ptsd symptoms before writing sessions showed a higher improvement in post-traumatic reaction after EW.

Depression symptoms were predicted by marital status and age. Young and married participants' depression levels improved more after the writing intervention.

Age, gender, and baseline value predicted change in global psychopathology, with young, men and those who showed higher GSI score at baseline had higher improvements after EW.

Social support is predicted by gender, marital status, and baseline value: women, single and the ones who presented lower levels of perceived social support before writing sessions showed a higher improvement. In the same direction, resilience

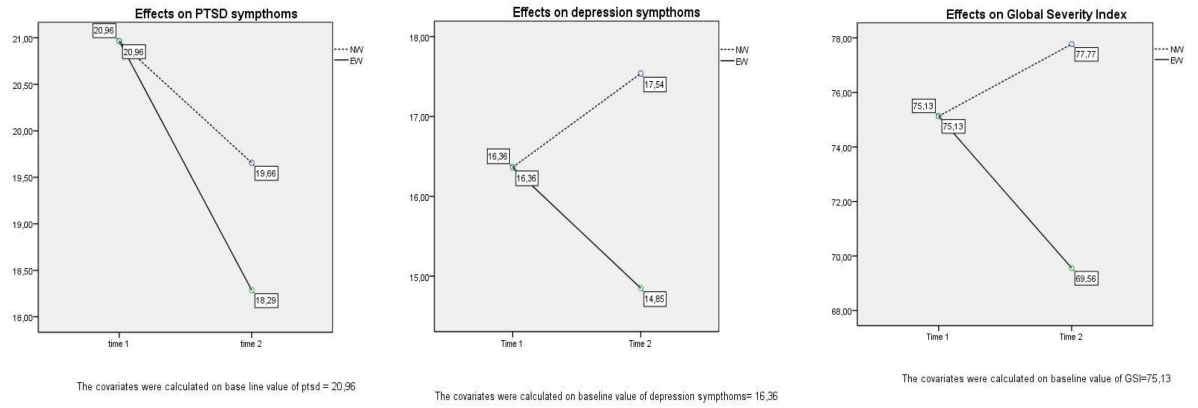

FIGURE 2 | Graphs of repeated-measure ANOVAs.

TABLE 4 | Repeated-measure ANOVAs.

	Sum of square	df	Mean square	*F*	*p*
ptsd	1.553	1	1.553	0.282	0.598
Ptsd × ptsd effect	6.779	1	6.779	1.231	0.272
Ptsd × writing condition	12.777	1	12.777	13.725	0.002
Depression	3.106	1	3.106	0.412	0.521
Depression × depression effect	5.842	1	5.842	0.775	0.383
Depression × writing condition	38.679	1	38.679	6.123	0.028
GSI	93.066	1	93.066	0.928	0.34
GSI × GSI effect	235.021	1	235.021	2.343	0.132
GSI × writing condition	335.135	1	335.135	5.232	0.03
Social support	72.948	1	72.948	3.425	0.56
Social support × social support effect	25.615	1	25.615	2.074	0.592
Social support × writing condition	2.33	1	2.33	0.116	0.735
Resilience	0.928	1	0.928	0.116	0.735
Resilience × resilience effect	2.716	1	2.716	0.338	0.563
Resilience × writing condition	0.965	1	0.965	0.12	0.73

is predicted by marital status with higher improvement in not married participants.

DISCUSSION

The aims of the study were to evaluate the psychological adjustment of Italian HCWs during the COVID-19 pandemic and to investigate the efficacy of an EW intervention to improve their mental well-being. The effects variability in function of individual differences was also investigated.

As regards the first aim, our findings mirror the trend in previous studies on the psychological impact of the COVID-19 affection among the general population in China during its initial stages (Kang et al., 2020; Li et al., 2020; Wang et al., 2020). Specifically, high level of global distress, with severe symptom of somatization, anxiety, obsessive compulsive disorder, sleep disturbances, and specific post-traumatic reactions (reexperiencing, avoidance, and hyperarousal) were found in our sample. Results confirm data from previous pandemics that underlined how HCWs might experience acute stress reactions, particularly after quarantine, developing symptoms of post-traumatic stress disorder, depression, and anxiety (Gold, 2020; Kinman et al., 2020; Pappa et al., 2020). Previous researches had found that psychosomatic symptoms (such as somatization) could accompany specific physical manifestations of various diseases, due to the psychological sequelae of the pandemic outbreaks (Chew et al., 2020; Xiang et al., 2020).

It is widely recognized that HCWs are need of psychological support interventions to help them to mitigate the effects of the COVID-19 pandemic on their well-being in short and long time. In particular, they are in need of recognizing and elaborating emotional stress and pain in order to avoid that unelaborated pain can become chronic and cumulative, with important personal and professional implications (Kinman et al., 2020).

For what is concerned to the second study hypothesis, our data confirm the efficacy of EW, in promoting the reflection upon stressful events and the elaboration of negative feelings that may over the time overwhelm the person's ability to cope with emotional distress, according to previous research (Tonarelli et al., 2017). A significant reduction in several symptoms were found in EW group, while NW group did not show improvement or even presented increased scores in clinical dimensions, maybe due to the continuation of the stress associated with the emergency.

In particular, the study results support the hypothesis that focusing on emotions, feelings, and deeper thoughts allow HCWs to reduce various distress symptoms, such as ptsd symptoms. It impacts positively also on depression symptoms and global psychopathology according to the previous researches

TABLE 5 | Multiple regression analyses in EW group (Δ values as "dependent variables"; age, gender, marital status, and baseline value as "predictors").

Criterion	Predictors	β	*T*	Significant	*R*-square
Δ ptsd symptoms	Age	−0.124	−0.717	0.48	0.261
	Gender	−0.3	−1.69	0.103	
	Marital status	0.444	2.531	0.018	
	ptsd t1	0.163	1.938	0.047	
Δ depression symptoms	Age	−0.355	−2.179	0.039	0.375
	Gender	−0.322	−1.938	0.064	
	Marital status	0.439	2.66	0.013	
	Depression t1	0.068	0.417	0.681	
Δ GSI	Age	−0.432	−2.65	0.014	0.355
	Gender	−0.374	−2.205	0.037	
	Marital status	0.257	1.566	0.013	
	GSI t1	−0.363	−2.17	0.04	
Δ social support	Age	−0.069	−0.994	0.33	0.884
	Gender	0.148	2.113	0.045	
	Marital status	−0.215	−2.637	0.014	
	Social support t1	−1.024	−12.712	0.0001	
Δ resilience	Age	0.242	1.455	0.158	0.316
	Gender	0.015	0.086	0.932	
	Marital status	−0.515	−3.015	0.006	
	Resilience t1	0.216	1.22	0.234	

(Greenberg et al., 1996; Schoutrop et al., 1997, 2002; Sloan and Marx, 2004a,b).

As regard the third hypothesis, regression analysis showed the moderating role of individual differences in EW benefits. Previous researchers have, in fact, explored different individual variables to identify subgroups for whom EW is more beneficial (Lu and Stanton, 2010). In this study, baseline value of ptsd symptoms predicts the change in post intervention scores: participants who reported more severe symptoms before the writing showed higher benefits, according to previous research (Di Blasio et al., 2015). It should be noted that since the HCWs in this study were part of a normative group, the ptsd, depression, and global psychopathology's symptoms do not have clinical significance but indicate sub-clinical symptoms. Because some research (Brugha et al., 2011; Furukawa et al., 2012) noted that without intervention sub-clinical symptoms tend to increase, the results suggested that the EW intervention in the normative group could be useful to buffer the negative development of psychological distress.

Gender effects were also found in this study, with men showing higher benefits in global psychopathology symptoms and women presenting higher level of perceived social support after EW.

Previous research has underlined gender differences in EW efficacy, but the results are still inconsistent. Some authors stated that men showed higher benefits, but other studies found no difference in outcomes between men and women, and among the studies that did, there is nearly an equal number supporting the argument that the benefits are stronger for women (Stickney, 2010). For example, Smyth et al.'s (1999) meta-analysis suggested that studies with a higher percentage of men had larger effect sizes (i.e., better outcomes) than studies with more women, but Frattaroli's (2006) found no such effect.

Our findings suggested that EW's efficacy in reducing psychopathological symptoms is higher in men. According to Range and Jenkins (2010), we suppose that men tend more to inhibit emotional expression and, when they are "forced" to focus on emotions and feelings, they benefit more than women, who are more used to expressing and verbalizing emotions. On the contrary women showed increased scores in perceived social support after writing and we presume that it's because when women are asked to communicate about negative emotion and thoughts, they perceived the task as and index of closeness and support.

Finally, marital status and age resulted to predict changes in outcome variables, with younger and married participants showing higher benefits, except for social support and resilience that increased more in single people. Authors of previous studies suggested that staff who were younger (Nickell et al., 2004; Sim et al., 2004; Tam et al., 2004; Wu et al., 2009; Austria-Corrales et al., 2011), or parents of dependent children (Maunder et al., 2004; Koh et al., 2005) are more vulnerable to psychological distress, probably because they are afraid of bringing the virus to their home and, in addition, they do not want their families to worry about them (Chen et al., 2020). HCWs may also feel the inner conflict between their desire to care for patients and, at the same time, their need to protect themselves and their loved ones from the life-threatening infection (Kisely et al., 2020).

On the contrary, higher improvements in perceived social support and in resilience in not married participant were found. We presume that single participants could have less opportunity to communicate their inner feeling during the crisis, so they could benefit more from the procedure because they live the research

like an opportunity to report and reflect on their feelings and negative emotion.

CONCLUSION

In conclusion, although psychological distress in HCWs is common in situations where they are under pressure to care many potentially infectious patients, EW can help to mitigate it. This kind of intervention could maximize the internal resources of HCWs by effectively improving their quality of life and, consequently, also patient outcomes. The development of a coherent narrative could help them to reorganize and elaborate the traumatic memories, allowing the structuration of more adaptive internal schemas.

The strength of the EW is the rapidity with which it allows the remission of symptoms and the expression of feelings. However, the impact of individual differences highlights the need to accompany this tool with long-term intervention, which could also benefit those who need a deeper elaboration of negative emotion.

The results are interesting but there is some limitation. The most important study limitation is the small sample size, which limited the statistical power of tests and restricts the generalization of results. For that we analyzed in hypothesis 2 and 3 only total score of global dimensions (ptsd symptoms, depression symptoms, GSI, social support, and resilience) but it could be interesting to consider all the sub-symptoms to deeply understand the effect of distress.

In addition, lack a follow-up testing after a longer period (6–12 months) that could allow to better understand if the changes in psychological adjustment are consistent and stable during the time.

Finally, to better understand the process of elaboration allowed by the writing intervention, the quantitative analysis could be successfully accompanied by a qualitative analysis of the writing to identify the emotional changes, the narrative markers of the inner process of meaning making, to detect the coping strategies and the changes of thematic content across 3 days (Tonarelli et al., 2017).

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the E Campus University Ethic Committee. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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Burnout and Its Relationship With Depressive Symptoms in Medical Staff During the COVID-19 Epidemic in China

Lijuan Huo[1†], Yongjie Zhou[2†], Shen Li[3], Yuping Ning[1,4], Lingyun Zeng[2], Zhengkui Liu[5], Wei Qian[5], Jiezhi Yang[6], Xin Zhou[7], Tiebang Liu[2] and Xiang Yang Zhang[5*]*

[1] Department of Psychiatry, Affiliated Brain Hospital of Guangzhou Medical University (Guangzhou Huiai Hospital), Guangzhou, China, [2] Department of Psychiatric Rehabilitation, Shenzhen Kangning Hospital, Shenzhen, Guangdong, China, [3] Department of Psychiatry, College of Basic Medical Sciences, Tianjin Medical University, Tianjin, China, [4] The First School of Clinical Medicine, Southern Medical University, Guangzhou, China, [5] CAS Key Laboratory of Mental Health, Institute of Psychology, Chinese Academy of Sciences, Beijing, China, [6] Shenzhen Health Development Research Center, Shenzhen, China, [7] Research Center for Psychological and Health Sciences, China University of Geosciences, Wuhan, China

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***Correspondence:**
Tiebang Liu
liutb530@163.com
Xiang Yang Zhang
zhangxy@psych.ac.cn

[†] These authors have contributed equally to this work

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Objective: The large-scale epidemic of Coronavirus Disease 2019 (COVID-19) has triggered unprecedented physical and psychological stress on health professionals. This study aimed to investigate the prevalence and risk factors of burnout syndrome, and the relationship between burnout and depressive symptoms among frontline medical staff during the COVID-19 epidemic in China.

Methods: A total of 606 frontline medical staff were recruited from 133 cities in China using a cross-sectional survey. The Maslach Burnout Inventory (MBI) was used to assess the level of burnout. Depressive symptoms were assessed by the Patient Health Questionnaire Depression (PHQ-9).

Results: During the COVID-19 pandemic, 36.5% of the medical staff experienced burnout. Personal and work-related factors were independently associated with burnout, including age (OR = 0.68, 95% CI: 0.52–0.89, $p = 0.004$), family income (OR = 0.72, 95% CI: 0.53–0.99, $p = 0.045$), having physical diseases (OR = 2.16, 95% CI: 1.42–3.28, $p < 0.001$), daily working hours (OR = 1.35, 95% CI: 1.03–1.77, $p = 0.033$), and profession of nurse (OR = 2.14, 95% CI: 1.12–4.10, $p = 0.022$). The correlation coefficients between the scores of each burnout subscale and the scores of depressive symptoms were 0.57 for emotional exhaustion, 0.37 for cynicism, and −0.41 for professional efficacy (all $p < 0.001$).

Conclusions: Our findings suggest that the prevalence rate of burnout is extremely high among medical staff during the COVID-19 pandemic, which is associated with other psychological disorders, such as depression. Psychological intervention for medical staff is urgently needed. Young and less experienced medical staff, especially nurses, should receive more attention when providing psychological assistance.

Keywords: prevalence, medical staff, COVID-19, depression, burnout

INTRODUCTION

The outbreak of coronavirus disease 2019 (COVID-19) first appeared in Wuhan, China in December 2019, and has since swept the world at an incredible speed. As of December 2020, there have been more than 70 million confirmed cases and more than 1.7 million deaths[1]. Due to high contagion and possible asymptomatic transmission, as well as a lack of knowledge of the virus, the demand and pressure on frontline medical staff have increased dramatically, especially in the early stages of the pandemic (Hu B. et al., 2020; Li et al., 2020). This condition has seriously aggravated the mental fatigue of healthcare professionals.

According to the latest World Health Organization's International Disease Classification (ICD-11), burnout is officially classified as an occupational health syndrome, which is characterized by emotional and mental exhaustion due to long-term workplace stress and negative job perception. The most recognized definition of burnout is the three-dimensional psychological syndrome proposed by Maslach and Jackson (1981) that includes emotional exhaustion, cynicism, and reduced professional efficacy. Medical staff are susceptible to job burnout, which has attracted more and more attention recently (Dzau et al., 2018). Meta-analyses have shown that the pooled prevalence of burnout among medical staff is estimated to be about or more than 30% (Dimou et al., 2016; Gómez-Urquiza et al., 2017; O'Connor et al., 2018; Rezaei et al., 2018), a rate of more than twice compared with professionals in other fields (Dzau et al., 2018). Because of the nature of their work, medical staff often face a lot of pressure and negative emotions, such as heavy workload, poor doctor-patient relationship (especially in mainland China), and accumulated frustration in the face of death (He and Qian, 2016; Alharbi et al., 2019). Job burnout reduces working efficiency and increases medical errors (Patel et al., 2018; Tawfik et al., 2019). To make matters worse, burnout may lead to other severe mental disorders, including alcohol abuse/dependence, depression, and an increased risk of suicide (Dyrbye et al., 2008; Johnson et al., 2018).

The unprecedented outbreak of COVID-19 has further damaged the mental health of health care workers. During this pandemic, many social and environmental factors lead to burnout of medical staff, such as isolation, expanded workloads, life-threatening workplaces, concern about infecting relatives or colleagues, and some personal factors (Lai et al., 2020). A number of insightful commentaries have been published to appeal to the mental burden of medical staff, and to propose guidelines and expert consensus on mental health services (Greenberg et al., 2020; Liu et al., 2020; Raudenská et al., 2020). Many surveys have also reported that health care workers exposed to COVID-19 suffered from serious psychological disturbances, the most common of which were depression, anxiety, insomnia, and fear (Lai et al., 2020; Que et al., 2020; Tan et al., 2020a; Zhang W. R. et al., 2020). However, so far, few quantitative studies have investigated the symptoms of job burnout among medical staff (Hu D. et al., 2020; Matsuo et al., 2020; Tan et al., 2020b; Zhang Y. et al., 2020). These studies evaluated burnout symptoms, and focused on frontline nurses instead of estimating prevalence (Hu D. et al., 2020; Zhang Y. et al., 2020), or collecting information in one single institution (Matsuo et al., 2020; Zhang Y. et al., 2020). Tan et al. (2020b) started the survey half a year after the outbreak of the pandemic in China and 4 months after the outbreak in Singapore. At that time, the pressure of medical staff was different (Tan et al., 2020b). Further, they did not separately analyze the three recognized dimensions of burnout due to the use of other tools.

The purposes of this study were: (1) to explore the prevalence of burnout in the frontline medical staff in China during the early stage of COVID-19 epidemic; (2) to identify the individual and job-related determinants of burnout in this population, and (3) to determine the relationship between burnout and depressive symptoms.

MATERIALS AND METHODS

Study Design and Participants

This was a cross-sectional survey designed to assess the job burnout and other mental conditions of frontline medical workers in China during the COVID-19 epidemic. In order to avoid face-to-face interaction, an online questionnaire was constructed and distributed via WeChat, one of the most important social tools in mainland China. Data were collected from February 14 to March 29, 2020. A total of 606 frontline medical workers were recruited from 133 cities across the country. Doctors, nurses, or medical technicians in hospitals, aged 18 years or above were included in this study.

The study was approved by the Institute of Psychology, Chinese Academy of Sciences. Each participant signed an electronic informed consent form before the survey. The information of all respondents was confidential.

Assessments for Burnout and Depressive Symptoms

Demographic and work-related information was collected, including residence, age, sex, height, weight, ethnicity, marital status, education, annual family income, occupation, department, length of service, and daily working hours. At the same time whether relatives or friends were infected, financial loss, and whether they had experienced SARS outbreaks were also collected.

The Chinese version of the Maslach Burnout Inventory-General Survey (MBI-GS)(Maslach and Jackson, 1981; Schutte et al., 2000) was used to assess job burnout, which has been widely used among healthcare workers in China, and has satisfactory reliability and validity (Wu et al., 2007). The MBI-GS consists of 15 items, measuring three dimensions of occupational burnout: emotional exhaustion (EE), which means being emotionally depleted at work; cynicism (CY), which means negative or cynical attitudes toward work; professional efficacy (PE), which means a positive sense of success/achievement at work. Each item is scored using a 7-point frequency range scale (0 = never to 6 = daily). The total score of each subscale is stratified into high,

[1]https://www.who.int/emergencies/diseases/novel-coronavirus-2019

moderate, or low tertiles. Based on the previous large sample studies on Chinese healthcare workers (Wu et al., 2014), the cutoffs for each tertile of burnout were determined as follows: low EE < 9, moderate EE 9–13, high EE > 13; low CY < 3, moderate CY 3–9, high CY > 9; low PE > 30, moderate PE 30–18, high PE < 18. A score in the highest tertiles of EE, in combination with the highest tertiles of CY or the lowest tertiles of PE indicates burnout syndrome, according to the "exhaustion + 1" criterion (Brenninkmeijer and VanYperen, 2003). Since the definition of burnout varies considerably in the literature, the prevalence of burnout was also calculated using an alternative formula, a more restrictive definition, that is, a combination of a high EE and high CY and low PE subscale score (Lin et al., 2019). Patient Health Questionnaire-9 (PHQ-9) was applied to assess depressive symptoms (Kroenke et al., 2001). PHQ-9 consists of 9 items, each with a score from 0 to 3. People with a total score of 4 or more are identified to have depressive symptoms.

Statistical Analysis

The chi-square test and analysis of variance (ANOVA) were used to compare the demographic and work-related variables of participants between the burnout group and the non-burnout group. The binary logistic regression model was used to find out factors independently related to burnout experience. Then, in order to further identify the independent factors associated with MBI-GS scores, stepwise multivariate linear regression models were used, with the MBI-GS subscores as dependent variables, and other variables with potential correlation ($p < 0.1$) with MBI-GS scores as independent factors. Associations between MBI-GS subscale scores and PHQ-9 scores were examined using Pearson correlation analysis and then linear regression model. Bonferroni corrections were applied to adjust multiple tests. A two-tailed test at $p < 0.05$ was set to be statistically significant. All statistical analyses were conducted using SPSS (version 24.0).

RESULTS

Demographic Characteristics

Among all the participants, 492 (81.2%) were female and 114 (18.8%) were male. The age of participants ranged from 22 to 65 years old, with an average age of 35.77 ± 8.13 years. The average BMI was 23.34 ± 5.61 Kg/m^2. More detailed information about the demographic and job-related characteristics of participants is shown in **Table 1**.

Prevalence of Burnout in Medical Staffs

Burnout was defined as a high EE combing with a high CY or low PE subscale scores. During the epidemic of COVID-19, 36.5% of medical staff met the criteria for burnout in our sample. The prevalence of burnout in female workers was significantly higher than that in male workers, whether it was the inclusive criteria (38.8% vs. 26.3%, $\chi^2 = 6.25$, $p = 0.012$) or the restrictive one (30.5% vs. 16.7%, $\chi^2 = 8.79$, $p = 0.003$). For each component of burnout, the prevalence of EE, CY, and PE was 40.9, 63.7, and 46%, respectively. In addition, under the strictest definition, combining the highest level of EE and CY and the lowest level of PE, the overall prevalence of burnout was 27.8%.

Chi-squared tests also revealed that there were significant differences between burnout and non-burnout groups in terms of age, annual family income, physical disease, occupation, and service time (all $p < 0.05$). The burnout rates of each type of variables were shown in **Table 1**. Specifically, medical staff with younger age, female gender, lower family income, more severe physical disease, shorter service, and nursing profession had more severe syndrome of burnout. Individuals having relatives or friends infected with COVID-19 were at a marginally higher risk experiencing burnout ($p = 0.058$). There was no significant difference in BMI, education, marital status, ethnicity, experienced SARS or not, and daily working hours (all $p > 0.05$) between the burnout and non-burnout groups.

Further, the binary logistic regression model revealed that the following variables were independently associated with burnout, including age (OR = 0.68, 95% CI: 0.52–0.89, $p = 0.004$), family income (OR = 0.72, 95% CI: 0.53–0.99, $p = 0.045$), having physical disease (OR = 2.16, 95% CI: 1.42–3.28, $p < 0.001$), daily working hours (OR = 1.35, 95% CI: 1.03–1.77, $p = 0.033$), and profession of nurse (OR = 2.14, 95% CI: 1.12–4.10, $p = 0.022$).

Factors Associated With Burnout and Its Three Components in Medical Staffs

The average burnout score was 11.94 ± 6.47 on EE subscale, 10.27 ± 4.74 on CY subscale, and 19.25 ± 6.72 on PE subscale. MBI-GS subscale scores after grouping according to demographics and work-related variables were present in **Table 2**. Then multiple linear regressions were performed to identify independent related factors to each MBI-GS subscore. EE was independently correlated with age (β = −0.13, $t = -2.87$, $p = 0.004$), physical diseases (β = 0.12, $t = 3.0$, $p = 0.003$), professional role of nurses (β = 0.09, $t = 2.16$, $p = 0.031$), and daily working hours (β = 0.14, $t = 3.57$, $p < 0.001$). CY was independently correlated with professional role of nurses (β = 0.21, $t = 4.90$, $p < 0.001$), age (β = −0.11, $t = -2.45$, $p = 0.015$), and family income (β = −0.10, $t = -2.40$, $p = 0.017$). PE was independently correlated with age (β = 0.13, $t = 3.06$, $p = 0.002$) and professional role of nurses (β = −0.30, $t = -7.18$, $p < 0.001$). Taken together, younger age and nursing profession were independently correlated with all dimensions of burnout.

The Association Between Burnout and Depressive Symptoms in Medical Staffs

The mean score of PHQ-9 was 6.46 ± 5.57. With the cut-off score of 4, the overall prevalence of depressive symptoms in medical staff was 57.6%. The correlation coefficients between the score of each MBI-GS subscale and the score of PHQ-9 were 0.57 for EE, 0.37 for CY, and −0.41 for PE (all $p < 0.001$, **Figure 1**). These associations remained significant after Bonferroni corrections. Stepwise multiple regression model showed that scores of EE (β = 0.51, $t = 12.12$) and PE (β = 0.51, $t = 12.12$) were independently associated with PHQ-9 score. These two components of burnout together accounted for 32.8% of the variance (adjusted R^2) in PHQ-9 ($F = 148.75$, $p < 0.001$).

DISCUSSION

Although there has been a large number of studies on mental health problems caused by the COVID-19 pandemic, only a few have investigated burnout syndrome, which was particularly prevalent in medical staff even before this pandemic. To our knowledge, this is the first nationwide cross-sectional survey on job burnout of medical staff during the COVID-19 pandemic, with a total of 606 participants. The main findings of this study were: (1) up to 36.5% of the respondents met the criteria of burnout; (2) personal factors (i.e., age, sex, physical diseases, and family income) and job-related factors (daily working hours, length of service, and nursing profession) were associated with burnout; (3) the burnout levels were associated with the severity of depressive symptoms.

Our results showed an extremely high prevalence (36.5%) of burnout, which made medical workers psychologically vulnerable in this pandemic. Consistently, previous studies have revealed

TABLE 1 | Demographic data of participants with and without burnout.

Variable	Total (*n* = 606)	Non-burnout (*n* = 385)	Burnout (*n* = 221)	*p*-value
Age				<0.001
<30	177 (29.2%)	102 (57.6%)	75 (42.4%)	
30–40	261 (43.1%)	155 (59.4%)	106 (40.6%)	
>40	168 (27.7%)	128 (76.2%)	40 (23.8%)	
Sex				0.012
Male/Female (male%)	114/492 (18.8%)	84/301 (21.8%)	30/191 (13.6%)	
BMI				0.682
<18.5	43 (7.1%)	29 (67.4%)	14 (32.6%)	
18.5–24	379 (62.5%)	243 (64.1%)	136 (35.9%)	
>24	183 (30.2%)	112 (61.2%)	71 (38.8%)	
Education				0.488
High school degree or lower, n (%)	14 (2.3%)	7 (50%)	7 (50%)	
College degree, n (%)	446 (73.6%)	282 (63.2%)	164 (36.8%)	
Master or Doctoral degree, n (%)	146 (24.1%)	96 (65.8%)	50 (34.2%)	
Marital status				0.455
Single, n (%)	123 (20.6%)	73 (59.3%)	50 (40.7%)	
Married, n (%)	456 (74.9%)	293 (64.3%)	163 (35.7%)	
Widowed or divorced	27 (4.5%)	19 (70.4%)	8 (29.6%)	
Ethnicity				0.493
Han/Non-han population (Han%)	556/50 (91.7%)	351/34 (91.2%)	205/16 (92.8%)	
Family income				0.018
Low	106 (17.5%)	56 (52.8%)	50 (47.2%)	
Medium	402 (66.3%)	259 (64.4%)	143 (35.6%)	
High	98 (16.2%)	70 (71.4%)	28 (28.6%)	
Physical diseases				0.003
Yes/No (Yes%)	133/473 (21.9%)	70/315 (18.2%)	63/158 (28.5%)	
Infected relatives or friends				0.058
Yes/No (Yes%)	13/593 (2.1%)	5/380 (1.3%)	8/213 (3.6%)	
Experienced SARS				0.199
Yes/No (Yes%)	262/344 (43.2%)	174/211 (45.2%)	88/133 (39.8%)	
Profession				0.001
Doctor	208 (34.3%)	143 (68.8%)	65 (31.3%)	
Nurse	334 (55.1%)	192 (57.5%)	142 (42.5%)	
Medical technician	64 (10.6%)	50 (78.1%)	14 (21.9%)	
Length of service				0.036
<6 years	110 (18.2%)	69 (62.7%)	41 (37.3%)	
6–10 years	163 (26.9%)	92 (56.4%)	71 (43.6%)	
11–20 years	194 (32%)	123 (63.4%)	71 (36.6%)	
>20 years	139 (22.9%)	101 (72.7%)	38 (27.3%)	
Daily working hours				0.190
4–8	284 (46.9%)	190 (66.9%)	94 (33.1%)	
8–10	268 (44.2%)	165 (61.6%)	103 (38.4%)	
> 10	54 (8.9%)	30 (55.6%)	24 (44.4%)	

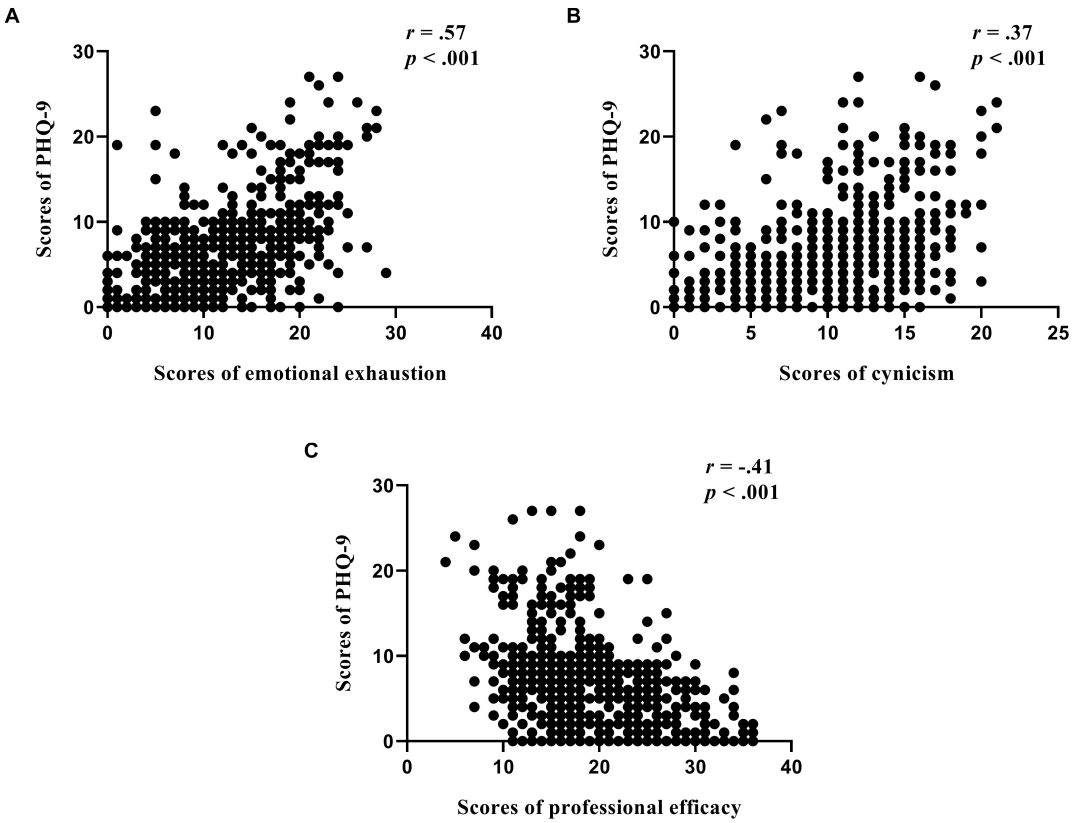

FIGURE 1 | Three dimensions of burnout **(A)** emotional exhaustion, **(B)** cynicism, and **(C)** professional efficacy were associated with depressive symptoms (PHQ-9) in medical staff.

that medical workers are particularly prone to burnout. The prevalence of burnout in healthcare professions varies from 12.6 to 76.9% in different studies (Abdulla et al., 2014; Adriaenssens et al., 2015; Elmore et al., 2016; Wen et al., 2016; Gómez-Urquiza et al., 2017). The huge differences across studies not only result from regional disparities but also result from different approaches to define burnout (Rotenstein et al., 2018). It is still in dispute whether the concept of burnout should be regarded as a unidimensional or multidimensional construct. Some research defined burnout as a multidimensional construct, so individuals were considered burnout when meeting the criterion of one of the three MBI dimensions (Elmore et al., 2016; Gómez-Urquiza et al., 2017). While other studies combine different dimensions into a unidimensional burnout, which also develop many formulas (Adriaenssens et al., 2015; Wen et al., 2016). To solve this problem, Brenninkmeijer and VanYperen (2003) tested different approaches and concluded that "exhaustion + 1" is the most recommended approach. This means that individuals are determined as burned out when having high levels of exhaustion and either high levels of cynicism or low levels of professional efficacy. This approach is in line with the idea that exhaustion is the core symptom of burnout, also the only dimension present in all different definitions and assessment tools for burnout. Therefore, exhaustion is a necessary symptom to set the "diagnosis" of burnout.

Due to the substantially various definitions and the impossibility to compare burnout prevalences across studies, we also directly compared the burnout scores between our results and studies using the same tool. Compared with the specific burnout scores of medical staff in different studies in China, this study found that the scores of medical staff on the EE and CY subscale were extremely higher, while the score on the PE subscale was lower (Wu et al., 2008, 2011, 2013, 2014; He et al., 2019). Taken together, it is speculated that there is a significant negative correlation between the long-term COVID-19 pandemic and the burnout experience of medical staff, although the criteria for the diagnosis of burnout are different.

Among the related factors of job burnout, job-related factors are the most concerned and discussed in detail under the burden of the COVID-19 pandemic. First of all, the occupation was closely related to job burnout. Compared with doctors and medical technicians, nurses are most likely to experience job burnout, which is consistent with many previous studies (Alacacioglu et al., 2009; Wu et al., 2011; Chou et al., 2014; Schooley et al., 2016) and the latest surveys conducted during the COVID-19 pandemic (Hu D. et al., 2020; Matsuo et al., 2020; Zhang Y. et al., 2020). Nursing job burnout has become a global phenomenon. In hospitals in the United States, there is a shortage of nursing staff, resulting in a high patient-to-nurse ratio, persistent emotional exhaustion, and job dissatisfaction

TABLE 2 | MBI-GS subscale scores in grouped demographics and work-related variables.

Variables	EE	CY	PE
Age, years			
<30	12.69 ± 6.70	11.11 ± 4.53	17.77 ± 6.15
30–40	12.41 ± 6.45	10.85 ± 4.44	18.32 ± 6.24
>40	10.43 ± 6.05	8.47 ± 4.96	22.23 ± 7.10
F	6.54**	17.73**	25.18**
Sex			
Male	10.79 ± 5.92	8.84 ± 4.70	21.54 ± 6.8
Female	12.21 ± 6.57	10.60 ± 4.70	18.72 ± 6.59
F	4.49*	12.89**	16.73**
BMI			
<18.5	11.16 ± 6.03	11.16 ± 4.35	18.05 ± 6.53
18.5–24	11.90 ± 6.5	10.47 ± 4.62	18.99 ± 6.64
>24	12.24 ± 6.54	9.61 ± 5.03	20.05 ± 6.88
F	0.51	2.87	2.26
Education			
High school degree or lower	12.71 ± 7.69	11.71 ± 1.90	17.93 ± 3.56
College degree	11.93 ± 6.58	10.71 ± 4.69	18.57 ± 6.60
Master or Doctoral degree	11.91 ± 6.06	8.77 ± 4.79	21.45 ± 6.86
F	0.10	10.11**	10.70**
Marital status			
Single	12.55 ± 6.60	10.71 ± 4.84	18.31 ± 6.74
Married	11.78 ± 6.49	10.16 ± 4.71	19.43 ± 6.69
Widowed or divorced	11.85 ± 5.70	9.96 ± 4.94	20.44 ± 6.90
F	0.67	0.69	1.80
Ethnicity			
Han population	11.93 ± 6.42	10.36 ± 4.71	19.11 ± 6.73
Non-han population	12.10 ± 7.11	9.18 ± 5.08	20.74 ± 6.48
F	0.32	2.86	2.70
Family income			
Low	13.17 ± 6.89	11.42 ± 3.97	18.06 ± 5.62
Medium	11.79 ± 6.35	10.38 ± 4.79	18.99 ± 6.73
High	11.27 ± 6.41	8.55 ± 4.91	21.58 ± 7.25
F	2.57	9.91**	8.06**
Physical diseases			
No	11.60 ± 6.46	10.22 ± 4.71	19.26 ± 6.70
Yes	13.18 ± 6.40	10.41 ± 4.89	19.21 ± 6.81
F	6.27*	0.17	0.01
Infected relatives or friends			
No	11.90 ± 6.48	10.25 ± 4.72	19.24 ± 6.68
Yes	14.08 ± 6.06	10.77 ± 5.93	19.38 ± 8.72
F	1.44	0.15	0.01
Experienced SARS			
No	11.92 ± 6.59	10.52 ± 4.63	18.83 ± 6.79
Yes	11.98 ± 6.33	9.94 ± 4.88	19.79 ± 6.60
F	0.2	2.25	3.08
Profession			
Doctor	11.38 ± 6.15	8.54 ± 4.94	22 ± 6.85
Nurse	12.69 ± 6.65	11.43 ± 4.22	17.13 ± 5.89
Medical technician	9.89 ± 6.03	9.77 ± 4.96	21.33 ± 6.53
F	6.36**	26.21**	42.14**
Length of service			
<6 years	12.06 ± 7.05	10 ± 5.13	19.47 ± 7.22
6–10 years	12.96 ± 6.31	11.61 ± 4.20	17.14 ± 5.30
11–20 years	11.81 ± 6.22	10.36 ± 4.88	19.28 ± 6.67
>20 years	10.84 ± 6.41	8.78 ± 4.96	21.50 ± 7.14
F	2.75*	9.42**	11.14**
Daily working hours			
4–8	11.13 ± 6.24	10.43 ± 4.58	19.18 ± 6.56
8–10	12.48 ± 6.43	10.37 ± 4.68	19.09 ± 6.71
>10	13.57 ± 7.38	8.89 ± 5.67	20.39 ± 7.59
F	4.93**	2.52	0.87

**p < 0.05, **p < 0.01. MBI-GS, Maslach Burnout Inventory-General Survey; EE, emotional exhaustion; CY, cynicism; PE, professional efficacy.*

(Aiken et al., 2002). A cross-sectional study of 12 European countries found that longer shifts (12 h or more) were associated with job burnout (Dall'Ora et al., 2015). The difference in working environment between countries limits the promotion of research in western countries. According to the few pieces of literature in China, the sense of professional efficacy of nurses is lower than that of doctors (Wu et al., 2013, 2014). For Chinese nurses, the large population base leads to a high nurse-patient ratio. Compared with doctors and medical technicians, nursing is a relatively low-paid profession in China. The reform of health care system policy and management strategy is accompanied by economic reform, which aggravates the great pressure and burnout of nurses (Wu et al., 2010). To make matters worse, in the early days of COVID-19 pandemic, medical personnel were not equipped with protective equipment and tested for coronavirus. As the main caregivers of patients, nurses have direct contact with infected patients many times a day when performing their duties. Therefore, compared with other medical staff, nurses face greater health risks, and consequently bear more psychological burden. Another explanation may be that nurses are mainly women, and they may bear more psychopathological burdens in outbreaks that threaten the health of family members or affect the care of children. Previous studies have demonstrated that women are more likely to suffer from Posttraumatic Stress Disorder (PTSD) and Posttraumatic Stress Symptoms (PTSS), and have more depressive and anxiety symptoms in the face of every coronavirus outbreak (Buselli et al., 2020; Carmassi et al., 2020).

The length of service was significantly correlated with every dimension of the burnout experience. Less than 20 years of service was risky for job burnout. The medical staff with a working life of 6–10 years had the strongest sense of emotional exhaustion and cynicism and the lowest sense of professional efficacy. Rich work experience after long service may contribute to higher esteem and better emotional regulation. It is reasonable that medical staff with work experience had enhanced psychological preparation and knowledge of infection control, and reduced the level of job burnout. The previous studies found that experienced nurses had a lower risk of violence in the workplace and a higher tolerance for patient aggression (Whittington, 2002; Edward et al., 2014). Young and

inexperienced employees may be more nervous about highly contagious diseases.

Interestingly, we found that prolonged daily working hours were only associated with emotional exhaustion, not with cynicism and professional efficacy. As the relationship between excessive workload and a higher level of burnout has been well proved, many studies have proposed limiting working hours as the first step to prevent burnout (Gopal et al., 2005; Martini et al., 2006; Dugani et al., 2018). It should be noted that reducing working hours may not necessarily reduce cynicism and improve professional effectiveness. Moreover, during the COVID-19 epidemic, the huge number of infections and the exponential spread of coronavirus made the workload impossible to reduce. Therefore, during the pandemic, other more feasible methods are needed to alleviate the burnout experience.

Another important finding is that during the COVID-19 outbreak, job burnout of medical staff was positively correlated with depression. The latest report has demonstrated that during the COVID-19 outbreak, medical workers are twice as likely to suffer from depressive symptoms and other psychological disorders as the general population (Lu et al., 2020). The bi-directional link between burnout and depression has been widely recognized. Longitudinal studies have shown that an increase in burnout levels can predict a subsequent increase in depressive symptoms (Bianchi et al., 2015). As a result, the increase in depression is likely to be the result of exposure to unprecedented work-related stress during the COVID-19 pandemic, and vice versa. It is worth noting that due to the cross-sectional design, this study did not prove the causal relationship between burnout and depression.

This study has several limitations. First, this cross-sectional survey conducted at a single time point could not compare burnout levels before and after the outbreak. Moreover, there was relatively limited information on the specific factors of outbreaks that contribute to an increase in the prevalence of burnout. Therefore, our findings cannot reveal the causal relationship between the COVID-19 outbreak and high levels of job burnout. Second, as there is no consensus on the diagnosis of job burnout, it is difficult to directly compare the prevalence of job burnout. A recent review found that the existing literature used at least 47 different definitions of the prevalence of burnout when using the MBI tool to measure burnout (Rotenstein et al., 2018). Therefore, it is necessary in future studies to reach a consensus on how to classify different degrees of job burnout. Third, the levels of job burnout in the health care profession were not be compared with that of other occupations, as other industries were almost completely shut down during the pandemic. Therefore, the special impact of the COVID-19 epidemic on medical staff was not investigated. Fourth, there may be a sampling bias. The sample was composed of most female subjects who were more vulnerable to traumatic events. Hence, caution should be taken when extending our findings to other populations. Fifth, psychiatric evaluation of the samples was not performed before the study. As previously reported, pre-existing mental illness or susceptibility may have affected the development of burnout and depressive symptoms during the COVID-19 pandemic (Fiorillo et al., 2020). Sixth, the existence of burnout was investigated using an online self-administered questionnaire, which may compromise the reliability and validity of the measurement.

In summary, our report showed that there was a high rate of burnout among medical staff in China, which is likely to intensify during the COVID-19 pandemic. Occupation, length of service, working hours, and several individual variables, including age, sex, pre-existing physical diseases, and family income, are determinants of job burnout scores. The experience of burnout hinders the fight against the epidemic situation of COVID-19 and has a lasting negative impact on mental health. During and after the COVID-19 pandemic, intervention measures such as mindfulness-based decompression are urgent to deal with stress and solve the job burnout of medical staff. Psychological evaluation and psychological counseling should be carried out for medical staff on a long-term and regular basis. Our study suggests that when providing mental health services, more attention should be paid to young and less experienced medical staff, especially nurses. Compared with western countries, there are relatively few studies on job burnout of medical staff in China. Therefore, even after the COVID-19 pandemic, it is necessary to conduct more investigations on the causes and consequences of burnout and take effective intervention measures to prevent burnout.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of the Institute of Psychology, Chinese Academy of Sciences. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LH and YZ were responsible for statistical analysis and manuscript drafting. TL and XYZ were responsible for study design and writing review. YN, SL, ZL, and WQ were involved in statistical analysis and the manuscript revision. LZ, JY, and XZ were responsible for data acquirement. All the authors critically reviewed the manuscript and gave final approval for its publication.

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The Job Demands and Resources Related to COVID-19 in Predicting Emotional Exhaustion and Secondary Traumatic Stress Among Health Professionals in Spain

Jennifer E. Moreno-Jiménez[1], Luis Manuel Blanco-Donoso[1], Mario Chico-Fernández[2], Sylvia Belda Hofheinz[2], Bernardo Moreno-Jiménez[1] and Eva Garrosa[1]*

[1] Departamento de Psicología Biológica y de la Salud, Facultad de Psicología, Universidad Autónoma de Madrid, Madrid, Spain, [2] University Hospital October 12, Madrid, Spain

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Eduardo Salas,
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***Correspondence:**
Jennifer E. Moreno-Jiménez
jennifer.moreno@uam.es

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The current COVID-19 crisis may have an impact on the mental health of professionals working on the frontline, especially healthcare workers due to the increase of occupational psychosocial risks, such as emotional exhaustion and secondary traumatic stress (STS). This study explored job demands and resources during the COVID-19 crisis in predicting emotional exhaustion and STS among health professionals. The present study is a descriptive and correlational cross-sectional design, conducted in different hospitals and health centers in Spain. The sample consisted of 221 health professionals with direct involvement in treating COVID-19. An online survey was created and distributed nationwide from March 20 to April 15 which assessed: sociodemographic and occupational data, fear of contagion, contact with death/suffering, lack of material and human protection resources (MHRP), challenge, emotional exhaustion, and STS. Descriptive findings show high levels of workload, contact with death/suffering, lack of MHPR and challenge, and are moderately high for fear of contagion, emotional exhaustion, and STS. We found an indirect significant effect of lack of MHPR on predicting (1) emotional exhaustion through the workload and (2) on STS through fear of contagion, contact with death/suffering, and workload. To conclude, this study examines the immediate consequences of the crisis on health professionals' well-being in Spain, emphasizing the job demands related to COVID-19 that health professionals are facing, and the resources available in these health contexts. These findings may boost follow-up of this crisis among health professionals to prevent them from long-term consequences.

Keywords: COVID-19 crisis, health professionals, job demands, job resources, challenge, emotional exhaustion, secondary traumatic stress

INTRODUCTION

Until recently the novel disease induced by SARS-CoV-2 (COVID-19) has been spreading worldwide. It has been declared as a Public Health Emergency of International Concern (PHEIC; World Health Organization, 2020a), and the pandemic has caused critical global rates of infection, with 2.97 million people infected and 207,000 deaths (retrieved April 27, World Health Organization, 2020a) since the beginning of the pandemic. Data from August 2020 shows differences in the spread of COVID-19 worldwide, including the following critical rates: 21294845 cases globally; 11420860 cases in the Americas; 3754649 cases in Europe; 3040168 cases in South-East Asia; 1723673 cases in the Eastern Mediterranean; 945165 cases in Africa; and 409589 cases in the Western Pacific (World Health Organization, 2020b). Several findings point to Europe as the epicenter of the virus and highlight Italy, Spain, and France as the countries with the fastest infection rates and negative consequences (Ceylan, 2020). Spain has the second-highest rate of people infected and deaths caused by COVID-19 disease in Europe (220000 and 23521, respectively up to April; and 1510023 and 41688 up to November) (Ministry of Health, 2020), which shows the fast spread of the pandemic.

Health professionals were at risk of suffering from several occupational risks before the pandemic (i.e., burnout and secondary traumatic stress) (Blanco-donoso et al., 2018; Moreno-Jiménez et al., 2019), but in the face of COVID-19 encounter several further occupational hazards that may have an immediate psychological impact on well-being (Brooks et al., 2020; Luceño-Moreno et al., 2020; Zhu et al., 2020). Spain has one of the highest rates of health professionals infected by the disease, reaching 40,961 cases in May (Red Nacional de Vigilancia Epidemiológica, 2020). These high rates indicate the need to pay attention to all health professionals fighting against the disease, as they seem to be exposed to stressors of this pandemic as an exceptional crisis (Benfante et al., 2020). Despite the proliferation of scientific papers on this subject, more research is needed that is focused on the impact of the COVID-19 crisis on different health professionals and health contexts.

Concerning the consequences of this crisis, Burnout and Secondary Traumatic Stress (STS) are two negative outcomes widely studied when it comes to health professionals (Kelly, 2020). Firstly, burnout has been considered as emotional exhaustion, depersonalization in professional-patient-relationships, and a lack of accomplishment, due to the high levels of work-related stress (Embriaco et al., 2007). Emotional exhaustion has been commonly considered as the core dimension which better predicts burnout in the short-term (Cieslak et al., 2014), and is considered the outcome of feeling extremely fatigued as a consequence of long exposure to physical, cognitive, and emotional strain due to work conditions. Looking closely, recent studies focused on burnout in health professionals during this COVID-19 crisis in Spain have revealed a critical rate of 41% among these health professionals suffering from emotional exhaustion (Luceño-Moreno et al., 2020).

STS has been defined as the stress resulting from helping or wanting to help others who are suffering a traumatized event (Figley, 1999; Morrison and Joy, 2016). Moreover, STS has been explored in those health professionals more secondarily exposed to traumatic events and for example occurs in health professionals such as those working in Intensive Care Units (hereinafter ICU) (Meadors et al., 2010; Van Mol et al., 2015). However, current findings based on COVID-19 studies have established that the pandemic has increased exposure to traumatic stimuli, such as the fear of contagion, fear of infecting relatives, or increasing rates of deaths (Luceño-Moreno et al., 2020). This impacts directly on all health professionals and increases the risk of developing STS, regardless of specialization. Explaining possible risk factors could help to prevent these negative outcomes. The Job Demands-Resources model (JD-R; Bakker and Demerouti, 2017) provides a way of measuring empirical evidence to theoretically explain the development of both occupational hazards, even in this specific COVID-19 outbreak (Sinclair et al., 2020).

The JD-R model established that job demands are directly and positively related to burnout, and particularly to emotional exhaustion (Bakker et al., 2004). Furthermore, current studies also address other job demands presented in the health contexts (i.e. ethical decision making, the contact with death/suffering, the emotional management of patients/relatives, and the time and social pressure for caring tasks) as strongly related to STS (Moreno-Jiménez et al., 2019, 2020). The JD-R model also supports the idea that the presence of either job or personal resources may diminish the burden of job demands (Bakker and Demerouti, 2017). Within the COVID-19 crisis, the need to examine the job demands and resources presented in health contexts is undeniably relevant in preventing the development of negative outcomes such as burnout and STS. Health professionals are on the "battlefront" in fighting against the disease and are exposed mainly to the high job demands presented during this crisis (Jiang et al., 2020), including a lack of both material and human resources, at the time infections rose (Giusti et al., 2020; Lai et al., 2020). For that purpose, we considered all health professionals within hospitals and health centers as affected by this crisis.

Job Demands of COVID-19 Outbreak in Health Professionals

Based on the JD-R model, job demands are defined as those physical, cognitive, social, or emotional aspects of a job that require an effort to overcome them and involve a cost (Bakker and Demerouti, 2017). Following this definition, the current situation imposed by COVID-19 disease has resulted in health professionals experiencing long exposure to high workloads, which may have a short-term impact on their psychological well-being (Jiang et al., 2020), and which is associated with more emotional exhaustion (Bakker and Demerouti, 2017). Increases in deaths and infection rates mean it is more likely that they will come into contact with death and the suffering linked to the new phenomenon of fear of contagion (Huang et al., 2020) which may increase the risk of developing STS (Cai et al., 2020). For this reason, contact with death/suffering, fear of contagion, and workload were selected as the outstanding job demands-related

to COVID-19, affecting all health professionals in different health contexts as the scenario of this crisis.

Job Resources of COVID-19 in Health Professionals

In response to the increase in workload, new units have been created to attend to patients infected by COVID-19, extending the crisis impact to affect not only the ICU but also related healthcare units. Consequently, this increase in people infected and the massive use of the ICUs are linked to a depletion of resources. It is noteworthy that the lack of both material resources (i.e., personal protection equipment), due to the increased number of people infected, and the human resources, in turn, related to the increase in infected health professionals. The rate of health professionals infected therefore rose by the time the disease was spreading. This challenges the standard capacity of the caring tasks of those professionals, having fewer resources, and a higher workload (Del Rio and Malani, 2020). Based on the JD-R model (Bakker and Demerouti, 2017), job resources are considered as "those aspects of the job that are functional in achieving work goals and reduce job demands and the associated physiological and psychological costs" (Bakker et al., 2004, p. 86). The lack of material and human protection resources in the current crisis may increase these job demands, not only in terms of workload burdens as mentioned before, but also in terms of those tasks related to COVID-19, increasing risk of contagion and their contact with death and suffering (Cai et al., 2020; Ji et al., 2020). This lack of material and human protection resources may impact job demands, making them more of a hindrance rather than a challenge (Bakker and Sanz-Vergel, 2013), and indeed, making the appearance of negative outcomes more likely (i.e. emotional exhaustion and STS) (Schaufeli et al., 2009).

Personal Resources of Health Professionals in the COVID-19 Outbreak

Following the JD-R model, personal resources are considered as "beliefs people hold regarding how much control they have over their environment" (Bakker and Demerouti, 2017, p. 275). In challenging crises situations, as seems to be the COVID-19 outbreak, the approach to variable challenges faced by those with hardiness personality have been studied to examine protector factors for emotional exhaustion, which boosts the perception of a difficult situation as a way to grow and learn, making stimulating such difficulties (Henderson, 2015; Ladstätter et al., 2018). This challenge, as a personal resource, depicts an adventurous and exploring approach to live events (Bartone and Bowles, 2020), that enhances the perception of difficulties as challenging and in turn, activates resources to overcome them. Thus, interpretation of a crisis as a challenge means people quickly engage and adapt to these situations (Johnsen and Saus, 2019).

Moreover, several findings on how the hardiness personality faces challenges have been revealed to protect against STS in emergency professionals, by giving significant meaning to the traumatic tasks as a way to learn new competencies and as an opportunity for personal growth (Moreno-Jiménez et al., 2008). This vision allows them to gain more experience by the time they are more involved (Johnsen and Saus, 2019). It seems that people with high adaptability challenges can respond to critical stimuli more quickly and effectively, due to their way of seeing the difficult scenario as a learning context. This challenge could be considered relevant in a crisis, especially in more individual stress control in highly stressful jobs to prevent burnout (Bartone and Bowles, 2020) and specifically among health professionals (Maramis and Cong, 2019).

This study aims to explore these job-related demands (i.e., fear of contagion, contact with death/suffering, and workload) and job-related resources (i.e., the lack of material and human protection) specifically during the COVID-19 crisis, as well as a personal resource (i.e., challenge) that may hinder this negative effect on health professionals, based on the well-established JD-R model. The main contribution of this research relies not only on the study of the high prevalence of the negative outcomes due to the COVID-19 outbreak but also provides a theoretical basis that could boost knowledge of this crisis. This study examines the following hypotheses:

H_1 The job demands (i.e., fear of contagion, contact with death/ suffering, and workload), the job resources (i.e., the lack of material and human protection resources), personal resource (i.e., challenge) and negative outcomes (i.e., burnout and STS) will not have any difference among different units in health contexts and type of professionals in this COVID-19 outbreak.

H_2 Fear of contagion, contact with death/suffering, and workload, as job demands in this COVID-19 outbreak, are positively related to (a) emotional exhaustion and (b) STS.

H_3 The lack of material and human protection resources, as a job resource in this COVID-19 outbreak, is positively related to (a) emotional exhaustion and (b) STS.

H_4 Challenge within hardiness personality, as a personal resource, is negatively related to (a) emotional exhaustion and (b) STS.

H_5. The job demands related to COVID-19 (fear of contagion, contact with death/suffering, and workload) mediate between the resources (the lack of material and human protection resources and challenge) and (a) emotional exhaustion and (b) STS.

The lack of material and human protection resources will be related to high emotional exhaustion and STS. This is possibly due to the increase in job demands provoked by a perception of the lack of resources.

Figure 1 represents the model proposed.

MATERIALS AND METHODS

Participants

The study included 221 health professionals from different public hospitals and health centers in Spain, including 78.7% female and 21.3% male participants, with an average age of 40.31 years. The sample was composed of different job positions, the majority of the sample nurses (45.2%) and physicians (33%). Moreover, the sample was classified in different units (depending on where they were working by the assessment time), where the health professionals of ICU and other health specialization within the

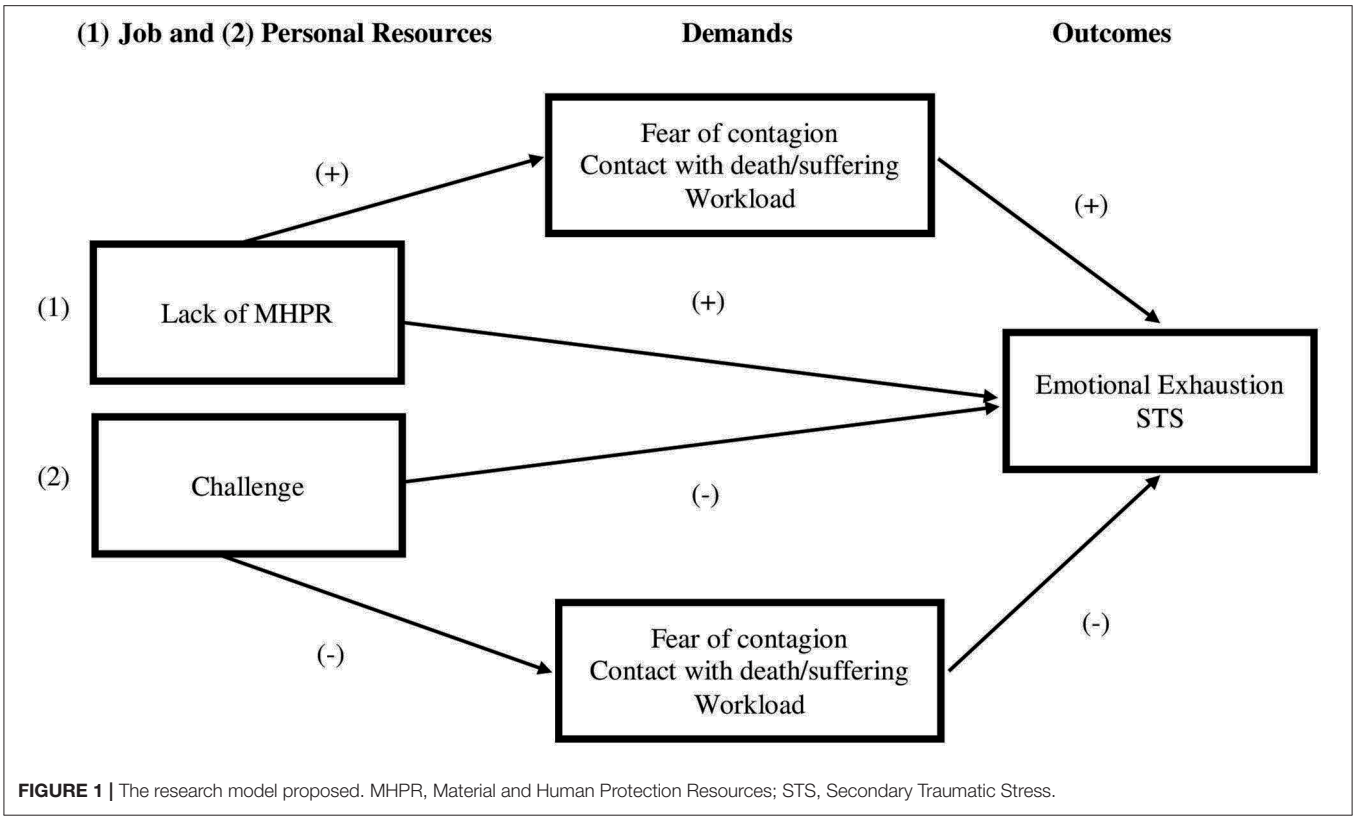

FIGURE 1 | The research model proposed. MHPR, Material and Human Protection Resources; STS, Secondary Traumatic Stress.

hospitals (i.e., intern medicine, oncology, pediatric, urology) were more prevalent, 22.2 and 20.4%, respectively. The average years of work experience of the health professionals were 15.79 years. As an outstanding point, 90% of the sample were exposed to patients with COVID-19 symptoms. The sociodemographic and occupational data of the sample are summarized in **Tables 1**, **2** respectively.

Procedure

The general procedure was as follows: firstly, we created the questionnaire using the Qualtrics platform (see https://www.qualtrics.com/es/). Within this online questionnaire, the first screen displayed the information related to the study, the main goals, and the informed consent that the participants accepted. The voluntary nature of the study was stated, as well as the possibility to withdraw it at their convenience. They were told that to register their participation, they could send results via email and that they would be contacted with the questionnaire after. Then, once this online questionnaire was created, we obtained a link to access it. This link was sent nationwide by contacting health professionals via email and social networks (such as Facebook, Instagram, Twitter, and LinkedIn). The sample was collected using the well-known snowball techniques for about 3 weeks (from March 20 to April 15). During this period, Spain declared that it was in an "alarm state" and a national lockdown was implemented, except for health professionals who were providing front-line services. All material and human resources in health contexts were mobilized to attend to all patients infected by the COVID-19. These conditions imposed many restrictions that impeded data collection through methods other than via an online questionnaire. This study obtained approval from the Ethical Committee of the Autonomous University of Madrid (CEI-106-2059).

Measures

The instruments included present good reliability indexes (see **Table 2**):

Sociodemographic data such as gender, status, job position, years of work experience, unit in which they are working, and contact with COVID-19 patients. They were asked to answer "in this moment" to specifically assess their work status during the COVID-19 outbreak.

Fear of contagion. A 3-item scale was designed to assess their fear of both being infected and infecting others with the virus, including relatives ("I have fear of being infected by the virus"). The response category was a Likert scale ranging from 1 ("*nothing*") to 4 ("*a lot*").

Contact with death/suffering. The 4-item scale related to this variable in the Nursing Burnout Scale (NBS) was included (Moreno-Jiménez et al., 2000). This scale assessed the pain and suffering related to tasks that involved caring for patients before dying ("I feel pain when patients do not receive the visit of their relatives"). The Likert response scale ranged from 1 ("*totally disagree*") to 4 ("*totally agree*").

TABLE 1 | Sociodemographic data of the total sample.

	Total health workers (*N* = 221)	
Categorical variables	***n***	**%**
Gender		
Male	47	21.3
Female	174	78.7
Sentimental Relationship		
With a relationship	175	79.2
Without a relationship	46	20.8
Quantitative variables	*M*	*SD*
Age	40.31	11.59

TABLE 2 | Occupational data of the total sample.

	Total health workers (*N* = 221)	
Categorical variables	***n***	**%**
Job position		
Physician	73	33
Resident medical intern	13	5.9
Nurse	100	45.2
Nurse aides	22	10
Emergency technician	2	0.9
Ancillary	4	1.8
Psychologist	1	0.45
Others health professionals[a]	4	1.8
Missing values	2	0.9
Unit		
ICU	49	22.2
Urgency	29	13.1
R&S	22	10
COVID-19	27	10.9
Other specializations within hospitals[b]	45	20.4
HC	43	19.5
Others health services [c]	6	2.71
First time working in this unit		
Yes	51	23.1
No	170	76.9
Contact with covid-19 patient		
Yes	199	90
No	22	10
Quantitative variables	*M*	*SD*
Years of experience in the field	15.79	10.97

R&S, Reanimation and Surgery; HC, Health Centers.
[a]Radiodiagnostic technician and pharmacy technician are included within this category.
[b]Intern medicine, oncology, psychiatry, pneumology, pediatric, traumatology, and urology are included in this category.
[c]Public Health Services and Prevention of Occupational Risks services are included in this category.

Workload. This variable was assessed through the Spanish version of the Secondary Traumatic Stress Scale (STSS; Meda, Moreno-Jiménez et al., 2012). It consisted of 5 items that assessed the amount of work and time pressures required to develop job tasks ("Sometimes we attend to a second notice without enough time to recovery of the previous one"). The Likert-response scale ranged from 1 ("*totally disagree*") to 4 ("*totally agree*").

Lack of material and human protection resources (MHPR). This consisted of a 2-item scale designed *ad-hoc* to assess the subjective perception of lack of both protection materials and human resources ("the lack of individual protection equipment scares me" and "the lack of the necessary human resources scares me"). An open section was included at the end of the questionnaire so that participants could add comments finding among these comments a common complaint of lack of material and human protection resources during this crisis. The Likert-response scale ranged from 1 ("*nothing*") to 4 ("*a lot*").

Challenge. Challenge is a dimension within the hardiness personality, assessed through the Spanish adaptation of Occupational Hardiness Questionnaire (OHQ; Moreno-Jiménez et al., 2014). This variable assesses the natural predisposition to like and feel comfortable in new situations ("At work, I feel more attracted by the innovation and the novelty of procedures"). The scale response ranged from 1 ("*totally disagree*") to 4 ("*totally agree*").

Emotional Exhaustion. This consists of a 3-item scale included in the Spanish version of the Short Burnout Questionnaire (Moreno-Jiménez et al., 1997). It assesses the physical and mental fatigue related to the caring tasks ("In general, I am rather sick of my job"). The Likert-response scale ranged from 1 ("*nothing*") to 5 ("*a lot*").

Secondary Traumatic Stress. This outcome was assessed using the Spanish version of the Secondary Traumatic Stress Scale (STSS; Meda et al., 2012). It consists of a 14-item scale in which the cost of being exposed to traumatic events is assessed, in an emotional ("I feel emotionally without strength") and cognitive ("this work makes me see the world as unfair") way and the symptomatology related to posttraumatic disorder ("I keep real images about those accidents which affect me a lot"). The Likert-scale response ranged from 1 ("*totally disagree*") to 4 ("*totally agree*").

RESULTS

Descriptive Analysis

Due to the exploratory nature of this study, means, standard deviations, and Pearson correlations were initially carried out (see **Table 3**). As observed in **Table 3**, the job demands related to COVID-19 presented high levels, specifically in contact with death/suffering, and workload and moderately high in fear of contagion. In terms of resources, the lack of MHPR had a high score, as well as a challenge variable. In terms of the outcomes, both emotional exhaustion and STS presented moderately-high levels.

To explore the differences within the sample proposed in H_1, mean differences through ANOVA were calculated by considering the type of unit (see **Table 4**) and job position (see **Table 5**), and Bonferroni statistic was used to make multiple *post hoc* comparison per groups (see note section in **Tables 4**, **5**). Regarding these mean differences, only significant differences were found in lack of MHPR, specifically between health centers and other health specializations (i.e., oncology, psychiatry,

TABLE 3 | Means, standard deviations, internal consistency indexes (Cronbach's alpha), and bivariate correlations.

Variable	$\overline{X}$[a]	*SD*	α	1	2	3	4	5	6	7	8
1. Gender	–	–		–							
2. Fear of contagion	2.91	0.75	0.80	0.20**	–						
3. Contact with death and suffering	3.58	0.48	0.91	0.37**	0.38**	–					
4. Workload	3.22	0.56	0.80	0.146*	0.34**	0.41**	–				
5. Lack of MHPR	3.30	0.70	0.68	0.13	0.54**	0.30**	0.48**	–			
6. Challenge	3.05	0.59	0.77	−0.055	0.03	0.11	0.06	0.04	–		
7. Emotional exhaustion	2.75	0.43	0.81	0.77	0.16*	0.063	0.30**	0.31**	−0.26**	–	
8. Secondary traumatic stress	2.50	0.88	0.84	0.23**	0.39**	0.37**	0.45**	0.43**	−0.02	0.60**	–

MHPR, Material and Human Protection Resources.
Gender was coded as 1= male 2 = female.
All variables are measured from 1 to 4 except for emotional exhaustion which is measured from 1 to 5.
[a]*1 < 2 = low; 2 < 3 = medium; 3 < 4 = high; 4 < 5 = very high (in case of emotional exhaustion).*
**p < 0.05; **p < 0.01.*

TABLE 4 | Mean differences between interested units.

	ICU *n* = 49	Urgency *n* = 29	R&S *n* = 22	Covid-19 *n* = 27	HC *n* = 43	Others[a] *n* = 51	F	Sig
	$\overline{X}$	$\overline{X}$	$\overline{X}$	$\overline{X}$	$\overline{X}$	$\overline{X}$		
Fear of contagion	2.87	2.92	2.85	3.04	2.75	3.06	1.013	0.411
Contact with death/suffering	3.52	3.51	3.47	3.62	3.61	3.70	1.178	0.321
Workload	3.25	3.21	3.36	3.24	2.99	3.31	2.006	0.079
Lack of MHPR	3.18	3.15	3.34	3.44	3.13	3.56	2.762	0.019*[A]
Challenge	3.17	2.97	3.15	2.77	2.86	3.24	3.765	0.003**[B]
Emotional exhaustion	2.58	2.35	2.44	2.60	2.34	2.63	0.799	0.551
Secondary traumatic stress	2.75	2.63	2.69	2.81	2.64	2.90	2.375	0.056

R&S, Reanimation and Surgery; HC, Health Centers; MHPR, Material and Human Protection Resources.
All variables are measured from 1 to 4 except for emotional exhaustion which is measured from 1 to 5.
[a]*Other health specialization (i.e., oncology, pneumology, psychiatry, public health).*
[A]*Significant mean difference found between health centers and other health specializations (95% CI [-0.85,−0.007]; p < 0.05).*
[B]*Significant mean differences found between COVID-19 unit and other health specialization (95% CI [-0.87,−0.05], p < 0.05) and between health centers and other health specialization (95% CI [-0.73,−0.009], p < 0.05). *p < 0.05; **p < 0.01.*

TABLE 5 | Mean differences between job position.

	Physician[a] *n* = 86	Nurses *n* = 100	Nurse aides *n* = 22	Others[b] *n* = 10	*F*	Sig
	$\overline{X}$	$\overline{X}$	$\overline{X}$	$\overline{X}$		
Fear of contagion	2.81	2.93	3.09	3.16	1.396	0.24
Contact with death/suffering	3.63	3.57	3.51	3.53	0.510	0.67
Workload	3.13	3.28	3.15	3.42	1.799	0.15
Lack of MHPR	3.19	3.38	3.27	3.42	1.237	0.29
Challenge	3.05	2.97	3.23	3.36	2.25	0.08
Emotional exhaustion	2.50	2.55	2.30	2.52	0.477	0.69
Secondary traumatic stress	2.70	2.79	2.82	2.65	1.031	0.38

MHPR, Material and Human Protection Resources.
All response scale was ranging from 1 to 4 except for emotional exhaustion that was from 1 to 5. There were two missing values that did not answer to the job position.
[a]*Physician and resident medical intern were taken together.*
[b]*Due to the small sample, this category is formed by ancillary (n = 4), psychologist (n = 1), emergency technician (n = 2), and other health professionals (n = 4).*

pediatric, urology, traumatology, and Public Health Services, see **Table 2**), being higher in other specializations within the hospital rather than health centers ($\overline{X}$ = 3.56 and $\overline{X}$ = 3.13; (95% CI [−0.85, −0.01]; $p < 0.05$). Moreover, significant differences in the challenge were found, specifically between the COVID-19 unit and other health specializations ($\overline{X}$ = 2.77 and $\overline{X}$ = 3.24; 95%

CI [−0.87, −0.05], $p < 0.05$) and between the latter and health centers ($\overline{X} = 2.86$ y $\overline{X} = 3.24$, 95% CI [−0.73, −0.01], $p < 0.05$), being higher in other health specializations in both cases (see **Table 4**). As observed in **Table 5**, non-significant differences were found regarding job position in none of the interested variables.

Hypothesis Testing

Firstly, to test H_2 and H_3, hierarchical multiple regression using stepwise was conducted to establish the possible predictors for both emotional exhaustion and secondary traumatic stress (see **Table 7**). As authors suggest a differential role in terms of gender in the face of COVID-19, gender was included as a control variable (Wenham et al., 2020). The descriptive analysis split by gender is summarized in **Table 6**. These analyses were conducted using the SPSS 26.0 statistic program.

As observed in **Table 7**, we found a higher explained variance in secondary traumatic stress ($R^2 = 0.326$; 32.6%), being the greater increment in step 3 with the inclusion of job resources, in this case, the lack of MHPR. In contrast, we found 17,4% of the explained variance in emotional exhaustion, being the greater increment in the last step (step 4) with the inclusion of personal resources, in this case, challenge. ($\Delta R^2 = 0.072$).

In one hand, only workload as job demands seems a positive predictor for emotional exhaustion ($B = 0.234$; $p < 0.01$), as well as the lack of MHPR ($\beta = 0.216$; $p < 0.01$). Furthermore, challenge seems a negative predictor for this outcome ($\beta = -0.276$; $p < 0.001$). These findings support H_2 a for workload, along with H_3a and H_4a.

On the other hand, all job demands related to COVID-19 seem positive predictors for secondary traumatic stress (see **Table 7**). Moreover, the lack of MHPR seems a positive predictor as well ($\beta = 0.211$; $p < 0.01$), but in this case, we did not find a challenge as a significant predictor so that there is no support for H_4b based on our results. Thus, our findings support H_2b and H_3b.

Mediational Effects of Job Demand and Resources

Finally, mediation analysis between the significant resources and job demands related to COVID-19 (fear of contagion, contact to death/suffering, and workload) were carried out. For that purpose, the macro PROCESS was used to calculate the significance of these mediations (see http://processmacro.org/index.html; Hayes and Preacher, 2014). All variables were centered to avoid possible multicollinearity issues.

Due to the lack of a significant relationship between job demands and challenge (see **Table 3**), we did not find support to test the mediational effect of these job demands between challenge and the outcomes (i.e., emotional exhaustion and secondary traumatic stress), as they need to be significant (Mathieu and Taylor, 2007). Hence, we tested the mediational effect of job demands between the lack of MHPR and both emotional exhaustion and secondary traumatic stress. **Figures 2**, **3** show these findings.

On the one hand, we found a significant indirect effect of lack of MHPR on emotional exhaustion through workload (see **Figure 2**). As we observe in this figure, the lack of MHPR positively predicts workload, and this workload leads to more emotional exhaustion (positive predictor). This model explained the 12.8% of the emotional exhaustion variance ($R^2 = 0.128$), presenting a medium effect size ($E = 0.09$; 95 % CI [.01, 0.10] (Preacher and Kelley, 2011).

On the other hand, we found a significant indirect effect of lack of MHPR on STS through the fear of contagion, contact with death/suffering, and workload. In this sense, observing **Figure 3**, we can see the lack of MHPR as a positive predictor for fear of contagion, contact with death/suffering, and workload, and these job demands related to COVID-19 lead to more STS (positive predictor). The proposed model explained the 33,7% of the secondary traumatic stress variance ($R^2 = 0.337$), presenting a medium effect size ($E = 0.23$; 95 % CI [.14, 0.35] (Preacher and Kelley, 2011).

Additional Analysis

Prior to contrast mediational effect, we undertook a multiple linear regression to test the possible moderator role of the resources in our model (step 5). We did not find support for the moderator role of either lack of MHPR or challenge between the job demands and emotional exhaustion ($R^2 = 0.167$; $p > 0.05$) and STS ($R^2 = 0.334$; $p > 0.05$).

DISCUSSION

This study aimed to test the impact of the COVID-19 crisis on health professionals working on the front-line of this pandemic by examining perceptions of the job demands (i.e., fear of contagion, contact with death/suffering, and workload) and resources (i.e., lack of MHPR and challenge) during this crisis. Moreover, we aimed to test the effects of a lack of resources in developing negative outcomes, such as emotional exhaustion and secondary traumatic stress. To the best of our knowledge, this is the first study to explore the immediate consequences of the health crisis among health professionals in Spain using a theoretical basis as the JD-R model.

Firstly, our findings provide empirical evidence about the high job demands faced by health professionals among hospitals and health centers. These high levels of job demands are positively predicted by the lack of resources, which highlights the outstanding role of this lack of resources and its relationships with the negative outcomes, as proposed in H_5. According to previous studies in China, a lack of material and human resources is related to a higher workload, making work shifts more exhausting and even requiring extra work to accomplish all caring tasks required (Jiang et al., 2020). As the authors suggest, working under these stressful conditions and high workloads may increase emotional exhaustion, as these health professionals may not have enough resources to overcome their tasks (Bakker and Demerouti, 2017). This is supported by our findings in H_5, in which the lack of MHPR is positively related to the workload. This workload alongside emotional exhaustion, have a mediational effect on the workload between this lack of MHPR and emotional exhaustion.

A lack of MHPR, specifically the personal protection equipment during this pandemic, increases the vulnerability of healthcare worlers to contagion and consequently the fear of it (Kang et al., 2020; Lai et al., 2020). This fear of contagion

alongside an increase in and near-constant contact with death/suffering, means that health care workers are more likely to develop STS (Kelly, 2020). Spain has one of the highest rates of health professional infection by coronavirus disease, which undeniably highlights the lack of human resources and their fear of contagion which leads to more posttraumatic symptoms (Luceño-Moreno et al., 2020). These conclusions, based on our findings, indicate the mediational effect of workload, fear of contagion, and contact with death/suffering between the lack of MHPR and STS. These findings not only emphasize the positive relationship between high job demands, emotional exhaustion, and STS but also the importance of lack of resources, which may increase job demands and lead to more negative long-term consequences.

Secondly, our findings indicate that the demanding contexts of this crisis faced by health professionals have a similar effect regardless of job position. This result highlights the need to pay special attention to all health professionals working in front-line COVID-19 disease-facing roles. The differences found regarding the lack of material and human resources between the other health specialization within the hospital and the health centers, reveal the extend of the crisis and its qualitative impact. Health professionals of other specializations within hospitals have experienced an increase in job demands and are exposed to the main infection focus (i.e., the increased rate of infected patients within the hospitals), deriving their material resources to these units, mainly focused on infected patients with COVID-19. For this reason, they may experience a lack of resources to a high degree, both material and human, due to the need to allocate health professionals from other specializations to COVID-19-related areas. Linked to that, it is possible that in highly specialized units such as intensive care units, they are most used to working under certain stressors related to workload and time pressure, as well as limited resources (Embriaco et al., 2007). This fact may explain that their perception of the lack of resources could be lower in comparison with other units, although it has worsened during this health crisis.

Remarkably, a positive result may be found regarding challenge as a personal resource. This challenge may protect against the exhaustion derived from the high workload and the lack of material and human resources but seems to not be related specifically to demands related to COVID-19 (i.e., fear of contagion and contact with death and suffering). This is a preliminary result in understanding how personal cognitions and interpretation of the crisis may play a protective role against emotional exhaustion. However, little is known about their interaction in such a demanding context, with higher rates of contact with death and suffering and fear of contagion, meaning these findings require careful interpretation. As an example of this, despite all health professionals presenting a high level of challenge, possibly activated by this crisis, a significant difference appears in other health specializations within hospitals in comparison with other units (i.e., COVID-19 unit and health centers). It could be possible that the

TABLE 6 | Descriptive information per variable concerning gender: males ($n = 47$) and females ($n = 174$).

	Males		Females	
	$\bar{X}$	SD	$\bar{X}$	SD
Fear of contagion	2.62	0.69	2.99	0.75
Contact with death/suffering	3.24	0.59	3.68	0.40
Workload	3.06	0.67	3.26	0.52
Lack of MHPR	3.13	0.77	3.35	0.68
Challenge	3.12	0.60	3.04	0.59
Emotional exhaustion	2.47	0.84	2.52	0.90
Secondary traumatic stress	2.56	0.46	2.80	0.42

MHPR, Material and Human Protection Resources.

TABLE 7 | Hierarchical regression model on criterion variables of secondary traumatic stress and emotional exhaustion.

Predictors	Emotional exhaustion				Secondary traumatic stress			
		Standardized β				Standardized β		
Step 1. Control Gender	0.024	−0.002	−0.002	−0.032	0.232**	0.091	0.091	0.085
Step 2. Job demands								
Fear of contagion		0.088	−0.001	−0.005		0.235**	0.147*	0.146*
Contact with death/suffering		−0.087	−0.085	−0.046		0.127	0.130	0.138*
Workload		0.294***	0.229**	0.234**		0.332***	0.268***	0.269***
Step 3. Job resources								
Lack of MHPR			0.213**	0.216**			0.200**	0.211**
Step 4. Personal resource								
Challenge				−0.276***				−0.056
R^2	−0.004	0.075	0.102	0.174	0.049	0.299	0.326	0.326
ΔR^2		0.071**	0.027**	0.072***		0.250***	0.027**	0.000

MHPR, Material & Human Protection Resources.
R^2, Percentage of explained variance by the inclusion of variables.
$^*p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

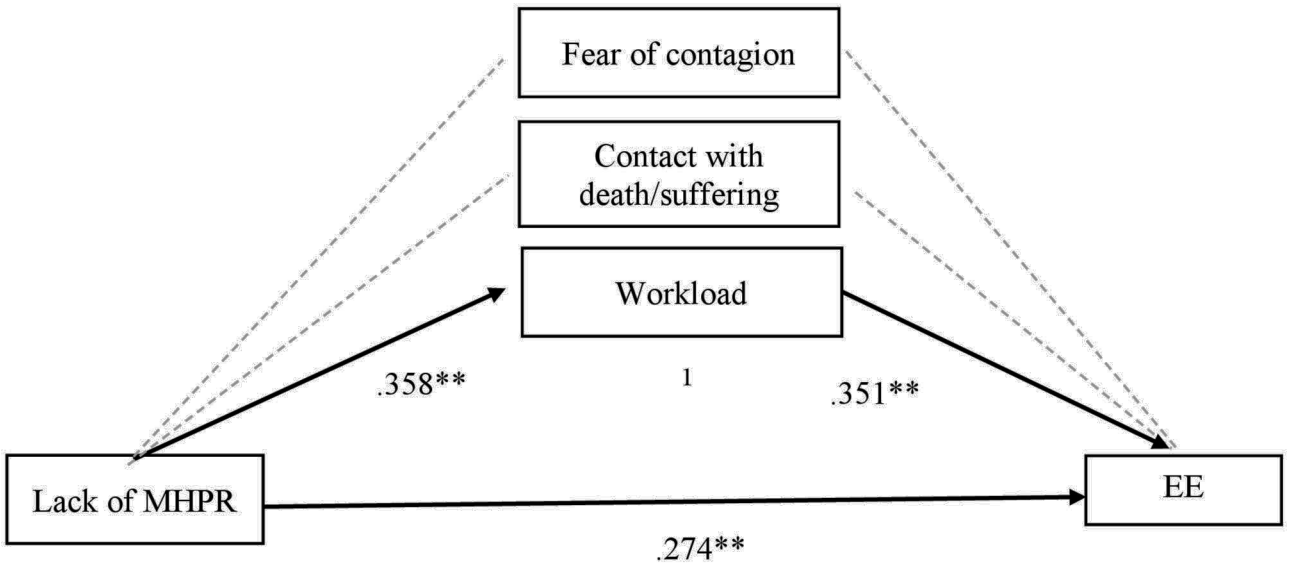

FIGURE 2 | Mediational effects of job demands on lack of MHPR in predicting Emotional Exhaustion (EE). MHPR, Material and Human Protection Resources; EE, Emotional Exhaustion. [1]Total indirect effect of lack of MHPR on EE through workload ($\beta = 0.12$; $t = 2.97$; $p > 0.01$). $^{**}p < 0.01$.

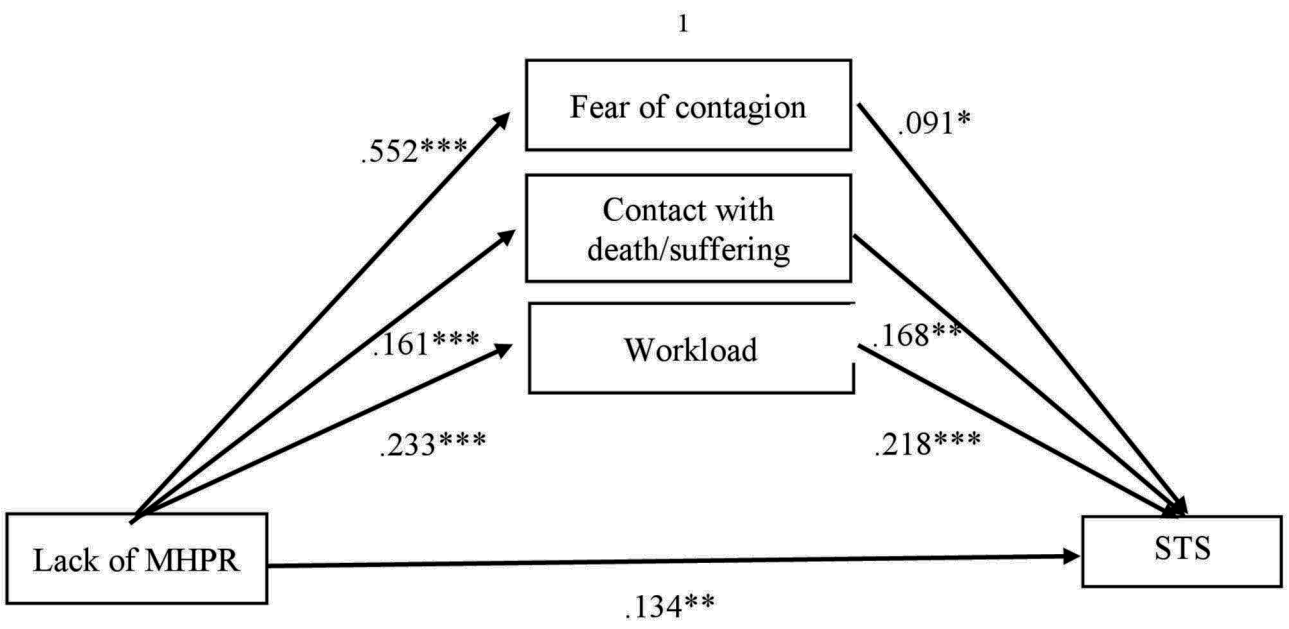

FIGURE 3 | Mediational effects of job demands on lack of MHPR in predicting Secondary Traumatic Stress (STS). MHPR, Material and Human Protection Resources; STS, Secondary Traumatic Stress. [1]Total indirect effect of lack of MHPR on STS through all job demands ($\beta = 0.139$; $t = 2.976$; $p < 0.01$). $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

qualitative higher levels of contact with death/suffering and type of caring tasks of interacting directly with infected patients on the front line, could change or perturb their perception of challenge, in comparison with those in the second line, as occurs in other health specializations. In this case, challenge profiles could not have a protector effect on STS and have a possible interaction with another hardiness dimension, such as control or commitment, which play a key role in traumatic-related demands (Ladstätter et al., 2018). This fact must be taken carefully as a preliminary result and future longitudinal designs may allow us

to temporarily study this along with the crisis and its effect on both outcomes.

The present study remarks on the relevance of taking a closer look into the well-being of health professionals during this crisis. Although the levels of both outcomes are still moderate, the impact of the crisis could be noticed after a period of time, and in this sense, previous studies have pointed out that the psychological impact of this epidemic may last longer than the epidemic itself (Ornell et al., 2020). Because we may have exhausted health professionals, turnover and quit intentions could increase (Moreno-Jiménez et al., 2012), and the quality of care might diminish (Wang et al., 2020). For this reason, currently, studies strongly suggest that the presence of material and human resources is the main motivational factor for health professionals to continue developing their careers (Cai et al., 2020), according to our findings. Furthermore, recent studies about the pandemic in China address the buffering role that leaders may play against the stress burden in this crisis (Jiang et al., 2020).

Limitations and Future Research

Despite the valuable findings of the present study, some limitations should be emphasized to improve further future research. Firstly, the heterogeneity of the sample aimed to include as many health professionals as possible to gather the real impact of the crisis within all levels. This issue may hinder the applicability of the results, obtaining different levels of exposure and units which may function in different ways (i.e., intensive care units vs. other health specializations within the hospitals). The reason to be inclusive even to health centers was to remark on the extent of the health crisis, and in the second place, to make them part of all preventative measures which should be considered, despite minimizing the effect size of the study. Secondly, the only feasible way to study the real impact in the acute phase of the crisis specifically with the health professionals in the front line was through an online questionnaire using self-report measures. Although this method diminishes ways of objectively assessing the interested variables, obtaining their perceptions and expectations about the job demands and resources during this critical period was crucial to boosting preventative measures from early stages.

Further short and medium-term research should be conducted aiming to surpass these limitations. Based on this, a longitudinal design will be carried out with two goals: (1) to get a follow-up of the impact of the crisis on health professionals' well-being; and (2) to study the different effective coping skills used to overcome this crisis, to be trained after this period, and preventing the participants from a future health crisis, otherwise, we would not learn about the current situation. For these goals, it is important to collect a bigger sample, considering the units and job positions included in this research and establishing better predicting results.

Practical Implications

Practical implications should be addressed, highlighting the power of prevention and due to the long-term effect that this crisis may have. In the first place, prevention needed a theoretical model to explain the relevant risk factors affecting health professionals. This study provides a valuable theoretical basis using the JD-R model, which allows us to classify the demands and resources to better understand the process. Following our findings, the next steps to prevent long-term negative consequences in health professionals should involve providing greater job resources, from material resources (i.e., personal protection equipment) and staff reinforcements or more co-worker and supervisor support. An increase in job resources could lead to a smaller workload, fear of contagion, and even contact with death/suffering, preventing them specifically from STS and its emotional consequences.

CONCLUSIONS

The current health context involves higher job demands, including not only increased workload, but also traumatic events such as fear of contagion and contact with death and suffering. In this demanding context, addressing this lack of resources is crucial to prevent the development of occupational negative outcomes, such as emotional exhaustion and secondary traumatic stress. This study has revealed that health professionals are facing a critical situation that poses an extra challenge and reflects their motivation toward professions. However, although their challenge allows them to adapt and respond to this crisis, this personal resource should be reinforced by more material and human resources, as well as better working conditions, to diminish the impact of the crisis (i.e., adequate recovery time and less job insecurity, among others). Furthermore, a follow-up of crisis impact should be made to continue caring for those health professionals now on the front line of the crisis.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethical Committee of Autonomous University of Madrid. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

The authors presented in this paper have played a role in each phase of the research development. In the first place. JM-J and LB-D with the supervision of BM-J and EG created the online questionnaire and was nationwide send with the collaboration of MC-F and SB. In the second place, JM-J and LB-D were in charge of analyzing the data, being supervised by BM-J and EG. Finally, the first draft of the manuscript was originally written by the first author (JM-J), but being revised, corrected and modified by each author (LB-D, MC-F, SB, BM-J, and EG). All authors contributed to the article and approved the submitted version.

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frontiers in Psychology

ORIGINAL RESEARCH
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Social Support and Hope Mediate the Relationship Between Gratitude and Depression Among Front-Line Medical Staff During the Pandemic of COVID-19

*Lijuan Feng[1] and Rong Yin[2]**

[1] Student Mental Health Education and Counseling Center, Northwest Minzu University, Lanzhou, China, [2] Department of Neurology, The 940th Hospital of Joint Logistics Support Force of the PLA, Lanzhou, China

Background: The pandemic of Coronavirus Disease 2019 (COVID-19) has burdened an unprecedented psychological stress on the front-line medical staff, who are at high risk of depression. While existing studies and theories suggest that factors such as gratitude, social support, and hope play a role in the risk of depression, few studies have combined these factors to explore the relationship between them.

Objective: This study examined the mediating roles of social support and hope in the relationship between gratitude and depression among front-line medical staff during the pandemic of COVID-19.

Methods: This study used the Gratitude Questionnaire, the Perceived Social Support Scale (PSSS), the State Hope Scale (SHS), and the Center for Epidemiologic Studies Depression Scale to examine the gratitude, social support, hope, and depression among 344 front-line medical workers in Wuhan, which was the hardest-hit area of COVID-19 in China.

Results: The results showed that the prevalence of mild depressive disorder was 40.12% and the prevalence of major depressive disorder was 9.59% among front-line medical staff during the pandemic of COVID-19; gratitude has a direct and negative effect on depression. Gratitude was negative predictors of depression through the mediating variables of social support and hope [$\beta_{gratitude-socialsupport-depression} = -0.096$, 95%CI(−0.129 to −0.064); $\beta_{gratitude-hope-depression} = -0.034$, 95%CI(−0.055 to −0.013)], as well as via an indirect path from social support to hope [$\beta_{gratitude-socialsupport-hope-depression} = -0.089$, 95%CI (−0.108 to −0.070)].

Conclusion: The study findings indicate that gratitude as a positive emotion can reduce depression in medical staff by promoting social support and hope, respectively. Gratitude also reduced depression in health care workers through a chain mediating effect of social support and hope. Overall, gratitude can directly foster social support and hope, and protect people from stress and depression, which has implications for clinical interventions among front-line medical staff during the pandemic of COVID-19.

Keywords: COVID-19, gratitude, social support, hope, depression

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***Correspondence:**
Rong Yin
yin_rong_@hotmail.com

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INTRODUCTION

Previous studies have found that in high-risk and stressful pandemic environments, medical staff are prone to have a range of psychological problems (Bohlken et al., 2020). Coronavirus Disease 2019 (COVID-19) is highly contagious and has a certain mortality rate, and individual's anxiety that he or she might be infected with novel coronavirus may result in the appearance of negative emotions, which can lead to depressive symptoms and other psychological problems (Spoorthy, 2020). The medical staff in the frontline of pandemic have to deal with the social and psychological stress of high exposure to the virus while working to treat patients. Therefore, the mental health of medical staff has become a worldwide topic that is worthy of attention, and how to reduce the depression symptoms of medical staff has become one of the key challenges to deal with the pandemic. According to the previous studies, some positive emotions are the protective factors of depression in stressful situations, among which gratitude, as a common positive emotion, may play an important role in reducing depression (Fredrickson, 2001).

Within the field of gratitude research, there is a lack of agreement about the nature of the concept. Gratitude has been conceptualized as an emotion, an attitude, a moral virtue, a habit, a personality trait, or a coping response (Emmons and Shelton, 2002; Emmons and McCullough, 2003). In part, gratitude is an emotion that occurs after people receiving aid which is perceived as costly, valuable, and altruistic (Wood et al., 2008a). On this basis, current studies have conceptualized gratitude as an emotion that is always directing toward appreciating the helpful actions from other people (McCullough et al., 2002). Wood et al. (2008a) showed that feeling grateful for the positive aspects of the world would be likely to make a depressive bout more bearable and of shorter duration. Seligman et al. (2005) suggested that by increasing gratitude, depression could be effectively reduced.

The broaden-and-build theory of positive emotions argues that gratitude may build up social resources and psychological resources (Fredrickson, 2001). These resources function as reserves to be drawn in times of need, which is beneficial during the difficult periods of people lives (Emmons and McCullough, 2003). On one hand, the building of social resources can improve the interaction mode between the individual and the external environment, help individuals to establish a more supportive social system, and make individuals feel and accept the support of others (Deichert et al., 2019). On the other hand, the building of psychological resources can help individuals to face the future with a more positive attitude and have more hope for the future (Loo et al., 2014).

The experience of gratitude and the actions stimulated by it build and strengthen social bonds and friendships. Moreover, encouraging people to focus on the benefits they have received from others leads them to feel loved and cared for by others (McCullough et al., 2008; Lan and Wang, 2019a). Therefore, gratitude appears to build friendships and other social bonds. These are social resources because, in times of need, these social bonds are wellsprings to be tapped for the provision of social support (Emmons and McCullough, 2003). Adequate social support can provide a safe environment for individuals to talk freely with others about negative experiences and related emotions, thus reducing individual depression symptoms (Hobfoll and Shirom, 2001; Lan and Wang, 2019b). It is also found that social support can reduce depression according to relevant empirical studies (Lan et al., 2019).

In addition to building up social resources, gratitude can also reduce depression by building up psychological resources, such as hope (Fredrickson, 2001). Gratitude is a positive evaluation of the benefits that already obtained, while hope is a positive expectation of the expected results in the future (Scioli et al., 2011). McCullough et al. (2002) argued that people who are full of gratitude and hope will enjoy their lives, and whether they look at the past positively or pursue meaningful future goals, the inner social orientation of gratitude may further promote the generation of hope. Witvliet et al. (2019) found that by letting the individuals recall people or things that deserve gratitude in the past, their hope for the future could be effectively improved. Increasing individuals' hope can help them to distract their attention from negative events, and promote individuals to adopt more adaptive strategies to deal with negative events, thus alleviating depression symptoms (Snyder, 2002; Kaleta and Justyna, 2020). An empirical study on post-traumatic groups also found that the higher the level of hope, the lower the level of depression (Hassija et al., 2012).

Social support not only provides material support to make up for the resources that individuals lose in coping with stress, but also improves their sense of meaning and sense of purpose (Wang et al., 2020). According to the theory of social connectedness, social connectivity represented by "keeping close relationship with society" can meet the individuals' belonging needs, and can provide support for the individuals' goal-oriented behavior, thus promoting the generation of hope (Lee et al., 2001).

The Present Study

Since the COVID-19 outbreak, the growing number of patients has put tremendous pressure on the local medical system and medical staff in Wuhan. Medical workers in Wuhan have been facing many challenges (Kang et al., 2020). At the time when local medical supplies and staff were in short supply, medical workers from other provinces of China rushed to Wuhan for assistance after January 23, 2020. As of April, a total of 42,000 medical staff from all over China had arrived Wuhan. Gansu Province sent a medical team of several hundred people to Wuhan to participate in the treatment of COVID-19 patients. This study investigated the incidence of depression among front-line medical staff participating in the treatment of COVID-19 patients from Gansu Province and the influence mechanism of gratitude on depression.

In recent years, with the rise of positive psychology, more and more researchers have begun to pay attention to the positive influence that negative events may bring to individuals. Seligman and Csikszentmihalyi (2000) stated that the study of positive psychology should focus on positive emotion, positive environment and positive attitude. Gratitude as a positive emotion may influence depression through a combination of positive environmental factors represented by social support and positive attitude represented by hope

(Wang and Wu, 2020). Although previous studies have explored the relationship between gratitude, social support, hope, and depression, respectively, few studies have examined how gratitude affects depression through the mediating role of social support and hope. From the perspective of positive psychology, this study intends to investigate the influence of gratitude on depression of medical staff during the pandemic, and analyze the mediating effect of social support and hope. On the basis of the previous theoretical and empirical studies, this study assumes that gratitude can directly and negatively predict depression, and can also positively predict depression through the intermediary of social support and hope, and can also positively predict depression through the chain intermediary of social support and hope.

METHODS

Participants and Procedures

Participants in this study involved 344 front-line medical workers in Wuhan, which was the hardest-hit area of COVID-19 in China. The medical workers were from a medical team from Gansu province that aimed to assist Wuhan city. The research team recruited them online and offline after obtaining the consent of the leader of the assistance medical team. These medical workers had been on the frontline of treating COVID-19 for more than 2 months prior to participating in the present study. The period of data collection lasted 10 days and was undertaken between April 27, 2020 and May 6, 2020. A total of 360 medical workers participated in our survey, and 344 (95.56%) of them completed all the questionnaires.

The Institutional Ethics Committee approved all the procedures. The purpose of the study and the autonomy of medical workers were highlighted before the survey. Written informed consent forms were obtained from each participant, and the participants were free to withdraw from the survey at any time. Once recruited and consented, the participants then completed the survey through the Wenjuanxing platform which is an online survey tool.

Measures

Gratitude

Gratitude was measured using Gratitude Questionnaire-6 (GQ-6, McCullough et al., 2002). This questionnaire includes six items, each of the items are scored on a seven-point scale ranging from 0 (completely disagree) to 6 (completely agree), for example, "I have so much in life to be thankful of." Higher scores represent higher levels of gratitude. This scale shows good reliability in Chinese (Wang et al., 2018). Cronbach's alpha was 0.86 in the current study.

Social Support

Perceived social support was measured by the Perceived Social Support Scale (PSSS; Zimet et al., 1988), which was validated in the Chinese context before by Chou (2000), showing adequate concurrent and construct validity. The PSSS is a 12-item self-report scale that assessing perceived support arising from three dimensions, namely, family support (e.g., "I get the emotional help and support I need from my family"), friend support (e.g., "I can count on my friends when things go wrong"), and others support (e.g., "There is a special person in my life who cares about my feelings"). Each item is scored on a seven-point scale ranging from 1 (completely disagree) to 7 (completely agree). Total scores can range from 12 to 84, with higher scores indicating greater perceived social support. In the present study, the Cronbach's alpha was 0.87.

Hope

Hope was assessed using the State Hope Scale (SHS; Snyder et al., 1996). This scale includes six items that assess agency (e.g., "I meet the goals that I set for myself") and pathways thinking (e.g., "I can think of many ways to get out of a jam"), ranged from 1 (completely disagree) to 8 (completely agree). A higher score indicates a higher degree of sense of hope. The Chinese version of the SHS has been proven to be a valid scale (Zhou et al., 2017). In the present study, the Cronbach's alpha was 0.83.

Depressive Symptoms

Depressive symptoms were measured by the Center for Epidemiological Studies-Depression Scale (CES-D, Radloff, 1977). This scale has 20 items (e.g., "I was bothered by things that don't usually bother me"), and the Chinese version has been well validated (Lan and Wang, 2019b). The items are rated on a four-point scale that ranges from 0 (rarely) to 3 (sometimes). After four items are reversed coded, a higher total score indicates a higher level of depressive symptoms. Cronbach's alpha was 0.86 in the current sample.

Data Analysis Strategies

Data analyses were conducted via SPSS 17.0 and Mplus 7.0. First, descriptive analyses were conducted for the variables of interest for the total sample. Structural Equation Model (SEM) was carried out to examine the mediating role of social support and hope in the relationship between gratitude and depression among front-line medical staff during the pandemic of COVID-19. Missing data were handled with full-information maximum likelihood (FIML) estimates in structural models. We used chi-square values to evaluate model fit, the comparative fit index (CFI), the Tucker–Lewis index (TLI), the RMSEA, and the standardized root-mean residual (SRMR). A non-significant chi-square indicates good model-data fit. The general cutoffs for accepting a model are equal to or greater than 0.90 for the CFI and TLI, and less than 0.08 for the SRMR and RMSEA (Wen et al., 2004).

Measurement model fit should be evaluated before proceeding to an evaluation of the full model (Anderson and Gerbing, 1988). This stepwise procedure offers the safeguard of explicitly verifying the acceptability of construct measurement before proceeding to an evaluation of relationships among constructs. We followed this approach here. Next, we applied the SEM approach to assess the following models: (a) a direct effect model with structural paths from gratitude to depression and (b) an indirect effect model, with the mediators (social support and hope) inserted between gratitude and depression, and one

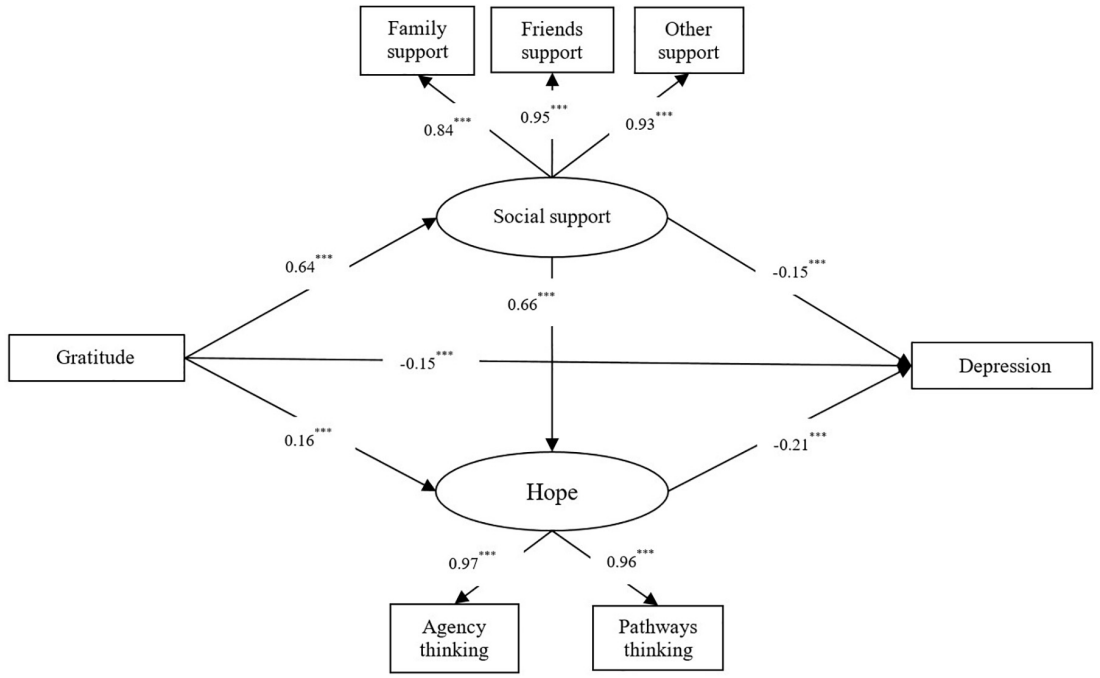

FIGURE 1 | The multiple indirect effects model. ***$p < 0.001$.

predictive path from social support to hope added. The final model is presented in **Figure 1**.

RESULTS

Characteristics of Participants

Sample characteristics data from 344 front-line medical workers were included in the analysis. The mean age was 34.05 years (SD = 7.25, range 20–57), 65.4% of the participants were females, 34.6% were males, average age were 34.05 years (*SD* = 7.25; min 20 years old—max 57 years old). Of the 344 participants included in this study, 40.1% were medical doctors and 59.9% were nurses.

Descriptive Statistics and Correlations

As shown in **Table 1**, gratitude was significantly and positively associated with social support and hope, negatively associated with depression; social support was significantly and positively associated with hope, negatively associated with depression; hope was significantly and negatively associated with depression. In addition, the results showed that the prevalence of mild depressive disorder was 40.12% and the prevalence of major depressive disorder was 9.59% among front-line medical staff during the pandemic of COVID-19.

Structural Equation Model Analyses

First, the measurement model was tested. It consisted of two latent variables: social support and hope. The social support latent variable has three subscales: family support, friends support, and other support. The hope latent variable has two subscales: agency thinking and pathways thinking. The measurement model fit was acceptable: χ^2/df = 2.885, CFI = 0.951, TLI = 0.976, RMSEA (90% CI) = 0.035(0.011–0.059).

Prior to testing the mediating effect, we examined the direct effect of gratitude on depression. The direct effects model demonstrated a good fit: [χ^2/df = 2.521, CFI = 0.948, TLI = 0.972, RMSEA (90%CI) = 0.052 (0.033–0.071)]. The results of the path analysis indicated that the path coefficient of gratitude direct effect on depression was $\beta = 0.372$ ($p < 0.001$).

In order to further probe into the predictive mechanism of gratitude on depression, in this study, social support and hope were simultaneously included as mediating variables in the direct effect model based on a direct model. The fit index of the model was considered ideal [χ^2/df = 3.985, CFI = 0.927, TLI = 0.951, RMSEA (90% CI) = 0.067 (0.060–0.075)]. The results of the model are shown in **Figure 1**. Analysis on the various paths in the model found that gratitude was negative predictors of depression through the mediating variables of social support and hope [$\beta_{gratitude-socialsupport-depression} = -0.096$, 95%CI (−0.129 to −0.064); $\beta_{gratitude-hope-depression} = -0.034$, 95%CI(−0.055 to −0.013)], as well as via an indirect path from social support to hope [$\beta_{gratitude-socialsupport-hope-depression} = -0.089$, 95%CI (−0.108 to −0.070)].

DISCUSSION

This study found that the depression was common among front-line medical staffs during the pandemic of COVID-19. Medical staffs have to identify the people infected with the disease,

TABLE 1 | Descriptive statistics and correlations for key variables (N = 344).

Variables	*M*	*SD*	Gratitude	Social support	Hope	Depression
Gratitude	27.19	6.43	1			
Social support	63.34	15.07	0.63***	1		
Hope	35.55	8.78	0.56***	0.73***	1	
Depression	14.87	8.97	−0.31***	−0.31***	−0.36***	1

***$p < 0.001$.

respond to their treatment needs, carry out the severe and difficult treatment processes in hospitalized patients, face the psychological breakdown caused by each patient passed away, and also face the risk of developing the disease at any time (Seçer et al., 2020). These factors will lead to an increased risk of depression among medical staff.

However, this study found that gratitude can reduce the depression of medical staff, which is consistent with previous studies (McCullough et al., 2002; Lin, 2015). From the perspective of broaden-and-build theory of positive emotions, gratitude, as a typical positive emotion, helps individuals to look at others and the world from a more positive perspective, thus reducing individual depression (Fredrickson, 2001). Through further research on the mechanism of gratitude affecting depression, it is found that social support and hope play an intermediary role in the influence of gratitude on depression.

This study found that gratitude can reduce depression by promoting social support. The promotion of gratitude to social support is consistent with previous studies (Wang et al., 2018). Gratitude may lead to the development of more supportive environments, represented in conscious awareness as perceived social support (Wood et al., 2008b). Additionally, gratitude leads to characteristic attributions regarding social situations, with grateful people interpreting the help they receive as more valuable, more costly, and seeing their benefactors' intentions as more altruistic (Wood et al., 2008a; Algoe et al., 2013). As gratitude is involved in both encouraging actual supportive behaviors and in appraising situations positively, gratitude seems particularly likely to lead to perceived social support (Wood et al., 2008a; Kong et al., 2015).

By analyzing the influence of gratitude on depression path through hope, we can find that gratitude may lower the occurrence of depression by improving the hope of medical staff. From the relationship between gratitude and hope, gratitude is a positive evaluation of what has happened, while hope is a positive expectation of what has not happened (Scioli et al., 2011). People who are grateful in their lives mean that they have a more positive evaluation of their past, and these people are often more able to look at the future positively and have a higher sense of hope (McCullough et al., 2002). Previous research has also found that being grateful to people who helped them in the past can help individuals cope with future difficulties and challenges in a more positive attitude and make them hopeful about the future (Witvliet et al., 2019). During the pandemic, the hope level of medical staff is particularly important for depression. The pandemic may lead to the breakdown of the medical staff's original cognitive beliefs about the world, lead to the loss of the medical staff's sense of control over themselves, others or the world, and even lead to the loss of hope for the future (Glass et al., 2009). The hope aroused by gratitude can make the medical staff who affected by the pandemic distract their attention from the clues such as negative news reports related to the pandemic, and urge individuals to pay attention to more positive information. In addition, hope can make the medical staff cope with a series of frustration experiences better during the pandemic, help them discover the positive connotation behind the disaster, and promote them to fully explore their own potential to deal with difficulties, and finally play a role in reducing depression (Snyder, 2002; Hassija et al., 2012; Kaleta and Justyna, 2020).

This study also found that gratitude can reduce depression through the chain mediation of social support and hope. During the pandemic period, the sense of belonging of medical staff with more social support will be better satisfied, and their goal-oriented behavior will be fully stimulated, which will help to enhance the hope of medical staff for future life (Lee et al., 2001).

Implications for the Clinical Practice

This study suggests that psychological intervention workers should not only pay attention to alleviating the negative psychological problems of medical staff, but also pay attention to the positive psychological growth of medical staff. Practices such as gratitude writing and gratitude visit can be used to promote gratitude and to guide medical staff to the people and things for which they are grateful (Seligman et al., 2005). It can also guide medical staff to further transform gratitude and sufficient social support into psychological resources facing the future, so that medical staff can actively cope with the difficulties during the pandemic through the hope for the future.

Limitations

However, there are some limitations in this study. First of all, this study focuses on the medical staff aiding Wuhan who are affected by the pandemic situation, and these medical staff have different degrees of trauma exposure in the pandemic situation. The study does not adequately control for other factors that may influence depression, such as whether the medical staff was in a satisfying relationship. Second, cross-sectional data are used in this study, which makes it difficult to explain the causal relationship between variables. Previous studies, for example, have suggested that closer social connections may help people develop gratitude (Alfieri et al., 2018). Future studies should investigate further from the perspective of tracking. Finally, according to this study, it is found that after adding social support and hope, the direct prediction effect of gratitude on depression in the model is

still significant, which indicates that there may be other factors that play a role in the influence of gratitude on depression, and future research can further examine the mechanism from other perspectives.

CONCLUSION

The study findings indicate that gratitude as a positive emotion can reduce depression in medical staff by promoting social support and hope, respectively. Gratitude also reduces depression in health care workers through a chain mediating effect of social support and hope. Overall, gratitude can directly foster social support and hope, and to protect people from stress and depression, which has implications for clinical interventions among front-line medical staff during the pandemic of COVID-19.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material. Further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of Northwest Minzu University, Lanzhou, China. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LF developed the study design, participated in and supervised data collection, performed the statistical analysis, and drafted the manuscript. RY conceived the study and revised the manuscript critically for important intellectual content. Both authors gave their final approval of the current version of the manuscript.

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Psychosocial Framework of Resilience: Navigating Needs and Adversities During the Pandemic, A Qualitative Exploration in the Indian Frontline Physicians

Debanjan Banerjee[1], T. S. Sathyanarayana Rao[2], Roy Abraham Kallivayalil[3] and Afzal Javed[4,5]**

[1] Department of Psychiatry, National Institute of Mental Health and Neurosciences (NIMHANS), Bengaluru, India, [2] Department of Psychiatry, JSS Medical College and Hospital, JSS Academy of Higher Education and Research, Mysuru, India, [3] Department of Psychiatry, Pushpagiri Institute of Medical Sciences and Research Centre, Thiruvalla, India, [4] Pakistan Psychiatric Research Centre, Fountain House Lahore, Islamabad, Pakistan, [5] President, World Psychiatric Association (WPA), Geneva, Switzerland

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***Correspondence:**
Debanjan Banerjee
dr.Djan88@gmail.com
Afzal Javed
afzalj@gmail.com

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Introduction: Frontline healthcare workers (HCW) have faced significant plight during the ongoing Coronavirus disease 2019 (COVID-19) pandemic. Studies have shown their vulnerabilities to depression, anxiety disorders, post-traumatic stress, and insomnia. In a developing country like India, with a rising caseload, resource limitations, and stigma, the adversities faced by the physicians are more significant. We attempted to hear their "voices" to understand their adversities and conceptualize their resilience framework.

Methods: A qualitative approach was used with a constructivist paradigm. After an initial pilot, a socio-demographically heterogeneous population of 172 physicians working in COVID-designated centers were purposively sampled from all over India. Following in-depth virtual interviews using a pre-formed semi-structured guide, the data was transcribed and translated verbatim. The interview was focused on their challenges, needs, and processes of coping and support. Charmaz's grounded theory was used for analysis supplemented by NVivo 10 software.

Results: Fear of infection, uncertainty, stigma, guilt, and social isolation emerged as the main challenges. Simultaneously, their "unmet needs" were flexible work policies, administrative measures for better medical protection, the sensitivity of media toward the image of HCW, effective risk communication for their health, and finally, social inclusion. Their resilience "framework" emerged as a process while navigating these adversities and consisted of three facets: forming a "resilient identity," managing the resilience, and working through the socio-occupational distress. The role of mental well-being, social network, peer support, problem negotiation, and self-care emerged as the key coping strategies.

Conclusion: The study findings support the global call for better psychosocial health and quality of life of the frontline HCWs. Their "unheard voices" explored in the study can anchor subsequent resilience-enhancing interventions and policies. Guidelines focusing on the psychological wellbeing of frontline HCWs need to be grounded in their unmet needs and lived experiences.

Keywords: healthcare workers, physicians, COVID-19, resilience, psychosocial, challenges, frontline workers

INTRODUCTION

The unprecedented global crisis caused by the Coronavirus disease 2019 (COVID-19) pandemic has disproportionality affected many sections of the society. For obvious reasons, health care workers (HCW), especially those working on the frontline, are uniquely vulnerable to both the physiological and psychological offshoots of the outbreak (Chew et al., 2020; Greenberg et al., 2020; Vizheh et al., 2020). Even in the earlier Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS), and recently the Zika and Ebola outbreaks, the HCWs have faced overwhelming difficulties, chronic stress, high risk of infection and uncertainty, impaired quality of life and disturbed interpersonal relationships (Paladino et al., 2017; Simas et al., 2020; Xiao et al., 2020). Since the declaration of COVID-19 as a pandemic, multiple quantitative studies from various countries have explored the plight of the frontline physicians and reported increased rates of depression, anxiety, sleep disturbances, post-traumatic stress, and adjustment problems (Que et al., 2020; Spoorthy et al., 2020). With understaffing, rising caseload, and mental health-related stigma, the situation is even direr in a low and middle-income country (LMIC) like India, where the physician: patient ratio is 1:1,456 against the World Health Organization (WHO) recommendation of 1:1,000 (Paul and Bhatia, 2016). Considering the socio-cultural diversities and varied response to stressful situations, it is vital to understand the "unheard voices" of those fighting the pandemic at the upfront and qualitative approaches are better in that regard. Especially while navigating this adversity, it is important to appreciate their "processes of resilience" and strategies to improvise. According to Manning (2013), individuals who continue to manage hardships and flourish in personal and social lives are considered to be resilient; however, this concept of resilience has been highly contextualized based on the research settings and populations in whom it has been studied (Fletcher and Sarkar, 2013). Psychological resilience is the ability to emotionally cope with a crisis to return to the pre-critical state. It is said to exist when an individual uses "mental processes and behaviors in promoting personal assets and protecting self from the potential negative effects of stressors." (De Terte and Stephens, 2014). The other way of looking at resilience is as a "psychological capital" that helps one stride through stressors and losses by the means of humor and hope (Pedro-Carroll and Jones, 2005). Emmy Werner, one of the first researchers who used the term resilience in 1970s after studying children in Hawaii, highlighted the need to understand resilience as a "fluid process" rather than a dichotomous construct that is built through constant interaction of an individual with his/her stressors and eventually helps in tiding over the adversity (Werner, 1971). Resilience research during biological disasters, maltreatment, abuse, violence, catastrophic life events, and poverty has focused on understanding the "processes" of resilience, so that it can be further enhanced through interventions (Grotberg, 1997; Werner, 2005). As resilience is considered as a dynamic interaction between individuals and the ongoing environment (Fletcher and Sarkar, 2013), we planned to explore the "lived experiences" of the frontline physicians, irrespective of their specialties, in terms of their challenges, unmet needs and further construct a "conceptual framework" of their psychological resilience during the ongoing crisis. Though HCW include many more specialties, it will be used interchangeably with physicians/doctors for the purpose of this study.

METHODOLOGY

Design and Sample

We adopted a qualitative design for the study with a social constructivist paradigm, especially as the objective was to gather "rich data" from the participants in terms of their lived experiences and explore the processes of their resilience. As opposed to the positivist approach in quantitative studies, social constructivism views knowledge to be constructed through constant interaction with others as human development is socially based (McKinley, 2015). In that way, social "realities" can be multiple based on the context, communication and interpretation all of which form the approach in qualitative research (which is based on social constructivism) (Walker, 2015). Qualitative methods have been shown to provide a substantial contribution to understanding the concept of resilience (Ungar, 2003). This is usually achieved through exploring lived experiences, phenomenological interpretation, understanding "minority voices," constructing meaning of the "undefined" and member-checking of the results to establish trustworthiness (Ungar, 2003). We conceptualized resilience as a dynamic process that is difficult to be scaled or quantified and hence the approach to explore it needs to be "grounded" within the experiences of the population who use their resilience to navigate through the adverse situations. After being approved by the JSS-AHER Institutional Ethics Board, a semi-structured interview guide was designed based on detailed discussion among the researchers, existing literature related to the potential challenges faced by the frontline HCW, and clinical experience of the researchers (**Box 1**). It consisted of open-ended questions related to the experiences of the physicians while working in COVID-designated hospitals (as decided by the Government

BOX 1 | Semi-structured interview guide used for the study.
Difficulties during the pandemic:

- How have the COVID-19 times been different for you (personally & professionally)?
- In what ways has the pandemic affected you and your loved ones?
- How do you feel about the ways you have been affected during this outbreak?
- What were the challenges that you faced as a physician during these times?
- How did you feel when you faced these challenges?
- How has the COVID-related lockdown impacted your clinical work, self-care and care for your family?
- What are the various factors that have led to these effects (that you mentioned above)?

Needs during the pandemic:

- How do you feel things could have been different during the outbreak (personal & professional font)?
- Based on the challenges mentioned above, what were your expectations from individuals/society/government?
- How did you feel about these expectations?
- What do you think your fellow healthcare workers felt during similar situations?
- How were those expectations met/not met? How did you feel about the same?

Coping during the pandemic:

- What were the positive things for you during the COVID-19 outbreak?
- How did these 'positive aspects' help you?
- How do you think your fellow healthcare workers fare during the pandemic? What factors may have helped them?
- Regarding the 'challenges' that you mentioned earlier, how did you deal with them?
- If you have overcome all/some of them, how did you do so?
- How has the pandemic changed you (as a healthcare worker and individual)? How do you feel about it?
- What would you suggest to others in similar situations of crisis?

of India) (Government of India, 2020), the adversities that they have faced, their perceived needs while working, and how they attempted to overcome these hardships, including their sources of support, sense of control and narratives of the "process" of coping. The guide was supplemented by open-ended probes, prompts, and regular memo-writing to maintain the data trail. Only the salient questions have been mentioned in **Box 1** for the sake of clarity. We theorized resilience as a flexible construct that lies on a dynamic continuum with inter-relationships between socio-cultural development and personal capacity building while exposed to stressful conditions, which can be altered and enhanced through various processes. The study used a theoretical and purposive sampling technique (Corbin and Strauss, 1990). The contact details were obtained through professional networks and directories of the national medical associations (Indian Psychiatric Society, Indian Medical Association), and snowballing was used to maximize sampling. We selected physicians of any specialty who were consistently working in a COVID-designated hospital (dealing with COVID-positive inpatients and outpatients) for at least 2 weeks. The time limit was arbitrary to exclude HCW, who are temporarily posted in COVID-wards on an *ad hoc* basis. Those who had been diagnosed with COVID-19 anytime in the last 6 months were excluded, which would alter their perceptions differently. All physicians were assessed by two independent psychiatrists (with a clinical consensus) before the interview to rule out any diagnosable mental health condition, in which case they would be excluded from the study. This was done as psychopathology could have been a potential confounding factor biasing the content of interviews, especially when it was related to the processes of coping during a stressful situation. Besides, a long, unbiased in-depth interview would not have been pragmatically and ethically possible with them. International Classification of Diseases (ICD)-10 was used for clinical diagnosis. A total of 28 participants were excluded in this way. Their symptoms may have been related to the professional stressors of the pandemic, however, the details of their diagnoses are not mentioned as they do not fall within the scope of this study. Irrespective of the participation status, they were provided required treatment by the psychiatrists involved.

Participants were sought based on varied ages, gender, all areas of India, practice settings, specialties, and socio-economic backgrounds. The contacts were initially mailed regarding the purpose, objectives, and nature of the study. Participants provided explicit informed consent, with whom virtual (Google Meet/Zoom/Skype) one-to-one detailed interviews were conducted over 1–2 sessions based on mutual convenience. The average session lasted 112 + −9.5 min. The open-ended questions of the interview guide were supplemented by various probing and supplementary queries to further obtain "rich" information, that forms the essence of qualitative research. However, the need and extent of probing varied between participants and were also based on the pragmatic feasibility of a virtual interview platform. All sessions were recorded with consent and conducted by the first three authors in English and Hindi. The initial pilot was done on 10 physicians, subsequent to which the interview guide was modified accordingly. The study was conducted between April-August 2020 and continued till the thematic saturation of data was obtained. To maintain anonymity and confidentiality, data sets were identified with a serial number/code and no names/identifiers were used. Furthermore, access to the participants' interview recordings was strictly limited to the researchers. The participants were offered if they wanted to review the recordings or wished certain parts to be eliminated.

Analysis

Charmaz's grounded theory approach was used to analyze the data (Charmaz, 2006). Initially, all the interviews were transcribed and translated verbatim (with cross-translation) to ensure integrity. Subsequently, a frame-to-frame analysis was performed to obtain common contents or "codes," which was the process of initial coding. Subsequently, focused coding and axial coding were performed to coalesce and condense codes into relevant themes and form a meaningful hierarchical structure between the resultant categories, themes, and codes, respectively. To enhance the level of clarity, causal references were looked for in the data and organized into a structure/process of relationships, which was important for exploring resilience. All

steps of coding were done independently by the first two authors, who were certified in qualitative research. Through analysis, a constant comparison was made between the obtained themes and the actual "excerpts" back-and-forth to keep the results "grounded" in the data, along with syntheses of the themes based on rigorous discussion between the researchers. Though most of the coding was done manually as immersion into "rich data" is necessary for sound qualitative research, NVivo 10 software was used for assisting and organizing the analysis[1].

The conceptual process of resilience was focused on during analysis. Thematic saturation was obtained with 162 participants, but 10 more were interviewed for super-saturation. Triangulation and respondent validation were further used to ensure study rigor (Krefting, 1991). The latter involved presenting the initial results to 60 participants from different ages, areas, and settings to discuss whether they truly "reflected" their perceptions and processes of coping during the crisis. Based on their subsequent inputs, further interviews were conducted, and interpretations were made accordingly. The entire analysis took 3 months to be complete.

RESULTS

The findings suggest how the physicians all over India working on the frontline faced the challenges and adversities during their service, their unmet needs and the "conceptual process" of their psychological resilience. Though we tried to keep the sampling as heterogeneous as possible, the participants were mostly married males practicing in Government set-ups of urban areas. The zonal representation in the sample was fairly equal, with more general physicians in the sample. Most physicians were young, in the age range of 20–30 years. The mean age and experience of the sample were 29.2 + −3.8 years and 16.7 + −4.2 years, respectively. The socio-demographic details of the participants are highlighted in **Table 1**.

TABLE 1 | Socio-demographics of the participant physicians.

Attribute	Category	No. (*N* = 172)
Age (years)	20–30	42
	30–40	83
	40–50	29
	>50	18
Gender	Male	110
	Female	62
Marital status	Single	62
	Married	95
	Divorced/separated	15
Region (India)	North	32
	South	68
	East	30
	West	32
	Central	20
Specialty	General physicians	74
	General Medicine/Pulmonologists	52
	Intensive care specialists	25
	Other specialties	21
Experience (years)	0–5	25
	5–10	34
	10–20	92
	>20	21
Area of practice	Urban	98
	Semi-urban	53
	Rural	21
Set-up of practice	Government set-up	110
	Private organizations	47
	Private practice	15

Besides the challenges faced and the perceived needs, the results also reflect how the process of facing these hardships and the vulnerable state had helped their coping and resilience evolve through time. There were three facets to this:

- The resilient "identity or self" that was formed harnessing social support, rooted in morality, gratitude, and a sense of purpose (duties of a physician) that provided hope.
- The resilience "management" which occurred through regular dialogue with self and stress-management strategies that helped in problem-solving and negotiation with adversities. The sense of "togetherness" in the "physician community" enabled collectivism, which supplemented by their past training and stressful life-experiences helped them build resilience. Finally, the assumption of a "vulnerable or sick role" throughout the chronic stress of their challenges helped decrease expectations, promoted self-care, and reduced self-stigma.
- Working through the "distress" was facilitated by self-commitment and care (adequate sleep, diet, hobbies, small celebrations, festivities, etc.) that boosted self-confidence and positive lifestyle changes. They also drew their strength from their relationships, which was complemented by peer support, which proved valuable for their understanding, empathy, and validation. Telephonic sessions also helped them "work through" the adversities, and mental health was considered to be an important component of well-being. Finally, the participants agreed that facing the difficulties with a balanced and pragmatic approach was the only way to build resilience, as resilience and stress were bi-directional.

The above-mentioned processes together formed the "conceptual framework" of the psychosocial resilience developed by our participant physicians while facing their challenges and adversities (**Figure 1**). This was grounded in their verbatim data obtained during the in-depth interviews.

Table 2 summarizes the key categories and themes, supported by the verbal excerpts from the participants. As the sample was large, we present only a few of the relevant excerpts in the results. The detailed participant-responses will be made available on reasonable request directed to the authors. Though there were no marked differences in the themes based on the gender, lady HCWs reported more challenges in work-life balance ("work from home" vs. "work for home"), especially those who were mothers. A greater proportion of them reported guilt of spreading the infection and social stigma compared to their male

[1]www.qsrinternational.com

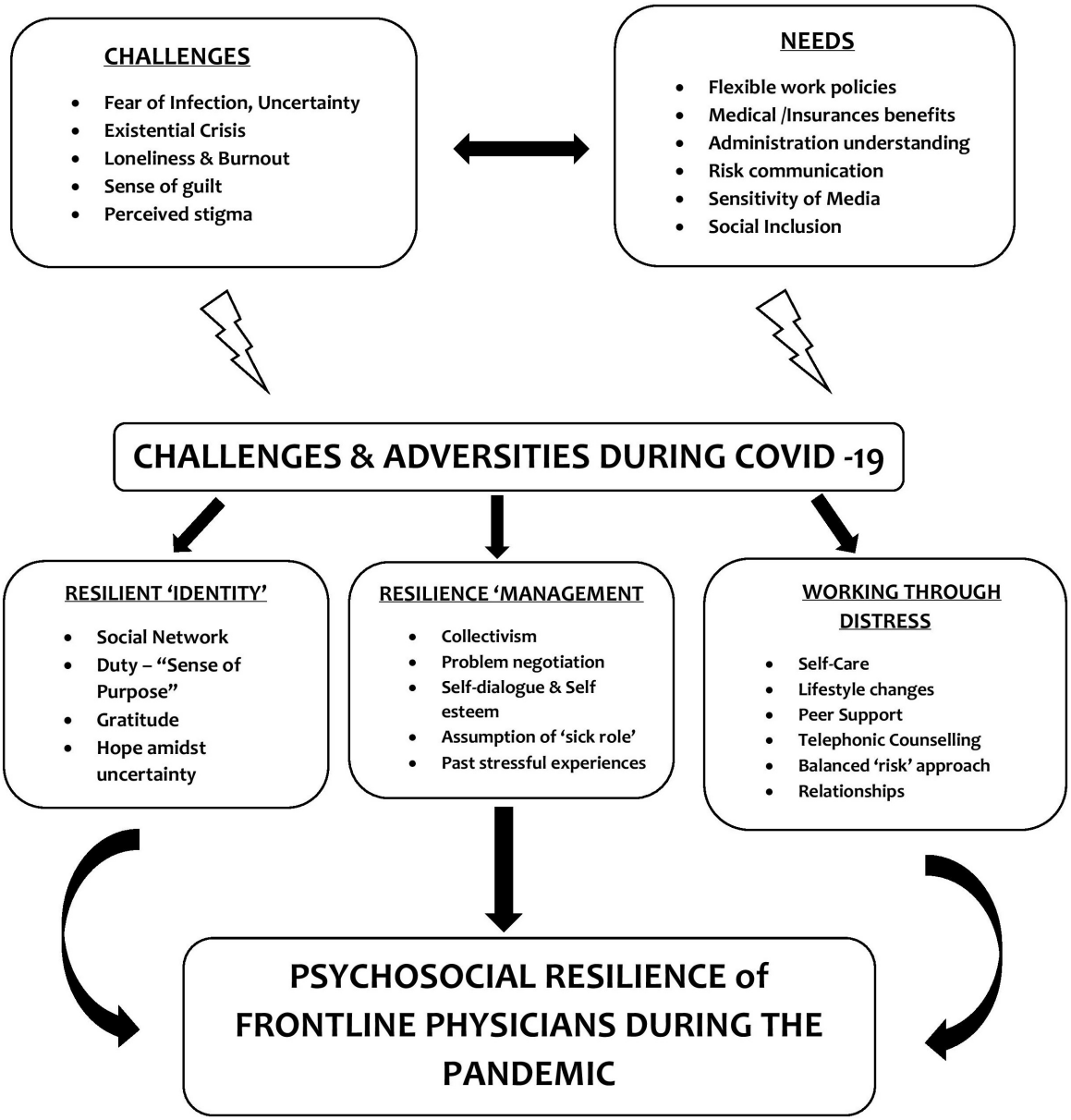

FIGURE 1 | Psychosocial Resilience Framework of the Frontline Physicians during the COVID-19 pandemic as they navigate their needs and adversities: Through the processes of developing a resilient "identity," managing the resilience resources and strategies of working through the "distress."

counterparts. While exploring resilience, we did not find any difference between the male and female HCWs.

DISCUSSION

Challenges Faced by the Physicians

Our study identified the various key factors involved in building the process of resilience for the physicians working on the frontline. One of the prime challenges was perceived stigma and avoidance, which have been observed in healthcare since the beginning of the pandemic. Bagcchi (2020) mentioned about the condemning of more than 200 incidents of COVID-19 related attacks on health care workers by 13 medical and humanitarian organizations. Globally, the frontline HCWs have faced *"social ostracism,"* othering, discrimination, restrictions to public resources, and eviction from their apartments (Galbraith et al., 2020). Public fear and avoidance of them have been highlighted as an under-recognized form of stigmatization (Taylor et al., 2020). Media reports in India have occasionally portrayed doctors as "carriers of infections" and hence feared in the community (Bloomberg Quint, 2020). Since the beginning of the pandemic, xenophobic sentiments, and social prejudice were directed toward certain populations, especially the frontline

TABLE 2 | Categories, Themes of analysis and supporting verbal excerpts from the participants.

Categories	Themes (frequency)	Verbal Excerpts
Challenges	• Fear of infection and uncertainty (80%) • Existential crisis (65%) • Loneliness and burnout (69%) • Sense of Guilt (53%) • Perceived stigma (71%)	• *"Each day is difficult. It's like living with a constant sense of apprehension and guilt of infecting my family."* • *"I haven't met my parents for months now. I stay separate to keep them safe. I have lost my colleague. Don't know if I will lose them too…"* • *"People have started looking at me with "disgust"! It feels as if a doctor is always a carrier unless proven otherwise…"*
Unmet Needs	• Flexible work policies (88%) • Medical/Insurance benefits (70%) • Administrative understanding (60%) • Effective risk communication (43%) • Sensitivity of media (82%) • Social inclusion (90%)	• *"We are already understaffed. I haven't got a single-day leave in the last 6 months. it can't go on like this…"* • *"The wards are not sanitized regularly. If the authority doesn't organize, how will be managed such a caseload!"* • *"Doctors are not immune. We work most closely with COVID patients. The degree of our risk estimates and shift rotations are mostly chaotic… that adds to our stress…"* • *"All that we need in such difficult times is some empathy. Many of my colleagues are being evicted from their apartments or looked down upon…"* • *"Doctors are being portrayed in a negative shade. this needs to stop! The popular media has a huge role to play in improving our status…"*
Processes of Resilience		
Resilient Identity	• Social network (55%) • Duty: "Sense of purpose" (67%) • Gratitude (42%) • Hope amidst uncertainty (49%)	• *"I am really thankful to my friends and family, who helped me move on, even from miles away…"* • *"I have seen the sufferings, deaths* and *grief myself, it makes me feel I can make a difference, save lives…"* • *"My duty and oath as a physician are my strengths, my hope…"*
Resilience management	• Collectivism (39%) • Problem negotiation (73%) • Dialogue with self and self-esteem (59%) • Assumption of "sick role" (52%) • Past stressful experiences (66%)	• *"I kept writing letters to myself…that was my stress-buster."* • *"Now, I realize the importance of ICU duties and prolonged shifts. The training helps me gear up so much now…"* • *"There are multiple things at stake. I try my best to organize and prioritize at the end of the day… it helps me cope…"* • *"While working in COVID-wards, we have to consider ourselves "vulnerable," "potentially" sick: this stops too many expectations."* • *"I just keep telling myself, it's a susceptible period, not to be too hard on myself…"*
Working through distress	• Self-care (73%) • Lifestyle changes (40%) • Peer support (84%) • Telephonic counseling (34%) • Balanced "risk" approach (47%) • Relationships (72%)	• *"Indulging in my hobbies and maintaining a schedule has helped me de-stress…"* • *"I felt my colleagues and co-workers understand my status best. I felt validated…"* • *"Even weekly discussions with the counselor was fruitful. I felt there was an "audience" to my voice."* • *"Risk was inevitable since the pandemic started. You can't avoid it, just try ways to minimize it…"* • *"You don't cope till you face the risk. Face it in a pragmatic way that helps in the face of such distress…"*

workers. These have been compounded by misinformation related to the spread of infection, suggested remedies, and fear of "accessing healthcare facilities." (Bhattacharya et al., 2020; Menon et al., 2020). With marked cultural diversities, pre-existing mental healthcare stigma, and varied societal beliefs, the perceptions toward HCW in India have been quite mixed. Such societal attitudes generate self-stigma in physicians, according to the Health-Stigma-Discrimination model, which facilitates internal hate, minimizes interactions, and causes social exclusion, further compounding isolation and burnout (Stangl et al., 2019). Guilt about transferring the infection to their loved ones, physical separation, and existential questions about the future of their families emerged as important themes in our study. This emotional insecurity also stemmed from a lack of perceived physical safety, as lack of adequate essential medical protective devices (PPE) has been reported as a consistent concern in the earlier studies from the United States (U.S.), China, and Saudi Arabia (Almaghrabi et al., 2020; Liu et al., 2020; Santarone et al., 2020). The constant fear of getting infected, decreased testing rates, and lack of leaves enhance the uncertainty, which along with "a helpless witness of daily suffering" in patients, creates "vicarious trauma" for the HCWs that impairs coping and accentuates chronic, complex trauma. Resource constraints, stigma related to mental illness even among physicians, and rising COVID-caseload in recent months potentially add to the burden.

Needs

Based on the unprecedented global crisis created by the pandemic, the needs of the HCWs can be heterogeneous. Our participants welcomed the study as they felt that it provided an "audience" to their "unmet needs" and were quite expressive about the same during the interviews. A possible reason could be that the researchers were also physicians, which could have acted as a "peer support." Flexible working hours, insurance coverage, and adequate medical safety are concerns that have been resonated worldwide (Taylor et al., 2020; Vindrola-Padros et al., 2020), but assume renewed significance in developing countries. One of the first studies done on Indian physicians during Lockdown highlighted the need for administrative assurance, financial security, recognition and societal understanding as important factors for altruistic coping (Chatterjee et al., 2020). Recognition and support of staff in healthcare are vital factors for

confidence, motivation, sense of achievement, and occupational security (Abu Sultan et al., 2018). Interestingly, social inclusion, timely risk communication by the infection control committee to the HCWs, and the presence of "medical trust" in the system were the predominant needs reported in our study. With a widening treatment gap and lack of primary – tertiary collaboration, this can be a significant concern in India. The benefits of periodic mental health screenings, digital peer support groups, and counseling sessions have demonstrated benefits in other pandemic-struck countries like China and Italy (Di Tella et al., 2020; Liu et al., 2020). Our participant HCWs perceived that their "emotional needs" lacked ears and, with the added stigma, further isolated them from the mainstream. Such social exclusion has been shown to increase apprehension and uncertainty, which can potentially increase experiential avoidance, enhancing stress (Seçer et al., 2020). As pointed out by Banerjee et al. (2020) in the systematic and advocacy review of the Indian Psychiatric Society (IPS) related to COVID-19 and psychological well-being, the need for safeguarding physical, financial security and psychosocial healthcare of frontline physicians are supposed to serve as important parameters in the fight against the pandemic. Though the guidelines of the Ministry of Health and Family Welfare (MoHFw), Government of India (GOI) mention the "selfless service" and critical roles of frontline HCW including nurses in the community and call upon for national stigma-mitigating techniques, our study indicates that the practical implementation of such guidelines is still a way to go. The available guidelines for psychosocial wellbeing during emergencies focus more on categorical definitions of distress and fail to tap into the resilience of the frontline workers. A study by San Juan et al. (2020) contrasted guidelines with lived experiences of practicing HCWs in United Kingdom and reported that understaffing, mental exhaustion and busy schedules often prevented them from accessing the available interventions. Future research can focus on exploring the gaps in the current guidelines when compared to the unmet needs and perceptions of HCWs in India during the pandemic crisis.

Resilience as a Process

Most of our participants mentioned resilience as a continuum developed through experiencing and facing an unprecedented crisis, aided by social support and past encounters with stress. Traditionally, schools of thought have debated on the static versus dynamic views of resilience, which pave the way for resilience-building strategies and interventions (Werner, 2005; Fletcher and Sarkar, 2013). Our findings grounded in the experiences of our physicians support the "learned resilience" hypothesis (Ryff, 2014), conceptualizing the framework through a "resilience identity," managing the gradual development of resilience and working through the ongoing distress. Hence it is a process that can be intervened with therapeutic strategies, adaptive coping, resilience training, stress counseling, etc. It has also been related to secondary trauma faced by the HCWs, which can cause biopsychosocial impairment and decisional inefficacy in physicians during the pandemic (Vagni et al., 2020). Based on the conceptualization of resilience in our study as mentioned before, our results suggested that the consistent living through hardships and adversities of the COVID-19 crisis with responsible risk-taking helped pave the way for problem-solving, personal efficiency, and coping in the physicians.

An overarching theme in our study was a physician's duty and moral obligation to serve during crisis situation, which provided the physicians with a "moral sense of purpose" and formed the basis of a resilient self. HCWs derived hope and gratitude from the same with further help from their social connections. This engagement process has been theorized during COVID-19 to help combat loneliness and isolation, turning them into resilient and self-subserving "solitude" (Banerjee and Rai, 2020). Further, our participants also reported the timeliness of activating these social supports in order to prevent reaching the breaking point. Based on their prior experiences, reframing of hardships was a vital factor. Few studies of resilience and resources in HCWs done earlier have identified work as "personal gratification" and "doctor's duty as a resilience among challenges" in HCWs (Ardebili et al., 2020; Liu et al., 2020). The latter study though done on a much smaller sample, was one of the first to identify that a physician's "training, oaths, and values" were related to coping and resilience in such crisis situations. Social constructivism in qualitative research can have various approaches. Nyashanu et al. (2020) used interpretive phenomenological analysis (IPA) to study the lived experiences of 40 frontline HCWs in Midlands, United Kingdom. They worked mainly in the private care homes and domiciliary care agencies. Death of colleagues, fear of infecting others, unreliable testing and shortage of staff were reported as important concerns in the study. The participants felt that poor preparedness for the pandemic crisis had affected their coping adversely. Psychological preparedness as well as advance public health measures have been suggested as vital strategies to deal with the pandemic burden in a socio-culturally heterogenous and populous nation like India (Banerjee, 2020). The HCWs in this study also added to this by mentioning that public understanding and social support during the initial phase of the COVID-19 crisis had boosted the process of their resilience. A community-based psychosocial toolkit based on the Zika virus model that was proposed to deal with the pandemic burden in India also includes resilience building among frontline workers through sense of purpose, social support and social cohesion at all levels of healthcare (Banerjee and Nair, 2020).

The next attribute was managing the "*praxis of resilience*" through an enhanced sense of self-esteem and maintaining it through self-dialogue. Socio-cultural diversities existed in our sample interviewed from various parts of India, and the ways, as well as processes of coping varied but there, was a commonality in "problem negotiation" (confronting and reframing the problem areas). Based on Cognitive-Behavioral principles, this is considered as a healthy problem-solving approach that involves perceived self-efficacy (Brown et al., 2012). Further, many HCWs assumed a "sick role" considering themselves exposed to the infection, which helped them reduce personal expectations and perceived guilt. The sick role has shown to be beneficial during the chronic crisis as per sociological theories and help attributes the impaired performance and socio-occupational shortcomings of sick or vulnerable individuals to the ongoing adverse

situations, which creates a "shielding" from enhanced roles and responsibilities during a crisis situation (Shilling, 2002). Hope and adaptation to a different lifestyle were reported by more than half of our participants as coping mechanisms which they though would fetch them more experience during the post-pandemic aftermath. "New normalization" and using gained experiences to adapt to the pandemic stress have also been reported in a qualitative study from Iran where 97 HCWs including emergency services, physicians, nurses, pharmacists, laboratory personnel, radiology technicians, etc. reported change in personal lifestyle, new experiences in the pandemic era, negative emotions, learning to deal with them and finally need for mental health interventions as the major themes of their lived experiences while working during the outbreak (Ardebili et al., 2020).

Also, based on each of their training and experiences, they developed a "resilience model" consisting of mutual support among the peers, empathy, and positivism that generated hope in spite of adversities. Earlier studies on lived experiences during pandemic reported positivism and collectivism as powerful coping strategies that also help in the reduction of stigma. Xenophobia has been a growing concern during the pandemic, compounded by misinformation, which has been shown to increase fear of infection and can be potentially mitigated by collectivistic attitudes and personal growth (Ahuja et al., 2020). Xenophobic attitudes and social stigma was experienced by a greater proportion of lady HCWs in our study. This has been resonated earlier as well, where "amplification of social inequalities, paternalistic discourses and professional overshadowing of personal lives" were prominent among female NHS frontline health workers (Yarrow and Pagan, 2020).

Finally, our participants agreed on the "gray line" of calculated risk-taking as part of occupational hazards with the strategic precautions, which boosted medical and emotional security. Most of them admitted that when "escape from stress" is impossible, facing it helps in the process of coping, whereas avoidance makes it chronic. The ongoing adversities of working in a pandemic situation helped them sustain personally and professionally. They discussed retaining a positive image while facing vulnerabilities and stressors on a pre-planned support system, through digital connectedness with peer groups and enjoying their hobbies and small celebrations. Studies have shown that groups with similar occupations can emphasize better during the crisis, which was resonated by the strength derived by our physicians from peer-support. "The risk with reason" approach helped our participants "work through the distress" aided by hobbies, support, spirituality or positivism, and the HCWs were quite open to discussion of how to focus on diet, nutrition, sleep, and lifestyle through generic measures, aided in resilience. Positive risk-taking has been related to risk-perception during infectious disease outbreaks, which in turn influence psychological wellbeing. Studies from China and Italy have shown how health risk perception can be influenced by empathy, self-efficacy and positive imagination (Commodari et al., 2020; Ding et al., 2020). The HCWs participants in our study also mentioned that a "careful balance between risk adaptation and medical safety measures" helped them face the prolonged stress of work during the pandemic and they faced reduced personal susceptibility to the infection. Self-care and management have been considered as a dynamic interaction between an individual and his/her stressful circumstances that determine overall health and well-being. The well-known concept of micro-resilience is also related to self-care, self-esteem, and internal locus of control (Ryff, 2014). These factors can help in fostering resilience through the lifespan, which forms the "psychological capital" during a crisis. Our study also revealed that the simple measures of telephonic counseling provided validation and an "emotional audience," which went a long way for emotional support. This has been the basis for the telecare model in china for HCWs in hospitals of Hubei province, where the pandemic first appeared. In short, the overall process of resilience was highly contextualized and related to the socio-occupational environment, but irrespective of the personal strategies used, the results help in conceptualizing a common ground in the "resilience-framework" of physicians during the ongoing outbreak. Such focused social support and understanding of the distress faced by HCWs during crisis times can help reduce social stigma and improve social connections. This has been termed as an "epidemic of empathy" that has the potential to bring together science and humanism that might be beneficial even after cessation of the pandemic (Barello and Graffigna, 2020). As discussed before, empathy, optimism and self-efficacy can also improve personal health-risk perception, which is vital for psychological resilience during pandemics (Commodari et al., 2020).

The study has the usual limitations of qualitative work, including generalizability and subjectivity. Besides, we only included physicians in the sample, while HCW also consists of nurses, para-medical staff, and other allied professionals. However, the study sample was large and heterogenous in socio-demographics, from all parts of India. Also, the rich data of the lived experiences of the physicians and rigorous analysis are the added strengths of the study. Besides this, we had to exclude some participants as they were diagnosed to be psychiatrically ill by independent psychiatrists prior to the commencement of the study. Only clinical interview was used though diagnosis was established through a consensus. The authors agree that some of these mental health issues could have been contributed by the psychosocial stressors of working during COVID-19. However, the objective of the present study was to explore resilience framework and coping in HCWs and pre-existing psychopathology would have colored their subjective perceptions during the pandemic, which form the main data of this qualitative study.

CONCLUSION

The psychosocial well-being of the physicians strengthens the healthcare infrastructure, which is vital for any country. With growing caseload, increased work-burden, and resource constraints, the quality of life of HCW assumes exaggerated importance in developing countries like India. To the best of our knowledge, this is the first study from any LMIC to explore

the "voices" of those directly working with COVID-19 patients and conceptualize their processes of resilience. Santarone et al. (2020) highlighted the importance of incorporating the needs and perspectives of HCW into resilience-building strategies that can involve mental health screenings, peer support, sensitive workplace infrastructure, and social security. Stigma-mitigating strategies need to be a collective responsibility for all levels of stakeholders, including sensitive reporting by the media. Bhattacharya et al. (2020) while discussing the consequences of social stigma in India, mentions the "dual burden" of the pandemic and prejudice in HCWs, suggesting the need to amplify their voices for psychosocial management and administrative policymaking. The "resilience framework" derived in the study can be integrated into digital psychotherapeutic interventions involving cognitive-behavioral, interpersonal and humanistic principles. The post-pandemic aftermath is uncertain, and various public health agencies have globally called for the safety and resilience-building of the frontline HCW (Banerjee et al., 2020; Galbraith et al., 2020; Xiao et al., 2020). This study provides a small step toward that "call" and obviously warrants further systematic, population-based, and mixed-method research into the emotional and psychosocial well-being of the HCW, their mental health issues, hardships at work, and finally the ways of coping, which can shape tailored interventions and legislations. There is also an urgent need to tailor the existing guidelines for the psychosocial wellbeing of the frontline HCWs based on their unmet needs and lived experiences. This much-needed approach can potentially anchor the ongoing fight against the pandemic and help preparedness for such futuristic crises.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, on reasonable request.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the JSS University, Mysore, India. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

DB and AJ share the corresponding authorship. DB, TS, and AJ were responsible for the data collection and curation. DB and TS were involved in data analysis. DB and RK worte the first draft of the manuscript. All authors had conceptualized the study and design, had full access to the data and take responsibility for data integrity and analysis, responsible for the reviewing, editing, and final approval of the manuscript.

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REVIEW
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Harnessing the Neurobiology of Resilience to Protect the Mental Well-Being of Healthcare Workers During the COVID-19 Pandemic

*Ravi Philip Rajkumar**

Department of Psychiatry, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry, India

Healthcare workers are at a high risk of psychological morbidity in the face of the COVID-19 pandemic. However, there is significant variability in the impact of this crisis on individual healthcare workers, which can be best explained through an appreciation of the construct of resilience. Broadly speaking, resilience refers to the ability to successfully adapt to stressful or traumatic events, and thus plays a key role in determining mental health outcomes following exposure to such events. A proper understanding of resilience is vital in enabling a shift from a reactive to a proactive approach for protecting and promoting the mental well-being of healthcare workers. Research in the past decade has identified six areas that provide promising leads in understanding the biological basis of individual variations in resilience. These are: (1) the key role played by the monoamines noradrenaline and serotonin, (2) the centrality of the hypothalamic-pituitary-adrenal axis in influencing stress vulnerability and resilience, (3) the intimate links between the immune system and stress sensitivity, (4) the role of epigenetic modulation of gene expression in influencing the stress response, (5) the role played by certain neuropeptides as a natural "brake" mechanism in the face of stress, and (6) the neurobiological mechanisms by which environmental factors, such as exercise, diet, and social support, influence resilience to subsequent life events. Though much of this research is still in its early stages, it has already provided valuable information on which strategies – including dietary changes, lifestyle modification, environmental modification, psychosocial interventions, and even pharmacological treatments – may prove to be useful in fostering resilience in individuals and groups. This paper examines the above evidence more closely, with a specific focus on the challenges faced by healthcare workers during the COVID-19 pandemic, and provides suggestions regarding how it may be translated into real-world interventions, as well as how the more tentative hypotheses advanced in this field may be tested during this critical period.

Keywords: resilience, stress, neurobiology, neuroendocrinology, neuropeptides, cortisol, coronavirus disease 2019, epigenetics

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***Correspondence:**
Ravi Philip Rajkumar
ravi.psych@gmail.com

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INTRODUCTION

A Cautionary Tale

The COVID-19 pandemic has taken a significant toll on the psychological well-being of healthcare workers, and that this impact remains substantial even in those who are not directly involved in caring for patients with this disease (da Silva and Neto, 2020). Based on experience from earlier outbreaks of similar severity and smaller scope (Maunder et al., 2008; Lee et al., 2018), this phenomenon was predicted well in advance, and in many cases, plans and services were developed to minimize the traumatic impact of COVID-19 on healthcare workers as the pandemic began to evolve and take on a truly global scope. One of the earliest reports of such an attempt, published in February, came from the Second Xiangya Hospital of Central South University, China, which was at the center of the initial COVID-19 outbreak (Chen et al., 2020a). The importance of this report, despite its anecdotal nature, was that it highlighted the limitations of the "conventional" approach to such problems. At this hospital, which was handling a large number of COVID-19 cases, a three-pronged approach was devised by a team of experts, which consisted of (i) a psychological intervention team which provided online courses to address common mental health problems, (ii) a dedicated hotline, and (iii) group psychological activities to minimize stress. Such an approach was in line with recommendations from the existing literature. However, the majority of staff were unwilling to participate in these activities, and many of them refused assistance from the team despite showing obvious signs of distress.

Interviews with the staff revealed that this program did not address their real-world concerns, which included separation from their families, difficulties in handling the anxieties of patients, worries regarding shortages of food, protective equipment, and other essential supplies, and a lack of time for sleep or leisure. This feedback led to an overhaul of the entire program, which now included (i) ensuring the availability of food and essential supplies, (ii) training staff to handle patients' concerns, (iii) provision of a rest area and leisure activities, and (iv) periodic visits by a counselor; on the other hand, there was a reduced emphasis on the exclusively psychological or counseling-based interventions which formed part of the initial plan. This approach led to greater satisfaction and a reduction in perceived stress among nursing and other staff.

What can we learn from the initial failure and later success of such programs? At a surface level, they highlight the need to listen to healthcare workers' actual concerns when designing interventions to improve their psychological well-being. However, a deeper insight into such occurrences can be obtained by a careful study of contemporary research into resilience, the multiple and interconnected biological mechanisms that underlie it, and the way in which resilience can be fostered by methods such as exercise, socialization, and environmental modification. The purpose of this paper is to provide an overview of this research, with a particular focus on how it might apply to the psychological health of healthcare workers in the context of the COVID-19 pandemic, and outline suggestions for how this knowledge can be translated into effective strategies for the prevention and management of psychological distress in this population.

Reactive and Proactive Approaches to Psychological Health in Healthcare Workers During the COVID-19 Pandemic

In a meta-analytic review of 13 observational studies, Pappa et al. (2020) have estimated that 23.2% of healthcare workers experience significant symptoms of anxiety in the context of the COVID-19 pandemic; 22.8% report significant depressive symptoms; and 38.9% screen positive for insomnia. Similar results were obtained in a meta-analysis of eight studies dealing exclusively with frontline healthcare workers (da Silva and Neto, 2020). Many of these observational studies have concluded with recommendations for the monitoring and treatment of healthcare workers with such symptoms (Huang and Zhao, 2020; Zhang et al., 2020b); however, only one paper pointed out the potential benefits of a preventive approach (Li et al., 2020). While it is essential that healthcare workers with emergent symptoms of psychological distress are identified and treated early, there are advantages to supplementing this conventional model with an approach based on enhancing the abilities of asymptomatic healthcare workers to cope with stress – in other words, with a resilience-based approach. Such a proactive approach will continue to gain importance as the COVID-19 pandemic continues to evolve, and even after it begins to abate, as large numbers of healthcare workers will remain exposed to stress, socioeconomic difficulties and ethical challenges over a prolonged period of time (Vinkers et al., 2020). The advantages of a proactive approach informed by an understanding of resilience include not only the prevention and mitigation of psychological distress, but improved functioning and an enhanced capacity to handle challenging or unpredictable situations in patient care, particularly in the setting of a scarcity of resources (Rosen et al., 2020; Vinkers et al., 2020). In addition, if successful, such an approach would reduce the burden faced by conventional mental health care services, and permit them to provide optimal care to those healthcare workers with more severe symptoms and greater treatment needs (Freeman, 2020).

Understanding Resilience: Psychological and Neuroscience-Based Approaches

Resilience can be defined as "the ability to adapt successfully in the face of stress and adversity" (Wu et al., 2013). In other words, it refers to the capacity to maintain a normal or near-normal level of functioning, even when exposed to a stressful or traumatic event. It is a common-sense observation that, even after exposure to a traumatic event such as a natural or man-made disaster, not all individuals develop symptoms of psychological distress. Moreover, those who do so exhibit varying levels of such symptoms, with severe sequelae being the exception rather than the rule (Rutter, 2012). Resilience is best understood as a continuous, dynamic concept, and not an all-or-none phenomenon, which aims to capture inter-individual variations in biological, psychological, and behavioral responses and outcomes

following a stressful event (Zovkic et al., 2013). From a psychological point of view, resilience can be studied in terms of constructs such as self-efficacy, optimism, positive emotions, and cognitive appraisal (Feder et al., 2019) and operationalized in terms of absent or low levels of mental health problems and sustained normal functioning during times of adversity. Some researchers have identified two components to resilience – adversity and positive adaptation – but others have argued for more complex models, particularly on the basis of longitudinal studies (Cosco et al., 2017).

From a neuroscientific perspective, resilience can be defined and studied in terms of changes at the genetic, biochemical, cellular, anatomical, and physiological levels that correlate with responses to adversity, threat, or trauma (Cathomas et al., 2019; Feder et al., 2019; Gururajan et al., 2019). For example, candidate gene and genome-wide analyses have identified genetic factors that are associated with individual responses to stressful events (Stein et al., 2019; Notaras and van den Buuse, 2020); neurochemical studies have identified changes in specific neurotransmitters, such as monoamines and neuropeptides, which correlate with varying responses to stress (Averill et al., 2018); and neuroimaging studies have investigated structural and functional changes in particular brain regions that are related to stress vulnerability (Hanson et al., 2019). A useful model that bridges the conceptual gap between neuroscience and observed responses is the affiliative neuroscience approach outlined by Feldman (2018). From this perspective, which integrates biology and behavior, resilience is viewed in terms of three aspects: *plasticity*, which is the ability of living tissue – in this case, neural tissue – to adapt to changes; *sociality*, which refers to the protective and stress-buffering role of social behaviors and relationships, and *meaning*, which is specific to humans and involves finding significance and strength in the face of suffering and also covers such constructs as spirituality and altruism. This model will be used in this paper when outlining possible links between research findings and the actual needs and experiences of healthcare workers.

The Need for a Biologically Informed, Resilience-Based Approach to Mental Health, Particularly in Healthcare Workers

In recent times, a growing awareness of the limitations of contemporary models of mental health and illness has led some researchers to critically examine the value of a resilience-based approach to these subjects. Such an approach has already begun to yield fruit in the study of psychiatric disorders such as depression (Elisei et al., 2013; Richter-Levin and Xu, 2018) and post-traumatic stress disorder (PTSD; Yehuda et al., 2016; Olff et al., 2019; Rakesh et al., 2019). Similarly, researchers in the field of child development are beginning to unravel the way in which genes, brain regions, and specific neurotransmitters influence the response of a child's brain to maltreatment or neglect. This raises the encouraging possibility of using this knowledge to promote resilience in children who have experienced deprivation (Ioannidis et al., 2020).

Such work is of direct relevance to healthcare workers, particularly during the current pandemic. Due to the specific nature of their work and the multiple stressors it may entail, these personnel are at an elevated risk of adverse mental health outcomes, and have been identified as a population that would benefit from resilience-enhancing interventions well before the COVID-19 pandemic. Available evidence suggests that certain "resilience training" programs, based on the mindfulness or cognitive-behavioral models, may have a short-term beneficial effect on perceived stress and depressive symptoms; however, a Cochrane Database systematic review found that the effect sizes for these interventions were small, and the certainty that could be attributed to any positive results was low (Kunzler et al., 2020). Moreover, a neurobiological evaluation of one such "stress management training" program found that it did not significantly alter the cortisol response to stress, and even worsened it in some participants, suggesting that such interventions may fail to achieve optimal results because they do not lead to relevant changes at the cellular or neural level (Gloster et al., 2019). In the context of such results, there is a significant need for approaches that adapt the principles of the neurobiology of resilience to the healthcare context (Llinas et al., 2018), a need that takes on a particular urgency as the world prepares itself for a "second surge" of the COVID-19 pandemic (Benham et al., 2020).

The Focus of the Current Paper

Though hundreds of papers have been published in this field in recent years, for the sake of brevity and clarity, the current paper has chosen to focus on six specific areas. These six domains are:

- The contemporary understanding of monoamine transmitter systems, particularly those involving noradrenaline and serotonin, in modulating stress response and resilience.
- The central role of psychoneuroendocrine mechanisms, particularly those involving the hypothalamic-pituitary-adrenal axis (HPA), as a putative "final common pathway" mediating vulnerability and resilience to stress.
- The key links between the immune system and the stress response, in terms of both risk and resilience.
- The epigenetic regulation of key genes involved in the stress response, and the role of this process in mediating resilience.
- The functions of certain peptide transmitters, such as neuropeptide Y (NPY) and oxytocin, in moderating the effects of stress and acting as a natural "brake" mechanism in this context.
- The neurobiological mechanisms by which environmental factors, such as early life stress, exercise, and social support, influence resilience to subsequent life events.

Three factors influenced the decision to focus on these domains. First, they have been identified as foci of particular research interest and activity in recent reviews (Fleshner et al., 2011; Wu et al., 2013; Averill et al., 2018; Feder et al., 2019). Second, they can be easily related to the affiliative neuroscience framework outlined by Feldman (2018) in a more or less

hierarchical manner: the first two are more directly related to *plasticity*, while the last four provide a bridge from *plasticity* to *sociality* and *meaning*. Finally, and most importantly, they provide potential or actual targets for intervention that can be tested with relative ease in the current context. It is not the purpose of this article to provide a systematic review of work in this field, but rather to illustrate the potential value of this approach through certain key examples. A broad outline of these mechanisms and the interplay between them is provided in **Figure 1**.

KEY RESEARCH AREAS IN THE NEUROBIOLOGY OF RESILIENCE AND THEIR APPLICATION TO THE COVID-19 HEALTHCARE WORKER SCENARIO

Monoaminergic Modulation of Stress and Resilience

A consistent body of evidence supports the notion that monoamine transmitters are key modulators of human emotional and behavioral responses to stress. In the context of a prolonged traumatic situation such as the COVID-19 pandemic, the two transmitters of greatest potential significance are noradrenaline, which mediates the "flight or fight" response to stress, and serotonin, which is involved in risk appraisal and in the emotions of sadness and anxiety (Wang et al., 2020b). Variations in genes involved in regulating the function of these two transmitters, such as the catechol-O-methyltransferase (*COMT*) gene, the monoamine oxidase type A (*MAOA*) gene, the tryptophan hydroxylase type II gene (*TPH2*), and the serotonin transporter (*SLC6A4*), have been associated with significant variations in stress response and resilience in both human and animal subjects (Jabbi et al., 2007; Clukay et al., 2019; Gonzalez-Giraldo and Forero, 2020; Strekalova et al., 2020). Research in mice suggests that the noradrenergic system plays a particular role in influencing resilience to chronic stress (Isingrini et al., 2016), and that the activation of a specific serotonin receptor subtype ($5HT_4$) reduces both fear-like and depressive-like responses to chronic stress (Chen et al., 2020b). Drugs that putatively influence resilience *via* other receptors, such as ketamine, have also been shown to depend on intact monoamine systems for their effects in preventing stress-induced depression (Brachman et al., 2016; Bowman et al., 2020).

These effects are mediated both by the direct post-synaptic effects of these transmitters, and by their "cross-talk" with other pathways such as the midbrain dopaminergic pathway (Krystal and Neumeister, 2009), peptides such as NPY (Hokfelt et al., 2018; see section Neuropeptides), and, most significantly, the HPA "stress axis" (Ancelin et al., 2017; Prakash et al., 2020; see section The Hypothalamic-Pituitary-Adrenal Axis). Translational evidence has identified neural "final common pathways" for these effects. For example, the noradrenergic locus coeruleus (NOR-LC) system, connecting the brainstem with the amygdala, which modulates the formation and consolidation of memories related to stressful or traumatic events (Haubrich et al., 2020). Similarly, plasticity of midbrain serotonergic neurons has been associated with resilience to stress-induced depressive symptoms (Prakash et al., 2020).

At a higher level of analysis, genetic variations in serotonergic transmission have been associated with varying levels of psychological flexibility (Gloster et al., 2015), which is a key variable influencing coping strategies and stress resilience during the COVID-19 pandemic (Smith et al., 2020). Similarly, heart rate variability (HRV), a cardiac index influenced by noradrenergic transmission, is an important modulator of the neuroendocrine stress axis (Kemp and Quintana, 2013;

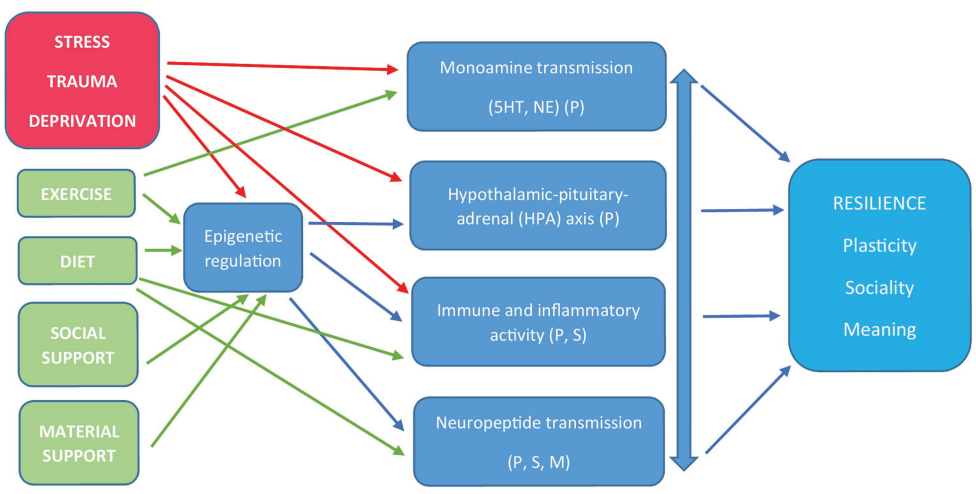

FIGURE 1 | An overview of biological mechanisms underlying stress susceptibility and resilience. Blue arrows indicate regulatory mechanisms and pathways. Red arrows indicate negative effects and green arrows indicate positive effects. Interrelations between the four common molecular mechanisms are reciprocal, as indicated by the double arrow. 5-HT, serotonin; NE, norepinephrine; HPA, hypothalamic-pituitary-adrenal; P, plasticity; S, sociality; M, meaning.

see section Epigenetic Regulation of the Stress Response) and is itself correlated with psychological flexibility. Direct evidence for a link between these parameters was observed in a study of patients with depression, in which the level of occupancy of norepinephrine transporters by the antidepressant venlafaxine was associated with both improved resilience and increased HRV (Davidson et al., 2005). Studies of both civilians and military personnel have found that elevated levels of norepinephrine are associated with an increase subsequent risk of PTSD, while lower levels predict resilience (Highland et al., 2015). Similarly, a study of nurses working in operating rooms found that elevations in peripheral levels of norepinephrine were significantly associated with the development of post-traumatic disorder (Ke et al., 2020), and that this alteration was also associated with immune dysregulation (see section Immune-Inflammatory Influences on Stress and Resilience).

Taken together, these results suggest that variations in monoaminergic functioning can potentially influence several downstream neuroendocrine, neuroimmune, and neurocognitive processes through alterations in *plasticity* (Levone et al., 2015), leading to variations in stress vulnerability and resilience. It is, therefore, possible that modulation of these systems may enhance resilience in healthcare workers, particularly those exposed to stressful or traumatic situations related to the pandemic. Some of these modulation strategies are discussed in subsequent sections, but others include:

- The prophylactic or early use of antidepressant medications targeting monoamine pathways, particularly in high-risk or frontline staff. Though this approach may not be effective in all cases, there is translational evidence that it may be useful in a subgroup of individuals (Davidson et al., 2005; Nieto-Gonzalez et al., 2015; Han et al., 2017). It is also of interest that some of these drugs have been shown to ameliorate the symptoms of COVID-19 infection, suggesting that they may be particularly useful in healthcare workers who develop COVID-19 (Lenze et al., 2020).
- The experimental use of $5HT_4$ receptor agonists in reducing anxiety and depressive symptoms in healthcare workers exposed to chronic stress (Chen et al., 2020b).
- The use of ketamine, already approved for the acute treatment of depression and suicidal behavior in humans, in subjects at high risk of pandemic-related stress (McGhee et al., 2008; Weinbroum, 2021); the efficacy of this drug appears to depend on intact monoamine pathways (Bowman et al., 2020).

The Hypothalamic-Pituitary-Adrenal Axis

A substantial body of research has identified the hypothalamic-pituitary adrenal axis as a biological "final common pathway" on which external stress, vulnerability factors, and resilience factors converge. Recent studies have refined the understanding of the complexities involved in HPA axis functioning and regulation (Frodl and O'Keane, 2013). Apart from the established links between HPA axis dysregulation and several common mental disorders (Zorn et al., 2017), recent research has outlined the role of this neuroendocrine pathway in phenomena such as burnout (Kakiashvili et al., 2013; Chow et al., 2018), maladaptive work-related attitudes and practices (Eddy et al., 2018), and responses to discrimination (Busse et al., 2017). These three facets are of particular importance to the situation of healthcare workers during the COVID-19 pandemic, in which chronic workplace stress, high demands and expectations, and stigma related to the risk of infection can all contribute to adverse mental health outcomes (da Silva and Neto, 2020; Dobson et al., 2020; Pappa et al., 2020; Sotgiu and Dobler, 2020; Taylor et al., 2020a). In general, increased workplace stress and a perceived lack of proportionate rewards lead to HPA axis overactivity (Eddy et al., 2018), but in the long run, prolonged stress leading to burnout results in relatively low cortisol levels, despite elevations in corticotrophin-releasing hormone (CRH). These endocrine changes lead to alterations in the methylation of key genes moderating stress response and resilience, such as the glucocorticoid receptor (*NR3C1*) and brain-derived neurotrophic factor (*BDNF*) genes, and to lower levels of BDNF which impair neural plasticity and correlate with the severity of burnout (Bakusic et al., 2017). Relative hypocortisolism is also seen in PTSD, while relative over-activation is seen in depression. Both these conditions are often observed in healthcare workers during the COVID-19 pandemic (Chew et al., 2020).

Recent neurobiological advances provide a number of promising leads for interventions that can positively modulate HPA axis functioning, thereby minimizing the risk of burnout as well as mental disorders in healthcare workers. For example, it has been shown that there is a close link between HRV, a measure of decreased parasympathetic and increased sympathetic nervous system functioning, and regulation of the HPA axis. Reduced HRV is associated with greater dysregulation, and is correlated with impairments in psychological flexibility, social cognition, and resilience to stress (Kemp and Quintana, 2013). Interventions that normalize HRV may lead to improved HPA axis functioning, and protect healthcare workers from a variety of adverse outcomes. A similar relationship has been identified between human circadian rhythms and the HPA axis response to stress; sleep deprivation and frequent changes in sleep-wake schedule can all contribute to dysfunction of this pathway, leading to reduced resilience (Kinlein and Karatsoreos, 2020). This aspect is of particular relevance to healthcare workers involved in frontline or intensive care duties during the COVID-19 pandemic. Finally, the downstream effects of HPA axis dysregulation appear to be related to reduced expression of glucocorticoid receptors (GR) in the hippocampus, a change that can potentially be reversed by pre-treatment with antidepressants in animal models of stress (Han et al., 2017). The latter finding underlines the close links between the HPA axis and monoamine transmission, as discussed in section Monoaminergic Modulation of Stress and Resilience.

Given these complexities, direct pharmacological modulation of the HPA axis may not always yield the expected results, though they may have a role in specific cases. For example, antagonism of CRF receptors would theoretically be expected to enhance resilience; however, CRF-1 antagonists have yielded disappointing results in human subjects to date (Spierling and Zorrilla, 2017). On the other hand, there is promising evidence from controlled

clinical trials that administration of low-dose hydrocortisone in the immediate aftermath of trauma could attenuate or even prevent PTSD in inpatients with physical illnesses, perhaps by correcting relative hypocortisolism (Astill Wright et al., 2019). This approach may be useful in healthcare workers who are themselves hospitalized for COVID-19.

In real-world settings, *these findings suggest several promising avenues for building resilience and countering the effects of stress on healthcare workers, through behavioral or pharmacological modulation of the several factors influencing HPA axis functioning.* These interventions can be seen as working chiefly at the level of *plasticity* in Feldman (2018) model Bakusic et al. (2017). Possibilities include:

- The use of techniques that correct reduced HRV, thereby enhancing resilience through HPA axis modulation. These include exercise (Kemp and Quintana, 2013), mindfulness-based interventions (Radmark et al., 2019), yoga-based techniques centered on breathing (Nivethitha et al., 2016), and guided relaxation (Lewis et al., 2015). There is already considerable evidence that such techniques produce significant changes in HPA axis functioning when implemented in workplace settings (Heckenberg et al., 2018).
- Organizational changes aimed at correcting environmental or workplace factors that can contribute to HPA axis dysregulation in the long run. These include due attention to shift work hours to minimize impacts on individual healthcare workers, and efforts to reduce the stigmatization or isolation of those who work with COVID-19 patients and are wrongly viewed as "dangerous" or "infectious" (Taylor et al., 2020a).
- Counseling or self-help techniques aimed, not at general stress reduction, but at correcting factors such as psychological inflexibility and overcommitment to work which are associated with HPA axis dysfunction (Eddy et al., 2018; Guevara and Murdock, 2020) as well as with adverse mental health outcomes in the context of COVID-19 (Landi et al., 2020; Smith et al., 2020). This would regulate this neuroendocrine pathway in a "top-down" manner.
- More speculatively, the use of low-dose steroids in healthcare workers exposed to severe trauma, as this approach has been shown to prevent the development of subsequent PTSD in both translational models and clinical settings (Zohar et al., 2011; Astill Wright et al., 2019).

Immune-Inflammatory Influences on Stress and Resilience

Over the past three decades, substantial evidence has accumulated on the close links between immune system functioning, responses to stress, and resilience (Breen et al., 2015; Dantzer et al., 2018; Gururajan et al., 2019). Changes in several inflammatory markers, such as elevations in C-reactive protein (CRP), lowered levels of the cytokines interferon-gamma (IFNγ) and tumor necrosis factor-alpha (TNFα), and elevated levels of the chemokines CCL13, CCL20, and CXCL6 have all been associated with an increased risk of PTSD following exposure to traumatic stressors (Eraly et al., 2014; Michopoulos et al., 2020; Zhang et al., 2020a). Conversely, lower levels of interleukin-6 (IL-6) and elevations of the chemokine CX3CL1 have been identified as potential markers of resilience (Imai et al., 2019; Zhang et al., 2020a). In a more general manner, research in animals has shown that exposure to social stress is associated with increase in levels of specific cytokines (IL-2, IL-6, IL-10, IL-17A, IL-22, and TNFα), and these changes are correlated with behavioral responses to stress, and these changes have been associated with reduced neurogenesis and synaptic plasticity (Hodes et al., 2014; Muhie et al., 2017). Given this finding, as well as the intimate reciprocal links between immune and HPA axis functioning in response to experimental models of social stress (Page et al., 2014), it is plausible that alterations in immune function can affect individual resilience at the levels of both *plasticity* and *sociality*. Thus, alterations in immune-inflammatory functioning may represent a mechanism linking both these dimensions. Preliminary evidence in humans has also found evidence of a close link between exposure to social stress and changes in both cortisol and IL-6 levels, which in turn can affect neural plasticity and subsequent responses to adversity (Chen et al., 2017).

As is the case with the HPA axis, there are several promising possibilities for modulating stress-induced changes in immune function and thereby enhancing resilience. From a top-down perspective, reducing social isolation – a particular problem in healthcare workers dealing with the pandemic – has been associated with beneficial changes in peripheral inflammatory markers (Yang et al., 2014; Ahmadian et al., 2020). Similar beneficial effects on immune function have been observed with exercise and dietary changes, as discussed in section Environmental Influences on Resilience: Neurobiological Principles below. From a bottom-up perspective, animal models have shown that immunization with specific substances, such as myelin-related peptides (Lewitus et al., 2008), and certain mycobacterial strains (Reber et al., 2016; Loupy et al., 2021) can attenuate stress-induced anxiety and promote resilience *via* alterations in immune functioning, such as inhibition of stress-related increases in IL-6. The latter finding is of particular significance in the context of the COVID-19 pandemic, as it has been noted that immunization against *Mycobacterium tuberculosis* exerts a potential protective effect against COVID-19 mortality (Li, 2021) and trials of BCG immunization in healthcare workers for this purpose are in progress (Junqueira-Kipnis et al., 2020; Madsen et al., 2020). Stress-induced alterations in immune function are also under epigenetic control and may be amenable to modulation in this manner, as discussed in the next section.

The implications of these findings for healthcare workers are that *it may be possible to identify healthcare workers at a higher risk of adverse outcomes in response to stress by measuring immune-inflammatory markers, and to enhance resilience in staff to stress by direct or indirect modulation of the immune system.* Approaches of possible merit in this regard include:

- Examining the predictive value of immune markers already identified as markers of stress (high CRP, low IFNγ, and TNFα) or resilience (low IL6 and elevated CX3CL1) in prospective studies of healthcare workers.

- Reducing peripheral inflammatory activity by minimizing social isolation and loneliness and fostering mutual and institutional support for healthcare workers.
- Changes in dietary pattern and exercise (discussed in section Environmental Influences on Resilience: Neurobiological Principles below).
- More experimentally, assessing whether BCG immunization is associated with enhanced resilience in data from ongoing clinical trials in healthcare workers, and if this proves to be the case, conducting cautious further trials with this specific outcome in mind.

Epigenetic Regulation of the Stress Response

Early research into the genetics of resilience focused on candidate genes that were thought to influence the responsiveness of the stress axis, such as monoamine transmitters or HPA axis-related receptors (Jabbi et al., 2007; Derijk and de Kloet, 2008) and then grew to encompass the role of multiple gene-environment interactions, and other genetic variants (Daskalakis et al., 2013). Subsequent studies focused on more downstream molecular mediators of resilience.

A subsequent group of studies focused on molecules that were further downstream in the signal of inter- and intracellular signaling, such as brain-derived neurotrophic factor (BDNF; Notaras and van den Buuse, 2020) as well as genome-wide analyses which have identified novel genes related to psychological resilience, such as doublecortin-like kinase 2 (*DCLK2*) and kelch-like family member 36 (*KLHL36*; Stein et al., 2019). Most of these novel candidates are associated with neuronal integrity and plasticity; thus, these results are in line with a Feldman's model, in which cellular plasticity is a key mediator of resilience (Feldman, 2018).

However, research into mental disorders such as major depression and PTSD has underlined the key role of gene-environment (GxE) interactions in determining the relationship between genetic variants and mental health outcomes, in what may be termed "two-hit" (genotype x environmental stress) or "three-hit" (genotype x early life adversity x current stress) models (Daskalakis et al., 2013; Zannas and West, 2014). In other words, while genetic variants and childhood adversity may impair resilience, these effects can be buffered by interventions in the "here and now." A key mechanism underlying this buffering effect is the epigenetic modification of key genes by a variety of environmental factors. These modifications involve chemical changes such as DNA methylation that alter gene transcription and expression without any changes in the actual nucleotide sequence. Environmental stress has been found to exert a marked influence on these processes, both through effects on proteins that regulate methylation, and through effects on "reader" proteins such as methyl-CpG binding protein 2 (*MECP2*) that link DNA methylation to transcriptional activity in key genes, such as the *FKBP5* gene which regulates HPA axis functioning (Reul et al., 2014; Zannas and West, 2014). In fact, it has been suggested that the typical physiological and behavioral responses to stress and trauma in humans are largely caused by epigenetic changes common to many mammals, particularly in genes regulating immune function (Sipahi et al., 2014). Both experimental models of social stress (Nasca et al., 2019) and experiences of stress in real-world settings (Arzate-Mejia et al., 2020) have been associated with demonstrable changes in DNA methylation patterns. In other words, epigenetic mechanisms are another pathway linking the resilience dimensions of *plasticity* and *sociality* in the Feldman's model.

These changes can, in turn, be potentially reversed through appropriate behavioral, psychological, or even pharmacological interventions, providing a further potential target for interventions aimed at enhancing resilience which can be objectively assessed by measuring changes in DNA methylation (Pape et al., 2018; Gottschalk et al., 2020). Such changes have already been documented for interventions such as meditation (Kaliman, 2019) and psychological therapies (Roberts et al., 2015; Kumsta, 2019), and may prove useful in identifying those who would best profit from such approaches. Beneficial epigenetic changes in GR genes have also been observed in response to psychological interventions in patients with PTSD (Castro-Vale and Carvalho, 2020). It has also been observed that a phytochemical product, dihydrocaffeic acid (DHCA), promotes stress resilience in mice by inhibiting DNA methylation of the interleukin-6 gene (*IL6*; Wang et al., 2018) though such a finding requires replication and testing in human subjects, it represents a promising future intervention strategy for healthcare workers.

In real-world terms, the chief implication of these studies for healthcare workers is that *vulnerability to stress is partly genetically determined, but can be moderated by behavioral and environmental modification*. Potential epigenetics-based approaches in this population could include:

- Assessing changes in methylation of key stress axis genes (*BDNF*, glucocorticoid receptors, and *FKBP5*) in healthcare workers experiencing stress-induced symptoms of anxiety, depression and PTSD, as well as in those making use of workplace stress-reduction programs.
- Provision of early specific trauma-related counseling to frontline healthcare workers, or those showing early signs of traumatic stress while on COVID-19 duty (Castro-Vale and Carvalho, 2020).
- Environmental changes, particularly the provision of emotional and material support (Miller et al., 2015; Shields et al., 2016), which may reverse stress-induced epigenetic changes.
- Experimentally, trials of drugs known to have a positive effect on epigenetic modulation of the HPA axis, immune system, or neuronal plasticity, such as antidepressants (Muñoz-Cobo et al., 2018), antagonists of the corticotropin-releasing factor 1 (CRF) receptor (Pape et al., 2018), and phytochemicals (Wang et al., 2018).

Neuropeptides

Over the last two decades, a significant body of evidence has accumulated on the key role of neuropeptides in a variety of mental disorders, including anxiety disorders, obsessive-compulsive

disorder, PTSD, eating disorders, depression, and alcohol dependence (Bandelow et al., 2017; Harper et al., 2018; Plessow et al., 2018; Shariq et al., 2019). This association may be explained by the fact that neuropeptides co-exist with "classic" neurotransmitters (such as serotonin or dopamine) within neurons, and themselves act as transmitters, neurotrophic factors, and regulators of "classic" neural transmission (Hokfelt et al., 2018). As many of these disorders are triggered or exacerbated by stress, it stands to reason that neuropeptides may prove to be key mediators of resilience at the cellular level. Moreover, neuropeptides are important regulators of social behavior and bonding (Meyer-Lindenberg et al., 2011), making them of direct relevance to the *social* dimension of resilience, particularly in the context of the COVID-19 pandemic where social distancing, quarantine, and reduced social support all exert a negative impact on the mental health of healthcare workers (da Silva and Neto, 2020). Specific neuropeptides have also been strongly correlated with individual variations, religious, and spiritual beliefs (Imamura et al., 2017; Tonnesen et al., 2018), suggesting that – uniquely among the mechanisms discussed thus far – they are also related to the *meaning* dimension of resilience. In other words, from a conceptual viewpoint, neuropeptides are implicated in all three of Feldman's postulated dimensions of resilience.

Among the various neuropeptides of interest, the most attention has been given to NPY, a 36-amino acid peptide which is widely distributed in the central nervous system. The effects of NPY on resilience are complex: activation of type 1 (Y1) NPY receptors reduces anxiety and mediates resilience, while activation of type 2 (Y2) receptors increase anxiety. On the whole, NPY is considered to have a protective effect against stress, by counteracting the actions of the peptide corticotrophin-releasing hormone (CRH) which activates the "stress axis" (Wu et al., 2013; Reichmann and Holzer, 2016). Administration of NPY reduces submissive and defensive behaviors in male hamsters subjected to social defeat; this effect persisted even after experimental blockade of Y1 receptors, suggesting that other NPY receptor subtypes play an important role in resilience (Lacey et al., 2019). In human subjects, plasma and cerebrospinal fluid levels of NPY correlate negatively with levels of post-traumatic stress in military veterans (Sah et al., 2014), and a functional polymorphism (rs16147) of the *NPY* gene was found to interact with trauma exposure to predict resilience in adults, with the *T* allele conferring a protective role (Gan et al., 2019). Though NPY represents an attractive molecular target for the enhancement of resilience, its effectiveness has not yet been tested in formal pharmacological trials. However, the NPY pathway may be indirectly targeted through modification of gut microbiota or inflammatory activity through the use of probiotics or dietary modification, as gut inflammation has been associated with reduced NPY levels in key brain regions related to stress, such as the hippocampus and amygdala (Holzer et al., 2012).

Besides NPY, a number of neuropeptides have been identified as potential mediators of resilience at the cellular level as well as in terms of influencing adaptive social behavior – in other words, as moderators of *plasticity* and *sociality*. One of the most prominent of these peptides is oxytocin, which appears to exert a regulatory effect on the cortisol response to stress (Li et al., 2019; Winter and Jurek, 2019). In addition, it has been shown to reduce depressive symptoms following loss of a partner in animal models (Bosch and Young, 2018), to reduce brain responses to fear-provoking visual stimuli in human suffering already exposed to trauma (Flanagan et al., 2019), and to potentially enhance the likelihood of engaging in altruistic or pro-social behaviors (Hurlemann, 2017). These effects are all relevant to the COVID-19 pandemic, where healthcare workers often experience interpersonal separation, social isolation, and a heightened exposure to fear-generating cues. Polymorphisms of the oxytocin receptor gene have also been found to influence vulnerability to PTSD (Sippel et al., 2017). These findings suggest that the administration of oxytocin – which is already used as a pharmacological agent in obstetric settings, and as an experimental adjunct to psychological therapies (Domes et al., 2019) – may be effective in increasing resilience and reducing the risk of stress-related mental disorders (Sharma et al., 2020).

Other peptides which have been shown to influence resilience and stress responses, though at a much more preliminary level of evidence, include the endogenous opioid family of enkephalins (Nam et al., 2019), orexin (Staton et al., 2018; Summers et al., 2020), nociceptin (Narendran et al., 2019), somatostatin (Stengel and Tache, 2017), and galanin (Sciolino et al., 2015). These peptides have been shown to enhance resilience in animal models during experimental stress-inducing procedures, and to influence other molecules of key importance in brain resilience, such as BDNF. However, their exact role and significance in humans, and more particularly in the specific situations faced by healthcare workers during the COVID-19 pandemic, requires further investigation.

In real-world settings, the significance of the above findings lies in *the potential to augment resilience to stress, both at the neural and the social levels, through direct (pharmacological) or indirect (diet and exercise) manipulation of brain neuropeptide transmission*. Potential roles for neuropeptide-based interventions in this setting could include:

- The use of lifestyle modifications, such as diet-based interventions or physical exercise, in enhancing the effects of peptides such as NPY and galanin in boosting resilience (Holmes, 2014; Farzi et al., 2015).
- The potential for direct pharmacotherapy using intranasal oxytocin to enhance pro-social behavior and resilience in healthcare workers, either alone or as an adjunct to psychological or behavioral interventions (Koch et al., 2014).
- The possibility of using opioid-based therapies to attenuate the effects of social stress and isolation – "social pain" – in healthcare workers facing specific situations, such as prolonged hours away from home or quarantine, *via* modulation of endogenous opioid receptors. Though a caveat must be raised regarding the possibility of abuse in this context, such treatments may be effective even when used at low doses for short periods of time (Yovell et al., 2016).

Environmental Influences on Resilience: Neurobiological Principles

The foregoing sections have provided an overview of the myriad biological mechanisms that influence resilience, the relationships between them, and their links to the resilience dimensions of *plasticity*, *sociality*, and *meaning*, particularly in the context of the COVID-19 pandemic. In discussing these, frequent mentions have been made of the influence of environmental factors on the regulation of these processes. It is useful to revisit some of these links from a neurobiological perspective for two reasons. First, certain lifestyle or environmental modifications that have been shown to correlate with specific biological changes, which in turn can be used to objectively assess the effect of such interventions in terms of parameters such as HPA axis functioning, DNA methylation, altered levels of immune markers, or regional brain activity. Second, the knowledge of these correlates could lead to a more purposeful approach to designing and implementing programs to boost resilience in the face of a major crisis, such as the COVID-19 pandemic. Keeping these two objectives in mind, the following are specific domains where experimental knowledge of the biological correlates of resilience and feasible interventions for healthcare workers intersect:

Exercise

Regular physical exercise interacts with genetic vulnerability to minimize the risk of post-traumatic stress symptoms, increases HRV, and may positively influence the activity of resilience-promoting neuropeptides. The final common pathway for all these effects may be the expression of the *BDNF* gene in key brain areas involved in resilience, such as the hippocampus and prefrontal cortex, leading to increased local BDNF levels and enhancement of neurogenesis and neural plasticity (Taliaz et al., 2011; Holmes, 2014). In addition, exercise may partially reversing stress-induced changes in immune function (Wang et al., 2020a). Exercise can also exert a beneficial effect on physical health in the context of COVID-19, and the amount of exercise required to achieve these effects – about 15–20 min of walking or other moderate activity per day – is well within the range of what is practical for healthcare workers (Simpson and Katsanis, 2020; Wang et al., 2020a). This aspect is sometimes passed over in standard "stress management" packages for healthcare workers (Chen et al., 2020a), but there are few significant obstacles to its inclusion.

Diet

Though firm evidence for a translational link between the gut-brain axis and resilience in humans is lacking (Tooley, 2020), there is evidence that specific nutrients (Toyoda, 2020) or probiotics (Maehata et al., 2019; Westfall et al., 2021) may modulate stress resilience in animal models, most probably by influencing immune function. There is some preliminary evidence to support such an effect in humans (Taylor et al., 2020b), and this approach may be beneficial when planning meals for healthcare workers. Similarly, healthy eating behaviors may be encouraged by instruction and example (Zheng et al., 2020).

Housing and Shelter

Animal models have provided a preliminary picture of the complex relationship between housing and stress. In young rodents, but not in adults, single housing is associated with elevated stress compared to group housing. In adult rodents, paired housing evokes a greater stress response than group housing. These effects appear to correlate with the level of expression of the glucocorticoid receptor gene *NR3C1* in the hippocampus (Pan-Vazquez et al., 2015). In addition, the provision of an enriched environment during group housing – which, in animal models, refers to the provision of toys and running wheels – also minimizes the impact of external stressors (van Praag et al., 2000; Huzard et al., 2015). These considerations may be particularly relevant to the living conditions of healthcare workers during the COVID-19 pandemic, where the social isolation caused by individual accommodation (for example, during quarantine) may worsen stress, and the provision of group rest areas and leisure activities may foster resilience.

Sleep

Stress has both subjective and objective effects on sleep quantity, quality, and structure, which appear to be mediated by changes in metabotropic glutamate receptor functioning in limbic brain regions (Highland et al., 2019; Sweeten et al., 2021). In addition, sleep deprivation leads to reduced hippocampal neurogenesis and plasticity, potentially impairing resilience to stress (Saletin et al., 2016). In healthcare workers already dealing with long hours or frequent changes in shifts due to the COVID-19 pandemic, these two effects may form a self-reinforcing process, in which sleep deprivation lowers resilience, leading to an increased impact of stress on sleep (Huffmann et al., 2020; Salari et al., 2020). Administrative policies to miminize frequent changes in sleep patterns or prolonged shift work, as well as individual or group behavioral interventions to improve sleep hygiene and sleep-related practices, may prove helpful in minimizing the impact of sleep disruptions on resilience in this population (Elder et al., 2020; Muller et al., 2020; Rajkumar, 2020).

Social Support

Evidence from animal research has shown that social involvement, such as the presence of cage mates of the same species during experimental models of stress, significantly increases adaptive behaviors and facilitates fear extinction. These resilience-enhancing effects appear to be associated with changes in the expression of immediate early genes, such as *fos* (Colnaghi et al., 2016). On the other hand, overcrowding, isolation, social defeat, and "social instability" (alternating crowding and isolation) can result in increases in endocrine and behavioral responses to stress in rodent models, an effect which may be partially mediated by the neuropeptide CRH (Beery and Kaufer, 2015) or altered immune functioning (Page et al., 2014). There is evidence that social support is inversely associated with psychological distress in healthcare workers during the COVID-19 pandemic (Alizadeh et al., 2020; Nowicki et al., 2020). In this context, ensuring adequate opportunities for socialization with colleagues, family members, and friends, while adhering to appropriate infection control guidelines, can help in fostering resilience in healthcare workers at the individual and team level, as can attempts to minimize the stigmatization faced by these personnel (Taylor et al., 2020a).

Economic and Food Security

Rodent models suggest that scarcity of material resources, such as food, can alter HPA axis functioning and DNA methylation patterns, leading to disturbances in neuroendocrine functioning and social behavior (Perry et al., 2019; Pertille et al., 2020); similar alterations in stress axis functioning in response to poverty or disadvantageous environments have been noted in human children (Finegood et al., 2017) and adults (Sullivan et al., 2019). For a variety of reasons, including work timings, business closures, and stigmatization, healthcare workers may experience insecurity in terms of food, material needs, and income during the COVID-19 pandemic (Cotrin et al., 2020; Larson et al., 2020), particularly in low- and middle-income countries (Onigbinde et al., 2020). Organizational policies that assist healthcare workers in this aspect, both at the workplace and in their homes, may be useful in normalizing endocrine responses to stress and enhancing resilience.

There are several other factors that may be considered in this regard, including the effect of larger-scale social changes, such as those caused by a pandemic, on biomarkers of stress and resilience (Thomaes et al., 2016). However, the purpose of this review is to focus on aspects of environmental change that are supported by translational evidence, and which can be implemented within a reasonable time frame at the institutional or workplace level.

CONCLUSION: A CAUTIONARY TALE, REVISITED

In the light of the foregoing evidence (see **Figure 1**), it is now possible to understand what was lacking in the healthcare worker wellness program described in Chen et al. (2020a) and how subsequent modifications substantially improved its acceptability efficacy. Though done unknowingly, many of the changes made in the second wave of this program – the provision of a common rest area and leisure activities, ensuring security in terms of food and other essential supplies, and periodic visits for the purpose of support or counseling – are entirely in line with measures to combat stress and enhance resilience that have proved valuable in experimental models. This is particularly true with reference to the studies summarized section Environmental Influences on Resilience: Neurobiological Principles above, in which exercise, leisure, sleep, and social support can all positively influence the biological and behavioral response to external stress, through mechanisms that are outlined in sections "Monoaminergic Modulation of Stress and Resilience, The Hypothalamic-Pituitary-Adrenal Axis, Immune-Inflammatory Influences on Stress, and Resilience, Epigenetic Regulation of the Stress Response, and Neuropeptides." However, it is possible to go beyond this. Future programs aimed at building resilience in healthcare workers during and after the COVID-19 pandemic should be multifaceted, and consider the possibility of other neurobiologically-informed approaches to stress modulation, which may include dietary modification, the use of probiotics, mindfulness-based approaches, and even the judicious use of pharmacological agents such as oxytocin, low-dose cortisol, antidepressants, ketamine, or ultra-low-dose opioid agonists in selected cases. This biologically informed approach can also be fruitfully linked with the psychotherapeutic approach advocated by Rosen et al. (2020) – for example, by developing individual or group educational and counseling programs for healthcare workers that focus on specific constructs such as psychological flexibility or the avoidance of overcommitment. Finally, specific biomarkers – involving not only "classical" HPA axis parameters but levels of neuropeptides, genetic polymorphisms, epigenetic alterations, and measures of regional brain activity – could be used both to identify those at high risk of psychological distress, who would benefit from more intensive or sustained interventions, and to obtain objective correlates of the effectiveness of the strategies outlined above. In a context such as the COVID-19 pandemic, it is impossible to avoid stress altogether; moreover, the avoidance of stressors may actually lower resilience (Katz et al., 2019). What is needed is a comprehensive set of approaches that work synergistically to enable healthcare workers to maintain an adaptive level of functioning while minimizing psychological distress, and there is good reason to believe that the methods described in the preceding sections may be valuable additions to this set. Due to space constraints, other neurobiological mediators of resilience, such as the neurotransmitters gamma-amino butyric acid and glutamate (Wagner et al., 2015; Ardi et al., 2019) and the role of microRNAs in influencing the expression of stress-related genes and resilience (Issler et al., 2014), could not be covered in depth; however, they also represent promising future avenues for research and intervention in this field.

In conclusion, there are enough promising leads from both human and animal research – some of which are already being confirmed through field reports, preliminary clinical trials, or both – to suggest that harnessing the potential of the neurobiology of resilience, and placing it at the service of healthcare workers burdened by the COVID-19 pandemic and its attendant stressors, is feasible and may prove to be more efficacious than conventional approaches based on expert opinion. A major challenge for the future will be to integrate these findings into existing services aimed at addressing the mental health needs of healthcare workers, and adapting them to cultural realities as well as to economic and logistic constraints. To ensure the validity of such approaches, both biomarker-based and psychometrically assessed aspects of stress and resilience must be adopted as outcome measures when assessing them in real-world settings.

AUTHOR CONTRIBUTIONS

The author developed the concept for this review, carried out the literature search, wrote the paper, and proofread it. This paper represents the author's original work and has not been submitted for publication elsewhere.

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BRIEF RESEARCH REPORT
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Psychological Differences Among Healthcare Workers of a Rehabilitation Institute During the COVID-19 Pandemic: A Two-Step Study

Anna Panzeri[1,2]*, *Silvia Rossi Ferrario*[2] *and Paola Cerutti*[2]

[1] *Department of General Psychology, University of Padua, Padua, Italy,* [2] *Unit of Psychology-Neuropsychology, Institute of Veruno, Maugeri Scientific Institutes for Research, Hospitalization and Health Care, Veruno, Italy*

Introduction: Healthcare workers facing the threatening COVID-19 can experience severe difficulties. Despite the need to evaluate both the psychological distress and positive protective resources, brief and reliable assessment tools are lacking.

Aim: Study 1 aimed at developing a new assessment tool to measure psychological distress and esteem in healthcare workers during the COVID-19 pandemic. Study 2 aimed to explore and compare the psychological reactions of healthcare workers of the COVID-19 and the non-COVID-19 wards.

Methods: In Study 1, psychologists created 25 items based on their clinical experience. A preliminary qualitative evaluation selected the best 15 items for the new tool (CPI-HP) assessing the COVID-19 psychological impact with 2 scales: psychological distress and esteem. The CPI-HP was administered to 110 healthcare professionals to study its psychometric properties and the internal structure with exploratory graph analysis and confirmatory factor analysis. Study 2 compared two groups of healthcare professionals of the COVID-19 and non-COVID-19 departments.

Results: In Study 1, the CPI-HP showed satisfying psychometric properties, and the two-factor structure was confirmed with good fit indices. In Study 2, the two groups of healthcare workers showed comparable levels of psychological distress and resilient coping, but the COVID-19 group displayed significantly higher esteem and appreciation of the experience.

Discussion: All operators showed high psychological distress during the emergency, but the COVID-19 group reported higher resources, probably due to stronger group cohesion and greater esteem, perceived meaning, and own work value.

Conclusion: Assessing the psychological distress and resources of healthcare professionals with specific tools is important. Psychological interventions should promote their psychological health.

Keywords: assessment, clinical psychology, distress, esteem, healthcare-workers, rehabilitation, COVID-19

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Elena Vegni,
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***Correspondence:**
Anna Panzeri
anna.panzeri@phd.unipd.it

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INTRODUCTION

Since December 2019, the COVID-19 disease has rapidly spread, and Italy was one of the first countries in Europe with a vast number of cases. Hospitals and rehabilitation institutes were required to manage and provide care for many acute and post-acute COVID-19 patients while still treating non-COVID-19 patients (e.g., those with cardiovascular and neurological diseases and the elderly).

Health professionals were engaged in the first line to fight the unforeseen, severe, life-threatening, and highly infectious disease and faced several issues. They had to comply with stressful emotional conditions related to both their professional and personal lives. They had to learn new protocols and procedures at work, dealing with an exceeding number of patients and sustaining long shifts with protective clothes with the fear of being infected (Vagni et al., 2020). Also, health professionals' private life was affected as they suffered from psychosocial issues such as isolation and stigmatization; a consistent number of them isolated themselves, moving away from home to not infect their families (Dioscoridi and Carrisi, 2020).

As a whole, these challenging circumstances required prolonged efforts, leading healthcare workers to develop psychological distress symptoms on the cognitive (e.g., worries), emotional (e.g., mood swings), and behavioral (e.g., sleep difficulties and disordered eating) domains (Benfante et al., 2020; Spoorthy, 2020). Despite the COVID-19-related difficulties and the adverse consequences of distress, healthcare professionals were required to cope with the situation, maintaining their individual and professional functioning (Di Tella et al., 2020).

Some key protective factors may have helped healthcare professionals to cope with the situation in a resilient way.

According to the anxiety buffer hypothesis (ABH) (Greenberg et al., 1992; Rossi et al., 2020a), (self-)esteem can represent a resource and a protective factor buffering the effects of stress. Indeed, as stated by the terror management theory (Pyszczynski et al., 2004), esteem also relies on one's social role and is reinforced by other society components. In the COVID-19 pandemic, health operators felt they had a crucial role in the emergency. By doing a meaningful and important job at a societal level, they felt more valuable and important, and their esteem was strengthened by the support and recognition provided by family, colleagues, and society (Greenberg et al., 1986; Hennekam et al., 2020). Moreover, according to the social identity theory (SIT; Tajfel and Turner, 1986), people can derive a sense of self-worth and social belongingness from their memberships in groups. In other words, in the COVID-19 emergency, the perception of being part of an (in-)group of peers and colleagues (i.e., the work team) sharing common features, aims, and feelings and supporting each other could have represented another factor sustaining esteem against distress.

Besides, a resilient coping strategy may have helped healthcare professionals to preserve good functioning despite the distress. *Coping* is the process of facing, tolerating, and reducing stress related to the demands of an adverse circumstance—as the pandemic—triggering negative emotions (Kocalevent et al., 2017). Individuals using resilient coping strategies can control their responses to stress and react to difficulties positively (Sinclair and Wallston, 2004). While some individuals are more prone to perceive the negative aspects of a situation (Giuntoli et al., 2019), others can still appreciate positive aspects even in the worst circumstances and show the so-called post-traumatic growth (Chen et al., 2020).

Given this background, in the critical and challenging circumstances represented by the outbreak of infectious disease, it is important to assess and monitor the psychological health of healthcare professionals to support them in coping with stress.

However, to date, there are no specific tools specifically developed to measure the psychological impact of COVID-19 on healthcare workers. Most of the existing studies used preexistent tools, mostly related to the negative impact of events, anxiety, and depression (Benfante et al., 2020; Pappa et al., 2020). Thus, a brief tool specifically developed to measure the healthcare professionals' psychological distress and esteem when facing the COVID-19 emergency was lacking.

Moreover, given the frequently asymptomatic and undetected COVID-19 infections, the healthcare workers of both COVID-19 and non-COVID-19 wards were exposed to stressful conditions, potentially triggering similar distress levels. Nonetheless, the similarities and differences in the psychological characteristics of health professionals working in COVID-19 and non-COVID-19 wards were not yet explored. Although similar distress levels are expected, the contribution of protective factors may differ among these groups, namely, the group cohesion and the perceived esteem.

The Present Research

The present two-step research aimed to measure and explore the psychological experience of healthcare professionals in a rehabilitation institute in the north of Italy, where a dedicated ward for patients with COVID-19 was opened in the middle of March 2020.

In Study 1, a new assessment tool was developed to evaluate the psychological impact of COVID-19 for healthcare workers, and its psychometric properties were analyzed.

In Study 2, the questionnaire created in Study 1 was used to assess, explore, and compare the psychological distress and adaptation of health workers and employees working in COVID-19 and non-COVID-19 wards of the institute.

STUDY 1

Study 1 aimed to develop an *ad hoc* self-report questionnaire assessing the most relevant psychological areas across healthcare workers' experience during the COVID-19 pandemic—(A) psychological distress and (B) esteem—and to evaluate its psychometrical properties.

Methods

Participants and Procedure

Participants of the study were recruited in a rehabilitation center in northern Italy. All the healthcare workers received an institutional e-mail presenting the study and inviting them to participate in it. Then, the coordinators of each section renewed

the invitation to the study. Interested workers were invited to contact the psychologists.

Inclusion criteria were (I) being a native Italian speaker and (II) working in the rehabilitation center during the COVID-19 emergency; and the exclusion criterium was (III) not being able to complete the questionnaire. The final sample of this study was composed of 110 healthcare workers [31 (28.2%) males and 79 (71.8%) females] aged from 23 to 66; mean age = 44.13 (*SD* 11.17)]. The sample characteristics are reported in **Table 1**.

Healthcare workers completed informed consent, a demographic measures form, and the items of the new questionnaire. This research was conducted according to the Helsinki guidelines and was approved by the Scientific Direction of the Institute. All participants were informed about the study aims and voluntarily agreed to participate.

Sample Size Calculation

Considering statistical analyses used in this study (see the designated section), scientific literature guidelines suggest that exploratory analysis could correctly estimate model parameters with a minimum sample of 100 observations (Golino and Epskamp, 2017). Moreover, also for simple confirmatory models, 100 individuals were considered adequate (Marsh et al., 1988; Kelloway, 2015).

Measures

Development of the COVID-19 Psychological Impact-Healthcare Professionals

The item pool for the CPI-HP was developed using a three-step double-blind study procedure—already employed in other studies (Simpson et al., 2018; Milavic et al., 2019; Pietrabissa et al., 2020a,b).

First, two psychologists–psychotherapists (SRF and PC) who supported healthcare workers during the first phases of the pandemic independently created a pool of items to assess the 3 scales: (A) *psychological distress* and (B) *esteem of healthcare workers*—focusing attention on constructs coverage. The *psychological distress* dimension concerned the fear and anxiety of being infected, mood swings, irritability, and helplessness. Psychological distress included not only emotional facets but also beliefs and behaviors. The *esteem of healthcare workers* dimension referred to other- and self-perceived personal values, motivation to work, and belongingness to one's workgroup.

TABLE 1 | Study 1 and Study 2: descriptive statistics of the samples.

	Study 1	Study 2		
	Total (*N* = 110)	**Total (*N* = 68)**	**COVID-19 ward (*n* = 34)**	**Non-COVID-19 ward (*n* = 34)**
Age, mean (SD)	45.70 (10.80)	40.409 (11.250)	39.719 (11.191)	41.059 (11.433)
Sex, *n* (%)				
Males	20 (22.22%)	28 (41.18%)	15 (44.12%)	13 (38.24%)
Females	70 (77.78%)	40 (58.82%)	19 (55.88%)	21 (61.76%)
Marital status, *n (%)*				
Single	23 (28.7%)	22 (32.35%)	6 (17.65%)	16 (47.06%)
Married	44 (48.9%)	37 (54.41%)	21 (61.76%)	16 (47.06%)
Separated/divorced	12 (13.3%)	6 (8.82%)	5 (14.71%)	1 (2.94%)
Widow	1 (1.1%)	–	–	–
Education, *n (%)*				
Middle school	8 (10%)	7 (10.29%)	6 (17.65%)	1 (2.94%)
High school	21 (26.3%)	13 (19.12%)	8 (23.53%)	5 (14.71%)
Degree	47 (58.8%)	44 (64.71%)	19 (55.88%)	25 (73.53%)
Master/specialization	4 (5%)	4 (5.88%)	1 (2.94%)	3 (8.82%)
Professional role, *n (%)*				
Healthcare assistant	9 (10.8%)	8 (11.76%)	6 (17.65%)	2 (5.88%)
Professional nurse	36 (43.4%)	25 (36.76%)	12 (35.29%)	13 (38.24%)
Rehabilitation technician	16 (19.3%)	10 (14.71%)	4 (11.76%)	6 (17.65%)
Physician	9 (10.8%)	10 (14.71%)	5 (14.71%)	5 (14.71%)
Administrative	6 (7.2%)	5 (7.35%)	–	5 (14.71%)
Maintainer	1 (1.2%)	5 (7.35%)	5 (14.71%)	–
Other	6 (7.2%)	5 (7.35%)	2 (5.88%)	3 (8.82%)
Psychological measures, mean (SD)				
Psychological distress	21.178 (6.989)	19.147 (7.184)	17.059 (6.415)	21.235 (7.394)
Esteem	20.600 (6.900)	21.118 (7.074)	23.618 (6.527)	18.618 (6.791)
Coping	9.9444 (2.628)	10.176 (2.823)	10.147 (3.036)	10.206 (2.637)
Experience	57.614 (24.436)	62.879 (24.164)	73.750 (21.137)	52.647 (22.537)

Second, the two lists of items were compared and screened: item phrasing was adjusted for the target population, and redundant items were removed. Thus, a preliminary item list (25 items) was approved by SRF and PC.

Third, a third psychologist (AP) administered the list of items to a sample of 10 healthcare workers (*judges*)—who sorted (in order of relevance) the most representative items for each dimension—giving attention to relevance and comprehensibility. Conclusions from the judges were matched and discussed. An agreement higher than 90% between judges was considered adequate to retain the item. If an agreement was reached for more than one item per dimension, judges were asked to select the most significant one. Finally, a list of 15 items (eight for *psychological distress* and seven for *esteem*) was provided.

Items were scaled on a 5-point Likert-type scale ranging from 0 (*never*) to 4 (*always*). The total score of each dimension (*psychological distress* or *esteem*) was computed by summing the items of each factor. The higher the score, the higher the value in that scale—thus the higher the psychological distress and/or esteem. No overall total score (psychological distress *plus* esteem) should be calculated. In the Appendix, **Table A1** shows the 15 items of the questionnaire.

Statistical Analysis

The R software (R Core Team, 2017) was used with the following packages: bootnet (Epskamp et al., 2018), EGAnet (Golino and Christensen, 2020), mgm (Haslbeck and Waldorp, 2020), lavaan (Rosseel, 2012), and psych (Revelle, 2018).

First of all, the level of item informativeness was checked (Mullarkey et al., 2018, 2019; Marchetti, 2019). Each item was compared to the mean level of informativeness of the CPI-HP (0.078) plus/minus 2.5*SD*s (0.194). Poorly informative items were excluded from subsequent analyses.

Second, an exploratory graph analysis (EGA) (Golino and Epskamp, 2017; Giuntoli and Vidotto, 2020; Golino and Christensen, 2020) was performed to assess item clustering by using the walktrap algorithm for weighted networks (Pons and Latapy, 2006)—in which nodes may cluster together forming tidy connected sub-networks. Consequently, the thicker an edge, the strongest the relationship between the items of a specific cluster (dimension/factor) (Mair, 2018; Christensen and Golino, 2020). Moreover, it has been demonstrated that EGA has an almost perfect accuracy to correctly extract the correct number of dimensions of a questionnaire—also with a sample size of 100 individuals (Golino and Epskamp, 2017).

Third, to confirm the results of the EGA (Chandrasekaran et al., 2012; Costantini et al., 2015; Epskamp et al., 2017), a confirmatory factor analysis (CFA) was performed (Christensen and Golino, 2020). Considering the CPI-HP response scale, the diagonally weighted least square (DWLS) estimator was used to perform each CFA (Brown, 2015; Lionetti et al., 2016; Manzoni et al., 2021). The model fit of the factorial structure of the CPI-HP was assessed through the (A) Satorra-Bentler χ^2 (S-Bχ^2); (B) root-mean-square error of approximation (RMSEA); (C) comparative fit index (CFI); and (D) the standard root mean square residual (SRMR) (Muthén, Muthén, 1998–2017; van de Schoot et al., 2012; Brown, 2015; Kline, 2016). The following cutoffs for "acceptable" model fit were applied: the S-Bχ^2 should be non-statistically significant ($p > 0.05$); the RMSEA should be lower than 0.080; the CFI should be higher than 0.90; and the SRMR should be lower than 0.080 (Hu and Bentler, 1999; Hoyle, 2012; van de Schoot et al., 2012; Brown, 2015). The internal consistency of each scale was assessed with Cronbach's α.

The adjusted item–total correlation was also calculated. Also, given that the CPI-HP is a new instrument, the items' ability to discriminate subjects with low or high scores was tested (Milavic et al., 2019; Consoli et al., 2020; Pietrabissa et al., 2020a); thus, the item discriminant power (IDP) was computed (Ebel, 1965; Chiorri, 2011). According to the literature about typical performance test items such as Likert scales, the maximum total score and the quartile rank were calculated for each participant. Then, the item discriminating power was calculated by using independent-sample *t*-tests and Cohen's Cohen (1988) *d*, the dependent variable was the total score of each scale, and the grouping variables were the lowest and the highest quartiles (Ebel, 1965; Chiorri, 2011; Milavic et al., 2019; Consoli et al., 2020; Pietrabissa et al., 2020a).

Results

Preliminary Analysis

As reported in **Table 2**, all the items were almost normally distributed, and none of them was poorly informative. Thus, all 15 items used to compose the CPI-HP could be retained into the principal statistical analyses for assessing the dimensionality of the questionnaire.

EGA

As reported in **Figure 1**, the EGA strongly confirmed the hypothesized two-factor solutions. Indeed, two well-separated sub-networks were identified in the CPI-HP network structure. In particular, on the one hand, the *psychological distress* was in red, and it was composed of all of the supposed 8 items. On the other hand, the (B) *esteem of healthcare workers* was in blue, and it was composed of all of the supposed seven items. These results suggest the two-factor-related first-order factor dimensionality of the CPI-HP scale.

Structural Validity

As showed in **Table 2**, the CFA clearly confirms the EGA results. Indeed, a good solution for the CPI-HP was found: S-B$\chi^2(89) = 72.772$; $p = 0.894$ *ns*; RMSEA = 0.000 [90% CI: 0.000–0.025; $p(\text{RMSEA} \leq 0.05) = 1$ *ns*]; CFI = 1.000; SRMR = 0.065. In addition, model modification indices showed that the model could not be improved. The two factors showed a small negative correlation: $r = -0.321$.

For the *psychological distress* scale, item factor loading ranged from 0.444 (item #2) to 0.926 (item #5): (*mean* = 0.681, *SD* = 0.177), with the items' R^2 ranging from 0.197 to 0.858 (*mean* = 0.492, *SD* = 0.239). For the *esteem of healthcare workers* scale, item factor loading ranged from 0.576 (item #1) to 0.842 (item #5) (*mean* = 0.756, *SD* = 0.086), with the items' R^2 ranging from 0.332 to 0.709 (*mean* = 0.577, *SD* = 0.120).

TABLE 2 | Study 1: psychometric properties of items.

	Descriptive statistics				ITC	IDP		EGA	CFA	
	Mean	*SD*	Skewness	Kurtosis	*r*	*t*	*d*	*dim.*	λ	R^2
Distress	15.93	6.443	−0.193	−0.671						
Item #1	2.12	1.247	−0.257	−0.959	0.423	−8.490	2.413	1	0.505	0.255
Item #2	1.61	1.134	−0.064	−1.126	0.397	−6.141	1.805	1	0.444	0.197
Item #3	2.21	1.084	−0.384	−0.652	0.736	−12.546	3.590	1	0.809	0.655
Item #4	1.94	1.294	−0.164	−1.132	0.595	−8.337	2.428	1	0.702	0.493
Item #5	2.03	1.121	−0.174	−0.681	0.786	−10.316	2.955	1	0.926	0.858
Item #6	2.73	1.031	−0.657	0.107	0.450	−5.859	1.668	1	0.507	0.257
Item #7	1.83	1.180	−0.204	−1.128	0.667	−10.862	3.109	1	0.829	0.688
Item #8	1.47	1.232	0.439	−0.657	0.588	−7.880	2.319	1	0.729	0.532
Esteem	16.30	6.222	−0.296	−0.197						
Item #1	2.68	1.092	−0.586	−0.180	0.509	−6.679	1.889	2	0.576	0.332
Item #2	2.25	1.137	−0.289	−0.606	0.689	−10.120	2.859	2	0.765	0.585
Item #3	2.52	1.115	−0.330	−0.573	0.645	−8.983	2.536	2	0.761	0.579
Item #4	2.30	1.138	−0.082	−0.762	0.647	−12.122	3.443	2	0.746	0.557
Item #5	2.38	1.226	−0.405	−0.770	0.755	−13.496	3.774	2	0.842	0.709
Item #6	1.77	1.290	0.226	−1.033	0.699	−18.203	5.180	2	0.812	0.660
Item #7	2.39	1.150	−0.299	−0.523	0.711	−10.363	2.906	2	0.788	0.620

ITC, item total correlation; IDP, item discriminant power; d, Cohen's d; EGA, exploratory graph analysis; dim., dimension resulting from EGA; CFA, confirmatory factor analysis; λ, item factor loading; R^2, explained variance.

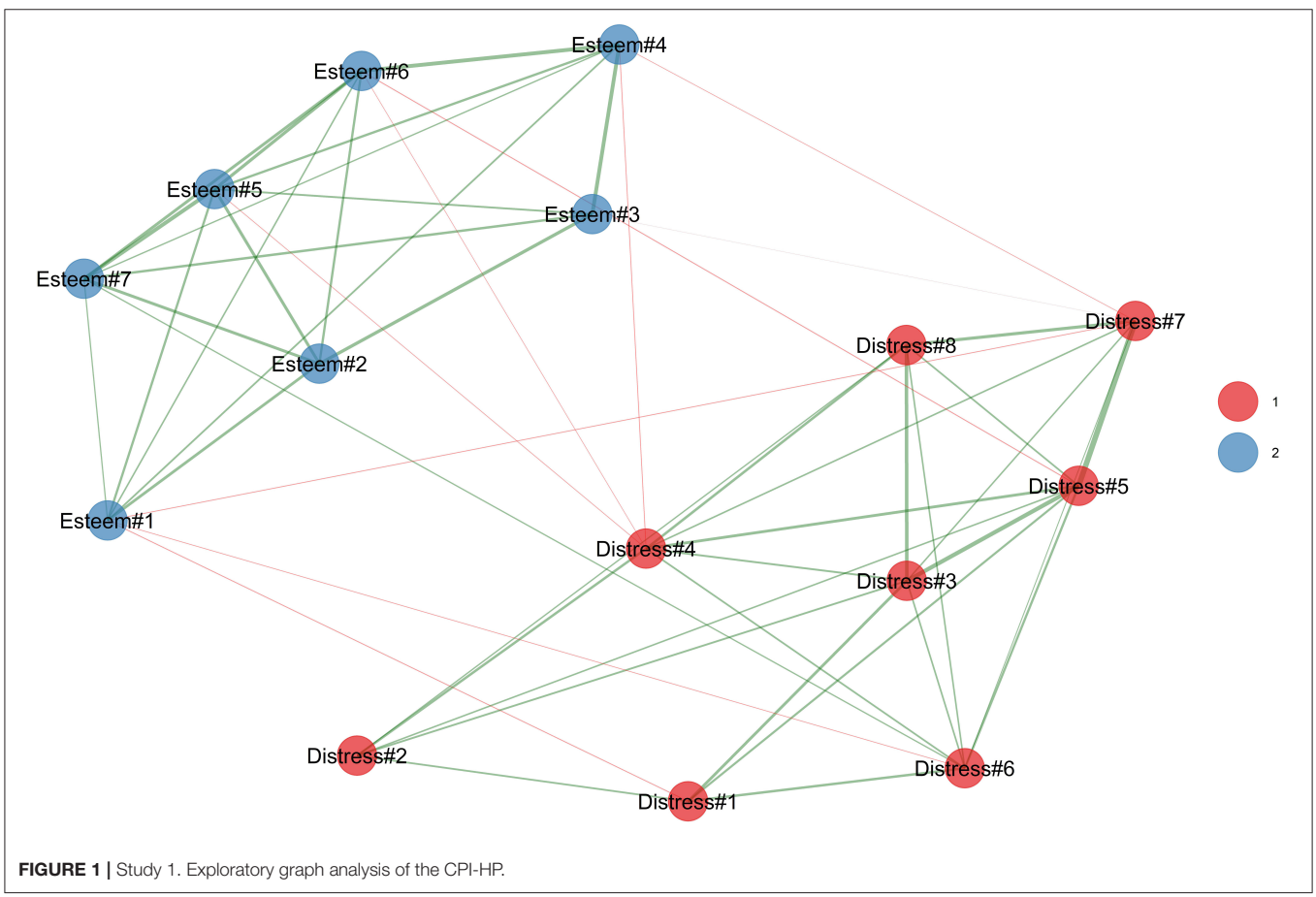

FIGURE 1 | Study 1. Exploratory graph analysis of the CPI-HP.

Psychometric Properties

Regarding internal consistency, Cronbach's α coefficients for the questionnaire scales were good: for the *psychological distress* scale, $\alpha = 0.842$, and for the *esteem of healthcare workers* scale, $\alpha = 0.880$.

The IDP analysis showed that 15 items of the CPI-HP discriminated well between subjects with low and high forgiveness of self, other, and situation in both first- and second-order dimensions (**Table 1**). Considering the *psychological distress* scale: the lower discriminative item was item #6 ($t_i = -5.859$, $p < 0.001$, $d = 1.668$), and in the opposite, the higher discriminative item was item #3 ($t_i = -12.546$, $p < 0.001$, $d = 3.590$). Considering the *esteem of healthcare workers* scale, the lower discriminative item was item #1 ($t_i = -6.679$, $p < 0.001$, $d = 1.889$), and in the opposite, the higher discriminative item was item #6 ($t_i = -18.203$, $p < 0.001$, $d = 5180$).

Finally, the adjusted item–total correlation showed statistically significant negative associations between each item and their respective factors (**Table 1**).

STUDY 2

Method

Study 2 aimed to assess and compare the psychological experience of the health professionals who worked in COVID-19 and non-COVID-19 wards of the institute.

Inclusion criteria were (I) being a native Italian speaker and (II) working in the rehabilitation center during the COVID-19 pandemic; the exclusion criteria was (III) not being able to complete the questionnaire.

Thus, a sample of 68 employees and health workers of the institute was considered. Half of them worked in the COVID-19 ward, while the other half did not. The two groups were strictly matched for age, sex, and professional role. It is worth noting that the COVID-19 group differed in terms of support of the professional activity (e.g., more strict hygiene protocols and more protections) and enhanced by a Whatsapp support group among colleagues of the work-team—these aspects may have a positive effect on the psychological experience.

The final sample of this study was composed of 68 healthcare workers [28 (41.18%) males and 40 (58.82%) females] aged from 23 to 62; mean age equal to 40.41 ($SD = 11.25$)]. The sample characteristics are reported in **Table 1**.

Participants gave informed consent and completed a questionnaire including demographics and psychological measures. Also, this research was conducted in agreement with the Helsinki guidelines, it was approved by the Scientific Direction of the Institute, and all participants voluntarily agreed to participate and provided written informed consent.

Measures

CPI-HP

The CPI-HP questionnaire—created in Study 1—was administered to evaluate the *psychological distress* with 8 items and *esteem* with seven items (total 15 items). The response format was a 5-point Likert-type scale from 0 (*never*) to 4 (*always*). Higher scores on each scale indicated higher levels of the measured variable. The α in this study was 0.830 for distress and 0.874 for esteem.

Brief Resilient Coping Scale

The BRCS (Sinclair and Wallston, 2004) is a four-item self-report tool to measure resilient coping, defined as the tendency to cope with stress in a highly adaptive and positive way despite the difficulties. The response format is a 5-point Likert-type response form (1 = "the statement does not describe me at all" and 5 = "it describes you very well"). Scores range from 0 to 16, with higher values indicating more resilient coping. The BCRS showed good internal consistency in this study, where the α was 0.72.

A visual analog scale (VAS) called *positivity of experience* asked participants to rate the degree of appreciation of their work experience during the COVID-19 pandemic from extremely negative (0) to extremely positive (100).

Statistical Analyses

The R software was used (R Core Team, 2017) with the following packages: *esvis* (Anderson, 2020), *ggplot2* (Wickham, 2016), *overlapping* (Pastore and Calcagnì, 2019), and *psych* (Revelle, 2018).

Similarities and differences among these groups were studied using independent-sample *t*-tests. Besides, Hedge's (1981) *g* was used as the effect size according to the guidelines' thresholds. Hedges' *g* is interpreted similarly as Cohen's *d*; the following rule of thumb can be used to interpret the results: 0–0.2 = *small* effect (not visible to the naked eye); 0.5 = *medium* effect; and 0.8–1 = *large* effect (visible to the naked eye). Moreover, Hedge's *g* was supported by the overlapping index (η); that is, it was used to quantify the magnitude of differences between the Kernel density distributions of the groups (Huberty and Lowman, 2000; Wen and Fan, 2015; Pastore and Calcagnì, 2019; Rossi et al., 2020b). The η ranges from 0 (perfect separation) to 1 (perfect overlap); thus, it should be interpreted as other normalized effect sizes (i.e., explained variance and percentage) (Pastore and Calcagnì, 2019).

Results

The psychological measures of the two groups are reported in **Table 2**; **Figure 2** shows the overlapping graphs.

Psychological Distress

According to the Welch two-sample *t*-test, both groups reported comparable levels of psychological distress (COVID-19 group: mean = 14.68, $SD = 7.03$; non-COVID-19 group: mean = 15.911, $SD = 15.91$) with a non-statistically significant difference [$t_{(63.96)} = 0.787$, $g = 0.189$, $p = 0.434$] and a small effect size. The overlapping indices show a moderate overlap (0.677) and a small separation index (0.323).

Esteem

The COVID-19 group showed higher esteem values (*mean* = 17.912, $SD = 5.485$) than the non-COVID-19 group (mean = 13.71, $SD = 6.441$), and the difference was statistically significant [$t_{(64.366)} = -2.899$, $g = 0.695$, $p = 0.005$] with a moderate–big effect size. The overlapping and separation indexes were moderate at 0.546 and 0.454, respectively.

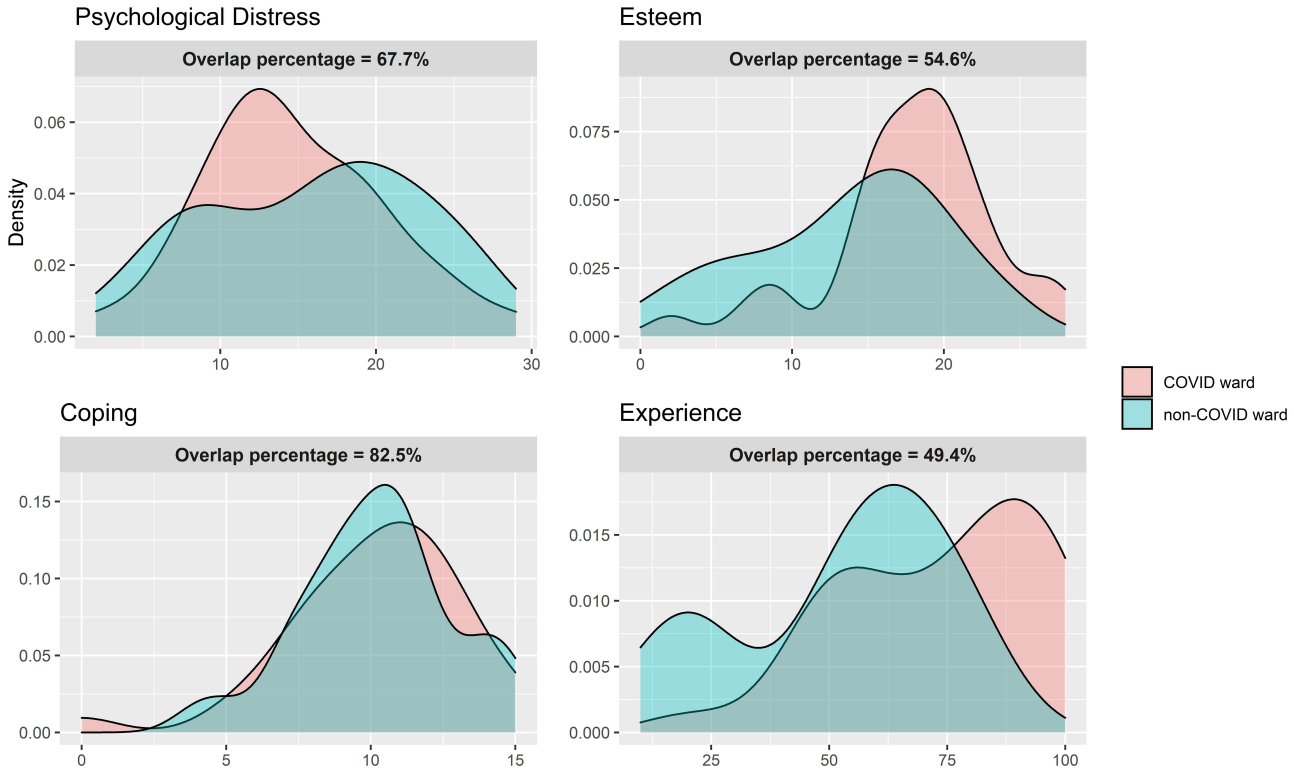

FIGURE 2 | Study 2. Distributions overlapping between HC from the COVID-19 ward and HC from the non-COVID-19 ward.

Coping

Considering resilient coping, there was no statistically significant difference [$t_{(64.732)} = 0.085$, $g = 0.020$, $p = 0.932$] between the COVID-19 (mean = 10.147, *SD* = 3.036) and non-COVID-19 groups (mean = 10.204, *SD* = 2.637). The effect size was negligible, the overlapping index was big (0.825), and the separation index was small (0.175).

Experience

The group of health professionals who worked in the COVID-19 ward reported a more positive experience (*mean* = 73.750, *SD* = 21.137) than the other group (*mean* = 52.647, *SD* = 22.537). The difference was statistically significant [$t_{(64)} = -3.925$, $g = 0.954$, $p < 0.001$), and the effect size was big. The overlapping and the separation indexes were moderate at 0.494 and 0.506, respectively.

Overall, in Study 2, higher psychological distress was associated with lower esteem ($r = -0.33$, $p < 0.008$) as well as with lower resilient coping ($r = -0.34$, $p < 0.006$). Moreover, higher esteem was associated with a more positive appreciation of work experience ($r = 0.65$, $p < 0.001$) and with resilient coping strategies ($r = 0.50$, $p < 0.001$).

DISCUSSIONS

This two-step research aimed to develop a new questionnaire to evaluate the psychological impact of COVID-19 on health professionals and compare the psychological experience of those who worked in the dedicated ward to those who continued working in ordinary departments.

According to Study 1, the EGA showed how the CPI-HP items constitute two well-distinct but correlated dimensions: psychological distress and esteem. Then, the EGA results were confirmed by the CFA reporting good fit indexes for the CPI-HP structural validity. The questionnaire showed good psychometric properties, representing a reliable and useful measure of psychological distress and esteem among health professionals. In particular, higher psychological distress was negatively associated with esteem, suggesting the protective role of esteem toward distress as in line with the TMT (Greenberg et al., 1986). Such a tool may be useful in clinical contexts to assess and monitor the health professionals' psychological health, encompassing both the negative and the protective factors.

Consequently, in Study 2, the CPI-HP was administered to assess and explore the psychological impact of COVID-19 on health professionals of a rehabilitation center during the pandemic of 2020. In particular, Study 2 results provided a reliable description and comparison of the psychological experience of health professionals who cared for post-acute patients with COVID-19 since the early phases of the pandemic, also comparing them with a group who did not directly work with patients with a COVID-19 diagnosis. Although all healthcare professionals reported a considerable level of psychological distress during the emergency, those who were not involved in the COVID-19 ward showed perceived lower esteem and

lower appreciation of experience than those who worked in the COVID-19 ward.

Moreover, according to the overlap graphs and indexes, the two groups showed different distributions of scores in psychological measures, even if these differences were not evident by observing the means and Hedge's *g* values only (Pastore and Calcagnì, 2019). The measures with the greater differences between groups were found in esteem and positivity of experience—with the COVID-19 group reporting higher values. The distributions of psychological distress were not so different, but a larger part of the COVID-19 group reported lower distress when compared to the non-COVID-19 group whose distress values were more tending to higher scores—suggesting that all healthcare workers faced high distress during the pandemic regardless of the COVID-19 or non-COVID-19 ward. Finally, the two groups showed similar distributions in the resilient coping levels, suggesting its value as a resource for both groups.

Such psychological differences and similarities among the COVID-19 and non-COVID-19 groups should be considered to inform clinical support interventions.

Moreover, the psychological differences among groups may be explained in the light of the following considerations. First, those who worked in the COVID-19 ward perceived safer work conditions consisting of special suits and accessories and more severe hygienic practices, as reported by operators during routine équipe meetings with psychologists. Second, in the COVID-19 ward, a large structured team was constituted and met regularly to share decisions and practices. The members of the team also had a WhatsApp group to support each other. Third, the social acclamation made them feel a sense of heroism that probably contributed to coping better with the stressful aspects of their professional and personal lives. Briefly, being involved in a new, threatening, and challenging experience—so important at an (inter)national level—strengthened the organizational and individual resources.

On the other hand, those who did not work in the COVID-19 ward, although reporting coping resources not different from the other group, also suffered from strong psychological distress and reported a more negative work experience, together with less perceived esteem. These results may be due to the different organization of the non-COVID-19 ward where the individual protection devices (IPDs) were simpler and where people could not constitute a new group of work, regularly sharing decisions about practices and feelings. Moreover, they were not part of a highly socially celebrated work context, despite being recognized as heroes triggered both positive and ambivalent reactions (Hennekam et al., 2020).

Regarding the clinical meaning of these findings, it is likely that the work team with the higher group identification and esteem could also appreciate more a problematic experience despite the distress. Maybe distress would have been higher without these positive resources. According to the TMT (Pyszczynski et al., 2004), dangerous situations (i.e., COVID-19 emergency) generate distress that can be buffered through (self-)esteem that is rooted in one's role in society, work, and purpose in life. It is worth noting that all these aspects were salient for healthcare workers during the emergency. Moreover, recent literature showed that meaning in life can be found in work-related aspects, especially in traumatic and emergency situations as the COVID-19 pandemic (Nowicki et al., 2020). In a nutshell, feeling important and perceiving to have a meaningful role in society may have strengthened the esteem and the appreciation of the experience.

Some limitations can be acknowledged in the present work. Although sufficient to correctly estimate statistical parameters, future studies could increase the sample size to obtain even more robust results. Moreover, these studies were conducted in a single COVID-19 rehabilitation center; future studies could test the generalizability of these results to other circumstances (e.g., other infective diseases).

Although most of the literature highlighted the negative impact of COVID-19 for health professionals (Benfante et al., 2020; Pappa et al., 2020), this study is one of the few trying to also consider the positive and protective factors as esteem, resilient coping, and the positivity of the experience (Rieckert et al., 2021). Recent studies also showed that the COVID-19 pandemic implied a severe psychological burden for health workers, but also COVID-19 patients and caregivers and the general population as well (Bruno et al., 2020; Nese et al., 2020; Panzeri and Rossi Ferrario, 2020; Parola et al., 2020; Que et al., 2020; Rossi Ferrario et al., 2021). Despite this fact, a significant number of people avoided seeking social support and/or professional psychological help (Ratti et al., 2017; Rossi and Mannarini, 2019), probably due to the associated social and personal stigma (Mannarini et al., 2018, 2020; Mannarini and Rossi, 2019). Thus, large-scale psychological and social interventions should support individuals in these challenging circumstances.

Future research will deepen psychological reactions to stressful situations and evaluate the effectiveness of psychological interventions to promote functional psychological adaptation and resilience.

CONCLUSIONS

Based on these findings, it is important to assess and monitor the psychological health of healthcare professionals in stressful circumstances as the COVID-19 pandemic, and the CPI-HP is proposed as a good tool to do so. Psychological screening programs should identify those operators who show a higher risk of (acute) stress reactions. Healthcare workers operating in either COVID-19 or non-COVID-19 wards similarly suffered from psychological distress, suggesting that timely psychological interventions should support them to reduce discomfort and symptoms. At the same time, resources to strengthen may include resilient coping processes and esteem.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because restrictions apply to the availability of this data to guarantee the respondents privacy. Requests to access the datasets should be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Scientific Reasearch Direction of the Scientific and Clinical Research Institute of Veruno, Maugeri Institutes. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AP did the analysis and interpretation of data. AP and SR participate in drafting the article. All authors made substantial contributions to conception and design, acquisition of data, revised the article critically for important intellectual content, and give final approval of the version to be submitted and any revised version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

APPENDIX

TABLE A1 | Items of the questionnaire.

Item #	Item text
	Psychological distress scale
1	La mia alimentazione è stata più disordinate *My eating habits were more disordered*
2	Ho avuto sintomi come mal di testa, disturbi gastro-intestinali o altri disturbi fisici *I had symptoms such as headaches, gastrointestinal disorders, or other physical disorders*
3	Ho sentito più irritabilità/nervosismo *I felt more irritability and nervousness*
4	Ho avuto difficoltà a dormire *I had trouble sleeping*
5	Il mio umore è stato instabile *My mood was unstable*
6	La stanchezza che ho provato è stata particolarmente intens *The fatigue I felt was particularly intense*
7	Ho sentito più ansia del solito *I felt more anxiety than usual*
8	Ho avuto paura di non farcela *I was afraid I wouldn't make it*
	Esteem scale
1	Mi sono sentita/o valorizzata/o nel mio lavoro da parte dei miei cari *I felt appreciated for my job by my loved ones*
2	In questo periodo ho sentito una motivazione più forte al mio lavoro *In this period, I felt a stronger motivation in my work*
3	Ho sentito forte l'appartenenza a un gruppo di lavoro *I felt myself strongly belonging to a work team*
4	Mi sono sentita/o valorizzata/o nel mio lavoro da parte dei colleghi *I felt appreciated in my job by colleagues*
5	Ho dato più valore al mio lavoro *I appreciated my job more than usual*
6	Mi sono sentita/o valorizzata/o nel mio lavoro da parte dei superiori *I felt appreciated in my work by my superiors*
7	Ho sentito di partecipare a qualcosa di davvero importante *I felt like I was part of something really important*

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ORIGINAL RESEARCH
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Prolonged COVID 19 Outbreak and Psychological Response of Nurses in Italian Healthcare System: Cross-Sectional Study

*Jessica Ranieri[1], Federica Guerra[1], E. Perilli[1], Domenico Passafiume[1], D. Maccarone[2], C. Ferri[1,2] and Dina Di Giacomo[1]**

[1] Life, Health and Environmental Sciences Department, University of L'Aquila, L'Aquila, Italy, [2] S. Salvatore Hospital, L'Aquila, Italy

Aim of the study was to analyze the posttraumatic stress disorder risk nurses, detecting the relationship between distress experience and personality dimensions in Italian COVID-19 outbreak. A cross-sectional study was conducted based on 2 data detection (March 2020 and September 2020). Mental evaluation was carried out in Laboratory of Clinical Psychology on n.69 nurses in range age 22–64 years old (mean age 37.3; sd ± 10.3; 55% working in nursing care with confirmed COVID-19 patients (named frontline; secondline nurses have been identified by nursing care working with infectious patients but no confirmed COVID-19). Measurement was focused on symptoms anxiety, personality traits, peritraumatic dissociation and post-traumatic stress for all participants. No online screening was applied. Comparisons (ANOVA test) within the various demographic characteristics demonstrated few significant differences between groups on DASS-21, PDEQ, and ISE-R scores. Correlation analysis (Spearman test) was performed among PDEQ, DASS-21, BFI-10 and IES-R and confirmed between anxiety (DASS-21) and peritraumatic dissociation and post-traumatic stress; then anxiety is positively correlated to agreeableness variable of BFI-10 test. The emotional distress was protracted overtime (after 6 months) but in long-term personality traits resulted mediator facing subjective stress. Our finding drew details for protective and predictive risk factors as well as mental health issues of nurses dealing with pandemic: healthcare workers faced the protracted challenge caring COVID-19 patients over and over again: in short time the impact was relevant, and the prolonged exposition to the stressor was tackled by personal resources such as personality traits.

Keywords: clinical psychology, nurse, COVID-19, psychological traits, personality traits, healthcare worker

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Yuan Shi,
Children's Hospital of Chongqing Medical University, China

***Correspondence:**
Dina Di Giacomo
dina.digiacomo@cc.univaq.it

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INTRODUCTION

Actual COVID-19 pandemic is affecting mental health of population. Several mental health screening were conducted for general population (Fan et al., 2021; Simşir et al., 2021), undergraduate, children and adolescent as well-health care workers (Lai et al., 2020; Ranieri et al., 2020; Rossi et al., 2020; Seçer et al., 2020; Wang et al., 2020). Depression, anxiety, peritraumatic dissociative experience and mental disease were detected as response in acute COVID-19 outbreak; healthcare workers, in particular young women and frontline, resulted intensively affected (Zhang et al., 2020).

Most researches conducted in coronavirus pandemic have been conducted applying survey method trying to involve the higher number of health care workers, as well general population in order to have the preliminary data about impact of pandemic on mental health; they screened mental health population detecting a general mental suffering. The limitation of those studies is into the application of survey methodology: it is evident the lacking for gold standard for psychological evaluation setting, so the results could be exposed to the lacking of objectivity; more, applying online survey potential bias effect could be the timing of completion online form being a web link available to everyone and exposed to potential risk for reliability data; last but not least, the lacking of demographic data related to the mental health preview pandemic (personal history of individuals) detectable by anamnesis and clinical interview as well the use of psychotropic drugs.

Moreover, several studies were based on emotional and well-being self-perception in short-time screening session. Prolonged pandemic exposition and the spread out of mental health needs are demanding to draw the effective psychopathological impact on mental health in health workers applying gold standard for mental health measurement and longitudinal as well as cross-sectional study designs.

February 2020 period started the Italian acute COVID-19 outbreak and stressing the healthcare system in terms of management of hospitalization procedure and management of emotional impact on healthcare workers in hospital emergency worried about the risk for own health (Protezione Civile, 2020). According Lai's et al. finding (2020), we wanted to evaluate the mental health of healthcare workers in short- and long-term Italian COVID-19 outbreak applying psychological measurements for posttraumatic disorder risk in traditional psychological setting applying a cross-sectional study design based on early (short-) and prolonged (long-) time of outbreak. Aim of the study was to investigate the posttraumatic stress disorder risk in healthcare workers facing protracted challenge of coronavirus phenomena, detecting the relationship between distress experience and personality dimensions.

METHODS

Ethical Approval

This study was approved by the Internal Review Board (IRB) of the University of L'Aquila, Italy (Prot. No. 107751/2020). Written informed consent was obtained following the Helsinki Declaration (WMA).

Study Design

Participants have been enrolled in Clinical Psychology Laboratory of University of L'Aquila. Informed consent was obtained from each participant at the time of enrolment and the study adhered to the Declaration of Helsinki. The study is cross-sectional study based on mental screening conducted in March 2020 and in September 2020. During March period, the total confirmed cases of COVID-19 exceeded 101.739 in Italy, whereas in September confirmed cases were 314.861 (Open Data). Trained clinical psychologists, blind to the objectives of the study, conducted the psychological screening in a quiet, dedicated room. The duration of the evaluations was 45 min. Data were collected anonymously.

Participants

Eligible participants were nurses aged 22–64 years old (mean age 37.3; sd ± 10.3). Demographic characteristics of the n.69 participants are: 49.2% (n.34) of them were married, 62.3% having no children; 55% working in nursing care with confirmed COVID-19 patients (named frontline; secondline nurses have been identified by nursing care working with infectious patients but no confirmed COVID-19). Inclusion criteria were: (a) aged 22–65; (b) being female; (c) being nurses in National Healthcare system; (d) no signs for previous psychological disorders and/or chronic disease.

Outcomes

Demographic data were self-reported by participants. Measurement was focused on symptoms anxiety, personality traits, peritraumatic dissociation and posttraumatic stress for all participants. Psychological battery has been composed of n.4 self-reports evaluating the anxiety (DASS-21), personality traits (BFI-10) and distress (EIS-R and PDEQ) to measure the presence/absence of psychological symptoms and related severity.

Big Five Inventory-10

The BFI-10 (Guido et al., 2015) evaluates the five personality dimensions on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree), each with two items: openness (OP), conscientiousness (CO), emotional stability (ES), extraversion (EX), and agreeableness (AG).

Depression, Anxiety, and Stress Scale (DASS-21)

The DASS (Beaufort et al., 2007) is a clinical assessment that measures the three related states of depression, anxiety and stress. It has 21 questions and takes about 3 min to complete. Each subscale measuring the emotional traits is composed of 7 items. We applied only the anxiety subscale.

Impact of Event Scale-Revised

It is a 22-item self-report questionnaire (Marmar et al., 1997) to measure the subjective response to a specific traumatic event, especially in the response sets of intrusion (intrusive thoughts, nightmares, intrusive feelings and imagery, dissociative-like re-experiencing), avoidance (numbing of responsiveness, avoidance of feelings, situations, and ideas), and hyperarousal (anger, irritability, hypervigilance, difficulty concentrating, heightened startle), as well as a total subjective stress IES-R score. Scores higher than 33 are of concern; the higher the score the greater the concern for post-traumatic stress and associated health and well-being consequences.

Peritraumatic Dissociative Experiences Questionnaire

It is a 10-items self-report questionnaire (Weiss, 2007) measuring peritraumatic dissociation. The PDEQ has well-established psychometric properties, with higher total scores indicating increased peritraumatic dissociation. A score above 15 is indicative of significant dissociation.

Statistical Analyses

The data analysis was performed using SPSS statistical software, with a fixed $\alpha \leq 0.05$. All demographic data were analyzed and presented as number (N) and percentage (%). Using MANOVA test as appropriate, we compared emotional severity by demographic variables. Spearman rank order correlation was used to examine correlations among anxiety, peritraumatic, post-traumatic stress and psychological traits.

RESULTS

Analysis of Emotional Dimension in Early Italian Outbreak (March 2020)

First, we analyses the prevalence of emotional symptoms among nurses in early time of outbreak (March 2020) (**Table 1**).

A considerable part of sample (77.3%) showed anxiety: 10.5% extremely severe, 13.1% severe, 28.9% moderate, and 23.7% mild level [DASS-21 subscale Anxiety >8 (score range 0–21)]. Fifty five percent of the sample evidenced significant peritraumatic dissociative experience [PDEQ score >15 (score range 1–50)] as well as 52.6% of nurses showed a probable presence of post-traumatic stress [IES-R score >33 (score range 0–88)] and 47.3% resulted in no stressed emotional condition.

For dimensions of personality status, the prevalence for each categories were: 79% high level of conscientiousness (21% moderate, no low level); 57, 9% moderate level of emotional stability (28.9% high and 13.1% low level); 50% moderate level of openness (39.4% high and 10.5% low level); 44.7% moderate extroversion level (36.8% high and 18.4% low level); then, 42.1% moderate level of agreeableness (34.2% low and 23.6% high level).

Comparisons (ANOVA test) within the various demographic characteristics demonstrated few significant differences between groups on DASS-21, PDEQ, and ISE-R scores. By age groups (median value = 35 years old) younger nurses showed higher anxiety (DASS-21) then old group ($\eta = 0.6$; $p = 0.02$). Marital status resulted significant: single nurses evidenced higher anxiety than married ($\eta = 0.7$; $p = 0.01$), as well as single reported higher level of post-traumatic stress than married (($\eta = 0.7$; $p = 0.01$). Nursing care wasn't significant.

Correlation analysis (Spearman test) was performed among BFI-10, PDEQ, DASS-21, and IES-R. The results summarized in **Table 2** confirm between anxiety (DASS-21) and peritraumatic dissociation and post-traumatic stress; then anxiety is positively correlated to agreeableness variable of BFI-10 test. Last, subjective stress for events (IES-R) was related to the anxiety ($p = 0.001$) and peritraumatic dissociation dimension ($p = 0.001$) for all indexes (avoidance, intrusivity, and hyperasoul). No correlation was significant by personality traits and emotional dimensions.

Analysis of Emotional Dimension in Prolonged Italian Outbreak (September 2020)

In **Table 3** were reported the raw score of psychological performance of nurses in prolonged outbreak (September 2020).

All of the sample showed anxiety: 87% extremely severe, and 12.9% severe level [DASS-21 subscale Anxiety >8 (score range 0–21)]. Sixty one percent of the sample evidenced significant peritraumatic dissociative experience [PDEQ score >15 (score range 1–50)] as well as 61.2% of nurses showed a probable presence of post-traumatic stress [IES-R score >33 (score range 0–88)] and 38.7% resulted in no stressed emotional condition.

TABLE 1 | Raw score of anxiety, distress, and PT stress symptoms in the sample in March 2020 detection data.

	Age group		Marital status		Level Caring	
	Younger (X, sd)	Old (X, sd)	Married (X, sd)	Single (X, sd)	Frontline (X, sd)	Secondline (X, sd)
DASS-21 anxiety	6.6 ± 3.7	4.4 ± 1.8	4 ± 2.3	6.5 ± 3.1	5.4 ± 3.4	5.8 ± 1.6
PDEQ	19.9 ± 8.3	15.8 ± 3.8	15.5 ± 3.6	19.4 ± 7.8	18.4 ± 7.4	16.2 ± 3.6
BFI-10 AG	5.4 ± 1.9	5.5 ± 1.5	5.2 ± 1.1	5.6 ± 2	5.3 ± 1.8	5.8 ± 1.5
BFI-10 CO	7.7 ± 1.6	8.4 ± 1.6	8.4 ± 1.3	7.8 ± 1.8	8 ± 1.6	8.2 ± 1.9
BFI-10 ES	6.1 ± 1.1	6.1 ± 1.8	6.2 ± 1.7	6 ± 1.3	5.9 ± 1.1	6.7 ± 2.2
BFI-10 EX	6.4 ± 2.5	6 ± 1.5	6.1 ± 1.9	6.3 ± 2.2	6.3 ± 2.2	5.7 ± 1.6
BFI-10 OP	6.5 ± 1.9	6.8 ± 1.8	6.5 ± 1.7	6.7 ± 2	6.7 ± 1.9	6.6 ± 1.8
IES-R avoidance	13.7 ± 7.1	10.6 ± 5	9.3 ± 5.2	14 ± 6.3	12.5 ± 6.9	11.1 ± 4
IES-R intrusivity	14.5 ± 7.3	12.6 ± 6.8	10.4 ± 6.1	15.6 ± 7	13.4 ± 7.2	14.1 ± 6.9
IES-R iperarousal	10.5 ± 6.1	8.3 ± 4.9	6.6 ± 4.7	11.2 ± 5.5	9.3 ± 5.7	9.7 ± 5.7
IES-R TOT	38.8 ± 19.4	31.4 ± 15.5	26.3 ± 14.6	40.9 ± 17.5	35.2 ± 18.6	34.9 ± 15.6

X, mean value.

TABLE 2 | Spearman correlations among emotional and psychological measurements in March 2020 evaluations correlation matrix.

		PDEQ	DASS-21 anxiety	BFI-10 AG	BFI-10 CO	BFI-10 OP	BFI-10 EX	IES-R avoidance	IES-R intrusivity	IES-R iperarousal	IES-R TOT
PDEQ	Spearman's rho	–									
	p-value	–									
DASS-21 anxiety	Spearman's rho	0.521***	–								
	p-value	<0.001	–								
BFI-10 AG	Spearman's rho	0.341*	0.249	–							
	p-value	0.036	0.131	–							
BFI-10 CO	Spearman's rho	−0.229	−0.132	0.102	–						
	p-value	0.167	0.431	0.543	–						
BFI-10 OP	Spearman's rho	−0.019	−0.042	0.086	0.402*	–					
	p-value	0.912	0.804	0.608	0.012	–					
BFI-10 EX	Spearman's rho	0.048	−0.159	0.019	0.281	−0.003	–				
	p-value	0.776	0.340	0.911	0.087	0.985	–				
IES-R avoidance	Spearman's rho	0.637***	0.374*	0.081	−0.084	0.280	−0.019	–			
	p-value	<0.001	0.021	0.630	0.614	0.088	0.908	–			
IES-R intrusivity	Spearman's rho	0.578***	0.484**	0.169	−0.110	0.274	0.017	0.783***	–		
	p-value	<0.001	0.002	0.310	0.511	0.096	0.918	<0.001	–		
IES-R iperarousal	Spearman's rho	0.663***	0.496**	0.015	−0.106	0.272	−0.062	0.776***	0.777***	–	
	p-value	<0.001	0.002	0.929	0.527	0.099	0.712	<0.001	<0.001	–	
IES-R TOT	Spearman's rho	0.692***	0.504**	0.140	−0.105	0.310	−0.015	0.917***	0.926***	0.904***	–
	p-value	<0.001	0.001	0.401	0.530	0.058	0.929	<0.001	<0.001	<0.001	–

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 3 | Raw score of anxiety, distress, and PT stress symptoms in the sample in September 2020 detection data.

	Age group		Marital status		Level caring	
	Younger (X, sd)	Old (X, sd)	Married (X, sd)	Single (X, sd)	Frontline (X, sd)	Secondline (X, sd)
DASS-21 anxiety	29.6 ± 6.3	23 ± 4.8	26.8 ± 6.2	25.1 ± 6.9	27.4 ± 6.4	24.7 ± 6.4
PDEQ	21.7 ± 8.6	18.4 ± 3.8	21.2 ± 8.0	18.1 ± 7.4	20.0 ± 7.6	20 ± 8.3
BFI-10 AG	6.1 ± 0.7	6.2 ± 1.4	6.3 ± 1.1	5.9 ± 1.2	5.8 ± 1.1	6.6 ± 1.0
BFI-10 CO	8.0 ± 1.9	8.8 ± 1.1	8.0 ± 1.7	9.0 ± 1.1	8.4 ± 1.5	8.4 ± 1.7
BFI-10 ES	5.5 ± 1.0	5.2 ± 1.8	5.4 ± 1.5	5.2 ± 1.4	4.7 ± 1.2	6.1 ± 1.5
BFI-10 EX	6.6 ± 2.5	6.0 ± 2.5	5.8 ± 2.8	7 ± 1.8	6.6 ± 2.4	5.9 ± 2.6
BFI-10 OP	6.1 ± 2.3	7.0 ± 1.4	6.5 ± 2.2	6.5 ± 1.3	7.2 ± 1.9	5.7 ± 1.6
IES-R avoidance	13.6 ± 6.9	11.6 ± 6.6	12.5 ± 7.7	12.8 ± 5.1	12.2 ± 7.0	13.0 ± 6.6
IES-R intrusivity	14.6 ± 6.2	12.3 ± 6.9	12.7 ± 7.1	14.5 ± 5.9	12.9 ± 6.3	14.0 ± 7.1
IES-R iperarousal	12.7 ± 6.3	7.4 ± 4.1	9.8 ± 6.8	10.2 ± 4.4	9.5 ± 4.8	10.4 ± 9.5
IES-R TOT	40.9 ± 18.9	31.4 ± 16.5	35.1 ± 20.4	37.4 ± 14.4	34.8 ± 16.3	37.4 ± 20.5

For dimensions of personality, the prevalence for each categories were: 74.1% high level of conscientiousness (25.8% moderate and no low level); 67.7% moderate level of emotional stability (29% low and 3.2% high level); 51.6% moderate level of openness (35.4% high and 12.9% low level); 38.7% moderate extroversion level (35.4% high and 25.8% low level); then, 87% moderate level of agreeableness (9.6% low and 3.2% high level).

Comparisons (ANOVA test,) within the various demographic characteristics demonstrated few significant differences between groups on DASS-21, PDEQ, and ISE-R scores. By age groups (median value = 37 years old) younger nurses showed higher anxiety (DASS-21) then old group ($\eta^2 = 0.22$; $p = 0.01$]. Geographical area of work was significant for anxiety [$F_{(2,1)} = 5.12$; $\eta^2 = 0.26$; $p = 0.01$), peritraumatic dissociative experience [$F_{(2,1)} = 5.42$; $\eta^2 = 0.27$; $p = 0.01$] and probable presence of post-traumatic stress [$F_{(2,1)} = 3.48$; $\eta^2 = 0.19$; $p = 0.04$]; in *post-hoc* analysis (Tukey test), per each measurement was significant the comparison between North and South Italian area evidencing the higher negative emotional outcome in nurses working in North Italy (anxiety $P_{tukey} = 0.009$ Cohen's $d = 1.38$; peritraumatic experience $P_{tukey} = 0.007$ Cohen's $d = 1.42$; probable presence of post-traumatic stress symptoms $P_{tukey} = 0.03$ Cohen's $d = 1.13$). Marital status, nursing care (frontline/secondline) resulted no significant.

Correlation analysis (Spearman test) was performed among BFI-10, PDEQ, DASS-21, and IES-R. The results summarized in **Table 4**: the correlation between anxiety (DASS-21) and peritraumatic dissociation and post-traumatic stress have been confirmed as well in March detection data; then even the correlation between peritraumatic stress, anxiety, and subjective stress for event have been detected; furthermore, personality traits were correlated negatively with subjective stress, in particular optimism with intrusivity index ($p = 0.004$), extroversion with avoidance ($p = 0.001$) and hyperarousal ($p = 0.001$) indexes.

DISCUSSION AND CONCLUSIONS

This cross-sectional study was focused on the screening of mental health in nurses in 2 differential timing of Italian COVID-19 outbreak; we wanted to investigate the mechanisms of mental adaption to environmental stressor in long-term challenge pandemic. Younger nurses were affected and, other demographic variables were incising in first time marital status was influencing the emotional condition of healthcare worker; afterward, geographical area of work resulted preeminent. Frontline/secondline nursing care was no decisive for emotional impact. Facing COVID-19 patients, healthcare workers developed in early time anxiety symptoms (from extremely severe to mild level) related to peritraumatic dissociative experience and probable sign for posttraumatic stress symptoms related even to subjective stress though intrusive thoughts, avoidance of feelings, situations, and ideas, anger, irritability, hypervigilance, difficulty concentrating. Personality dimension related was the agreeableness based on positive feeling, sincere and trusting.

After 6 months, anxiety for peritraumatic dissociative experiences resulted still effective as well subjective stress; an interesting point was no direct correlation with personality traits.

Our finding was obtained in short- and long-term Italian COVID-19 outbreak; we measured its short-time mental

TABLE 4 | Spearman correlations among emotional and psychological measurement in September 2020 evaluations.

		PDEQ	DASS-21 anxiety	BIG-10 AG	BIG-10 CO	BIG-10 ES	BIG-10 OP	BIG-10 EX	IES-R avoidance	IES-R intrusivity	IES-R Iperarousal	IES-R TOT
PDEQ	Spearman's rho	–										
	p-value	–										
DASS-21 anxiety	Spearman's rho	0.614***	–									
	p-value	<0.001	–									
BIG-10 AG	Spearman's rho	0.162	−0.027	–								
	p-value	0.384	0.885	–								
BIG-10 CO	Spearman's rho	−0.037	−0.033	0.162	–							
	p-value	0.845	0.859	0.382	–							
BIG-10 ES	Spearman's rho	0.275	0.034	0.084	−0.231	–						
	p-value	0.134	0.854	0.654	0.212	–						
BIG-10 OP	Spearman's rho	−0.333	−0.286	0.063	−0.220	−0.369*	–					
	p-value	0.067	0.119	0.736	0.233	0.041	–					
BIG-10 EX	Spearman's rho	−0.278	−0.189	−0.190	0.453*	−0.090	−0.019	–				
	p-value	0.130	0.309	0.306	0.010	0.629	0.921	–				
IES-R avoidance	Spearman's rho	0.733***	0.615***	0.168	−0.091	0.043	−0.312	−0.494**	–			
	p-value	<0.001	<0.001	0.366	0.627	0.818	0.087	0.005	–			
IES-R intrusivity	Spearman's rho	0.731***	0.598***	−0.229	0.086	0.128	−0.502**	−0.246	0.740***	–		
	p-value	<0.001	<0.001	0.215	0.646	0.494	0.004	0.182	<0.001	–		
IES-R iperarousal	Spearman's rho	0.784***	0.753***	−0.025	−0.148	0.169	−0.352	−0.393*	0.842***	0.858***	–	
	p-value	<0.001	<0.001	0.894	0.427	0.365	0.052	0.029	<0.001	<0.001	–	
IES-R TOT	Spearman's rho	0.820***	0.701***	−0.056	−0.050	0.141	−0.477**	−0.360*	0.883***	0.945***	0.953***	–
	p-value	<0.001	<0.001	0.764	0.788	0.451	0.007	0.047	<0.001	<0.001	<0.001	–

Correlation matrix.

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

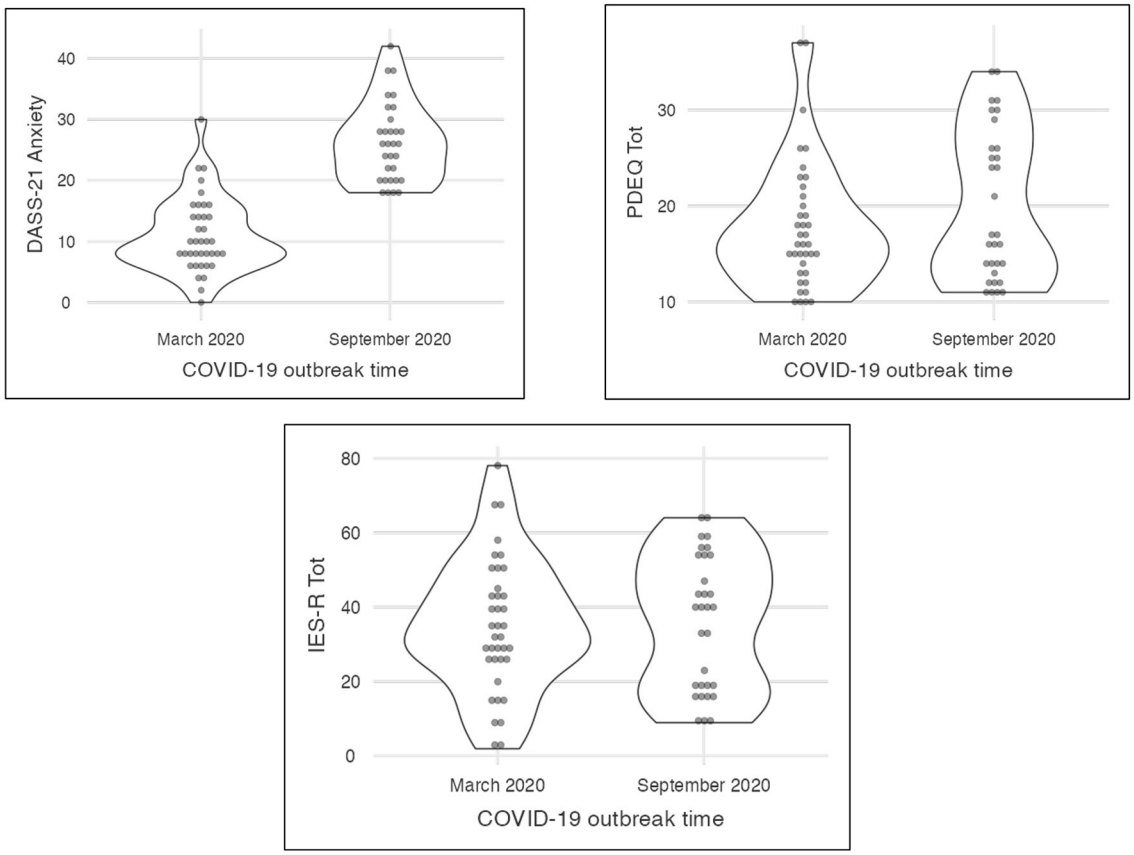

FIGURE 1 | Representation of emotional dimensions in short- and long-term COVID 19 outbreak.

health impact for healthcare workers highlighting the anxiety as early reaction for emotional distress and high risk for posttraumatic stress disorders; the personality dimensions haven't mediated the emotional distress as well as probable risk for posttraumatic stress symptoms: the impact of pandemic event on mental health of nurses was strong and unmanageable by themselves; individual resources did not help professionals to overcome the distress. Nurses appeared exposed to mental distress. The emotional distress was protracted overtime (after 6 months) but in long-term personality traits resulted mediator facing subjective stress (see **Figure 1**).

Our finding drew details for protective and predictive risk factors as well as mental health issues of nurses dealing with pandemic. Several study (Lai et al., 2020; Rossi et al., 2020; Wang et al., 2020) conducted a mental screening in public health emergency and outlined risk trend for health workers; our study has confirmed and implemented findings. Healthcare workers faced the protracted challenge caring COVID-19 patients over and over again: in short time the impact was relevant, and the prolonged exposition to the stressor was tackled by personal resources such as personality traits. Our findings highlighted in short time the intensive impact of COVID 19 outbreak in healthcare workers, as well as reported in recent literature (Lai et al., 2020; Ranieri et al., 2020; Wang et al., 2020), and in long time they have resorted to their own psychological resource (personality traits) providing the personal adaptation to the environmental prolonged outbreak stressor, toward to mitigate the negative effect of actual pandemic on mental health. Results evidenced the need to carry on mental health program for health workers (especially nursing professionals) in order to prevent burn out or post-traumatic stress symptoms in who took care of patients in acute COVID-19 outbreak. Moreover, tailored individual programs for empowerment and health promotion strategies might be priority for policy in National Healthcare System toward improvement of Health policy and service (Di Giacomo, 2020). Challenge is going to overcome and steer their mental health risk turning it as protecting process in public health emergency.

The study presents some limitations: the sample size and psychological measurements. Simple size is limited to consent generalization data but could be representative of extensive researches will be realized progressively; then, the psychological measurements are composed of short and fast battery but it was applied in traditional setting reflecting golden standard of psychological testing.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by University of L'Aquila IRB (Prof. 37589/2021). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

DD had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. FG, JR, DP, EP, and DM: acquisition, analysis, or interpretation of data. DD: drafting of the manuscript. CF: supervision. All authors: concept and design.

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The Psychological Impact of COVID-19 on Healthcare Providers in Obstetrics: A Cross-Sectional Survey Study

Lidia Del Piccolo[1†], Valeria Donisi[1†], Ricciarda Raffaelli[2], Simone Garzon[2], Cinzia Perlini[1], Michela Rimondini[1], Stefano Uccella[2], Antonella Cromi[3], Fabio Ghezzi[3], Maddalena Ginami[4], Enrico Sartori[4], Francesca Ciccarone[5], Giovanni Scambia[5] and Massimo Franchi[2]*

[1] Department of Neuroscience, Biomedicine and Movement Sciences, University of Verona, Verona, Italy, [2] Department of Obstetrics and Gynecology, AOUI Verona, University of Verona, Verona, Italy, [3] Department of Obstetrics and Gynecology, "Filippo Del Ponte" Hospital, University of Insubria, Varese, Italy, [4] Department of Obstetrics and Gynecology, University of Brescia, Brescia, Italy, [5] Division of Gynecologic Oncology, Department of Obstetrics and Gynecology, Catholic University of the Sacred Heart, Rome, Italy

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***Correspondence:**
Simone Garzon
simone.garzon@univr.it
orcid.org/0000-0002-5840-699X

[†]These authors have contributed equally to this work

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Objective: To assess the psychological distress of healthcare providers (HCPs) working in the field of obstetrics during the coronavirus disease 2019 (COVID-19) pandemic and to identify factors associated with psychological distress at the individual, interpersonal, and organizational level.

Design: Cross-sectional survey study.

Setting: Four University hospitals in Italy.

Participants: HCPs working in obstetrics, including gynecologists, residents in gynecology and obstetrics, and midwives.

Methods: The 104-item survey Impatto PSIcologico COVID-19 in Ostetricia (IPSICO) was created by a multidisciplinary expert panel and administered to HCPs in obstetrics in May 2020 *via* a web-based platform.

Main Outcome Measures: Psychological distress assessed by the General Health Questionnaire-12 (GHQ-12) included in the IPSICO survey.

Results: The response rate to the IPSICO survey was 88.2% (503/570), and that for GHQ-12 was 84.4% (481/570). Just over half (51.1%; 246/481) of the GHQ-12 respondents reported a clinically significant level of psychological distress (GHQ-12 $\geq$3). Psychological distress was associated with either individual (i.e., female gender, stressful experience related to COVID-19, exhaustion, and the use of dysfunctional coping strategies), interpersonal (i.e., lower family support, limitations in interactions with colleagues), and organizational (i.e., reduced perception of protection by personal protective equipment, perceived delays on updates and gaps in information on the pandemic) factors in dealing with the pandemic.

Conclusions: Results confirm the need for monitoring and assessing the psychological distress for HCPs in obstetrics. Interventions at the individual, interpersonal, and organizational level may relieve the psychological distress during the COVID-19 pandemic and foster resilience skills in facing emotional distress.

Keywords: health care providers, COVID-19, obstetrics, psychological distress, GHQ-12, coping strategies, stress

INTRODUCTION

Since the worldwide outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in March 2020 (WHO, 2020), healthcare systems and healthcare providers (HCPs) have been placed under extreme pressure and challenges. Different authors outlined the psychological impact of this condition, recommending tailored psychosocial interventions to preserve the well-being of HCPs and the quality of healthcare provided to the patients (Galli et al., 2020; Greenberg et al., 2020; Lai et al., 2020; Nie et al., 2020; Preti et al., 2020; Shaukat et al., 2020; Shreffler et al., 2020; Yao et al., 2020).

North Italian regions were the first in Europe to face the coronavirus disease 2019 (COVID-19) pandemic and the associated pressure on the healthcare system and HCPs (Alfieri et al., 2020; Armocida et al., 2020; Oliva et al., 2020). High levels of burnout, psychological distress, and psychosomatic symptoms were observed in physicians, nurses, and other professionals at the peak of the pandemic (Barello et al., 2020a,b; Giusti et al., 2020; Marton et al., 2020). Although HCPs working with COVID-19 patients reported a higher level of stress, depressive and anxiety symptoms, burnout, and post-traumatic stress disorders than other HCPs (Babore et al., 2020; Di Tella et al., 2020; Trumello et al., 2020), the emergency might have amplified preexisting vulnerability factors for psychological distress, regardless of direct or indirect management of COVID-19 patients. Therefore, baseline risk may help identify those HCPs who are more susceptible to adverse psychological impact of the COVID-19 pandemic. In this regard, HCPs who work in obstetrics are among those with a noticeable baseline risk for burnout and distress (Becker et al., 2006; Govardhan et al., 2012; Wahlberg et al., 2017; Bourne et al., 2019; Slade et al., 2020).

To the best of our knowledge, the data on COVID-19–related psychosocial distress in HCPs in obstetrics are limited, with the exception of a UK-wide study, which identified a high prevalence of depression and anxiety among obstetricians and gynecologists (Shah et al., 2020). HCPs working in obstetrics and gynecology experienced common and unique challenges during the COVID-19 pandemic. Similar to other HCPs, HCPs in obstetrics also had to adjust to the implementation of infection control measures, dedicated "emergency protocols," personal risk of exposure to infection, as well as concerns about the provision and use of personal protective equipment (PPE) (Alfieri et al., 2020; Armocida et al., 2020; Oliva et al., 2020). Moreover, HCPs in obstetrics faced specific challenges: the limited rescheduling of obstetrics care, the uncertainties about the potential of vertical transmission of SARS-CoV-2, the management of SARS-CoV-2–positive women during labor, the care of psychologically vulnerable patients without the involvement of the partner, and an increased rate of intrauterine fetal death due to reduced use of emergency service (Boelig et al., 2020; Dell'Utri et al., 2020; Franchi et al., 2020; Green et al., 2020; Qiao, 2020; Vafaei et al., 2020; Yalçin Bahat et al., 2020).

Based on this background, we investigated the psychological distress of HCPs working in obstetrics during the current pandemic in different Italian hospitals. This study aimed to identify HCPs with psychological distress and explore potentially associated factors at the individual, interpersonal, and organizational levels. The "socioecological" model proposed by Winkel et al. (2019) explaining how resilience grows in obstetrician-gynecologists was adopted to build up the Impatto PSIcologico COVID-19 in Ostetricia (IPSICO) survey. This model is based on grounded theory and showed that resilience emerges as "a capacity to connect authentically with the work that is influenced by personal and professional surroundings" and underlines the importance of "both individual and collective actions in promoting an environment in which physicians thrive." Therefore, in our study, we decided to analyze how individual response to adversity (i.e., level of perceived distress) was related either to personal factors (age, gender, psychological well-being before COVID-19 pandemic, perceived risk of infection, coping strategies, professional role, the experience of quarantine or self-isolation, and stressful events related and not related to COVID 19), quality of connections to others inside and outside professional activity (type and quality of support received by family, friends or others, and by colleagues), or to contextual and organizational factors (measures contributing to a greater sense of security, aspects related to the greatest stress, availability of organizational, and clinical protocols to deal with the pandemic). By using this approach, we aim to establish which are the most relevant intervening aspects contributing to the emotional burden of HCPs during the current pandemic and to define the type of intervention that is more appropriate at each level (individual, interpersonal, and organizational). A better understanding of the level at which influencing factors affect the professional well-being of HCPs in obstetrics is highly relevant to guide more appropriate interventions to manage distress and its negative consequences.

MATERIALS AND METHODS

Study Population and Study Design

Target respondents were all HCPs (gynecologists, residents in gynecology and obstetrics, and midwives) working at four Italian University hospitals (the University of Verona, the Catholic

University of the Sacred Heart of Rome, the University of Insubria, and the University of Brescia) accruing to a total of 570 HCPs in obstetrics. HCPs were invited by e-mail to complete the IPSICO survey between May 15, 2020, and May 31, 2020. The electronic invitation included the study presentation and the link to the survey located at a web-based platform. Each center provided the complete list of institutional e-mail addresses of target respondents. The survey was administered in the Italian language. Participation was voluntary and anonymous, and no remuneration was offered to respondents. HCPs were reminded up to 3 times by e-mail whether they were willing or not to take part in the survey.

The study was approved by the human research ethics committee of the University of Verona (2020-UNVRCLE-0143469). All participants gave informed consent for study participation and anonymized data collection and analysis for research purposes prior to accessing and completing the survey. There was no funding for the design and conduct of the study.

The IPSICO Survey

The IPSICO survey was designed and validated by a panel of trainees, specialty tutors, medical educationalists in obstetrics and gynecology, and clinical psychologists of the University of Verona. The survey resulted in a 104-item battery investigating the sociodemographic and professional characteristics of HCPs in obstetrics, the risk appraisal along with perceived social support and coping strategies, the perceived organizational support and changes in the work organization and climate, the emotional impact of COVID-19, and the impact of COVID-19 on the professional life, along with a measure of psychological distress. The survey was composed of validated psychological questionnaires and items tailored to obstetrics practice and COVID-19. Psychological questionnaires were already validated in the Italian language, such as the short version of the Coping Orientation to Problems Experienced (Brief-COPE) (Carver et al., 1989; Carver, 1997; Coolidge et al., 2000) questionnaire, and the General Health Questionnaire-12 (GHQ-12) (Piccinelli et al., 1993; Politi et al., 1994; Goldberg et al., 1997). Newly developed items were limited to exploring sociodemographic, obstetrics, and COVID-19–related factors.

Variables

The primary outcome was the presence or absence of clinically significant psychological distress in HCPs. The psychological distress level of HCPs was assessed by the validated Italian version of the GHQ-12 (Piccinelli et al., 1993; Politi et al., 1994; Goldberg et al., 1997), a widely used screening instrument for psychological distress. The GHQ-12 was analyzed based on the method proposed by Piccinelli et al. (1993) (all the 12 items at a 4-level scale of the GHQ-12 survey were scored as 0,0,1,1). A Cronbach α of 0.84 indicated a satisfactory internal consistency of the GHQ-12 in our sample (Politi et al., 1994). HCPs reporting a GHQ-12 score $\geq$3 were considered positive for the presence of clinically significant psychological distress.

A series of individual, interpersonal, and organizational factors have been used to describe the sample and evaluate their associations with the GHQ-12.

Sociodemographic variables included age (continuous variable), gender (i.e., male, female), marital status (i.e., married/cohabitant, separated/widowed, unmarried), family composition (i.e., single, couple, couple with children, two or more adults not familiar), and presence of old parents (i.e., yes, no). Professional variables investigated the professional role (i.e., specialized doctor, trainee doctor, midwife) and the years of work (continuous variable).

Coping strategies were evaluated using the Brief-COPE (Carver et al., 1989; Carver, 1997). The Brief-COPE is composed of 28 items describing different coping strategies self-evaluated by respondents on a 4-point Likert scale ranging from 1 ("not doing it at all") to 4 ("doing it a lot"). The coping strategies were grouped into emotions-focused (Cronbach $\alpha = 0.69$), problems-focused (Cronbach $\alpha = 0.66$), and dysfunctional (Cronbach $\alpha = 0.78$) coping strategies (Coolidge et al., 2000).

Using categorical variables (i.e., yes, no), the survey has evaluated if participants underwent a quarantine period, experienced a period of self-isolation, or experienced stressful events related and not related to COVID-19. Moreover, categorical variables were used to investigate the adoption of a shift strategy and the availability of organizational and clinical protocols to deal with the emergency problem.

All other variables regarding individual (i.e., psychological well-being before COVID-19; perceived risk of infection and death; level of professional satisfaction before the pandemic; other negative perceptions and feelings related to work—"exhaustion," "weight of professional role," "consideration to abandon the professional role," "working as duty"), interpersonal (i.e., support received by family, friends, trustworthy people, and colleagues; changes in the rules of interaction with colleagues and in the quality of relationship with patients), and organizational factors (i.e., protection by PPE; efficacy of patient triage on admission; utility of the shift strategy; receiving timely and complete information on the pandemic; reduction in the quality of obstetric service and change in perceived obstetric risk; level of involvement as an active part in the reorganization) have been self-evaluated by HCPs on a 10-point Likert scale ranging from 1 ("not at all") to 10 ("extremely").

Finally, the respondents were asked to select the aspects related to the greatest stress during COVID-19, the factors associated with a sense of security, the prevailing sensations in the relationship with the patient, and the prevalent feelings toward colleagues. Respondents could give more than one answer selecting the most corresponding ones to their personal experiences.

Further details of the IPSICO survey and details on all the survey variables were reported and described elsewhere (Del Piccolo et al., 2020).

Statistical Analysis

Descriptive statistics were used to summarize variables collected in the IPSICO questionnaire and the main characteristics of the study population. For the IPSICO questionnaire analysis, no exclusion criteria were used. Descriptive statistics were expressed with mean and standard deviation (SD) for variables with a normal distribution. Non–normally distributed and ordinal variables were described with median and interquartile range

(IQR); nominal variables were summarized with numbers and percentages. The GHQ-12 and Brief-COPE's reliability in our sample was estimated on the observed correlations of the items with each other and expressed using the Cronbach α. The Mann–Whitney *U*-test was used to compare two independent groups, and the Kruskal–Wallis test was adopted in the case of three or more categories. Categorical data were analyzed with the χ^2 test or Fisher exact test as appropriate. All reported *p*-values were two-sided, and significance was considered at $p < 0.05$. In the case of *post-hoc* pairwise comparisons with three or more groups, *p*-values were adjusted using the Bonferroni correction.

After identifying HCPs with psychological distress (i.e., GHQ-12 score ≥3), associated factors at the individual, interpersonal, and organizational levels have been explored using (i) logistic regression models and (ii) comparing HCPs with GHQ-12 score ≥3 with those with GHQ-12 score <3 in terms of perceived aspects related to the greatest stress and of interpersonal and organizational factors.

Logistic regression models were used to investigate the univariate association between clinically significant distress (GHQ-12 score ≥3) and different variables. Variables associated with the dependent variable in univariate analysis were included in a multivariable model, which was developed starting with a backward stepwise selection to eliminate less relevant variables and then using a hierarchical method for the final choice of predictors. The corrected Akaike information criterion was used to select the model (Ratner, 2010; Hosmer et al., 2013; Chowdhury and Turin, 2020). After defining the multivariable logistic regression model with fixed coefficients, multilevel logistic regression analysis was used to explore the multilevel structure of data related to the aggregation of HPCs within University hospitals (Raudenbush and Bryk, 2002). Comparisons between the model with fixed coefficients and multilevel models were made using the corrected Akaike information criterion (Tabachnick et al., 2019). This further analysis was performed because of the fact that our survey data had an inherent multilevel structure: HCPs within University hospitals (van Oyen, 2009). Therefore, the defined multivariable logistic regression model with fixed coefficients would not have completely corrected for between-group (University hospitals) differences, potentially relevant due, for example, to the different incidence of COVID-19 cases in the four geographic areas. The multilevel approach allows exploring effects that vary by hospitals, studying characteristics contributing to this differential effect, and identifying individual–group interaction effects (Cohen et al., 2013). All reported *p*-values were two-sided, and significance was considered at $p < 0.05$.

Data analysis was performed using IBM SPSS Statistics 23.0, Armonk, NY.

RESULTS

Sociodemographic, Professional Characteristics, and COVID-19 Impact in the Study Sample

Of 570 invited HCPs, 503 (88.2%) answered the IPSICO survey. Sociodemographic characteristics of the entire study population are summarized in **Table 1**, overall and stratified by center. The median age of respondents was 34 years (IQR = 29–46 years), and 83.7% of HCPs were female. Midwives represented more than one-third of respondents (38%), followed by trainees (33.6%) and specialized medical doctors (28.4%). Overall, the entire study sample reported a median work experience in the current role of 5 years (IQR = 2–18 years). Regarding family composition, most respondents answered to have a partner, and 38.8% reported to live with children and 7.7% with old parents; 77.7% of HCPs reported to live with someone else. Psychological well-being before the COVID-19 pandemic was self-evaluated as high, with a median value of 8 (IQR = 7–8) on a Likert scale of 1 = "very bad" to 10 = "very good."

Concerning the impact of COVID-19, although only 10.1% of HCPs experienced a quarantine period, almost one-third of them (32.2%) decided to undergo a period of self-isolation, and 51.9% of respondents experienced a stressful event related to COVID-19. The perceived risk of infection was reported higher than 5, on a scale of 1–10, by half of the respondents (IQR = 5–8); conversely, the perceived risk of death in the case of infection was lower, with a median of 3 (IQR = 2–4).

Prevalence of Psychological Distress

Four hundred eighty-one of 570 HCPs completed all items of the GHQ-12, resulting in a response rate of 84.4%. The impact of COVID-19 on psychological distress assessed with the GHQ-12 is summarized in **Figure 1**. GHQ-12 ≥3 was observed in 51.1% of respondents (246/481HCPs).

Factors Associated With Psychological Distress at the Individual, Interpersonal, and Organizational Levels

Factors Associated With Psychological Distress in Univariate and Multivariable Logistic Regression Analyses

Table 2 shows the results of the univariate logistic regression analysis investigating the association between psychological distress (GHQ-12 ≥3) and individual, interpersonal, and organizational factors derived from the IPSICO questionnaire. Variables univariately associated with a GHQ-12 score equal to or higher than 3 were included in the multivariable logistic regression analysis together with age. Individual factors independently associated with a GHQ-12 score ≥3 were gender, the experience of stressful events related to the ongoing pandemic, dysfunctional coping score (**Table 3** reports the details regarding the Brief-COPE items composing the dysfunctional coping score) (Carver et al., 1989; Carver, 1997; Coolidge et al., 2000), and perceived exhaustion from work. Interpersonal aspects were the perceived support received from the family and the limited interaction with colleagues. Organizational factors were the perceived protection by PPE and the possibility to receive timely and complete information on the pandemic (**Table 4**). Multilevel logistic regression models, fitted allowing parameters to vary between the University hospitals (random effect), were compared with the multivariable logistic regression model with fixed coefficients reported in **Table 4**. The comparison, made with the corrected Akaike

TABLE 1 | Sociodemographic and professional characteristics of the study population ($n = 503$).

Variable	Overall 503 (100%)	Brescia 185 (36.8%)	Rome 111 (22.1%)	Varese 82 (16.3%)	Verona 125 (24.9%)	*p*-value
Age, median (IQR)	34 (29–46)	39 (30–51)[a]	32 (28–38)[b]	35 (29.75–47.25)[a,b]	31 (28–41.5)[b]	<0.001
Gender, *n* (%)						<0.001
Female	421 (83.7)	161 (87.0)[a]	77 (69.4%)[b]	69 (84.1)[a,b]	114 (91.2)[a]	
Marital status, *n* (%)						0.06
Married/cohabitant	278 (55.2)	105 (56.8)	55 (49.5)	53 (64.6)	65 (52.0)	
Separated/widowed	20 (4.0)	12 (6.5)	3 (2.7)	3 (3.7)	2 (1.6)	
Unmarried	205 (40.8)	68 (36.8)	53 (47.7)	26 (31.7)	58 (46.4)	
Family composition, *n* (%)						<0.001
Single	112 (22.3)	33 (17.8)[a]	32 (28.8)[a]	17 (20.7)[a]	30 (24.0)[a]	
Couple	124 (24.7)	36 (19.5)[a]	39 (35.1)[b]	21 (25.6)[a,b]	28 (22.4)[a,b]	
Couple with children	195 (38.8)	87 (47.0)[a]	24 (21.6)[b]	40 (48.8)[a]	44 (35.2)[a,b]	
Two or more adults not familiar	72 (14.2)	29 (15.7)[a,b]	16 (14.4)[a,b]	4 (4.9)[b]	23 (18.4)[a]	
Presence of old parents, *n* (%)	38 (7.6)	21 (11.4)	4 (3.6)	5 (6.1)	8 (6.4)	0.079
Professional role, n (%)						<0.001
Specialized doctor	143 (28.4)	42 (22.7)[a]	54 (48.6)[b]	35 (42.7)[b]	12 (9.6)[c]	
Trainee doctor	169 (33.6)	35 (18.9)[a]	55 (49.5)[b]	24 (29.3)[a,c]	55 (44.0)[b,c]	
Midwife	191 (38.0)	108 (58.4)[a]	2 (1.8)[b]	23 (28.0) [c]	58 (46.4)[a]	
Years of work experience in the current role, median (IQR)	5 (2–18)	14 (4–22.5)[a]	4 (2–5)[b]	9.5 (2–16.75)[a,c]	5 (2–15.5)[b,c]	<0.001
Psychological well-being before COVID-19, median (IQR)	8 (7–8)	8 (7–8)	8 (7–8)	7 (7–8)	8 (7–8.25)	0.246
Underwent a quarantine period, *n* (%)	51 (10.1)	27 (14.6)	8 (7.2)	5 (6.1)	11 (8.8)	0.079
Experienced a period of self-isolation, *n* (%)	161 (32.2)	84 (45.4)[a]	24 (21.6)[b]	23 (28.0)[b]	31 (24.8)[b]	<0.001
Experience of stressful events related to COVID-19, *n* (%)	261 (51.9)	114 (61.6)[a]	40 (36.0)[b]	35 (42.7)[b,c]	72 (57.6)[a,c]	<0.001
Experience of stressful events *not* related to COVID-19, *n* (%)	118 (23.5)	49 (26.5)	18 (16.2)	18 (22.0)	33 (26.4)	0.180
Perceived risk of being infected, median (IQR)	6 (5–8)	7 (5–8)	6 (4–8)	6 (5–7)	6 (4–8)	0.055
Perceived risk of death in case of infection, median (IQR)	3 (2–4)	3 (2–5)	3 (2–4)	3 (2–5)	3 (2–5)	0.483

COVID-19, coronavirus disease 2019; IQR, interquartile range. Each subscript letter denotes a subset of University hospital categories whose parameters do not differ significantly from each other at the 0.05 level.

information criterion, did not show a statistically significant improvement of the model fit using any multilevel logistic regression model; therefore, we maintained the multivariable logistic regression model with fixed coefficients as it was more parsimonious.

Association Between Psychological Distress and Perception of HCPs of Aspects Related to the Greatest Stress

The perception of respondents regarding the aspects associated with the greatest stress is shown in **Table 5**. The fear of infecting the family and the continuous updating of recommendations and measures to be implemented were the most perceived distressing factors. These two aspects related to distress were reported by 56.8% of respondents. However, they were not associated with the GHQ-12 score. The constant and correct use of PPE was the third most frequent aspect related to the greatest stress. It was reported with higher frequency by HCPs in the group having GHQ-12 <3. Conversely, a significantly higher proportion of HCPs in the group having GHQ-12 ≥3 reported difficulties in reconciling private and family life with work, although this aspect was indicated by only 11.6% of HCPs.

Association Between Psychological Distress and Perception of HCPs of Interpersonal and Organizational Factors

Regarding interpersonal and organizational factors at work (**Table 6**), the group with psychological distress (GHQ-12 ≥3) reported more irritability in the relationship with the patient and guilt about the poor chance of collaboration. The contrary emerged for feelings of group cohesion. For the group having GHQ-12 ≥3, colleagues' support was more frequently reported as a factor that helped to face the emergency at work than in those without the evidence of clinically significant psychological distress (GHQ-12 <3).

DISCUSSION

Prevalence of Psychological Distress

Half of the HCPs who completed the GHQ-12 reported a clinically significant level of psychological distress (Piccinelli et al., 1993). This result is consistent with previous Italian and international studies exploring the psychological impact of the COVID-19 pandemic on HCPs

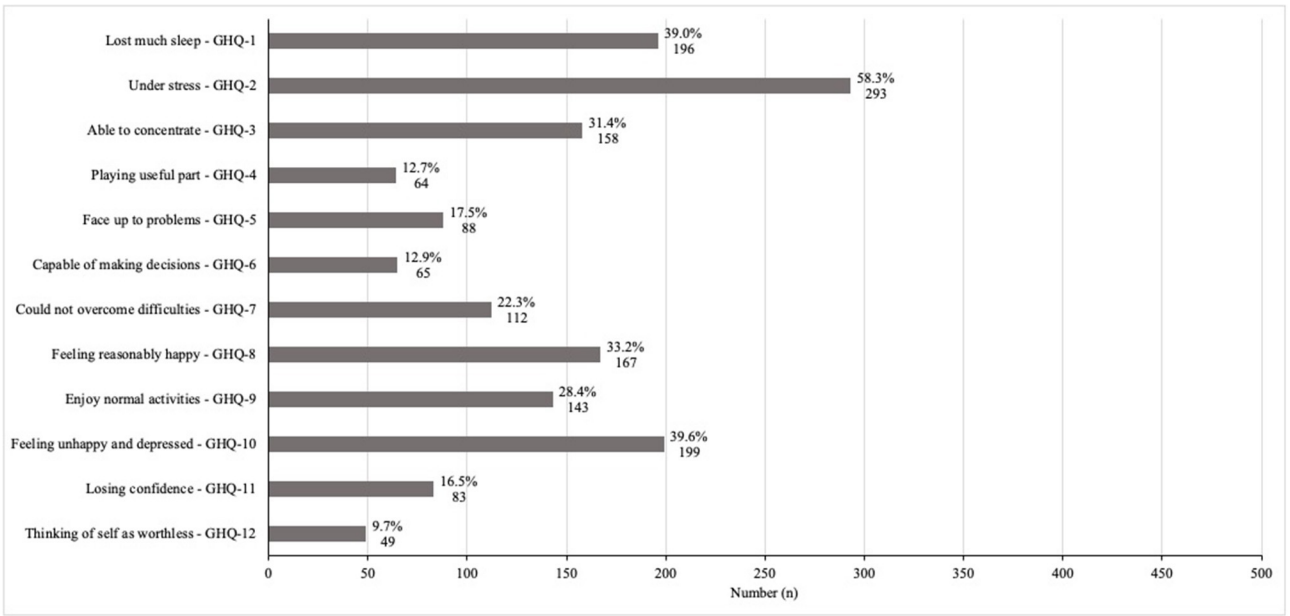

FIGURE 1 | General health and professional well-being assessed with the 12-item General Health Questionnaire (GHQ-12). The proportion of patients with a positive score for a worsening in each item composing the GHQ-12 ($n = 481$).

(Barello et al., 2020a,b; Galli et al., 2020; Giusti et al., 2020; Lai et al., 2020; Nie et al., 2020).

To the best of our knowledge, only one previous study in Europe specifically investigated this topic among HCPs working in obstetrics. Our results confirm the observed high level of psychological distress, although the percentage of HCPs with GAD-2 and PHQ-2 questionnaires scores suggestive of anxiety and depressive disorders was lower in the UK-based study than in our study (i.e., respectively, 25 and 16%) (Shah et al., 2020). However, the comparison with some of the prior studies is limited by using different psychological screening instruments or scoring methods for the GHQ-12. When comparing our results with the studies using the same GHQ-12 scoring system, we observed that the percentage of HCPs with clinically significant psychological distress was similar to that reported in a study conducted in China during the pandemic outbreak (Yao et al., 2020). Moreover, in both studies, "being under stress" and "having lost much sleep" were the GHQ-12 items most negatively affected (Yao et al., 2020). Noteworthy, in our sample, around 40% of HCPs reported being "feeling unhappy and depressed" rather or much more than usual.

Based on our results and previous evidence, psychological screening appears necessary to recognize psychological suffering and prevent negative consequences on HCPs and patient care in obstetrics. Notably, psychological support for these HCPs was already recommended before the current pandemic, considering that gynecologists and midwives are known to be exposed to high levels of posttraumatic stress disorder (Wahlberg et al., 2017; Bourne et al., 2019; Slade et al., 2020).

Factors Associated With Psychological Distress at the Individual, Interpersonal, and Organizational Levels

In our analysis, the identified model (socioecological) (Winkel et al., 2019), explaining the psychological distress among HCPs in obstetrics, included factors at individual, interpersonal, and organizational levels. Based on the multilevel regression analysis, the relevance of these factors appears similar across the included hospitals. These results reinforce the need to intervene at different levels to reduce the risk of psychological distress in dealing with the COVID-19 pandemic (Winkel et al., 2019; Slade et al., 2020).

Role of Individual Factors

During the pandemic, being female was one of the main factors associated with psychological distress in our model, similar to previous studies in obstetrics (Shah et al., 2020) or other HCP categories (Babore et al., 2020; Barello et al., 2020a; Di Tella et al., 2020; Shaukat et al., 2020; Yao et al., 2020). This result is coherent with a higher level of mental and stress disorders observed during the COVID-19 pandemic among females of the general population. This higher vulnerability of females to experience stress and develop posttraumatic symptoms was explained by differences in stress-response systems and a higher involvement as family caregivers (Mazza et al., 2020; García-Fernández et al., 2021). However, the higher prevalence of anxiety and mood disorders in females is recognized in many epidemiological studies (Kessler et al., 2005). Different biological, psychological, social, and gender–role theoretical explanations have been proposed to explain these differences.

TABLE 2 | Univariate logistic analysis of factors evaluated for an association with GHQ-12 ≥3 ($n = 481$).

Variable	Level	Univariate odds ratio (95% CI)	*p*-value
Age	Per 1 year	0.993 (0.977–1.010)	0.414
Years of work experience	Per 1 year	0.991 (0.974–1.008)	0.289
Gender (reference: male)	Female	2.137 (1.285–3.554)	0.003
Marital status (reference: married/cohabitant)	Unmarried	1.114 (0.770–1.611)	0.568
	Separated/widowed	0.716 (0.279–1.838)	0.488
Family composition (reference: single)	Couple	0.564 (0.332–0.959)	0.034
	Couple with children	0.689 (0.425–1.117)	0.131
	Two or more adults not familiar	0.485 (0.263–0.894)	0.020
University hospital (reference: Verona)	Brescia	0.6 (0.374–0.963)	0.034
	Rome	0.467 (0.274–0.797)	0.005
	Varese	0.450 (0.250–0.810)	0.008
Presence of old parents	No	0.770 (0.385–1.543)	0.462
Professional role (reference: midwifes)	Specialized doctor	0.983 (0.630–1.536)	0.941
	Trainee doctors	0.926 (0.608–1.412)	0.722
Underwent a quarantine period	No	1.154 (0.635–2.096)	0.638
Experienced a period of self-isolation	No	0.590 (0.400–0.869)	0.008
Experience of stressful events related to COVID-19	No	0.328 (0.226–0.475)	<0.001
Experience of stressful events not related to COVID-19	No	0.547 (0.355–0.844)	0.006
Psychological well-being before COVID-19	Per 1 point of score	0.840 (0.741–0.952)	0.006
Perceived risk of being infected	Per 1 point of score	1.108 (1.015–1.209)	0.022
Perceived risk of death in case of infection	Per 1 point of score	1.059 (0.957–1.171)	0.269
Support received from my family	Per 1 point of score	0.922 (0.866–0.982)	0.011
Support received from friends and trustworthy people	Per 1 point of score	0.905 (0.847–0.966)	0.003
Emotions-focused coping	Per 1 point of score	1.020 (0.979–1.062)	0.342
Problems-focused coping	Per 1 point of score	1.029 (0.976–1.084)	0.292
Dysfunctional coping	Per 1 point of score	1.120 (1.070–1.173)	<0.001
Perceived protection from PPE	Per 1 point of score	0.884 (0.818–0.955)	0.002
Perceived efficacy of triage for COVID-19 at patient admission	Per 1 point of score	0.887 (0.818–0.962)	0.004
Adoption of a shift strategy to ensure adequate rest and staff always available	No	1.161 (0.798–1.690)	0.435
Utility of the adopted shift strategy	Per 1 point of score	0.983 (0.935–1.034)	0.517
Availability of organizational and clinical protocols to deal with the emergency problem	No	1.548 (0.832–2.882)	0.168
To what extent you received timely and complete information on the pandemic to be able to deal with it adequately	Per 1 point of score	0.820 (0.752–0.895)	<0.001
How much the rules of interaction with colleagues influenced the quality of work	Per 1 point of score	1.153 (1.066–1.247)	<0.001
Perceived reduction in the quality of obstetric service	Per 1 point of score	1.182 (1.097–1.274)	<0.001
Changes in perceived obstetric risk with increased risk of contagion	Per 1 point of score	1.086 (1.010–1.168)	0.026
To what extent the quality of the relationship with the patients has changed	Per 1 point of score	1.171 (1.086–1.263)	<0.001
Level of satisfaction of the profession before the pandemic	Per 1 point of score	0.882 (0.796–0.977)	0.016
I have faced work in this period because it is my duty	Per 1 point of score	1.017 (0.950–1.090)	0.622
Perceived level of involvement as an active part in the reorganization of the activities to deal with the emergency	Per 1 point of score	0.929 (0.867–0.995)	0.034
The entity of perceived support by colleagues who play the same role during the pandemic	Per 1 point of score	0.969 (0.891–1.053)	0.453
The entity of perceived support by the team during the pandemic	Per 1 point of score	0.892 (0.819–0.971)	0.009
A feeling of exhaustion from my job during this pandemic	Per 1 point of score	1.491 (1.363–1.631)	<0.001
The weight of the professional role during this pandemic	Per 1 point of score	1.295 (1.197–1.402)	<0.001
How much was considered to abandon the professional role during this pandemic	Per 1 point of score	1.236 (1.117–1.368)	<0.001

TABLE 3 | Details regarding the Brief-COPE items composing the dysfunctional coping factor.

Brief-COPE items composing the dysfunctional coping factor, *n* (%)	1	2	3	4
I've been turning to work or other activities to take my mind off things.	58 (11.5)	122 (24.3)	220 (43.7)	86 (17.1)
I've been saying to myself, "this isn't real"	291 (57.9)	113 (22.5)	58 (11.5)	24 (4.8)
I've been using alcohol or other drugs to make myself feel better	425 (84.5)	41 (8.4)	14 (2.8)	6 (1.2)
I've been giving up trying to deal with it	332 (66.0)	111 (22.1)	39 (7.8)	4 (0.8)
I've been refusing to believe that it has happened	391 (77.7)	64 (12.7)	21 (4.2)	10 (2.0)
I've been saying things to let my unpleasant feelings escape	207 (41.2)	149 (29.6)	94 (18.7)	36 (7.2)
I've been using alcohol or other drugs to help me get through it	442 (87.9)	27 (5.4)	12 (2.5)	5 (1.0)
I've been criticizing myself	47 (9.3)	125 (24.9)	210 (43.2)	104 (20.7)
I've been giving up the attempt to cope	352 (70.0)	101 (20.1)	32 (6.4)	1 (0.2)
I've been doing something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping	113 (22.5)	144 (28.6)	151 (31.1)	78 (16.0)
I've been expressing my negative feelings	63 (12.5)	189 (37.6)	182 (36.2)	52 (10.3)
I've been blaming myself for things that happened	417 (82.9)	52 (10.3)	14 (2.8)	3 (0.6)
Dysfunctional coping (mean, SD)		21.38 (4.3)		

SD, standard deviation. All healthcare provides answered the Brief-COPE; each item provides a score from 1 to 4, which is summed to obtain the dysfunctional coping score.

TABLE 4 | Multivariable logistic regression model of factors evaluated for an association with GHQ-12 ≥3 ($n = 481$).

Variable	Level	Univariate odds ratio (95% CI)	*p* value
Gender	Male	1.0 reference	
	Female	2.739 (1.482–5.060)	0.001
Experience of stressful events related to COVID-19	Yes	1.0 reference	
	No	0.534 (0.345–0.825)	0.005
A feeling of exhaustion from my job during this pandemic	Per 1 point of score	1.412 (1.279–1.560)	<0.001
Dysfunctional coping	Per 1 point of score	1.070 (1.015–1.127)	0.012
Support received from my family	Per 1 point of score	0.914 (0.847–0.985)	0.018
How much the limitations in interaction with colleagues influenced the quality of work	Per 1 point of score	1.153 (1.047–1.269)	0.004
Perceived protection from PPE	Per 1 point of score	0.883 (0.798–0.977)	0.016
To what extent you received timely and complete information on the pandemic to be able to deal with it adequately	Per 1 point of score	0.850 (0.759–0.952)	0.005
Constant		0.1	0.004

$R^2 = 0.279$ (Cox and Snell), 0.372 (Nagelkerke).

Among other individual factors, the professional role and fewer years of experience were not associated with psychological distress in our sample, which is discordant with the previous studies (Barello et al., 2020b; Kisely et al., 2020; Marton et al., 2020; Yao et al., 2020). Conversely, we found that a lower level of self-evaluated psychological well-being before the pandemic was related to psychological distress in univariate analysis. This association was in line with some previous studies in which having a prior history of psychological distress has been considered a vulnerability factor during virus outbreaks (Giusti et al., 2020; Kisely et al., 2020).

Stressful events related to COVID-19 remained a factor associated with psychological distress in the multivariable analysis. Even non-frontline HCPs, such as gynecologists and midwives, experienced highly stressful situations, including quarantine and self-isolation. Notably, consistent with a previous survey in obstetrics (Yalçin Bahat et al., 2020) and HCPs in Italy (Marton et al., 2020), "fear to infect my family" was among the major sources of perceived stress, despite the fact that this fear was not associated with psychological distress.

In terms of coping, higher use of dysfunctional coping strategies was associated with clinically significant psychological distress. This is consistent with previously reported association between avoidant coping strategies and burnout and lower compassion satisfaction in the medical setting (Doolittle, 2020). Moreover, avoidant coping was associated with the perceived stress during the pandemic in an Italian study (Babore et al., 2020). The dysfunctional coping strategies mostly frequently used by our study participants were self-blame but also self-distraction strategies, such as doing something to think about the pandemic less. Notably, in emergency and uncertain conditions such as the COVID-19 pandemic, self-distraction might be considered

TABLE 5 | Association between psychological distress and perception of HCPs of aspects related to the greatest stress ($n = 481$).

	GHQ-12		
	<3	**≥3**	**Total**
	235 (48.9)	**246 (51.1)**	**481 (100)**
	100%	**100%**	**100%**
Aspects related to the greatest stress in the last period[†]			
Inability to limit routine outpatient activities, *n* (%)	7[a] (41.20) 3.0%	10[a] (58.80) 4.1%	17 3.5%
Other, *n* (%)	7[a] (50) 3.0%	7[a] (50) 2.8%	14 2.9%
Reconciling private/family life with work, *n* (%)	**17[a] (30.40)** **7.3%**	**39[b] (69.60)** **15.8%**	**56** **11.6%**
Continuous updating of recommendations and measures to be implemented, *n* (%)	59[a] (51.8) 25.1%	55[a] (48.2) 22.4%	114 23.7%
The constant and correct use of PPE, *n* (%)	**52[a] (61.9)** **22.1%**	**32[b] (38.1)** **13.0%**	**84** **17.5%**
Provide care to an infected patient, *n* (%)	13[a] (35.1) 5.5%	24[a] (64.9) 9.8%	37 7.7%
Fear to infect my family, *n* (%)	80[a] (50.3) 34.0%	79[a] (49.7) 32.1%	159 33.1%

χ^2 *Test regarding the entire table = 0.009. In bold significant associations. Each subscript letter denotes a subset of GHQ-12 categories whose column proportions do not differ significantly from each other at the 0.05 level.*

[†] *Single answer allowed.*

psychologically protective when used as a short-term strategy, although it might become problematic in the long term.

Role of Interpersonal Factors

Higher perceived support by the family was associated with a lower prevalence of psychological distress, in line with previous research among HCPs working in obstetrics (Vafaei et al., 2020; Yalçin Bahat et al., 2020) and other fields (Di Tella et al., 2020; Galli et al., 2020; Kisely et al., 2020; Nie et al., 2020). Our study supports these findings as our participants with clinically significant psychological distress reported twice as those without significant distress "reconciling private and family life with work" as one of the aspects related to the greatest stress.

Moreover, the significance of relationships with colleagues was confirmed as a relevant resilience feature in the obstetrics context (Winkel et al., 2019). Reduced interactions with colleagues were associated with psychological distress. In addition, HCPs presenting with psychological distress showed a higher frequency of "guilt about my poor chance of collaboration" and lower "perception of group cohesion" than the counterparts.

Role of Organizational Factors

In line with previous research (Green et al., 2020; Kisely et al., 2020; Nie et al., 2020; Semaan et al., 2020), higher scores in "perceived protection by PPE" and "receiving timely and complete information on the pandemic to deal with it" were associated with lower psychological distress. The relevance of information and PPE on psychological distress in our sample may be intensified because Italy was one of the first countries to face the pandemic. This phase was characterized by continuously changing guidelines and protocols and problematic resource allocation, including PPE, resulting in the exposure of HCPs to safety risk and psychological pressure (Oliva et al., 2020).

Notably, in our sample, HCPs perceived "continuous updating of recommendations and measures to be implemented" as the second aspect related to the greatest stress. This was also a major factor associated with the mental health status in the UK survey on HCPs in obstetrics (Shah et al., 2020).

Strengths and Limitations

The main strengths of the present study are the high response rate and the inclusion of both gynecologists—whether already specialized or trainees—and midwives. These characteristics allowed building a comprehensive and representative picture of the psychological impact of the COVID-19 pandemic in the obstetrics field. Second, an extensive list of potentially associated factors has been considered in our survey, in line with the conceptualization of psychological distress as a complex interaction between individual, interpersonal, and organizational factors (Winkel et al., 2019). Third, the survey items were created by a panel of experts in the field (i.e., HCPs working in the obstetrics and clinical psychologists supporting hospital HCPs during the pandemic), favoring the feasibility and multidisciplinary nature of the survey. Lastly, the use of validated instruments, such as the GHQ-12, a widely used and validated tool for screening psychiatric morbidity, increases generalizability of our findings and reproducibility of our study by other centers (Goldberg et al., 1997; Werneke et al., 2000).

One of the main limitations to the present study is the cross-sectional design. This study design is not appropriate for determination of causal effect and also limits the ability to explore temporal association and their variations over time.

TABLE 6 | Association between psychological distress and perception of HCPs of interpersonal and organizational factors ($n = 481$).

	GHQ-12		
	<3	**≥3**	**Total**
	235 (48.9)	**246 (51.1)**	**481 (100)**
Measures that gave you a greater sense of security in your relationship with the patient†			
Mask worn by the patient, *n* (%)	167[a] (49.6) 71.1%	170[a] (50.4) 69.1%	337 (100) 70.1%
Distancing, *n* (%)	66[a] (55) 28.1%	54[a] (45) 22.0%	120 (100) 24.9%
Absence of a partner/companion, *n* (%)	56[a] (46.7) 23.8%	64[a] (53.3) 26.0%	120 (100) 24.9%
Epidemiological and clinical triage on patient arrival, *n* (%)	98[a] (49) 41.7%	102[a] (51) 41.5%	200 (100) 17.5%
Prevailing sensations in the relationship with the patient†			
Fear of being infected, *n* (%)	126[a] (47.5) 53.6%	139[a] (52.5) 56.5%	265 (100) 55.1%
Fear of infecting someone, *n* (%)	98[a] (50.8) 41.7%	95[a] (49.2) 38.6%	193 (100) 40.1%
Difficult communication with the patient due to the absence of a companion, *n* (%)	65[a] (52.8) 27.7%	58[a] (47.2) 23.6%	123 (100) 25.6%
Greater irritability, *n* (%)	**18[a] (34.6) 7.7%**	**34[b] (65.4) 13.8%**	**52 (100) 10.8%**
Reduced tolerance, *n* (%)	30[a] (42.9) 12.8%	40[a] (57.1) 16.3%	70 (100) 70.1%
Prevailing feeling that emerged toward colleagues†			
Empathy, *n* (%)	70[a] (48.6) 29.8%	74[a] (51.4) 30.1%	144 (100) 29.9%
Fear of contagion, *n* (%)	37[a] (41.6) 15.7%	52[a] (58.4) 21.1%	89 (100) 18.5%
Guilt about my poor chance of collaboration, *n* (%)	**10[a] (29.4) 4.3%**	**24[b] (70.6) 9.8%**	**34 (100) 7.1%**
Resentment toward those who avoid exposing themselves to risk, *n* (%)	25[a] (41) 10.6%	36[a] (59) 14.6%	61 (100) 12.7%
Feeling of group cohesion, *n* (%)	**96[a] (57.5) 40.9%**	**71[b] (42.5) 28.9%**	**167 (100) 34.7%**
Feeling of human solidarity in the group, *n* (%)	112[a] (50.9) 47.7%	108[a] (49.1) 43.9%	220 (100) 45.7%
Factor that particularly helped to face this emergency at work†			
Professional competence, *n* (%)	44[a] (54.3) 18.7%	37[a] (45.7) 15%	81 (100) 16.8%
Support by colleagues, *n* (%)	**50[a] (41) 21.3%**	**72[b] (59) 29.3%**	**122 (100) 25.4%**
Support by family, *n* (%)	36[a] (43.4) 15.3%	47[a] (56.6) 19.1%	83 (100) 17.3%
Continuous updating of recommendations and measures to be implemented, *n* (%)	42[a] (55.3) 17.9%	34[a] (44.7) 13.8%	76 (100) 15.8%
Constant availability of appropriate contagion containment measures, *n* (%)	48[a] (57.8) 20.4%	35[a] (42.2) 14.2%	83 (100) 17.3%
Good relationship with the patient, *n* (%)	25[a] (52.1) 10.6%	23[a] (47.9) 9.3%	48 (100) 10%
Passion for my job, *n* (%)	139[a] (49.8) 59.1%	140[a] (50.2) 56.9%	279 (100) 58%
High organizational quality of the working context, *n* (%)	16[a] (47.1) 6.8%	18[a] (52.9) 7.3%	34 (100) 7.1%
Other, *n* (%)	4[a] (57.1) 1.7%	3[a] (42.9) 1.2%	7 (100) 1.5%

In bold significant associations. Each subscript letter denotes a subset of GHQ-12 categories whose column proportions do not differ significantly from each other at the 0.05 level.
† Multiple answers were allowed.

Psychological distress and other HCPs' perceptions and emotions were self-reported simultaneously at a single time point. Therefore, we cannot determine which is a cause and which a consequence of psychological distress. On that basis, further longitudinal studies should be conducted to verify observed results and clarify temporal associations.

Additional limitations related to the cross-sectional design are also present. A non-respondent bias should be considered, although a response rate of 84.4% reduces its impact. A possible referral bias suggests caution in extending our observations to HCPs in obstetrics who do not work in hospitals. In this regard, the generalizability of results may be affected by differences in infection risk and healthcare management of the outbreak across Italy (Armocida et al., 2020; Simione and Gnagnarella, 2020) or worldwide. In terms of geographical context, indeed, HCPs working in regions most affected by the pandemic reported a higher negative psychological impact (Trumello et al., 2020). However, our results suggest that the proposed model does not change across investigated hospitals, given that the multilevel regression analysis did not provide a better model fit in describing the outcome. A recall bias can be present for some items, such as the psychological well-being before the pandemic.

As an additional limitation, the evaluation of "enjoyment of day-to-day activities" of the GHQ-12 may be affected by the Italian lockdown as previously outlined in a UK article (Niedzwiedz et al., 2020). Moreover, our study focused on assessing the psychological distress in the aftermath of the pandemic. Therefore, future studies are required to determine the long-lasting psychological effects and the potential impact on burnout.

CONCLUSIONS

The psychological well-being of HCPs working in obstetrics at four Italian hospitals was poor during the COVID-19 outbreak, given that just over half of the respondents who reported clinically significant psychological distress. This observation stresses the importance of introducing a psychological screening and enhancing individuals and interpersonal and organizational resources to face stressful events, such as a pandemic. At the individual level, psychological interventions should promote acceptance of negative emotions and reduction of avoidance strategies and self-blame and should improve debriefing of stressful experiences. The crucial role of interpersonal factors suggested that group interventions, such as daily experience sharing and peer support, might be effective strategies aimed at normalizing and reducing psychological distress and the perceived difficulties in reconciling private and family life with work. Implementing group initiatives might also enhance the peer recognition of more vulnerable HCPs and reduce stigma. However, at the same time, actions at the organizational level are mandatory to ensure timely and complete access to information and proper material resources, such as PPE. Moreover, at this higher level, a culture of collaboration and support is essential to enhance actions at the individual and interpersonal level, as already suggested for the obstetrics context (Slade et al., 2020). Enhancing these integrated strategies may reduce the psychological impact of COVID-19 and other pandemics and mitigate the potential adverse effects of severe obstetric events, which remain a major source of work-related stress disorders.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article are available from the corresponding author on reasonable request.

ETHICS STATEMENT

The study involving human participants was reviewed and approved by the Human research ethics committee of the University of Verona (CARU, Comitato di Approvazione della Ricerca sull'Uomo) - 2020-UNVRCLE-0143469. The patients/participants provided their informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MF, RR, LD, VD, MR, CP, FG, ES, and GS conceptualized and designed the study. LD, RR, MF, VD, MR, and CP developed the questionnaire. SU, AC, FG, MG, ES, GS, and FC organized and performed the survey. SG, SU, MG, and FC managed the dataset and performed statistical analyses. LD, VD, and SG wrote the manuscript. All the authors conform to the International Committee of Medical Journal Editors (ICMJE) criteria for authorship, contributed to the intellectual content of the study, approved the final version of the article, contributed to the interpretation of the results, and the writing and editing of the manuscript.

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Facing COVID-19 Between Sensory and Psychoemotional Stress, and Instrumental Deprivation: A Qualitative Study of Unmanageable Critical Incidents With Doctors and Nurses in Two Hospitals in Northern Italy

Ines Testoni[1,2]*, *Chiara Franco*[1], *Enrica Gallo Stampino*[1], *Erika Iacona*[1], *Robert Crupi*[3] and *Claudio Pagano*[4]

[1] Department of Philosophy, Sociology, Education and Applied Psychology (FISPPA), University of Padova, Padua, Italy, [2] Emili Sagol Creative Arts Therapies Research Center, Faculty of Social Welfare and Health Sciences, University of Haifa, Haifa, Israel, [3] NewYork-Presbyterian Queens Hospital, New York, NY, United States, [4] Clinica Medica 3, Department of Medicine - DIMED, University of Padova, Padova, Italy

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***Correspondence:**
Ines Testoni
ines.testoni@unipd.it

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Background: The COVID-19 pandemic severely strained the already unprepared Italian healthcare system. This had repercussions on healthcare workers, stemming, in particular, from a lack of clear guidelines, adequate protective equipment, and professional preparedness. Such conditions were especially prevalent in Northern Italy.

Objectives: This study aimed to examine COVID-19-related professional and psychoemotional stress among nurses and doctors in two hospitals in Northern Italy, along with the worst critical incidents affecting healthcare personnel. A parallel objective was to elicit healthcare professionals' opinions about what changes are needed in the healthcare system's operations, as well as about the relational/emotional skills that are needed to better manage relationships with patients in emergency situations.

Participants: Snowball sampling was used to recruit participants and yielded 17 hospital professionals: six nurses (five female and one male) and 11 doctors (seven male and four female). Three of these professionals worked in intensive care and the others in different wards. All had close contact with COVID-19 patients.

Methods: The study employed a qualitative research design, using in-depth interviews of ∼60 min each that were conducted *via* Skype video calls. The interviews were recorded and transcribed, then analysed. The qualitative analysis employed mixed methods to identify the most relevant and recursive themes from the interviews.

Results: Four fundamental themes emerged from our analysis of the interview texts: (1) disorganisation and psychoemotional stress; (2) urgency and critical incidents; (3) everything surreal; and (4) disruptions in empathetic relationships with patients.

Conclusions: Through our analysis of the interview narratives, we found that systematic and in-depth psychological training is needed to prepare professionals for (1) altered relationships with patients in emergencies; (2) use of exceptional medical equipment; (3) elaboration of new bioethical models suitable for disasters and pandemics; and (4) engagement with the themes of death and dying.

Keywords: COVID-19 pandemic, critical incidents, psychoemotional stress, death, dehumanisation

INTRODUCTION

The COVID-19 pandemic has tested the Italian healthcare system and significantly affected the relationships among healthcare professionals, patients and their families. The pandemic occurred during a time of critical transformation during which healthcare professionals were already committed to changing their model for interacting with patients. In fact, the doctor/nurse-patient relationship had been evolving over the past two decades, corresponding with shifts in approaches to illness and health. The most significant of these changes has been a movement away from understanding disease as a compromise of biological structures and functions—on which doctors were the unique authority—to a new perspective that views health as a complex phenomenon with intertwined biological, psychological, social, and spiritual aspects. The latter view requires a different relationship between healthcare professionals and patients [i.e., one that moves away from authoritative frameworks and towards more humanistic ones, such as those recommended by the medical humanities and patient-centric approaches (Pirone, 2018)]. Despite a continuously heated debate over the ethical and psychological implications of this new type of relationship (Aulisio and Arora, 2014; Greenblum and Kasperbauer, 2018), the literature generally demonstrates its benefits in terms of its positive effects on the well-being of both healthcare professionals and patients (Fuertes et al., 2017). In some cases, the quality of patients' relationships with healthcare professionals seems to be even more important than active therapies targeting the disease, especially when there is little chance of recovery. Where chronic diseases are concerned, active care and the quality of relationships seem to be equal in importance (Hanganu et al., 2019). In recent years, several models have been developed. These focus on the development of healthcare professionals' relational/communicative skills (Dinkel et al., 2016; Adamson et al., 2019; Testoni et al., 2019b); shared responsibility in decision-making processes regarding the treatment plan; motivation (Kos, 2019; Lipovetski and Cojocaru, 2019); and trust (Hoff and Collinson, 2016; Ruberton et al., 2016; Chandra et al., 2018; Orom et al., 2018). However, as with any kind of human relationship, difficulties are inevitable—especially when doctors must make decisions that are painful for the patient (Restivo et al., 2018). In such cases, the empathy that physicians and nurses experience may cause them severe psychoemotional stress and heighten their risk of burnout (Zamperini et al., 2015). Healthcare professionals unconsciously deploy psychological defences aimed to distance patients from decision-making processes (Capozza et al., 2015). However, a recent study on a group of non-healthcare personnel showed that such defences do not reduce burnout levels (Testoni et al., 2020a). This demonstrated the need to find better strategies (Testoni et al., 2019a) [e.g., by enhancing the spiritual dimension (Testoni et al., 2016; Castro et al., 2019)]. This could be particularly helpful given the growing impact of new medical technologies on the healthcare provider-patient relationship, as such technologies often increase the distance between these parties (Pirone, 2018; Eyal et al., 2019; Dalton-Brown, 2020; Matthews, 2020; Sakka and Qarashay, 2020).

The COVID-19 crisis had serious consequences for public health and patients' medical care in Italy (Labrague and de Los Santos, 2020). It negatively impacted the healthcare provider-patient relationship as a result of the enormous surge in seriously ill, infected patients that overwhelmed the healthcare system (Ministry of Health, 2020; World Health Organization, 2020a). Physicians and nurses who had been trained to humanise their relationships with patients were suddenly forced to revert to older models of intervention. During the early phases of the pandemic, it was impossible for healthcare professionals to respond to patients' exigencies due to overcrowding in hospitals and insufficient staffing. Once can easily imagine the impacts of this peculiar psychological situation on mental health of healthcare professionals (Hossain et al., 2020a,b; Pfefferbaum and North, 2020). Similarly to what had occurred during the 2002–2004 severe acute respiratory syndrome (SARS) outbreak (Brooks et al., 2020), healthcare professionals were among the professionals who were most distressed (Labrague and Santos, 2020; Mo et al., 2020; Nemati et al., 2020), alongside patients (Guo et al., 2020).

Several psychological factors have been considered with regard to healthcare providers. First, according to recent studies (Jin et al., 2020; Sultana et al., 2020), the excessive number of working hours makes this group more susceptible to experiencing anxiety, depression, burnout, and insomnia. Additionally, healthcare providers feared contracting the coronavirus or infecting loved ones (Cao et al., 2020). In one study by Halcomb et al. (2020), this concern involved 80.9% of this worker population. Among the factors causing a high degree of stress was the reported fear of infection due to lacking or inadequate personal protective equipment (Chirico et al., 2020; Halcomb et al., 2020). Moreover, healthcare providers experienced high levels of stress in their attempts to mediate patients' needs compared with their own personal and family needs (Greenberg et al., 2020). Doctors and nurses were forced to make ethical decisions, taking into account the exceeded capacity of hospital wards and COVID-19 patients' medical

needs (Xiang et al., 2020). In addition to the exacerbation of anxiety, depression and post-traumatic stress disorder (PTSD) (Alharbi et al., 2020), a 40% increase in compassion fatigue was noted (Van Mol et al., 2015). Indeed, physical and psychological stress can be related to difficulties in mediating personal needs in connexion with constant and prolonged demand for patient care (Ruiz-Fernández et al., 2020). This situation has led to social dislocation and traumatic experiences that have been demonstrated to carry the risk of gradual desensitisation and loss of compassion due to excessive exposure to suffering (Joinson, 1992). The inadequacy and the insufficiency of resources for protecting frontline healthcare providers' physical and psychological well-being also needs to be considered.

In light of these difficult circumstances, the purpose of our study was to examine narratives describing the experiences of physicians and nurses who worked in hospitals in two of the Northern Italian cities hardest struck by COVID-19. The most significant critical incidents involving hospital professionals and the related psychoemotional stress were analysed to understand what substantial changes could be made to the current healthcare system to improve care for both patients and their healthcare providers facing a similar future crisis. Critical incidents, as job-related stressors, affect the individuals involved both at the time of their occurrence and even years after the incident had passed. Exposure to critical incidents (such as the current response to COVID-19) is a particular concern in the field of healthcare quality, considering that such exposure has the potential to increase the already heavy workloads of physicians and nurses (Caldas et al., 2020). In Italy, guidelines were released to provide all healthcare professionals involved in the COVID-19 crisis with psychological support services centred on coping strategies for managing stress and anxiety (Chirico et al., 2020).

MATERIALS AND METHODS

Objectives

This study utilised a qualitative research design method to investigate professional and psychoemotional stress among physicians and nurses during the COVID-19 pandemic, with a particular emphasis on their relationships with patients. We sought to understand if and how empathetic attention to patients and its humanising effect on medical care helped physicians and nurses cope with the pandemic. In particular, we were interested in the ways in which healthcare providers experienced the state of emergency imposed by the rapid spread of the coronavirus and the major difficulties they encountered. We paid special attention to the possibility that the critical incidents in which doctors and nurses found themselves during the worst period of the crisis (March to May 2020) might have generated significant psycho-emotional stress that undermined their empathetic relationships with their patients. A final aim was to identify, in participants' opinions, substantial changes and interventions that are deemed necessary to the Italian national health service.

Participants

Our study examined healthcare professionals working in hospitals in two areas of Northern Italy most affected by the virus during the first phase of the COVID-19 pandemic. A total of 17 healthcare professionals from two hospitals in Northern Italy were enrolled in the study. Of these, six were nurses (five female and one male) and 11 were physicians (seven male and four female). The mean age was 47 years (SD = 9, range: 35–60 years). Their years of service ranged from 6 to 30 years (mean = 19.88, SD = 10.86) (**Tables 1**, **2**). Three of the physicians who were interviewed worked in an intensive care unit and the remaining healthcare providers worked in general internal medicine departments, cardiology departments and infectious disease units. Because of the reorganisation of the hospitals in view of the pandemic, all the participants worked in close contact with COVID-19 patients. Recruitment began with a pre-research collaboration between the research team and two physicians. A discussion about the difficulties that healthcare professionals were experiencing motivated everyone to initiate this study. The two physicians, in turn, engaged physicians and nurses who felt able to talk about their experiences without it being too traumatic for them. The research team tried as much as possible not to further stress the participating healthcare providers, and the latter's ability to discuss their experiences was one of the selection criteria. Those who had experienced major psychological distress were already in treatment prior to the interview, and all participants could receive special counselling services.

Data Collection and Analysis

The snowball sampling method was employed for recruiting participants. This non-randomised method is often used in qualitative research in healthcare disciplines because it is viewed as appropriate, especially when the members of a particular population are difficult to locate (Rubin and Babbie, 2010). In this study, each participant referred colleagues, both doctors and nurses, as potential participants. Participant recruitment was halted only when reported themes from the interviewed professionals became repetitive and the data achieved theoretical saturation. Two specially-trained psychological interviewers conducted the interviews, and an experienced psychologist and professor supervised these interviewers continuously. Although, considering that their colleagues had invited them, the participants were familiar with the objectives of the interview, the conception of the study and all its objectives were explained to the participants by the researchers. The participants were asked whether they felt comfortable enough to support the research and were required to sign an informed consent form before proceeding. They were also asked to confirm their consent after the interview. Individual semi-structured interviews were conducted through Skype, with a mean duration of 60 min per interview (SD = 15').

In line with principles and processes common to thematic analysis (TA) (Braun and Clarke, 2006), the study followed a qualitative research-in-psychology design that utilised in-depth interviews concerned with existential, personal and professional dimensions (Camic et al., 2003). The researchers' primary concern was to collect data from participants on the issues that characterise the phenomenon under investigation while considering three predominant factors: changes and problematic aspects after the beginning of the outbreak; relationships with

TABLE 1 | Participants' characteristics.

Number of participants		Gender		Age		Length of service (in years)	
Physicians	**Nurses**	**Male**	**Female**	**Mean**	**SD**	**Mean**	**SD**
11 (64.7%)	6 (35.3%)	8 (47.05%)	9 (52.94%)	47	9	19.88	10.86

TABLE 2 | Participants: physicians and nurses.

Pseudonyms	Age	Length of service (in years)	Profession
Alfredo	36	8	Physician
Amalia	52	21	Physician
Arianna	54	30	Nurse
Aurora	37	8	Physician
Camillo	40	9	Physician
Carlotta	35	8	Physician
Eleonora	58	30	Nurse
Lelio	55	30	Physician
Martina	56	27	Nurse
Matilda	35	7	Physician
Salvo	36	4	Physician
Salvatore	44	20	Physician
Serenella	36	13	Nurse
Sonia	50	25	Nurse
Tarcisio	53	33	Nurse
Valerio	57	31	Physician
Vittorio	60	34	Physician

patients during a state of emergency; and emotions and reactions related to COVID-19. Because the study aimed to make sense of how doctors think through their lived experiences and focused on their reactions and on how their work changed during the pandemic, the semi-structured interviews were inspired by Interpretative Phenomenological Analysis (IPA) (Smith and Osborn, 2008; Pietkiewicz and Smith, 2014). Allowing participants to express themselves freely, the dialogues were realised through computer-mediated communication, recorded and transcribed verbatim. The interviews aimed to elicit respondents' horizons of meaning, as is characteristic of IPA, and the analysis attempted to recognise the main themes that were common *among* interviewees rather than within each of them (Larkin et al., 2006). Similarly, as in other studies that integrate two different methodologies (in this case, TA and IPA) (i.e., Danivas et al., 2016; Thompson, 2017; Ferguson and McAuley, 2019), the texts underwent an analysis that aimed to identify similarities and specificities *across* all the narratives (Braun and Clarke, 2020). In this process, thematic patterns were identified using Atlas.ti software (Muhr, 1991). Common patterns and emergent themes were identified to illustrate convergences and specificities among all participants' answers through a systematic comparison across the texts. The connexions were identified and interpreted through abstraction, which allowed the researchers to recognise the main emergent themes (Leo and Goodwin, 2016; Rotenberg et al., 2020). Two of the authors jointly developed a temporary codebook using the transcripts and attempted to ground each code in the participants' narrated experiences. Together, in an iterative process, they extracted codes and identified sentences that contained a single theme. After this, the coding was organised to refine and reduce the various themes to produce inclusive main themes. All differences of opinion were resolved through discussion until the codes were agreed upon unanimously. The codes were assigned descriptive labels that were consolidated into themes, then reviewed and revised several times through discussion. Finally, a consensus was reached with additional, supervising authors. The flexibility of this approach allowed for unexpected issues to emerge from the narratives without the use of a structured hypothesis guided by the literature (Testoni et al., 2018, 2020c; Rotenberg et al., 2020). The analysis performed by the interviewer and supervisor followed six fundamental phases: preparatory organisation; generating categories or themes; coding data; testing emerging understanding; searching for alternative explanations; and writing up the report (Marshall and Rossman, 1999; Braun and Clarke, 2006; Testoni et al., 2020b). To verify the correctness of the analysis and interpretive procedures adopted by the interviewer and the supervisor, two other members of the research team worked on the texts until agreement was reached among all the researchers.

The study respected the American Psychological Association's Ethical Principles and Code of Conduct, as well as the principles of the Declaration of Helsinki. Furthermore, the study was approved by the Ethics Committee of the University of Padua (n. 8DD829A1F8F83852FEDB64AAE38A4F79). Participants were informed about the study's aims and procedures, and they were assured that participation was voluntary and that their responses would remain anonymous. Informed consent was obtained from all participants. In order to protect the participants' identities, the names used in this text are pseudonyms.

RESULTS

Analysis of the interviews identified the following fundamental themes.

Disorganisation and Psychoemotional Stress

COVID-19's rapid spread exposed healthcare professionals to a completely unexpected and unpredictable scenario that caused intense psychoemotional stress, directly involving their relationships with patients. Arianna, a 54-year-old nurse,

described her great difficulty in managing a situation for which she felt totally unprepared:

> I had to deal with a flood of sick people, and I couldn't handle all the demands. Not only there was a lack of medical equipment, such as ventilators and masks, but I could not even respond verbally to patients' cries for help. I could not even go to the bed(s) of those who called me because they were choking to death. It was impossible to cure them. One simply tried to survive hoping that someone would be saved.

Almost all the participants cited this issue, and their descriptions of psychoemotional stress were associated with discouragement, helplessness and inadequacy, as exemplified by Eleonora, a 58-year-old nurse:

> What scared me the most was to realise that the antipyretic, antibiotic and oxygen had no effect. Previously, we were used to seeing improvement in even the most serious patients, thanks to these interventions. Instead, this time, we didn't have enough drugs and controls, and they didn't have the effect we expected. It was frightening, and the experience of helplessness was terrible. All this made my relationship with patients very uncertain because I did not know how to reassure them.

This feeling of impotence was associated with a loss of hope, along with a profound sense of inadequacy caused by the repeated ineffectiveness of the instruments that were normally used. In other situations, these instruments were effective and would usually give these professionals a sense of validation. Tarcisio, a 53-year-old nurse, added: "We didn't have enough masks or gowns. The growing urgency had to deal with the expectations of the boxes that carried the protective material, which often did not fit, and we had to adapt to what was available." Martina, a 56-year-old nurse, described a similar experience:

> It was shocking to see that all our efforts were not having any effect on patients! Everything was useless because whatever we did, the patients died suddenly. Any effort, any administration of powerful drugs was like giving fresh water. No therapy had any positive effect. Then we started using palliative drugs, at least to soothe their suffering and make their agony less excruciating! There was nothing else we could do.

This sense of powerlessness and the associated distress were exacerbated by a latent form of resentment, an anger without a precise object. The most concrete object they could hold responsible was the regional healthcare system, which, being an impersonal entity, could be taken as a general background on which to project their feelings. Anger and resentment were accompanied by demoralisation and helplessness, as described by Serenella, a 36-year-old nurse:

> About a 100 colleagues were taken from wards and clinics and moved to COVID areas to cope with the emergency. We came to this because there was a lack of personnel due to regional cuts in recent years. We were (used) as patches everywhere and were used as a stopgap here and there without anyone having the necessary expertise to deal with this emergency. The errors in the management of the health service have been a joint cause of this slaughterhouse. I hope that this terrible experience will make it clear that healthcare professionals are not a cost, but a resource for the true well-being of the population.

Psychoemotional stress had inevitable post-traumatic psychosomatic repercussions. Lelio, a doctor in internal medicine, reported:

> I relive continuously, day and night, the experiences lived during the first period of the pandemic—the urgency, the ineffectiveness of drugs, the deaths. Even now, it is as if I continue to work even when I am asleep because problematic situations reoccur, and sometimes the possible solutions I could have adopted come to mind. I keep thinking about it because I always want to give my best, and flashbacks require me to rethink what can be done to solve this situation.

The expression of a need for psycho-emotional distancing came through computer-mediated communication. This strategy was adopted because of thepsychological need to safeguard both physical health and psychological well-being. In fact, patients understood that physicians did not want to see them in person and, therefore, did not object. This simplification helped family physicians avoid becoming too emotionally involved through face-to-face relationships with patients.

Many healthcare professionals worked on wards where they did not normally deal with contagious diseases, yet were summoned to serve in COVID emergency wards and assigned tasks beyond their training, expertise and experience, as witnessed by Tarcisio:

> It was all sudden and suddenly unmanageable. I found myself literally catapulted from my department to the COVID one without any preparation. We all found ourselves working without knowing anything about each other, only names written on suits so that we could at least call each other by name without making mistakes. No training in the use of the new protocols, all improvised and all to learn from time to time, quickly, without time to compare ourselves with each other. And as soon as we learned something, we had to change because something new changed the whole system of functioning of relationships and treatments.

With respect to the problems they were confronted with and the readiness required of them in this situation, all participants expressed the need for specific training to be prepared for handling similar emergency working conditions in the future. All participants felt that they had been unprepared for the COVID-19 challenge. No one was equipped to handle the sudden escalation in deaths and ineffective care. Their idea was that a specific education on emergency and pandemic could have prepared them to prevent trauma. As Tarcisio suggested:

> COVID made us understand that in our healthcare system, in our organisation and in our training, there is a great deficiency: We have never considered the possibility that something exceptional, as a pandemic is, could happen. It is clear that this is a mistake that

> we can no longer make and, therefore, it is necessary to introduce special training courses and provide suitable protocols for these eventualities. It is necessary to do, like the firefighters who practise to always be ready.

Urgency and Critical Incidents

Incidents in care relationships can lead to healthcare professionals wanting to quit their jobs. This phenomenon did not emerge among our participants, but rather came to light in their narratives concerning the emotional work that would not allow them to leave the field. They clearly described how the urgency of the situation prevented them from becoming immediately aware of their emotions, as nurse Martina described:

> The work had become not only useless, but also frenetic. There was not enough time for anything, for thinking, for trying to find new solutions. There wasn't even time to cry or even to realise the pain we were feeling. It had to be done, it had to be done... and all in a hurry.... The number of sick people kept growing out of all proportion, and there wasn't time for everyone. However, the most frequent critical incidents were related to the fact that we did not arrive in time to prevent them from dying.

For Martina, the effect was damaging, and she still has visions of the traumatic scenes from the pandemic's first phases. Martina did not think about quitting her job or shirking her professional responsibilities, but she still had to withdraw from certain spaces:

> In the hospital, in some rooms, I still see the traumatic scenes related to the explosion of the pandemic. Even now, when I am on duty, when I enter some room(s), I see patients who could not breathe, in bed, who died suddenly. I still have these flashes that still shock me, especially when I enter two rooms in particular [. . .]. Whenever possible, I try to avoid going into those rooms so I don't relive those memories.

The feeling of not being able to count on the support and protection needed from the healthcare system; the desire not to give in to discouragement; and the determination not to abandon the field have led many of these professionals to seek personal solutions to safeguarding their health and continuing to help the sick responsibly. Matilda, a 35-year-old emergency medical doctor, declared: "They didn't even give us masks to defend ourselves. To avoid getting infected, I took courage and bought the masks on the internet and went to visit the sick, knowing that perhaps that tool might not be enough." Similarly, nurse Eleonora added the following:

> We didn't have the appropriate equipment to protect ourselves. The ones we had were scarce, and as (there was) not enough for everyone, we had to wear them all day or all night without ever giving them up, knowing that in that way, they were saturated with contaminants and viruses.

One of the most important dimensions thrown into crisis by the emergency situation was the relational dimension. Suddenly, all previous professional training in relating humanely and empathetically with patients became futile. Because of the pandemic, the healthcare provider-patient relationship abruptly became impersonal, and the sick could no longer be cared for as people. Their humanity had to be put on the back burner as a practical matter. Added to the accompanying sense of impotence, discouragement, and anger was the fear of a loss of humanity in the professionals' relationships with the sick. Lelio's trauma seemed to be caused by his empathy for his patients:

> We were constantly on edge because we were dealing with extremely scared people. They felt isolated, even though they hadn't been abandoned by their loved ones, and I suffered seeing their anguish because they knew they couldn't see their family members again. We couldn't do anything. We worked in terror.

Underlying the despair, anger and terror was the ethical problem of managing the scarcity of life-saving devices (e.g., oxygen). Participants often found themselves having to choose whom to save and whom to let die—and to do so quickly. This was a stark contrast to what they had previously learned about respecting the rights of every patient as a person and thereby guaranteeing minimum levels of care regardless of age, gender, ethnicity, or status. Nurse Arianna's narrative continued in this vein:

> It was traumatic because we were absolutely unprepared to manage such a situation and the relationship with patients in such a condition. We did not know how to move, we were not organised and we had to improvise in the constant emergency. No one expected this situation, and we were caught unprepared. We were constantly too late to save patients [. . .] We would have liked to cure everyone, but it was impossible. The most difficult incidents to manage were those caused by lack of resources. I'm sorry to say, but that's how it happened. We had to make ethical choices: If a young person came in urgently needing care, we gave priority to him/her and left aside the older ones, who then died. And for us, it was traumatic because we had not been able to treat them.

The narrative of Salvatore, a 44-year-old resuscitation physician, was similarly dramatic, although it described a totally different perspective. While Arianna talked about sacrificing elderly people to use life-saving medical devices on younger people, Salvatore found himself dealing with a tragic decision from the other end. A young mother was not treated as she could have been, which put him in deep crisis:

> We had to manage a patient who was in her 40's and was very healthy. The only chance we had to save her from COVID was to stabilise her and give her a heart transplant. My department head asked his superior for permission, who denied us the option. We all collapsed in despondency because we were forced to obey. We were not permitted to proceed with this course of treatment, and we let this woman die. She had only that one chance of survival. Instead, we continued to treat the elderly with therapeutic obstinacy, even when there was nothing left to do. Instead, for this young woman with three young children at home who needed her, we could do nothing. This incident to me is completely unacceptable. It was a monstrous decision.

The loss of all protocols and balance made the work environment a minefield where nothing was predictable anymore, producing upheaval not only in the participants' professional lives, but their personal ones, as well. Aurora, a 37-year-old female general practitioner, testified to this:

> All the work was an accident. Nothing worked the way it used to, and not only did (I) not recognise my job, but my whole life was turned upside down. [. . .] I was so upset that for a while, I refused to answer the phone. I didn't want to hear from friends or relatives because I couldn't even speak because of the level of stress, anxiety and suffering. I even avoided my parents for fear of answering them badly after terrifying days. The anxiety was so strong that I couldn't get to sleep, even though I was so tired.

Everything Surreal

A factor that further caused deep discomfort during the first phases of the pandemic was the change in the organisation of work and in the care and protection equipment to be adopted. These professionals were totally unprepared for this change, and one of the biggest difficulties was having to learn how to use new medical tools rapidly and without any previous training in a controlled environment. Amalia, a 52-year-old doctor, described the medical devices:

> At first, we didn't even have the usual instruments to protect ourselves. Then came the ones you need to use to defend yourself from infection. Now we are dressed like divers in heavy wetsuits, which do not allow us to drink, eat or go to the bathroom normally. We can't sit for 10 h in a row, and we arrive at the end of the shift exhausted and eager only to wash and sleep, without thinking about anything else because we don't have the strength to think or do anything anymore.

Having to work intensely amid the hectic and chaotic unpredictability of events was experienced as immersion in an uninhabitable space. Diverse terms were used to describe the protective medical suits. Lelio, like Amalia, called it a "diving suit," while Valerio, an internist and colleague of Lelio's, referred to it as a "sarcophagus." The most intensely stressful psychoemotional effect was that of finding oneself in a condition of sensory deprivation, as though in a coffin. Furthermore, movements were extremely difficult to perform, as Amalia described:

> Since the material was not always adequate, we found ourselves working with three pairs of gloves and huge, bulky, heavy suits that were not even our size, so each movement was awkward, slowed, braked, made impossible. The visor also fogged up, and it was difficult to see.

The shared feeling was that of being constantly immersed in an unreal situation. Lelio, who suffered from his empathy for patients, expressed his discomfort in these terms:

> Dressed like that, we appeared to the patients as Martians because we looked like astronauts, or divers, completely hidden by the diving suit. We were no longer recognisable as people, and the only thing that indicated who we were was our name because we wrote it on our suits with a marker pen so that the patients could recognise us. It was all surreal, like being suddenly thrown into space.

Not all strategies for coping with emotional distress were equally effective for everyone. For Tarcisio, writing one's name on the suit was not enough:

> I didn't recognise people, and I couldn't always distinguish if those I had in front of me were doctors or nurses. The whole team had changed because many professionals came from other departments, so even the relationship between us colleagues could not be based on previously established mutual knowledge.

Valerio experienced the reduction in physical contact with patients as a substantial loss: "The suits were like uniforms; they made us unrecognisable, all the same. We no longer understood who was a man and who a woman, and at the same time, we no longer perceived reality as we normally do [. . .]. This form of relationship is really stressful."

In addition to the difficulties linked to protective and preventive measures, the reorganisation of the hospitals' departments was a source of stress. Because of this reorganisation, everything that had previously been learned seemed to lose consistency and usefulness, while improvisation and rapid adaptability at any cost seemed to be the only measures to which anyone—independently—could resort. The loss of all referent launched doctors and nurses into a frenetic and chaotic space deprived of meaning related to their professional and human experiences.

Disruption of the Empathetic Relationship With the Patient

The loss of all human, ethical and deontological reference point concerning their relationships with patients rattled almost all participants. If this was the most critical underlying aspect of pandemic management, it was no less difficult for the participants to have to modify every aspect of their relationships with patients without any prior expertise on alternative models. Indeed, the state of emergency completely undermined their relationship with patients, and uncertainty contributed to the loss of all empathetic capacity. The uncertainty caused by the lack of effective drugs, medical equipment, and adequate time for patients forced participants to have relationships characterised by great insecurity. The core values that once guaranteed caring relationships suddenly became "pretty words" that had nothing to do with reality. Tarcisio expressed this idea in a strongly dismayed tone that also conveyed harsh disillusionment:

> There is much talk about ethical issues related to the relationship with the patient and informed consent. I work in the emergency room, and there, it was absolutely impossible to negotiate any kind of decision with patients. Here, patients just do what they are told. There is no room to negotiate treatment because there is no time. During the pandemic breakdown, we also did what was possible and always late in our response due to the absolute lack of time. We could never explain anything because we did not know

> how to handle the urgency either. I experienced a lot of stress because I wondered if it was right that they were subjected to our decisions without knowing what was waiting for them, while we knew that everything we were doing could be useless.

The total psychological distancing from patients resulted in the participants' perception that they were dealing not so much with human beings, but, rather, with things akin to furniture. This perception of the dehumanisation of relationships was expressed clearly by Salvatore:

> In resuscitation, we sedated all the patients and intubated them. It was impossible to have a relationship with them, and, little by little, we got used to this kind of relationship, so much so that in the end, we saw them as part of the furnishings. So, it is certainly easier to treat the patient.

Another form of distancing was conducted particularly by family physicians through the use of phone- and computer-mediated communication. As noted earlier, it was understandable to patients that their physicians would want to maintain physical distance so as not to become infected. However, this, in fact, also allowed physicians to distance themselves from the psychoemotional distress that in-person contact implied. Alfredo, alluding to the theme of the shared planning of care with patients, said:

> We were trying hard, and we tried to make the patients understand it too. They also understood that we could not do more and they became less argumentative. Many patients then contacted me *via* email to encourage me and to thank me. I used internet counselling a lot, and this allowed me to keep my distance, and the patients also understood that it was easier that way [. . .] This helped me to better manage their requests without being overwhelmed by their anxiety.

Amalia further emphasised patients' greater willingness to cooperate, pointing out that the pandemic had deconstructed the classic script in which patients are always ready to clash with physicians:

> They were also scared and maybe even disoriented, so they were less polemic(al) than what our work was. We all felt that even the patients understood that we were in trouble and that we were trying hard. The patients understood that none of us was prepared to death with this.

Distancing was also practised through protective equipment that made any empathetic contact even more difficult. Indeed, healthcare professionals' ability to express closeness to and empathy with the sick, even as they neared death, was severely hampered. Lelio described this difficulty in relating to patients as follows:

> The suit has certainly reduced the anxiety of coming into contact with sick patients. Before, we lived in terror. When we were able to wear these new medical devices, we felt personally safer, but even further away from the patients. The suit creates an almost insurmountable distance; it is a real barrier between the doctor and the patient. The empathetic relationship becomes absolutely impossible, and even on a perceptual level, the chances of coming into contact with patients (were) reduced. As much as we wanted to establish a dialogue, in fact, even the words were suffocated by the masks. No facial expressions could support communication. The gestures were awkward, and no physical contact was possible except those necessary for the treatment. Honestly, it was very difficult to go beyond formal gestures. However, the patients seemed to understand that we were in trouble, and they seemed very careful not to put us in any further difficulty. Both they and we were trying to adapt to each other's needs.

The need for distancing is a response to severe distress. The greater the importance previously placed on the empathetic relationship with the patient, the greater the anxiety over contagion. Martina suffered greatly through this situation:

> After all we did, they died badly in the end. The doctors could make every attempt possible, but they couldn't save them. They died with a hunger for air, and it was terrible to see them die like that [. . .] I have always given a lot of importance to the relationship with the patients. One night, however, I was assailed by the anxiety of contagion, and a seriously ill patient was asking for me insistently. I knew that she was dying and that I had to be close to her, holding her hand to make her feel my closeness and accompany her through the passage. I literally escaped from that room. The patient died. I will always remember her because she kept calling us and telling us not to "leave me here alone—don't leave me here alone" because she felt she was dying, but being inside meant you get sick too.

The perception of being faced with a situation in which the patient-centred model of care and the empathetic relationship were being challenged was a further cause of disorientation and emotional distress. Eleonora highlighted the discrepancy between her patient-centred approach training and its lack of applicability during the COVID-19 crisis, noting the need to find strategies for applying the same model in extreme contexts—particularly in patients' final stages of life:

> Patients were left to their own devices, and everything we usually do to enhance the care relationship had failed. Usually, when you accompany a terminal patient to death, you call the minister of worship, who helps the dying person get in touch with their spirituality. Usually, we hold his hand so that he does not feel alone in the passage. At this juncture, instead, we only wait for him to die to close him in a black bag and seal him well because this is the procedure to be used. As soon as the patients die, you close them in the black bag and take them to the mortuary to wait for the funeral home to pick him up. There is no more of those empathic relational modalities that characterise the end of life of other patients. The operations are now aseptic, really cold. I am not used to working like this because I give a lot of importance to the empathic relationship. I can't stand to treat patients (like) numbers. I can't stand the lack of a deep relationship with those who die.

Aurora described the same experience:

> I was used to having a very empathic relationship with my patients in the nursing home. I was accustomed to the caress of kissing, so

> a touch on the arm on the shoulder. My patients really need to feel my closeness in this way too. These things are impossible now, and the patients don't realise this because they don't understand what is happening. So, they still try to get their hands close to my face; they are somehow looking for closeness. It's all really difficult to manage now.

The increasingly widespread promotion of the palliative care model in Italy over the last decade has prepared most physicians and nurses to take patients' conditions into huge consideration, even during the terminal phase of their illness. Therefore, it has been very difficult for them to manage patients' deaths so coldly. Perhaps one of the worst moments for all participants was related to the management of corpses, as Martina noted:

> The most dramatic moment was when we had to learn how to manage the black bag. We had to learn to immediately close the corpses in the black sacks to have them taken immediately to the mortuary without blessing, without anyone having said goodbye. We had to store them in the mortuary and leave them there. Put them in the archives to wait their turn to leave and be cremated or buried quickly by the funeral home. And then close everything with papers, documentation and administrative practises. No, I was not ready to face all that.

Figure 1 summarises the major components of the interviews' most salient themes' by highlighting the relationships among them.

DISCUSSION

This study examined healthcare workers' lived experiences during the COVID-19 pandemic. Previous research had demonstrated that healthcare workers experienced significant psychoemotional stress during the SARS and MERS epidemics (Tam et al., 2004; Lee et al., 2018). Our study found that inadequate emergency preparation and limited resources in the Italian healthcare system elicited disastrous results after the unexpected arrival of COVID. Four closely-linked, main themes demonstrated the distressing effects on healthcare professionals of such lack of preparation: (1) disorganisation and psychoemotional stress; (2) urgency and critical incidents; (3) everything surreal; and (4) disruption of the empathetic relationship with patients.

The shortage of operational protocols and the lack of personal protective equipment needed for the crisis have been thoroughly documented worldwide (Livingston et al., 2020; Ranney et al., 2020). Based on the World Health Organization's (2020b) expectations, an estimated 89 million medical masks, 76 million examination gloves, and 1.6 million goggles are needed for the COVID-19 response each month. In Italy, as evidenced by Arianna's narrative, limited access to medical equipment such as medical masks and respirators left frontline healthcare workers ill-equipped to care for COVID-19 patients. This lack of personal protective equipment has been associated with increased psychoemotional stress among healthcare workers, thereby hindering their ability to cope with the crisis (Fernandez et al., 2020). Our results align with what other scholars have already demonstrated; healthcare professionals had higher perceived anxiety, insomnia, and overall psychological problems (Barello et al., 2020; Que et al., 2020). In our participants' narratives, the psychological and physical impacts of the state of emergency have been described mainly as difficulty falling asleep and having ruminative thoughts. A systematic review and meta-analysis developed by Pappa et al. (2020) provided early evidence that a high proportion of healthcare professionals experienced mood and sleep disturbances during the COVID-19 pandemic. As confirmed by Eleonora's and Martina's interviews, healthcare professionals experienced helplessness and frustration with regards to patients' suffering and sudden death.

Studies of past epidemics have shown that frontline healthcare professionals were at higher risk of mental health disorders, such as post-traumatic stress disorder, after the epidemic (Liu et al., 2020). Our research highlights additional difficulties. The lack of available treatments and protocols to guide both clinical management and prioritisation in caring for COVID patients was a source of suffering and distress. In particular, we refer to the narrative of Salvatore, who witnessed a young mother die without being able to do anything for her while elderly patients were given priority, with extraordinary effort directed towards treating them. His situation contrasted with Arianna's; due to a lack of resources, Arianna and her colleagues chose to save the youngest at the cost of the oldest. Both Salvatore and Arianna suffered not only from the ethical dilemmas that they faced without adequate preparation and guidance, but also from the need to alter their relationships with their patients. The first theme from these critical incidents (i.e., disorganisation and psychoemotional stress) punctuated the narratives of all participants, who began their accounts by highlighting the shock they suffered when finding themselves unprepared to handle the crisis without proper tools and protective equipment. As seen in the second theme (urgency and critical incidents), they then remarked on the importance of the relationship with the patient and how this was jeopardised by the lack of tools and intervention models. According to Tarcisio's narrative, the pre-existing shortage of healthcare providers forced the sudden redeployment of medical professionals in order to optimise resources for the pandemic. This was linked to the perception that everything was unmanageable due to substantial disorganisation within the healthcare system, which rendered all relationships unrecognisable and meaningless. In Tarcisio's opinion, even the principle of informed consent had been transformed into a rhetorical issue without any operational value. Throughout the emergency, all participants tried their best to provide psychological support for their patients, but exhaustion, fear of contagion and use of protective equipment made it impossible to establish empathetic relationships. The COVID-19 pandemic has threatened the cornerstones of modern patient-centred medicine; the sheer volume of seriously ill patients and the lack of healthcare providers and resources have limited interaction time with patients, especially in emergency care. Thus, psychoemotional stress sprang from the reality that participants could not use their training in

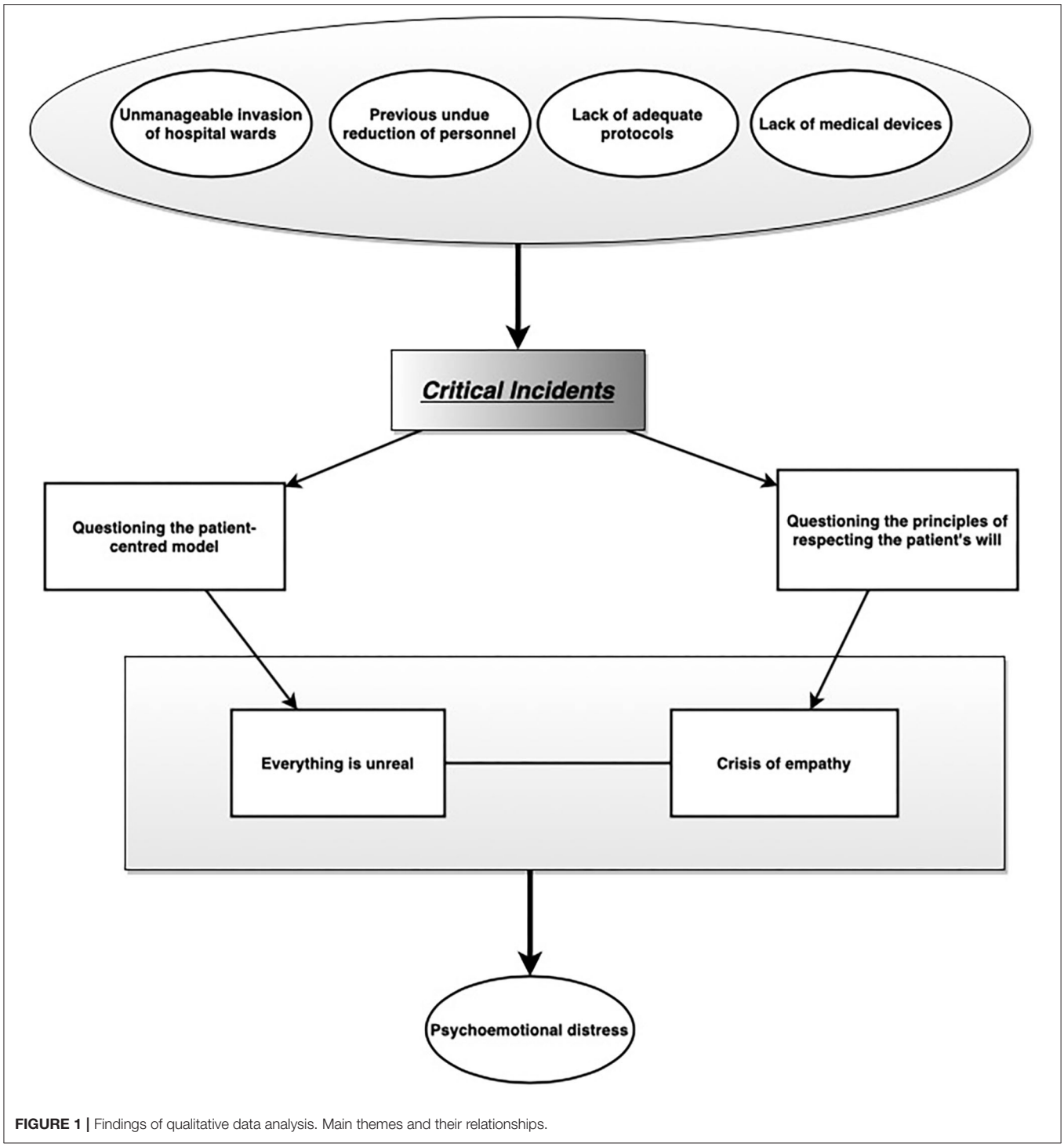

FIGURE 1 | Findings of qualitative data analysis. Main themes and their relationships.

humanising the provider-patient relationship while caring for COVID patients.

Indeed, one of the most important issues, in our opinion, relates to the fact that all participants were strongly aligned with the patient-centred approach and, therefore, were accustomed to exercising an empathetic relationship with patients. Almost all reported work-related challenges, such as the safe delivery of care to patients while wearing personal protective equipment for several hours. The presence of physical distress due to safety measures was consistent with the literature (Liu et al., 2020). The huge staffing shortages have been a major concern that influenced healthcare providers' ability to cope with the demanding workload during the pandemic (Fernandez et al., 2020). Time devoted to better understanding each patient's expectations,

feelings and fears—which lies at the foundation of a patient-based approach (Levenstein et al., 1986)—is impossible during a pandemic because time is prioritised for triage and treatment. This problem is closely linked to the psychoemotional stress caused by the serious ethical dilemmas healthcare professionals have faced.

Given our findings, we believe that a combination of adequate training and psychological support for hospital healthcare workers is important when disasters strike. This is particularly true in the instance of infectious disease pandemics, as has been evidenced by past pandemics. In fact, we believe that doctors and nurses should be prepared to modulate their empathy and closeness to patients by knowing how to regulate relational availability on the basis of concrete situations—be these normal or exceptional ones. It is necessary to define precise protocols on how to guarantee the best type of relationship with the patient from psychological and ethical perspectives. Of course, it is impossible to establish from this preliminary investigation how these protocols should be set up. Further research is required in this regard.

CONCLUSION

Through our analysis of the narratives obtained through in-depth interviews, we identified several important issues that must be taken into account in future educational and professional training for healthcare professionals. In particular, we found that the COVID-19 pandemic subverted the symbolic referents that normally surround the humanisation of care in medicine. It did so by undermining healthcare professionals' basic ethical protocols; the professionals found themselves unable to comply with these protocols without having alternative reference models. In our participants' opinions, systematic and in-depth psychological training is needed to prepare them for crisis conditions in terms of their altered relationships with patients; the use of exceptional equipment; the preparation of new bioethical models suitable for disasters and pandemics; and engagement with the themes of death and dying. Indeed, it is important to prepare healthcare professionals so that the profound feelings of discouragement that can grow out of exceptional situations such as COVID-19 can be avoided during similar states of emergency.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This study has some limitations, particularly concerning the impossibility of generalising the results, but it provides a much-needed foundation for future research on healthcare workers' difficulties and needs in managing acute states of urgency, thereby filling a current literature gap. In fact, further studies should investigate further frontline workers' experiences following unpredictable events and focus on what kind of professional interventions could be particularly helpful in sustaining their concrete necessities. Therefore, it could be very useful to analyze the psychological outcomes of the COVID-19 pandemic in the healthcare worker population to develop a more adequate support system for these professionals in future crisis situations. We believe that a crucial node of the entire research is the ethical questions involved, considering that important discrepancies emerged: For some, too much precedence was given to the elderly, while others felt that the young should have been prioritised. This specific issue requires a very thorough investigation, and everything should be considered in relation to the ethical models adopted to regulate the decision-making process in such crisis situations while simultaneously addressing its potential impact on "emotional labour" and "moral distress."

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by The Ethical Committee for the Psychological Research of the University of Padua. The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

IT: project ideation, research design, supervision, analysis, article writing, and coordination. CF: article writing. EG: project ideation and interviews. EI: analysis, coordination, and supervision. CP: research design and supervision. RC: research design, supervision, and article writing. All authors contributed to the article and approved the submitted version.

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Protective and Risk Factors for Medical and Nursing Staff Suffering From Psychological Symptoms During COVID-19

Hailong Luo[1], Huiqi Yao[2†], Yuandi Xi[3†], Zhun Zhang[1], Jia Li[4], Jie Li[5], Xuewen Wang[6], Zhixiong Zhong[7] and Yan Lv[8*]*

[1] Department of Psychology, Meizhou People's Hospital, Meizhou, China, [2] Department of Rehabilitation, Meizhou People's Hospital, Meizhou, China, [3] Department of Epidemiology, Public Health College, Capital Medical University, Beijing, China, [4] Department of Psychology, Hainan General Hospital, Haikou, China, [5] Department of Geriatrics, Meizhou People's Hospital, Meizhou, China, [6] Department of Cardiology, Wuhan Asian Cardiovascular Hospital, Wuhan, China, [7] Medical Department, Meizhou People's Hospital, Meizhou, China, [8] Department of Neurology, Hainan General Hospital, Haikou, China

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Elena Vegni,
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Lidia Del Piccolo,
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University of Messina, Italy

***Correspondence:**
Yan Lv
jqlvyan7@aliyun.com
Zhixiong Zhong
zhongzhixiong@mzrmyy.com

[†]These authors share first authorship

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Background: With the outbreak of the coronavirus disease 2019 (COVID-19) epidemic in China, the general public but also medical staff were confronted with psychological challenges, suffering from the highly infectious and unknown characteristics of COVID-19. In this study, we surveyed psychological symptoms including anxiety, depression, and sleep disorders in medical staff.

Method: A questionnaire star/WeChat link-based survey assessing the Generalized Anxiety Disorder 7-item scale, Patient Health Questionnaire-9 depression, the Insomnia Severity Index, Social Support scales in addition to lifestyle, and income level was conducted and included 8,288 medical staff from 24 provinces in China. Pearson Chi-square and Mann-Whitney *U*-tests were used to evaluate single risk factors and significant differences in psychological symptoms before and during the outbreak of COVID-19. Binary logistic regression analyses were conducted for the risk factors of anxiety, depression, and sleep disorder symptoms.

Results: Medical staff had a high incidence of psychological symptoms, which was more prominent during the COVID-19 epidemic. Comparatively, females, nurses, first-line department, never exercised, and low income were risk factors for psychological symptoms. Social support including objective support, subjective support, support utility, and regular sports over 3 times per week were protective and manageable elements that could protect from and manage the psychological symptoms of medical staff.

Conclusion: The susceptibility of psychological symptoms among medical staff should be of concern to policymakers and the public in the long-term, and the aggravation of mental health problems of medical staff could be eased by providing adequate social support during and after the COVID-19 outbreak.

Keywords: medical staff, social support, COVID-19, psychological symptoms, protective elements

BACKGROUND

At the beginning of 2020, coronavirus disease 2019 (COVID-19) broke out in Wuhan, China; 81,062 patients were diagnosed and 3,204 patients died according to one report (Deng and Peng, 2020). Although China had previously experienced the severe acute respiratory syndrome epidemic (Qiu et al., 2018), the Chinese people were still caught off guard with COVID-19 (Huang C. et al., 2020). The Chinese government learned from previous epidemics (Zhang, 2020) and developed effective strategies for controlling COVID-19 by isolating cases and contact tracing (Hellewell et al., 2020). Prior to the onset of other inflection points, Doctor Wengliang Li strongly encouraged Chinese medical staff in the battle against COVID-19. However, COVID-19 still posed a challenge in Chinese society and medical staff standing on the frontline treating patients were suffering from pressure and phobia (Asmundson and Taylor, 2020).

COVID-19 was not only an infectious attack (Jin et al., 2020; Luo et al., 2020), but also resulted in a considerable mental health burden in the general Chinese population (Du, 2020) and among health care workers at the beginning and peak of the pandemic. Anxiety, depression, and sleep disorders were the most common psychological symptoms in frontline medical staff under stress (Yaribeygi et al., 2017) including emergency departments (Song et al., 2020), ICU (Hu et al., 2021), and territory hospitals (Huang J. Z. et al., 2020; Fu et al., 2021). Medical staff, including students and caregivers (Paiva et al., 2018), and professionals (Zerbini et al., 2020) were potentially at risk of developing psychological symptoms, which would affect their daily life and work. Notably, the medical and nursing staff working in Wuhan had a high incidence of mental health disturbances in the immediate wake of the viral epidemic (Kang et al., 2020). A similar situation was found in European countries (Hummel and Oetjen, 2021).

Medical staff were the backbone of the battle against the COVID-19 epidemic. For this battle to be successful, the psychological well-being of medical personnel was essential (Kang et al., 2020) and will have an impact even after the pandemic (Juan et al., 2020; Moreno et al., 2020). Researchers worked diligently to determine risk factors and protective elements for medical staff confronting psychological symptoms. Among many factors such as marriage status, gender, and age, social support was one of the intervenable elements. At the same time, coping strategies were suggested based on those studies (Chen et al., 2021). Social support could improve the psychological health of caregivers such as nurses (Pedro et al., 2008). Therefore, we conducted a questionnaire star/WeChat link-based survey of the common psychological symptoms of medical staff as well as demographic factors including sex, profession, lifestyle, and social support to obtain an adoptable method to improve the psychological health conditions in the epidemic background not only for Chinese medical staff but also health workers around the world.

METHODS

Subjects and Data Collection

An electronic WeChat-based survey was distributed to medical staff from 24 provinces in China. The questionnaire survey was carried out from February 18, 2020 to May 7, 2020. The 24 provinces in this survey included: Guangdong, Hubei (except Wuhan), Wuhan, Hainan, Jiangxi, Beijing, Henan, Hebei, Shanxi, Hunan, Jiangsu, Zhejiang, Xinjiang, Anhui, Sichuan, Fujian, Guangxi, Shanghai, Tianjin, Liaoning, Shandong, Heilongjiang, Shanxi, and Hong Kong. There were 1,911,317 doctors and 3,020,813 nurses in China according to the 2018 annual survey (see **Supplementary Material**), the province-specific data of the number of medical staff were not statistically available since the government simply divided those areas into several districts, and the data had not been taken into consideration. The sample size in our survey was 8,028, which accounted for 0.16% of the total of doctors and nurses in China. The questionnaire consisted of 36 items; the average time for the test was about 200 s and responses <60 s were excluded. The participants were largely classified into doctors and nurses, those categorized as belonging to medical staff but classified into other afflicted professions were excluded. Questionnaires reporting paradoxical answers for the same question (questions 4 and 36) were also excluded.

Ethical Aspects

The Research Ethics Committee of Hainan General Hospital approved the study protocol. All participants indicated their agreement to participate in the study via the electronic informed consent included in the survey.

Calculation of Sample Size

Estimates suggest that ∼60% of the population of physicians who work in hospitals presented with psychological symptoms (Shanafelt et al., 2003). Accepting an estimate of absolute precision (i.e., how close the estimate is to the true value) of 10% and a level of significance of 1%, the minimum estimated sample size was 160 physicians 8. Our sample was larger than this and the survey not only sought to explore the prevalence of anxiety, depression, and sleep disorders, but also provided suggestions to the participants along with an evaluation of how to better manage psychological symptoms.

Questionnaire and Evaluation

The questionnaire asked for participants' gender, profession (doctor or nurse), marital status, income level, lifestyle including smoking, alcohol, frequency of exercise, and other things significant to a medical history. The Social Support Scale (SSS) was also used to examine the underlying causes and solutions of psychological symptoms. The SSS (**Supplementary File**, **Data Sheet 1**) was developed by Professor Xiao Shuiyuan, which included objective support, subjective support, and support utility (Yuan, 1994). Medical staff were also classified as belonging to first-line departments like the intensive care unit (ICU), fever clinic, emergency, infectious diseases, respiratory unit, and critical care, and second-line departments which included other clinical departments. The Generalized Anxiety Disorder 7-item (GAD-7), Patient Health Questionnaire-9 (PHQ-9) depression, and Insomnia Severity Index (ISI) scales were used for the evaluation of psychological symptoms. GAD-7

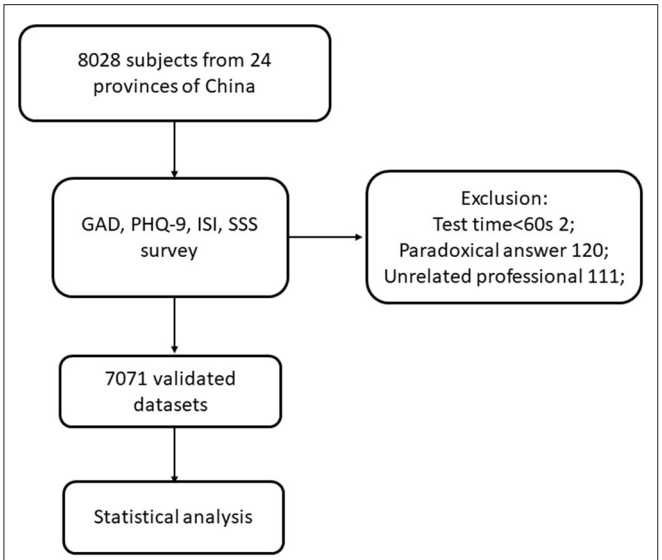

FIGURE 1 | Cohort diagram.

scores ≥5 were considered positive in measuring anxiety; PHQ-9 scores ≥5 were considered positive in measuring depression; ISI scores ≥8 were considered positive for measuring sleep disorders. After the survey, participants were provided with a survey evaluation and given suggestions to reduce anxiety, depression, and sleep disorders to help them cope with their problems. The Chinese and English versions of the questionnaires are included (**Data Sheet 2, 3**). We designed the questionnaire to cover both pre- and post-epidemic periods to compare the psychological symptoms of medical staff. So, the population was the same.

Statistical Analyses and Results Presentation

Variables were individually compared based on diagnoses of anxiety (yes/no), depression (yes/no), and sleep disorders (yes/no). Categorical and continuous variables were analyzed using the Pearson Chi-square test and Mann-Whitney *U*-test, respectively. Pairwise comparisons of statistically significant data from the Pearson Chi-square test were performed using the *Z*-test and the Bonferroni method was used to obtain the *p*-value. The Sigma Plot software was used to compare social support between groups. Variables associated with $p < 0.10$ in the univariate analyses were included in a binary logistic regression model to identify the risk factors of anxiety, depression, and sleep disorders. A two-tailed *p*-value of <0.05 was considered statistically significant. All statistical analyses were conducted using SPSS for Windows version 23 (SPSS, Inc., Chicago, IL, USA). Cytoscape 3.6 was used for the presentation of the statistical results (Shannon et al., 2003).

RESULTS

Population Description

There were 8,082 medical workers from 24 provinces of China who participated in the survey. Of these, 7,071 questionnaires from doctors and nurses were included for further statistical analysis. The Consolidated Standards of Reporting Trials flow diagram is shown in **Figure 1**. There were 2,037 males (29%), and 5,034 females (71%). A large proportion of participants were in the 21–30 years age group, accounting for 43% of all participants. There were 3,693 doctors (52%) and 3,378 nurses (48%), 5,069 (72%) were married, and 2,549 (36%) were doctors and nurses from first-line departments. Most doctors and nurses ($n = 3,288$, 46%) were paid RMB 50,000–100,000 annually. Participants' demographic characteristics are shown in **Table 1**.

Anxiety, Depression, and Sleep Disorder Scores and Prevalence Before and During COVID-19

Due to the imbalance of the samples in the provinces, we did not carry out statistical comparisons of the incidence of psychological symptoms of the surveyed medical staff among provinces (**Figure 2A**). The overall incidence of anxiety among the Chinese medical staff was 34.7% and the mild anxiety incidence was 24.8%. The district distribution of anxiety incidences is presented in **Figure 2A**: the incidence for Wuhan was 40%, and the incidences for Guangdong and Hainan were under 40%, several provinces had an incidence over 50%. However, the sample of surveyed participants in most provinces was small and should be under-estimated. Compared to the previous period, the percentages of anxiety, depression, and sleep disorders were evidently higher during the COVID-19 outbreak when compared with before. The most significant increase in anxiety, depression, and sleep disorders was clustered in the mild grade as illustrated in **Figure 2B**.

As indicated in **Figure 3**, the incidence among the Chinese medical staff of anxiety, depression, and sleep disorders were 35, 36, and 37%, respectively, during COVID-19, and 25, 28, and 26%, respectively, before the outbreak. The anxiety, depression, and sleep disorders percentages were evidently higher during the pandemic compared with before. The graded anxiety, depression, and sleep disorders percentages were similar to the whole psychological symptom spectrum.

Multivariate Analyses

All variables with $p < 0.10$ in the univariate analyses (**Table 2**) were included in binary logistic regression models for each analyzed outcome. Those working in first-line departments such as the ICU, fever clinic, emergency, infectious diseases, respiratory, and critical care were more likely to develop anxiety (OR = 1.979, $p < 0.01$), depression (OR = 1.468, $p < 0.01$), and sleep disorders (OR = 1.979, $p < 0.01$). Medical staff who never exercised were also susceptible to anxiety (OR = 2.045, $p < 0.01$), depression (OR = 1.979, $p < 0.01$), and sleep disorders (OR = 1.557, $p < 0.01$). The three dimensions of social support of objective support, subjective support, and support utility could protect the medical staff from suffering from anxiety,

TABLE 1 | Demographic characteristics of the participants.

Variables	Participants	Percentage
Gender		
Male	2,037	29%
Female	5,034	71%
Age (years)		
≤20	126	2%
21–30	3,021	43%
31–40	1,908	27%
41–50	1,711	24%
51–60	284	4%
>60	21	0%
Profession		
Doctor	3,693	52%
Nurse	3,378	48%
Department		
First line	2,549	36%
Second line	4,522	64%
Income (renminbi/per year)		
<50,000	3,127	44%
50,000–100,000	3,288	46%
110,000–150,000	460	7%
160,000–200,000	113	2%
210,000–300,000	55	1%
310,000–400,000	16	0%
>400,000	12	0%
Regular sports activities		
Never exercise	963	14%
Irregular physical activity	4,080	58%
Get more than 20 min of exercise twice a week	823	12%
Get more than 20 min of exercise 3–4 times a week	680	10%
Get more than 20 min of exercise over 5 times a week	525	7%
Smoking		
Smoking	606	9%
No-smoking	6,465	91%
Alcohol consumption		
Alcohol	311	4%
No-alcohol	6,760	96%
Marital status		
Unmarried	1,852	26%
Married	5,069	72%
Divorced	134	2%
Death of a spouse	11	0%
Cohabitation	5	0%

depression, and sleep disorders, as shown in **Tables 2**, **3**. Gender, marital status, profession, income level, smoking, and alcohol presented group differences but failed to achieve significant correlations with the psychological symptom outcomes. The candidate risk factors were grouped into candidate, protective, significant protective, and significant risk factors for anxiety, depression, and sleep disorders based on the statistical results (**Figure 4**).

DISCUSSION

The psychological health of medical staff guarantees effective and persistent defense against epidemics or other chronic diseases such as cancer or dementia (Busis et al., 2017; Zhou et al., 2017). However, during the COVID-19 epidemic, physicians were confronted with increasingly prevalent burnout (The, 2019a). In addition to work-related exhaustion, Chinese medical staff became aware that there were conflicting relationships between doctors and patients, already recognized in the period 2013–2016 (Cai et al., 2019) and emphasized in 2019, which emerged from events reported in the news and from the medical society (Chen et al., 2020). This situation also received attention and solidarity from the Lancet (The, 2020). The exhaustion of medical staff was rarely considered by the public, and the more established social and political policy aspects were avoided by the media and public. However, the COVID-19 outbreak and the heroic behavior of Doctor Wenliang Li reminded the majority of Chinese society and media that medical staff represent the backbone of this battle against COVID-19. In this report, based on the surveyed result, we urge for manageable protective factors against the psychological distress of medical staff. Also the persistent concern for social respect, acceptance, and care of medical staff both in China and world wide (The, 2019b) need to be considered.

In our survey, as indicated in **Figure 3**, the incidence of anxiety, depression, and sleep disorders in Chinese medical staff was 35, 36, and 37%, respectively. The result was in accordance with a meta-analysis review on a large population based on 66 studies with 221,970 subjects, which showed an overall pooled prevalence of depression, anxiety, and insomnia of 31.4, 31.9, and 37.9%, respectively (Wu et al., 2021). Meanwhile, the incidences of psychological symptoms were not consistent. Take anxiety for example, it was reported as 74% (Shrestha, 2020) in a tertiary care center in Nepal, 23% in Wuhan (Huang J. Z. et al., 2020), 11.4% in Gansu (Zhu et al., 2020), and 30.4% (Liang et al., 2020) in a hospital-based survey outside Wuhan in China. The reported differences might also be explained by sampling criteria, but in any case it is important to highlight the high incidence of acute distress including depression, anxiety, and sleep disorders among medical workers during COVID-19.

Among risk factors, being female was related to a higher risk for developing psychological symptoms, which is consistent with other Chinese surveys (Li G. et al., 2020; Wang et al., 2021). It is reported that medical staff aged 21–40 years are in a more vulnerable position in terms of their mental health (Ahmed et al., 2020), and we could also see that the middle age group was more vulnerable to psychological symptoms in our survey (as shown in **Figure 4** and **Table 3**). Working in a first-line department was also a risk factor. Understandably, medical staff standing at the front line should receive more care to protect them from mental disorders

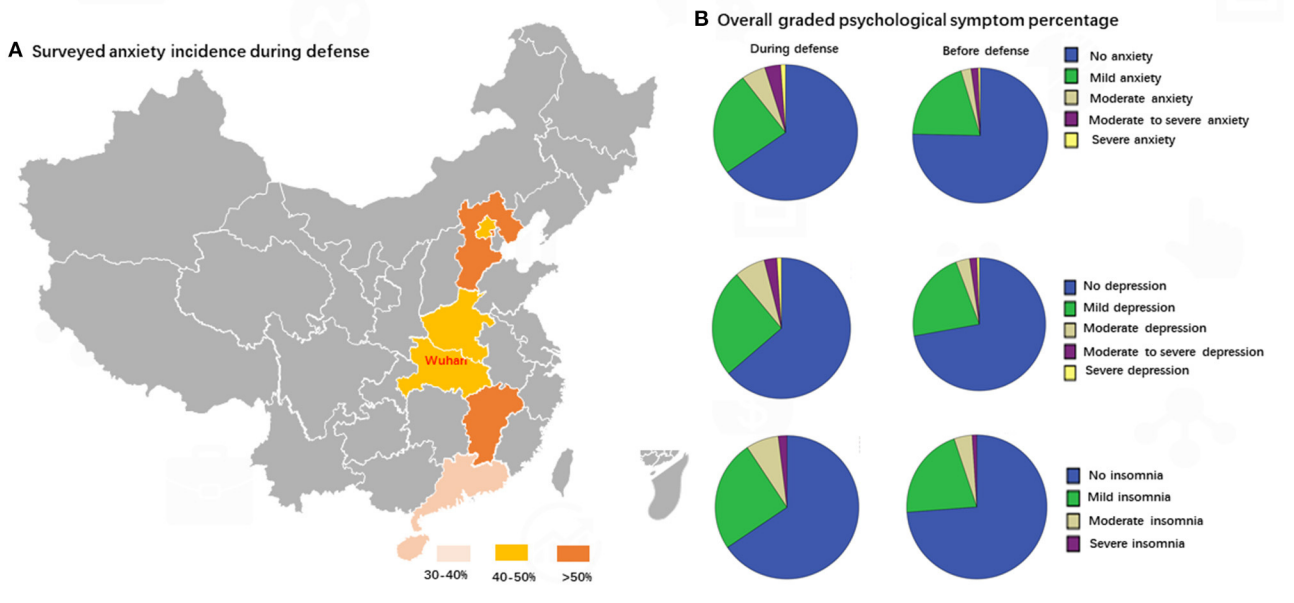

FIGURE 2 | Psychological symptom percentage and anxiety incidence distribution.

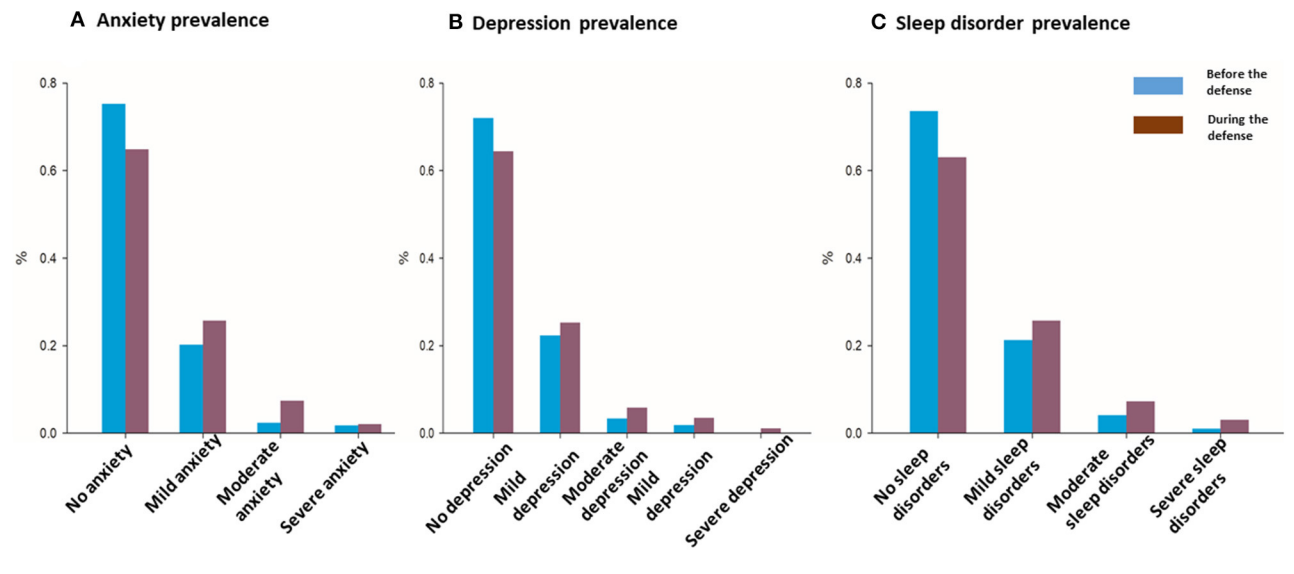

FIGURE 3 | Anxiety, depression, and sleep disorders incidence before and during COVID-19 outbreak.

(Zhan et al., 2020). Lack of exercise was a risk factor for all the psychological symptoms (as shown in **Figure 4** and **Table 3**), and the benefit of exercise for mental health was recognized (Mikkelsen et al., 2017). A low-income level was a risk factor for psychological symptoms in our survey. Medical staff with low income, medium-low income, and very low income levels were all susceptible to anxiety, staff with a medium-low income level were also vulnerable to depression and sleep disorders. It has been reported that income level is related to mental health both in developed countries such as Canada (Bartram, 2019) and developing countries such as Turkey (Kose, 2020).

Among the protective factors of psychological symptoms, social support was a manageable element, which we chose to discuss in detail. The high prevalence of anxiety and depression was also related to social media exposure when social support was scarce (Gao et al., 2020). Continued acknowledgment of medical staff by hospital management and the government,

TABLE 2 | Variables of psychological symptoms of Chinese medical staff during COVID-19.

Variable	Anxiety				Depression				Sleep disorders			
	No *N* (%)/x(sd)	Yes *N*(%)/x(sd)	X^2/U	*p*	No *N*(%)/x(sd)	Yes *N*(%)/x(sd)	X^2/U	*p*	No *N*(%)/x(sd)	Yes *N*(%)/x(sd)	X^2/U	*p*
Gender			9.656	0.002			5.481	0.019			2.279	0.131
Male	1368(19.3)	669(9.5)			1327(18.8)	710(10.0)			1348(19.1)	689(9.7)		
Female	3184(45.0)	1850(26.2)			3130(44.3)	1904(26.9)			3236(45.8)	1798(25.4)		
Age (years)			12.765	0.026			69.373	0.000			9.516	0.090
≤20	80(1.1)[a]	46(0.7)[a]			71(1.0)[a]	55(0.8)[a]			79(1.1)[a]	47(0.7)[a]		
21–30	1967(27.8)[a]	1054(14.9)[a]			1822(25.8)[a]	1199(17.0)[b]			1975(27.9)[a]	1046(14.8)[a]		
31–40	1184(16.7)[a]	724(10.2)[b]			1150(16.3)[a]	758(10.7)[b]			1197(16.9)[a]	711(10.1)[b]		
41–50	1102(15.6)[a]	609(8.6)[a]			1182(16.7)[a]	529(7.5)[b]			1119(15.8)[a]	592(8.4)[a]		
51–60	203(2.9)[a]	81(1.1)[b]			213(3.0)[a]	71(1.0)[b]			197(2.8)[a]	87(1.2)[a]		
>60	16(0.2)[a]	5(0.1)[a]			19(0.3)[a]	2(0.0)[b]			17(0.2)[a]	4(0.1)[a]		
Profession			14.505	0.000			5.657	0.017			10.469	0.001
Doctor	2454(34.7)[a]	1239(17.5)[b]			2376(33.6)[a]	1317(18.6)[b]			2459(34.8)[a]	1234(17.5)[b]		
Nurse	2098(29.7)[a]	1280(18.1)[b]			2081(29.4)[a]	1297(18.3)[b]			2125(30.1)[a]	1253(17.7)[b]		
Department			24.108	0.000			38.346	0.000			56.154	0.000
First-line	1546(21.9)[a]	1003(14.2)[b]			1486(21.0)[a]	1063(15.0)[b]			1508(21.3)[a]	1041(14.7)[b]		
Second-line	3006(42.5)[a]	1516(21.4)[b]			2971(42.0)[a]	1551(21.9)[b]			3076(43.5)[a]	1446(20.4)[b]		
Income (per year)			33.686	0.000			16.782	0.010			16.632	0.011
<50,000	2081(29.4)[a]	1046(14.8)[b]			1988(28.1)[a]	1139(16.1)[a]			2052(29.0)[a]	1075(15.2)[a]		
50,000–100,000	2101(29.7)[a]	1187(16.8)[a]			2102(29.7)[a]	1186(16.8)[a]			2151(30.4)[a]	1137(16.1)[a]		
110,000–150,000	247(3.5)[a]	213(3.0)[b]			253(3.6)[a]	207(2.9)[b]			261(3.7)[a]	199(2.8)[b]		
160,000–200,000	65(0.9)[a]	48(0.7)[a]			67(0.9)[a]	46(0.7)[a]			67(0.9)[a]	46(0.7)[a]		
210,000–300,000	40(0.6)[a]	15(0.2)[a]			32(0.5)[a]	23(0.3)[a]			36(0.5)[a]	19(0.3)[a]		
310,000–400,000	10(0.1)[a]	6(0.1)[a]			8(0.1)[a]	8(0.1)[a]			9(0.1)[a]	7(0.1)[a]		
>400,000	8(0.1)[a]	4(0.1)[a]			7(0.1)[a]	5(0.1)[a]			8(0.1)[a]	4(0.1)[a]		
Regular sports activities			123.199	0.000			203.062	0.000			103.871	0.000
Never exercise	501(7.1)[a]	462(6.5)[b]			454(6.4)[a]	509(7.2)[b]			513(7.3)[a]	450(6.4)[b]		
Irregular physical activity	2591(36.6)[a]	1489(21.1)[a]			2521(35.7)[a]	1559(22.0)[b]			2617(37.0)[a]	1463(20.7)[a]		
Get more than 20 min of exercise twice a week	578(8.2)[a]	245(3.5)[b]			576(8.1)[a]	247(3.5)[b]			574(8.1)[a]	249(3.5)[b]		
Get more than 20 min of exercise 3–4 times a week	480(6.8)[a]	200(2.8)[b]			498(7.0)[a]	182(2.6)[b]			484(6.8)[a]	196(2.8)[b]		
Get more than 20 min of exercise over 5 times a week	402(5.7)[a]	123(1.7)[b]			408(5.8)[a]	117(1.7)[b]			396(5.6)[a]	129(1.8)[b]		

(Continued)

TABLE 2 | Continued

Variable	Anxiety				Depression				Sleep disorders			
	No *N* (%)/x(sd)	Yes *N*(%)/x(sd)	X^2/U	*p*	No *N*(%)/x(sd)	Yes *N*(%)/x(sd)	X^2/U	*p*	No *N*(%)/x(sd)	Yes *N*(%)/x(sd)	X^2/U	*p*
Smoking			1.517	0.218			0.942	0.332			0.010	0.919
Smoking	404(5.7)	202(2.9)			393(5.6)	213(3.0)			394(5.6)	212(3.0)		
No-smoking	4148(58.7)	2317(32.8)			4064(57.5)	2401(34.0)			4190(59.3)	2275(32.2)		
Alcohol consumption			0.398	0.528			2.451	0.117			2.735	0.098
Alcohol	195(2.8)	116(1.6)			183(2.6)	128(1.8)			188(2.7)	123(1.7)		
No-alcohol	4357(61.6)	2403(34.0)			4274(60.4)	2486(35.2)			4396(62.2)	2364(33.4)		
Marital status			4.489	0.344			23.048	0.000			8.062	0.089
Unmarried	1225(17.3)[a]	627(8.9)[a]			1084(15.3)[a]	768(10.9)[b]			1212(17.1)[a]	640(9.1)[a]		
Married	3230(45.7)[a]	1839(26.0)[a]			3282(46.4)[a]	1787(25.3)[b]			3289(46.5)[a]	1780(25.2)[a]		
Divorced	87(1.2)[a]	47(0.7)[a]			82(1.2)[a]	52(0.7)[a]			72(1.0)[a]	62(0.9)[b]		
Death of a spouse	6(0.1)[a]	5(0.1)[a]			6(0.1)[a]	5(0.1)[a]			7(0.1)[a]	4(0.1)[a]		
Cohabitation	4(0.1)[a]	1(0.0)[a]			3(0.0)[a]	2(0.0)[a]			4(0.1)[a]	1(0.0)[a]		
Social support	42.85(8.85)	38.50(8.80)	4147966.000	0.000	43.56(8.59)	37.45(8.57)	3544877.500	0.000	43.05(8.77)	38.07(8.74)	3899575.500	0.000
Objective support	9.93(3.64)	8.81(3.45)	4734291.000	0.000	10.10(3.65)	8.58(3.33)	4446537.000	0.000	10.02(3.63)	8.65(3.39)	4491048.500	0.000
Subjective support	24.85(5.37)	22.45(5.45)	4246850.000	0.000	25.30(5.19)	21.78(5.35)	3631880.000	0.000	24.94(5.33)	22.25(5.44)	4047942.500	0.000
Support utility	8.06(2.08)	7.24(1.91)	4459075.000	0.000	8.17(2.07)	7.09(1.86)	4102739.000	0.000	8.09(2.08)	7.17(1.89)	4260975.000	0.000

If the superscript letters of the two groups are the same (both a or b), the difference between the two groups was not statistically significant. If the superscript letters are different between the two groups (a and b), the difference between the two groups was statistically significant. The colored parameter indicated statistically significant.

TABLE 3 | Binary logistic regression analysis of variables.

Variable	Anxiety					Depression					Sleep disorders				
	B	OR	*p*-value	CI(95%)		B	OR	*p*-value	CI(95%)		B	OR	*p*-value	CI(95%)	
Gender															
Male	−0.18	0.835	0.062	(0.687	0.938)	−0.165	0.848	0.113	(0.667	0.917)	−0.107	0.899	0.227	(0.756	1.069)
Age (years)			0.031					0.152					0.045		
<20	0.152	1.164	0.828	(0.317	3.087)	1.473	4.362	0.168	(0.873	21.857)	0.478	1.613	0.487	(0.419	6.212)
20–30	−0.076	0.927	0.908	(0.293	2.512)	1.545	4.690	0.135	(0.716	16.425)	0.337	1.401	0.604	(0.392	5.008)
30–40	0.104	1.109	0.874	(0.395	3.392)	1.677	5.350	0.105	(0.87	20.009)	0.530	1.698	0.414	(0.476	6.058)
40–50	0.23	1.258	0.726	(0.519	4.435)	1.517	4.559	0.142	(0.89	20.438)	0.633	1.884	0.329	(0.528	6.721)
50–60	−0.143	0.867	0.831	(0.439	3.927)	1.266	3.545	0.227	(0.773	18.437)	0.499	1.648	0.451	(0.449	6.039)
Marital status			0.01					0.106					0.013		
Unmarried	0.797	2.219	0.611	(0.237	2.199)	0.009	1.009	0.996	(0.147	1.485)	0.555	1.741	0.678	(0.127	23.819)
Married	1.07	2.915	0.495	(0.217	1.352)	0.175	1.192	0.917	(0.193	1.204)	0.854	2.350	0.522	(0.172	32.072)
Divorced	0.461	1.585	0.771	(0.287	1.754)	−0.456	0.634	0.789	(0.269	1.645)	0.967	2.629	0.474	(0.187	36.97)
Death of a spouse	0.628	1.873	0.729	(0.334	2.03)	−0.027	0.973	0.989	(0.34	2.065)	0.120	1.128	0.938	(0.054	23.767)
Profession as doctor	−0.099	0.905	0.213	(0.713	0.929)	0.078	1.081	0.370	(0.835	1.093)	−0.076	0.927	0.299	(0.802	1.07)
First-line department	0.239	1.27	0.000	(1.138	1.414)	0.384	1.468	0.000	(1.226	1.531)	0.406	1.501	0.000	(1.331	1.694)
Income level per year			0.000					0.020					0.335		
<50,000	−0.146	0.864	0.851	(0.288	3.557)	−0.742	0.476	0.322	(0.222	2.617)	0.015	1.015	0.983	(0.254	4.051)
50,000–100,000	0.098	1.103	0.899	(0.332	4.068)	−0.574	0.563	0.442	(0.238	2.786)	0.072	1.075	0.918	(0.27	4.283)
100,000–150,000	0.439	1.552	0.574	(0.429	5.359)	−0.243	0.784	0.748	(0.284	3.401)	0.300	1.350	0.674	(0.334	5.453)
150,000–200,000	0.011	1.011	0.989	(0.285	3.883)	−0.641	0.527	0.417	(0.168	2.21)	−0.049	0.952	0.947	(0.224	4.055)
200,000–300,000	−0.581	0.559	0.502	(0.114	1.85)	−0.615	0.541	0.465	(0.145	2.174)	−0.149	0.862	0.848	(0.189	3.941)
300,000–400,000	−1.075	0.341	0.305	(0.127	3.416)	0.064	1.066	0.947	(0.13	3.429)	−0.407	0.665	0.660	(0.108	4.089)
Smoking	−0.005	0.995	0.968	(0.863	1.328)	0.116	1.123	0.420	(0.919	1.427)	0.065	1.068	0.590	(0.842	1.354)
Alcohol	−0.06	0.942	0.724	(0.909	1.545)	−0.065	0.937	0.727	(1.09	1.869)	0.106	1.111	0.482	(0.828	1.493)
Exercise			0.000					0.000					0.011		
Never exercise	0.716	2.045	0.000	(1.59	2.66)	0.683	1.979	0.000	(1.584	2.694)	0.443	1.557	0.002	(1.175	2.065)
Irregular physical activity	0.459	1.583	0.001	(1.289	2.024)	0.350	1.419	0.022	(1.211	1.935)	0.274	1.315	0.029	(1.029	1.68)
Regular sports activities <20 min twice a week	0.21	1.234	0.2	(0.985	1.667)	0.120	1.127	0.503	(0.928	1.6)	0.118	1.125	0.422	(0.844	1.5)
Regular sports activities >20 min twice a week	0.33	1.39	0.047	(0.959	1.648)	0.168	1.183	0.358	(0.847	1.493)	0.151	1.163	0.316	(0.866	1.562)
Objective support	−0.014	0.986	0.2	(0.952	0.986)	−0.031	0.969	0.007	(0.948	0.982)	−0.039	0.962	0.000	(0.944	0.981)
Subjective support	−0.043	0.958	0.000	(0.932	0.953)	−0.057	0.945	0.000	(0.905	0.927)	−0.054	0.947	0.000	(0.935	0.96)
Support utility	−0.081	0.922	0.000	(0.865	0.917)	−0.099	0.906	0.000	(0.833	0.885)	−0.097	0.907	0.000	(0.878	0.938)

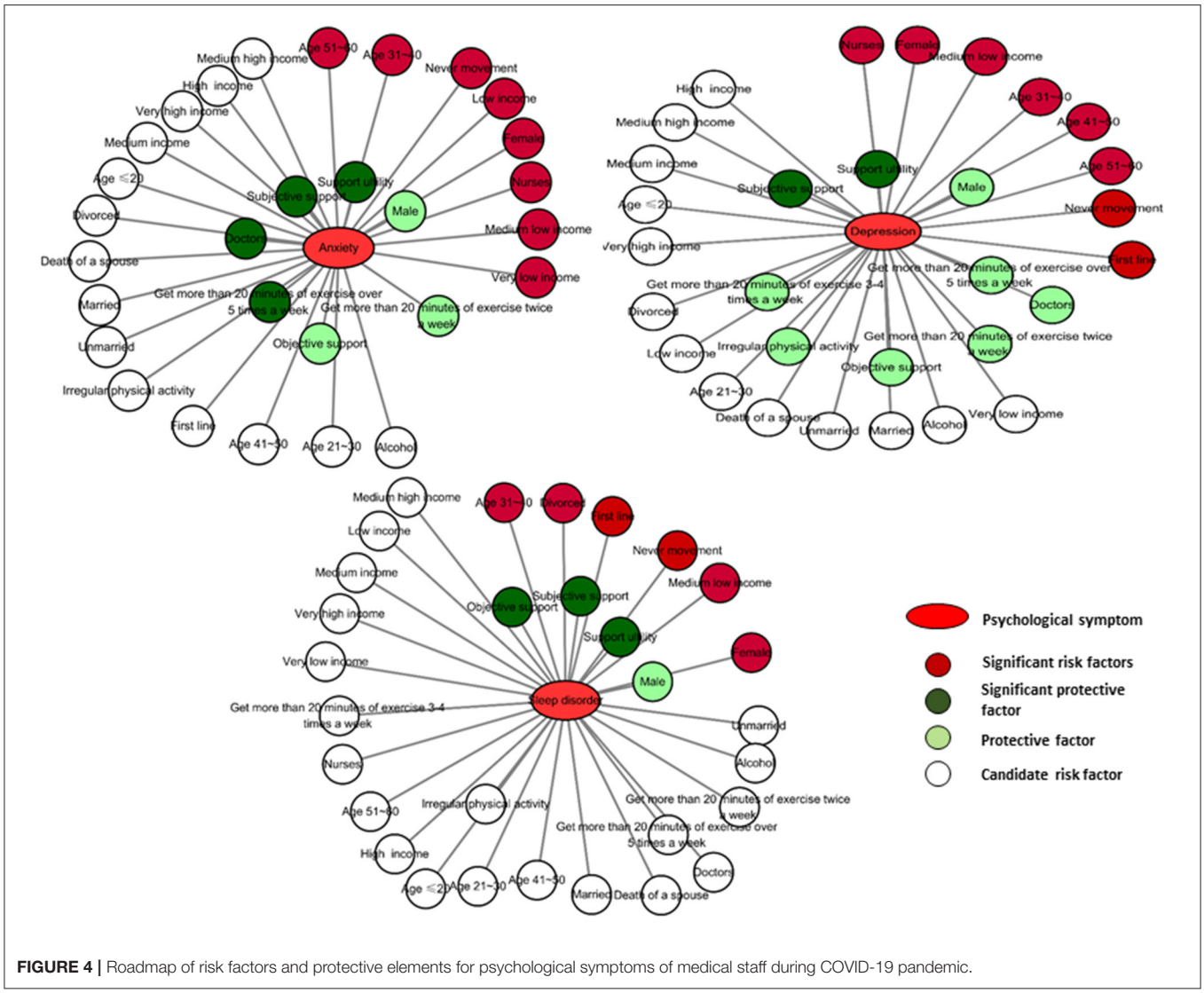

FIGURE 4 | Roadmap of risk factors and protective elements for psychological symptoms of medical staff during COVID-19 pandemic.

provision of infection control guidelines, specialized equipment, and facilities for the management of COVID-19 infection should be recognized as factors that may encourage medical staff to work during future epidemics (Cai et al., 2020). Also, the psychological symptoms brought about by the epidemic could be eased by enhancing social support (as shown in **Figure 4** and **Tables 1**, **2**), which may be adoptable in the current situation. The Chinese national culture has its intrinsic characteristics of emphasizing the social value of the individual and a consciousness-like "mianzi." "Mianzi" can be translated as "face," but connotes more dignity and respect rather than the physical organ of the face. This is also a double-edged sword, due to the emphasis of external acceptance, people put the group requirements of society first and inner personal requirements second. This custom and practice could lead to quick action during emergencies such as an epidemic but also a high incidence of psychological symptoms of susceptible individuals. Social support means a social structure that does not judge or blame but listens and comforts (shown in the translated version of SSS in the **Supplementary Material**). The concept and realization of social support could be an effective method to improve nursing quality. Compared with money as a typical objective support element, which was the only protective element for sleep disorders, subjective support and support utility were more essential and stable protective factors for medical staff for anxiety, depression, and sleep disorders (as shown in **Figure 4** and **Table 3**). A paralleled study showed that initiated and sustained person-centered communication as subjective support could ease both the psychological distress of the medical staff and infected older adults despite multiple challenges brought by the pandemic (Li J. et al., 2020). Thus, we also believe that social support will be helpful for the public. In addition to social support, exercise was also an adaptive way to enhance immunity for the fight against the epidemic. As indicated in our survey, getting more than 20 min of exercise per day should be encouraged and implemented by the medical staff dealing with the epidemic to protect them from anxiety

and depression (as shown in **Figure 4** and **Table 3**). Exercise should also be adopted into daily life to maintain mental health (Deslandes et al., 2009).

CONCLUSION

The results indicated that the medical staff had a high incidence of psychological symptoms, which were more prominent during the COVID-19 outbreak. Comparatively, being female, a nurse, working in a first-line department, never exercising, and having a low income were risk factors for psychological symptoms. Social support including objective support, subjective support, support utility, and regular exercise over 3 times per week were found to be elements that could protect the medical staff against psychological symptoms. In conclusion, the susceptibility of psychological symptoms of medical staff should raise the concern of both policymakers and the public in the long-term, and the aggravation of mental health problems of medical staff should be eased by providing adequate social support during and after the COVID-19 pandemic.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding authors.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethic committee of Hainan general hospital. The patients/participants provided their electrical informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

HLL: acquisition of data, analysis and interpretation, and critical revision of the manuscript for important intellectual content. HQY: study concept and design, analysis and interpretation of data analysis, and interpretation of data. YDX: analysis and interpretation, and critical revision of the manuscript for important intellectual content. ZZ, JiaL, JieL, and XWW: acquisition of data. ZXZ: study concept, acquisition of data, analysis and interpretation, critical revision of the manuscript for important intellectual content, and study supervision. YL: study concept and design, analysis and interpretation of data, analysis and interpretation of data analysis, critical revision of the manuscript, and supervision of the study. All authors listed have contributed sufficiently to the project to be included as authors, and all those who are qualified to be authors are listed in the author byline.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.603553/full#supplementary-material

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A Study on the Competence Characteristics of Psychological Hotline Counselors During the Outbreak of COVID-19

Linyu You, Xiaoming Jia, Yaping Ding, Qin An and Bo Li*

School of Humanities and Social Sciences, Beijing Institute of Technology, Beijing, China

Introduction: After the outbreak of COVID-19, psychological hotlines functioned as a main channel of psychological assistance and required a large number of professionals to provide services. These hotlines mostly offered a single-use service with short session times and allowed callers to retain anonymity. They functioned as a psychological counseling service for stress experienced in the COVID-19 public health emergency. Hotline psychological counselors must meet special competency requirements. The selection and evaluation tools for recruiting hotline counselors need to be developed.

Materials and Methods: The initial scale of competence for psychological hotline counselors was formed by expert evaluation based on theoretical constructs and by using the Delphi method. A link to the questionnaire was sent to a WeChat group of counselors from 36 major psychological hotlines in China in two stages. The questionnaire consisted of questions to elicit basic demographic information and the initial competence scale. In the first phase, 343 valid samples were used to perform exploratory factor analysis. In the second phase, 334 valid samples were used to perform confirmatory factor analysis. The status of the competence of psychological hotline counselors was also analyzed.

Results: The factor structure of the Psychological Hotline Counselor Competence Scale was verified and defined in terms of skills, attitude, and knowledge. The results of exploratory factor analysis and confirmatory factor analysis showed that the scale has good reliability and validity (χ^2/df = 1.758, GFI = 0.86, RMSEA = 0.05, CFI = 0.96, NFI = 0.91, NNFI = 0.95). The McDonald's omega for each factor was calculated (ω_{F1} = 0.927, 95%CI [0.914, 0.940]; ω_{F2} = 0.958, 95%CI [0.951, 0.965]; ω_{F3} = 0.954, 95%CI [0.945, 0.961]). Meanwhile, it was found that the psychological hotline counselors' self-assessed competence had a high average score (n = 334).

Conclusion: The Competence Scale for Psychological Hotline Counselors for Major Public Emergencies developed in this study has good reliability and validity, and can be a reliable tool for organizing psychological assistance and screening hotline psychological counselors during public emergencies in the future.

Keywords: COVID-19, psychological hotline, psychological counselors, competency characteristics, Chinese experience

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Eduardo Salas,
Rice University, United States

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Beijing Normal University, China
Frank Guangzhe Yuan,
University of Macau, China

****Correspondence:***
Yaping Ding
dyping@bit.edu.cn

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INTRODUCTION

The global outbreak of the novel coronavirus (COVID-19) was a public health emergency. Due to the highly contagious nature of COVID-19, all psychological assistance was provided remotely (via hotlines or online). During the epidemic, many new hotlines were established in various parts of China, including Wuhan (The State Council, 2020). To provide psychological assistance, the Psychological Assistance Platform of the Central China Normal University of the Ministry of Education alone recruited nearly 3,000 psychological counselors as volunteers. As the main contact point for psychological assistance during a major public health emergency, the psychological hotlines should have specific requirements for the competencies and qualifications of the hotline counselors (National Health Commission of the People's Republic of China, 2020). However, to date there is a lack of criteria for recruiting competent counselors for psychological assistance hotlines.

McClelland (1973) first proposed the concept of competence. Competence means being able to work according to corresponding professional standards (Barnett et al., 2006). In the field of psychological counseling, it requires counselors to possess the knowledge, skills, and abilities needed, and to practice them ethically to provide effective services (Barnett and Johnson, 2008). The competence of psychological counselors involves ethics and the law. Professional associations worldwide stipulate in their code of ethics that psychological counselors and psychotherapists must have professional competence (American Counseling Association [ACA], 2014; American Psychological Society [APA], 2017; Chinese Psychological Society, 2018), and believe that a lack of competence is often the main cause of harm to clients (Corey and Corey, 2011).

However, establishing criteria for evaluating competence is a complex and difficult issue (Kitchener, 2000, pp. 154–155). Spencer and Spencer (1993, p. 324) noted that "obvious traits such as knowledge and skills are the benchmarking characteristics of competence, and implicit traits such as attitudes and values are distinctive competence characteristics." Kaslow (2004) pointed out that the assessment of professional competence should target all areas of competence and related knowledge, skills, and attitudes (McIlvried and Bent, 2003; Kaslow, 2004).

Assessment of counseling trainees' competencies focuses on specific skills, and is measured through tools such as the Counseling Skill Scale (Eriksen and McAuliffe, 2003). The APA Benchmarks Work Group (Fouad et al., 2009) developed a Competency Benchmarks document and outlined the core foundational and functional competencies required for professional psychologists at different levels. However, only 48% of the APA-accredited programs adopted it (Grus et al., 2016). Researchers suggested that it would be better to integrate the Competency Benchmarks into routine supervision as they just provided an assessment framework rather than a verified inventory. Recently, Lambie et al. (2018) refined the Counseling Competencies Scale (Swank et al., 2012) and reported relatively sound reliability and validity; this scale was mainly used in the assessment of doctoral students' practicum and internships.

Some researchers in China have indicated that the core competencies of psychologists and therapists should include six aspects: professional attitudes and behaviors, knowledge on ethics and law; clinical knowledge and skills;, science and research; relationship-building skills; multicultural and Chinese cultural awareness; and case management (Wang M. et al., 2015). Research on the competence of psychological counselors includes the study of competency characteristics, such as those of group counselors (Xiao et al., 2016). The other focus of the research is the development of competency inventories, such as those for mental health personnel (Zhang, 2011) and school psychological counselors (Xie, 2008).

The question emerges as to whether there are specific competence requirements for psychological hotline counselors. Ordinary psychological hotline counselors have always been recruited as volunteers (Jia and An, 2006, pp. 22), and there are no strict requirements regarding professional and academic background. Before they take up their jobs, they receive unified training and belong to the field of quasi-professionals. Research on psychological hotlines has focused on an analysis of the characteristics of callers, including help-seeking problems and personal characteristics (Wang C. L. et al., 2015; Chen and Yang, 2016), analysis of the hotline consultation process (Qin and Jia, 2015; Yu and Li, 2015), the effect of hotline intervention (Wang et al., 2011), and the organization and management of hotlines (Cui et al., 2016). Psychological research on the use of hotlines after public health emergencies also focuses on the characteristics of help-seeking problems (Xu and Jiao, 2003; Zhou and Wang, 2004). These studies do not focus much on the competence of hotline counselors.

In a recent study, Nie et al. (2019) interviewed clinical psychologists with experience in disaster relief psychological assistance to clarify the required competencies of psychological assistance personnel. All interviewees believed that not all counselors are able to provide disaster relief psychological assistance. They generally emphasized the importance of mastering the knowledge and skills related to psychological rescue, hours of consultation, hours of supervision, and personal experience.

In contrast to the previous use of psychological hotlines, the psychological assistance hotlines that opened during the COVID-19 epidemic involved previously offline psychological assistance being moved to the phone line. The professional work of psychological counseling had to change its mode of operation. However, in comparison to offline services, hotline work has unique features such as a short session time, mostly one-time consultations, a certain degree of anonymity, and voice-only communication. Although most volunteers of psychological assistance hotlines are psychological counselors with professional qualifications, they still need to have corresponding professional competence (Jia and An, 2020). In particular, there were specific psychological problems caused by the sudden public health event of the COVID-19 epidemic. People experienced psychological stress in the early stage of the epidemic, grief reaction caused by loss in the middle and late stages of the epidemic, and post-traumatic stress disorder. There were economic pressures, family conflicts, and other problems as a result of the epidemic

(Li et al., 2020; Su et al., 2020; Xu et al., 2020). As such, the professional competence of the hotline psychological counselor in the epidemic situation requires specific investigation.

In China, most of the counselors recruited by the psychological assistance hotlines during the COVID-19 epidemic were certified and had some qualifications. They were certified by different institutions, and had received different training and supervision. Their experience varied widely. Currently, there is no instrument to assess the competence of hotline psychological counselors. This also brings some difficulties for selecting counselors in emergencies. There are different competence models for psychological counselors in general situations. The characteristics of the hotline and the nature of emergencies should also be considered in epidemics. Psychological assistance for public health emergencies is indispensable, and competent hotline counselors are the key to the quality of psychological services provided. Therefore, it is necessary to study the characteristics of the competence of hotline counselors and develop a corresponding assessment scale. This scale can be used for screening, training, supervising, and assessing psychological assistance professionals during public health emergencies in the future.

MATERIALS AND METHODS

Theoretical Construction: Preliminary Construct of the Competence of Psychological Hotline Counselors Based on the Competence Model

A psychological counselor's professional competence is a basic requirement for counseling practice. It generally includes a collection of traits including knowledge, ability, and attitude (Halley, 2001). Existing psychological counselor competence scales differ from one another and lack uniformity (Xie, 2008; Zhang, 2011; Xiao et al., 2016), but the theoretical construction of the scales has not gone beyond skills, attitudes, and knowledge. Knowledge means systematic study of the history, theory, and research in the field (Welfel, 2010). It includes being aware of which knowledge and intervention methods should be applied in specific situations and having objective standards to evaluate theory and research (Spruill et al., 2004). Skills refer to the ability of professionals to judge which intervention method is the most appropriate under current circumstances based on current counseling and treatment research (Welfel, 2010). Attitudes usually include aspects such as ethics and values, which means that the client's needs are the first priority for the counselor, who tries his or her best to help the client. If a counselor is not able to help the client, then he or she must be willing to refer the clients on to others (Welfel, 2010). Regarding the specific content of competence, the core competencies of counselors and therapists in China include professional knowledge and behavior; knowledge on ethics and law, science, and research; clinical knowledge and skills; relationship-building skills; multicultural and Chinese cultural awareness; and case management (Wang M. et al., 2015).

Sandberg (2000) emphasized that assessment of competence should fully consider the specific function of the work situation. Due to the high level of infectiousness and the wide-ranging impact of the COVID-19 epidemic, all psychological assistance could only be administered in the form of a hotline. Counselors participating in psychological assistance may also face psychological crisis interventions caused by the epidemic. Wu and Sang (2010) developed a competence model that focused on distinctive competency and threshold competency, and proposed a preliminary construct for the competence of psychological hotline counselors accordingly. The construct included the basic competencies of psychological counseling (threshold competency) and the competency requirements based on special circumstances (distinctive competency). The latter included both the competencies needed for general psychological hotlines and the required competencies for giving psychological assistance in major public emergencies.

In this study, the researchers analyzed the job responsibilities and work tasks of psychological hotline counselors in the epidemic situation, and applied the competence model to assess the competency characteristics of the hotline psychological counselors. The competence requirements for counselors operating the psychological hotline and giving emergency psychological assistance in terms of knowledge, skills, and attitudes are emphasized (**Table 1**). In order to meet the requirements of three aspects, 100 items were prepared for the preliminary scale.

Preliminary Competence Scale

Using the Delphi method, the preliminarily developed measurement questions were distributed to eight psychological experts to seek their opinions on each question. The expert members included six females and two males, all registered counseling supervisors of the Chinese Psychological Counselor Registration System with over 20 years supervision experience. They participated in SARS psychological relief, provided psychological assistance after the Wenchuan earthquake on May 12, 2008, and provided psychological assistance in other major domestic emergencies. They, therefore, had a vast amount of

TABLE 1 | The primary construct of the competence model for psychological hotline counselors.

Domain	Threshold competency	Distinctive competency
Knowledge	Basic knowledge of counseling	Basic knowledge of psychological hotlines
		Basic knowledge of public health emergencies
Skill	Basic skills of counseling	Basic skills of psychological hotline counseling
		Basic skills of crisis intervention
Attitude	Ethics for counseling	Ethics for psychological hotline counseling
		Ethics for crisis hotlines

practical experience and also served as hotline supervisors during the COVID-19 epidemic.

After obtaining the experts' preliminary opinions, the measurement scale was modified according to their feedback. The modified measurement questions were sent to the expert group again to obtain further suggestions. After two rounds of feedback, the project team aggregated the experts' suggestions to form a first draft of a 57-item questionnaire with three dimensions. There are 13, 22, and 22 items, respectively, on the dimensions of knowledge, skills, and attitude. Examples of the items include "understanding the advantages and limitations of hotline consulting," "able to respond flexibly to emergencies in the hotline," and "ability for self-reflection after each hotline consultation." A 5-point Likert scale was used to identify the degree to which the item description was consistent with the participants: 1 = completely inconsistent, 2 = inconsistent, 3 = neutral, 4 = consistent, and 5 = completely consistent.

Questionnaire Distribution and Data Collection

The questionnaire included the first draft of the competence scale, items on demographic information, and items on professional experience and training. The questionnaire was randomly distributed to psychological counselors at 36 well-established hotlines in China. It was distributed by forwarding the questionnaire link to the WeChat groups of the hotlines during two periods. The first data collection period was from March 15 to March 20, 2020 (Sample A). The preliminary measurement scale was administered to participants. The data from this period were used for exploratory factor analysis (EFA) and item analysis. The second data collection phase was from March 22 to March 28, 2020 (Sample B). The revised scale based on EFA was distributed to collect data for verifying the reliability and validity of the scale.

The questionnaire was distributed through the Internet and quality control was carried out in three ways. First, the integrity of the data was confirmed by deleting data from incomplete questionnaires. The second consideration was response time: samples with short response times were excluded. Third, data with unclear basic information and from questionable sources was screened out.

Data Analysis

The data were analyzed using SPSS 19.0 for exploratory factor analysis (EFA) and AMOS 20.0 for confirmatory factor analysis (CFA). First, we conducted EFA with Sample A (n = 343). The KMO test (>0.8) and Bartlett's test of sphericity ($P < 0.001$) were conducted to examine whether the variables were suitable for factor analysis. The criteria for item elimination were as follows: commonality (common factor variance) less than 0.4, or a serious deviation from the corresponding relationship of the factors (the load coefficients on two or more factors are relatively close to each other). The second EFA was conducted with the following criteria for item retention: (a) the eigenvalues of the three factors were all greater than 1; (b) a factor loading of 0.5 or greater. Next, according to the frequency distribution of the total score of each sample, all samples were divided into a high-score group (P71, since eight samples had equal score ranking from P71 to P73) and a low-score group (P27). Item analysis using the independent sample t-test was conducted. Third, point and interval estimates of McDonald's omega were calculated in R (R Development Core Team, 2012), using congeneric models along with bootstrapping to obtain confidence intervals for omega (Raykov, 1998). Guttman's half-reliability coefficient was also calculated to examine the reliability. Finally, CFA was conducted to examine the factor structure and the χ^2 ratio ($\chi^2/df < 3$), GFI (>0.9), RMSEA (<0.1), RMR (<0.05), CFI (>0.9), NFI (>0.9), and NNFI (>0.9) were calculated.

TABLE 2 | Exploratory factor analysis of the scale of hotline counselors' competence (N = 343).

Item	Coefficient of factor load			Commonality
	Factor 1	Factor 2	Factor 3	
q1			0.651	0.53
q2			0.666	0.593
q3			0.643	0.533
q4			0.786	0.695
q5			0.755	0.711
q6			0.749	0.724
q7			0.758	0.713
q8			0.619	0.61
q13			0.6	0.568
q14			0.538	0.609
q17	0.685			0.649
q18	0.696			0.637
q19	0.774			0.675
q20	0.75			0.653
q22	0.659			0.627
q23	0.68			0.587
q24	0.756			0.679
q25	0.72			0.682
q26	0.747			0.707
q30	0.693			0.638
q31	0.73			0.658
q32	0.689			0.592
q33	0.643			0.551
q34	0.635			0.609
q35	0.692			0.671
q36		0.72		0.573
q37		0.711		0.644
q41		0.713		0.62
q42		0.779		0.727
q44		0.809		0.702
q45		0.868		0.804
q46		0.756		0.659
q47		0.715		0.631
q48		0.731		0.645
q49		0.693		0.494
q50		0.705		0.58
q55		0.674		0.523
q57		0.656		0.601

TABLE 3 | Coefficient of factor load.

Factor	Item	(Coef.)	(Std. error)	*Z*	*P*	Std. estimate
Factor 1	q17	1	–	–	–	0.776
	q18	1.038	0.053	19.725	0	0.799
	q19	1.091	0.07	15.684	0	0.784
	q20	1.001	0.061	16.274	0	0.777
	q22	0.998	0.065	15.321	0	0.771
	q23	1.162	0.079	14.632	0	0.737
	q24	1.198	0.076	15.849	0	0.79
	q26	1.123	0.066	16.944	0	0.834
	q30	1.176	0.076	15.545	0	0.782
	q31	1.111	0.073	15.15	0	0.796
	q32	1.075	0.075	14.266	0	0.721
	q33	1.086	0.077	14.071	0	0.719
	q34	1.042	0.07	14.968	0	0.754
	q35	1.067	0.067	15.836	0	0.791
	q25	1.127	0.067	16.82	0	0.83
Factor 2	q36	1	–	–	–	0.745
	q37	1.187	0.065	18.24	0	0.828
	q41	1.076	0.072	14.916	0	0.792
	q42	1.182	0.074	16.031	0	0.84
	q44	1.076	0.069	15.659	0	0.826
	q45	1.129	0.068	16.632	0	0.869
	q46	1.217	0.078	15.516	0	0.818
	q47	1.112	0.073	15.312	0	0.81
	q48	1.093	0.071	15.298	0	0.806
	q49	0.707	0.062	11.331	0	0.616
	q50	0.957	0.069	13.823	0	0.738
	q55	0.961	0.077	12.451	0	0.672
	q57	1.047	0.075	13.916	0	0.74
Factor 3	q1	1	–	–	–	0.57
	q2	1.09	0.06	18.034	0	0.604
	q3	1.216	0.099	12.34	0	0.622
	q4	1.669	0.155	10.779	0	0.798
	q5	1.577	0.143	11.049	0	0.835
	q6	1.737	0.155	11.233	0	0.871
	q7	1.759	0.156	11.286	0	0.879
	q8	1.695	0.165	10.29	0	0.736
	q13	1.466	0.147	9.981	0	0.706
	q14	1.432	0.143	9.981	0	0.717

RESULTS

Exploratory Factor Analysis

Among the 343 participants of Sample A, 85.4% were female (M_{age} = 43.2 years, S_{age} = 9.5). Subjects with an education level of master's degree, undergraduate degree, and college diploma and below comprised 41.7, 49.6, and 8.7% of the sample, respectively.

The statistical results showed that the sampling suitability index KMO value was 0.965; therefore, it was appropriate to use factor analysis to verify the validity of the scale. According to the results of the EFA, 17 items were deleted and a 38-item hotline counselor competence scale was developed. After removing the data associated with 17 deleted items, the second EFA was conducted. The eigenvalues of the three factors were all greater than 1, the factor load was between 0.538 and 0.868, the item commonality was between 0.53 and 0.804, and all indicators were at a good level. According to the meaning of the items in each factor group, the factors were defined as factor 1 for skill, factor 2 for attitude, and factor 3 for knowledge (see **Table 2** for details).

Item Analysis

The high-score group was the sample with a total score of ≥174. There were 94 samples in the high-score group, accounting for 27.4% of the total sample. The low-score group was the sample with a total score of ≤152. There were 101 samples in the low-score group, accounting for 29.4% of the total. An independent sample *t*-test between the two groups was conducted and found that there were very significant differences between the two groups in the scores of each of the 38 items (df = 193, *t* = 9.622 -22.731). The results indicate that each item had a high degree of differentiation and could distinguish the two groups significantly. Further analysis of the correlation between each item and the total score found that there was a very significant correlation between the scores of each of the 38 items and the total score, and all the correlation coefficients were greater than 0.5. This shows that the items in this scale were highly correlated with competence.

Reliability and Validity Analysis of the Hotline Counselors' Competence Scale

After eliminating invalid questionnaires based on the response time and completeness of the questionnaire, a total sample of *n* = 334 was obtained (M_{age}: 43.7, S_{age}: 9.48; female: 86.5%; education level: graduate: 38.3%, undergraduate: 52.4%, college diploma and below: 9.3%). The number of samples studied was more than eight times the number of items in the scale, which ensures the quality of the CFA.

Reliability Analysis of the Scale

The coefficient McDonald's ω of each factor was 0.927 for Factor 1, 95% CI [0.914, 0.940], 0.958 for Factor 2, 95% CI [0.951, 0.965], and 0.954 for Factor 3, 95% CI [0.951, 0.965]. The Guttman's half-reliability coefficient was 0.872. The scale can thus be considered to have good reliability.

Validity Analysis of the Scale

The structural validity of the scale

The CFA results in **Table 3** show that, except for items q1–q3, q49, and q55, the standard load coefficients of other items were all larger than 0.7. In addition, the standard load coefficients for all items were significant at an α = 0.001 level. There was thus

TABLE 4 | Discriminant validity: Pearson correlation and AVE square root value.

	Factor 1	Factor 2	Factor 3
Factor 1	**0.747**		
Factor 2	0.727	**0.776**	
Factor 3	0.526	0.618	**0.783**

The bold numbers are the values of the square root of AVE.

TABLE 5 | Model fitting indicators.

Common indicator	χ^2	df	P	χ^2/df	GFI	RMSEA	RMR	CFI	NFI	NNFI
Criteria	–	–	>0.05	<3	>0.9	<0.10	<0.05	>0.9	>0.9	>0.9
Value	1056.452	601	0	1.758	0.855	0.048	0.018	0.96	0.912	0.953

TABLE 6 | Current competence of psychological hotline counselors.

	Max	Min	Average	Standard deviation
Skill	5	2.8	4.13	0.47
Attitude	5	3.15	4.55	0.42
Knowledge	4.5	2.7	3.87	0.42
Average score of competence	4.87	3.21	4.21	0.38

a good correspondence between the measurement items and the factors. The structural validity of the scale was good enough.

Differentiation of the scale items

Table 4 presents a comparison between the correlation coefficients of the three factors and the square root of each factor's AVE. The square root of AVE of each factor was greater than the correlation coefficient of one factor and the other factors. This shows that there were large differences among the 38 items.

The fit of the model

The ratio of chi-square to degrees of freedom, GFI, RMSEA, and other indicators of model fitting obtained by CFA are presented in **Table 5**. Obviously, except for the GFI being slightly lower than the criterion value of 0.9, all other indicators were in line with the criteria. This shows that the scale fit the model well.

Competencies of Psychological Hotline Counselors During the Epidemic

The competence of 334 participants was measured by using the competence model of psychological hotline counselors verified above. The average score for each dimension and the total were 4.13/5, 4.55/5, 3.87/5, and 4.21/5, respectively (see **Table 6**). The results show that the psychological hotline counselors scored high on this scale.

DISCUSSION

Competence Characteristics of Psychological Hotline Counselors

This study developed a competence model of hotline counselors during major public health emergencies based on the three dimensions of knowledge, skills, and attitudes. It focused on competence in general psychological counseling, the psychological hotline service, and psychological assistance in public emergent events.

Similar to former research (Zhang, 2011; Lambie et al., 2018), this scale emphasized the fundamental elements of counseling theories and skills in the knowledge and skills dimensions; for example, "Obtained the basic knowledge of psychology" (F1, knowledge) and "Mastered the basic intervention skills" (F2, skills). Both of those research studies assessed the capacities of relationship building, empathy, and focusing compared with the scale developed by Liang et al. (2017). According to the general requirements of benevolence, responsibility, integrity, justice, and respect, Chinese Psychological Society (2018), items like "Treat callers responsibly" were included in the attitude dimension. Ethical practice was also assessed in the former scales (Zhang, 2011; Lambie et al., 2018).

The major specialty of this scale was that it reflected the specific requirements for hotline counseling that operated during the COVID-19 epidemic. As mentioned at the beginning of the paper, the hotlines normally provided time-limited (no more than 30 min) and single-session services. We also assessed related competencies with items such as "Ability to build a relationship with the callers effectively," "Quickly focus on the major complaint of the callers and form the primary intervention plan," and "Ability to identify and respond to emergencies and nuisance calls."

The data analysis verified the original conception of the hotline counselor's competence model, which has good reliability and validity. The model also shows that the hotline counselors have unique competency requirements, which cannot be replaced by general competency characteristics. The competence model requires specified items about the psychological hotline and psychological assistance.

Professional Skills Are an Important Component of the Competence of Hotline Counselors

The EFA results show that professional skills have the highest contribution to the hotline counselor's competence, which might be related to the specific context of psychological hotlines. People called for help due to distress and crisis after the initial stage of the outbreak and needed highly skilled counselors in psychological first aid and crisis intervention. Moreover, most psychological hotlines provided a single-session service with each session limited to approximately 30 min, which required the counselors to be able to quickly focus on the problems of callers and provide effective intervention. The results are also consistent with previous studies. Liang et al. (2017) compiled a skill evaluation form for hotline psychological intervention based on three dimensions: counseling process, counseling attitude, and communication skills. They used this form to evaluate the qualifications of the hotline counselors' consulting skills, and emphasized the importance of consulting skills for the quality of hotline operation. From the perspective of competence training, operational experience is of fundamental importance for consulting psychology students to apply classroom learning in practice (Anderson and Ball, 1978; Weeks, 1982). The

training process enables students to work on real clients under supervision and focuses on skill improvement (Brown, 1985). Skills had the greatest weight in constructing psychological hotline counselors' competencies.

Current Competence of Psychological Hotline Counselors

The psychological hotline counselors scored high on the self-assessment scale. This could probably result from the sample selection and the assessment goal of the scale. The questionnaire was distributed to major hotline organizations/platforms in China. Most of the participants in the study were hotline counselors who had been screened and recruited by the organizations/platforms, which set higher criteria for qualifications and experience. The participants were well trained and supervised. Also, this scale aimed at assessing minimum competency, and participants may have scored higher on the scale, especially when they were already experienced.

Zeng et al. (2014) investigated the competence of psychological counselors in colleges and universities, and also found that more than half of the participants scored over 4 points. However, Zhang's survey on the competence of mental health professionals (2011) obtained the opposite results, which could be attributed to differences in the samples. In this study, the variation coefficients of scores on each dimension are close to that of the total scores, and the variation in scores on skills is the largest, which reflects that their competencies are on a par with each other. It can also be speculated that the difference in the total score mainly resulted from the difference in skills.

CONCLUSION AND FUTURE STUDIES

The Psychological Hotline Counselor Competence Scale developed in this study has good reliability and validity. The scale is suitable for screening and assessing the competencies of professionals who provide psychological assistance via hotlines or other media after disasters or major public health emergencies. The scale could provide a convincing reference point for service organizations to assess and recruit competent professionals. It could also be utilized in the supervision of psychological assistance provided via hotlines. It could map out the strengths and weaknesses of supervisees. The supervisors could quickly identify the areas of incompetence and help the counselors to improve their competencies.

There are several limitations in this study. On the one hand, the questionnaire was developed during the COVID-19 epidemic, which was reflected in the specific requirements for psychological assistance provided via hotlines or Internet platforms. Thus, the utilization of this scale may be limited to the specific format of hotlines. In addition, this research was conducted in mainland China. The items selected also reflected the practical requirements for psychological assistance needed to address the issues that emerged during the COVID-19 epidemic. Thus, cultural differences should be taken into consideration when the scale is applied to other countries.

With the increasing use of this scale in the future, the continuous accumulation of samples would help to build a more stable and reliable norm for the competence of hotline counselors. Longitudinal follow-up research could also be conducted to analyze the changing pathways of counselors' competencies and to explore related variables that may affect the competencies of psychological hotline counselors. This scale is also suitable for carrying out relevant intervention studies under major public health emergencies, for evaluating the effectiveness of supervision and training for psychological hotline counselors, and for customized training where there are weaknesses in areas of competence.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements. Written informed consent was implied via completion of the survey.

AUTHOR CONTRIBUTIONS

All the authors were engaged in each stage of this research, including proposing the theoretical construct of competency model, developing the primary scale, distribute the link of questionnaire, running statistic analysis, and forming discussion. Online meeting was arranged once there was a progress.

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Immediate Psychosocial Impact on Healthcare Workers During COVID-19 Pandemic in China: A Systematic Review and Meta-Analysis

Fei Dong[1,2], *Hong-liang Liu*[3], *Ming Yang*[1,2], *Chun-li Lu*[1,2], *Ning Dai*[1,2], *Ying Zhang*[1,2], *Nicola Robinson*[1,4] *and Jian-ping Liu*[1,5]*

[1] Center for Evidence-Based Chinese Medicine, Beijing University of Chinese Medicine, Beijing, China, [2] School of Traditional Chinese Medicine, Beijing University of Chinese Medicine, Beijing, China, [3] Gastroenterology Department, Guang'anmen Hospital, China Academy of Chinese Medicine Sciences, Beijing, China, [4] Institute of Health and Social Care, London South Bank University, London, United Kingdom, [5] Institute for Excellence in Evidence-Based Chinese Medicine, Beijing University of Chinese Medicine, Beijing, China

Objectives: The corona virus disease-2019 (COVID-19) pandemic spread globally, and we aimed to investigate the psychosocial impact on healthcare workers (HWs) in China during the pandemic.

Methods: In this systematic review and meta-analysis, we searched seven electronic databases for cross-sectional studies on psychosocial impact on HWs in relation to COVID-19 from January 1, 2020 to October 7, 2020. We included primary studies involving Chinese HWs during the pandemic, and data were extracted from the published articles. Our primary outcome was prevalence of anxiety, depression, and stress disorders. We pooled prevalence value with their 95% confidence interval using random effect models and assessed study quality on the basis of an 11-item checklist recommended by the Agency for Healthcare Research and Quality. The study protocol was registered in PROSPERO (CRD42020195843).

Results: We identified 25 articles comprising a total of 30,841 completed questionnaires and 22 studies for meta-analysis. The prevalence of anxiety, depression, and stress disorders was 34.4% (29.5–39.4%), 31.1% (24.5–37.7%), and 29.1% (24.3–33.8%) for HWs. The pooled prevalence of anxiety disorders for HWs from late January to early February was 46.4% (42.9–49.9%), significantly higher than those in mid-term February (28.0%, 23.9–32.1%) and after late February (27.6%, 16.0–39.2%). The pooled prevalence of depression disorders for HWs from late January to early February was 46.5% (38.8–54.2%), significantly higher than those in mid-term February (27.1%, 19.8–34.5%) and after late February (32.9%, 16.2–49.5%). HWs working in Hubei Province had a higher prevalence of anxiety (37.9 vs. 30.8%) and a lower prevalence of depression (27.5 vs. 34.7%) than those working in other regions. Nurses had a higher prevalence of anxiety (44.1 vs. 29.0%) and depression (34.1 vs. 29.2%) than other HWs.

Conclusions: About one-third of HWs in China suffered anxiety, depression, and stress at the early epidemic of COVID-19. HWs in Hubei Province, especially nurses, had a higher prevalence of psychological disorders. During the pandemic, a negative

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***Correspondence:**
Jian-ping Liu
Liujp@bucm.edu.cn;
jianping_l@hotmail.com

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psychological state may persist in a proportion of Chinese HWs, fluctuating with the control of the pandemic. The long-term impact should continue to be observed. Attention should be paid to HWs for their psychological impact due to the pandemic.

Systematic Review Registration: The study protocol was registered with PROSPERO (CRD42020195843).

Keywords: anxiety, COVID-19, depression, meta-analysis, psychosocial impact, systematic review

INTRODUCTION

The corona virus disease-2019 (COVID-19) pandemic has swept across the world. Over the course of the pandemic, many countries and regions have adopted preventive measures, such as lockdown, to regulate movement and workplaces (Brooks et al., 2020). Scholars across the globe have likewise highlighted the need to better understand psychosocial problems caused by the pandemic (Duan and Zhu, 2020; Holmes et al., 2020; Liu S. et al., 2020; Shigemura et al., 2020). Indeed there is a need for research that evaluates the mental health of healthcare workers (HWs) who are caring for patients during a viral outbreak and the potential psychosocial interventions (Kisely et al., 2020).

The COVID-19 pandemic has had a devastating effect on people's physical and mental health (Galea et al., 2020; Moreno et al., 2020). Published research on COVID-19 has identified the negative effects the pandemic has had on the mental health of different populations, causing conditions such as anxiety, depression, and stress (Cai W. et al., 2020; Liu Q. et al., 2020; Ni et al., 2020; Park and Park, 2020). As information on COVID-19 becomes available to the public, psychological distress resulting from repeated media exposure to the outbreak has emerged (Garfin et al., 2020). According to existing research, the more negative information one receives, the more inclined one is to feel stressed (Garfin et al., 2020). The general population has been quarantined in their homes; HWs and frontline workers involved in epidemic prevention must deal with the physical hardship of long working hours and the unavoidable mental stress caused by negative information from the media (Cao et al., 2020; Gao et al., 2020). Due to the unpredictability of the disease and the necessary isolation of patients, those who have been diagnosed with COVID-19 and people who have been medically quarantined were very likely to be anxious and depressed (Bo et al., 2020; Wang C. et al., 2020). According to existing research, patients with cancer and other underlying diseases exhibited increased psychological discomfort during the COVID-19 pandemic and received different levels of mental health services (Naqos and Khouchani, 2020; Wang Y. et al., 2020). Therefore, the COVID-19 pandemic has also posed high risks for other patients.

Healthcare workers around the globe have been involved in outbreak control and the treatment of patients. Compared with other groups, HWs have had to work longer hours under intense pressure. Increasing confirmed and suspected cases, heavy workloads, shortages of personal protective equipment, information overload, demand for specific drugs, and a lack of public support are all possible contributors to the psychological burdens faced by HWs (Fan et al., 2020; Galehdar et al., 2020; Liu Q. et al., 2020). For example, the Chinese government sent more than 42,000 HWs to treat patients in the affected areas of Hubei Province (Yao and Xu, 2020). Among these works, some lacked experience and expertise in infectious diseases before the COVID-19 pandemic and therefore faced additional hardships. However, even those medical workers who were not dispatched to remote locations and instead have worked at local hospitals have also faced significantly increased workloads and great challenges (Lai et al., 2020).

Soon following the outbreak of COVID-19, researchers carried out cross-sectional studies to analyze the psychosocial problems faced by HWs; researchers have also undertaken regular systematic reviews. Some reviews (Kisely et al., 2020; Krishnamoorthy et al., 2020; Luo et al., 2020; Pan et al., 2020; Pappa et al., 2020; Salazar De Pablo et al., 2020; Serrano-Ripoll et al., 2020; Da and Neto, 2021) have included evaluations and meta-analyses of the psychosocial problems faced by HWs during the COVID-19 pandemic. According to the evidence presented by researchers, a substantial proportion of HWs have experienced anxiety, depression, stress, sleep disorders, and other mental health problems during the outbreak. These findings emphasize a working mechanism of reduced risk to mental health and timely adjustments to psychological interventions in the context of the COVID-19 pandemic. However, these reviews pertain to journal articles published between March 2020 and May 2020 and only included cross-sectional studies published during the early months of the epidemic. It is likely that the COVID-19 pandemic will continue for quite some time. Therefore, it is necessary to update research evidence in a timely manner and track the changes in the mental health of HWs. Some studies provided only a qualitative description of existing literature as part of their narrative evaluations or general reviews (Barello et al., 2020; Bohlken et al., 2020; Braquehais et al., 2020; Chow et al., 2020; Fu et al., 2020; Heath et al., 2020; Magill et al., 2020; Muller et al., 2020; Paiano et al., 2020; Preti et al., 2020; Shaukat et al., 2020; Shreffler et al., 2020; Stuijfzand et al., 2020). Moreover, these studies neglected to include a quantitative evaluation of the strength, quality, and consistency of existing evidence. According to qualitative analysis, factors such as sex, age, specific job role, and experience in communicable disease control have influenced the mental health of HWs during the pandemic. Moreover, in different social and cultural contexts, people take different measures to deal with stress; this also applies to doctors, nurses, and other HWs (Cabarkapa et al., 2020). One study (Thombs et al., 2020) employed a relatively novel method of systematic review: living systematic review. Indeed among

studies on the COVID-19 pandemic, providing dynamic updates of specific questions is the most desirable method. However, in September 2020, the research group announced that it would stop updating research of "factors associated with levels or changes in symptoms" because of the rapid growth in the number of low-quality cross-sectional studies and an inadequate number of group members. Therefore, living systematic evaluation will no longer provide the latest evidence regarding changes in the psychological health of different populations in this review.

The characteristics of COVID-19 outbreaks and disease prevention and control measures vary drastically across different nations and are affected by local cultural conditions. Therefore, we believe that research on the mental health of HWs should be specific to each area in order to produce more targeted interventions. Moreover, with changes in the situation of disease prevention and the deepening of our understanding of COVID-19, it is necessary to determine whether the mental health of HWs will change accordingly. This is a question worth exploring. Nevertheless, no existing research has addressed the mental health of Chinese HWs during the epidemic.

As a result, we conducted a systematic review and meta-analysis to explore changes in the mental health of health workers, examining the prevalence of anxiety, depression, and stress disorders among this group. Compared with previous research, this research evaluates not only the mental health of Chinese HWs but also the prevalence of psychological problems in different stages and differences across different levels of involvement in disease prevention and different posts.

METHODS

Search Strategy and Selection Criteria

We did this systematic review and meta-analysis following the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines (known as PRISMA; **Supplementary Material**, pp. 2–4) and Meta-analyses of Observational Studies in Epidemiology (known as MOOSE; **Supplementary Material**, pp. 5 and 6) guidelines.

In this systematic review, the study population was Chinese HWs and the main outcome of the prevalence of abnormal psychosocial state and its change. We found that there were a number of cross-sectional surveys, and the quality was low in a previous literature review; therefore, this study reviewed the literature in observational studies, such as cross-sectional and longitudinal studies, not involving the study of intervention measures, but the sample must be able to represent the overall population.

Based on comprehensive searching in seven electronic databases, including PubMed, Embase, PsycINFO, Wanfang Data, Chongqing VIP, Sinomed, and Chinese National Knowledge Infrastructure databases, we established the COVID-19 Mental Health Database. The search strategies of all databases could be seen in the **Supplementary Material**, pp 7–9. The limited publication languages are English or Chinese, published between January 1, 2020 and October 7, 2020. We selected studies from the COVID-19 Mental Health Database according to inclusion and exclusion criteria.

Inclusion Criteria

- Date of the studies: any study carried out between January 1, 2020 and October 7, 2020.
- Subjects: Chinese HWs under the COVID-19 epidemic, regardless of age and gender. There was no restriction on ethnicity.
- Study design: observational studies, such as cross-sectional sampling survey and longitudinal study.
- Articles that have been officially published or published online, conference articles, or other gray literature.
- Outcome indicators: the prevalence rate of mental health and psychological disorders, such as depression, anxiety, and stress.

Exclusion Criteria

- Duplicated research.
- Literature without data required for the research from the original text.
- No response rate or sampling could not infer the overall populations (if convenience sampling method only was used).
- Survey tools: self-designed questionnaire.

In order to ensure the comprehensiveness of published data, this study intended to extend and search the reference list of literature.

The study protocol was registered with PROSPERO (CRD42020195843) before the systematic review was done. Due to the increasing number of cross-sectional studies, the studies which related to this systematic protocol involving different populations had to be split into different research papers. This paper discussed the psychosocial impact on HWs.

Data Analysis

Two authors (FD and HL) independently selected the literature, extracted data, and cross-checked for duplications. If two or more articles came from the same research, the one with the most complete data and the most detailed report was selected. Any differences were adjudicated through discussion or consultation with a third member of the research team. Documents were selected by reading the title and abstract first and then the full text in order to determine whether to include them in the study. If necessary, authors of the original study were contacted by email and telephone if there was any uncertainty or if important information was missing for the study. The data extraction form included the following: (1) the first author, research topic, and publication year; (2) characteristics of the studies: population category, research location, number of participants, gender, and departments; (3) key elements to assess bias and risk: research method, sampling method, survey form, survey tools, number of valid questionnaires, and survey time; (4) outcome indicators and outcome measurement data: number of reports of anxiety (mild, moderate, and severe), depression (mild, moderate, and severe), stress disorder, and scores on the SCL-90 scale. Findings of any other related psychosocial problems were also recorded. Frontline HWs were defined as doctors or nurses from departments of infectious diseases, emergency medicine, fever clinics, and intensive care units and included technicians

from radiology and laboratory medicine and HWs working in infection prevention and those that directly faced and treated confirmed or suspected COVID-19 patients.

The methodological quality of the studies included was assessed using an 11-item checklist which was recommended by the Agency for Healthcare Research and Quality (Rostom et al., 2004). An item would be scored "0" if it was answered "NO" or "UNCLEAR"; if it was answered "YES," then the item score was "1." The study quality was assessed as follows: low quality = 0–3, moderate quality = 4–7, and high quality = 8–11. Two authors (FD and HL) evaluated the methodological quality and cross-checked the results independently. Any differences were adjudicated through discussion or consultation with a third member of the research team.

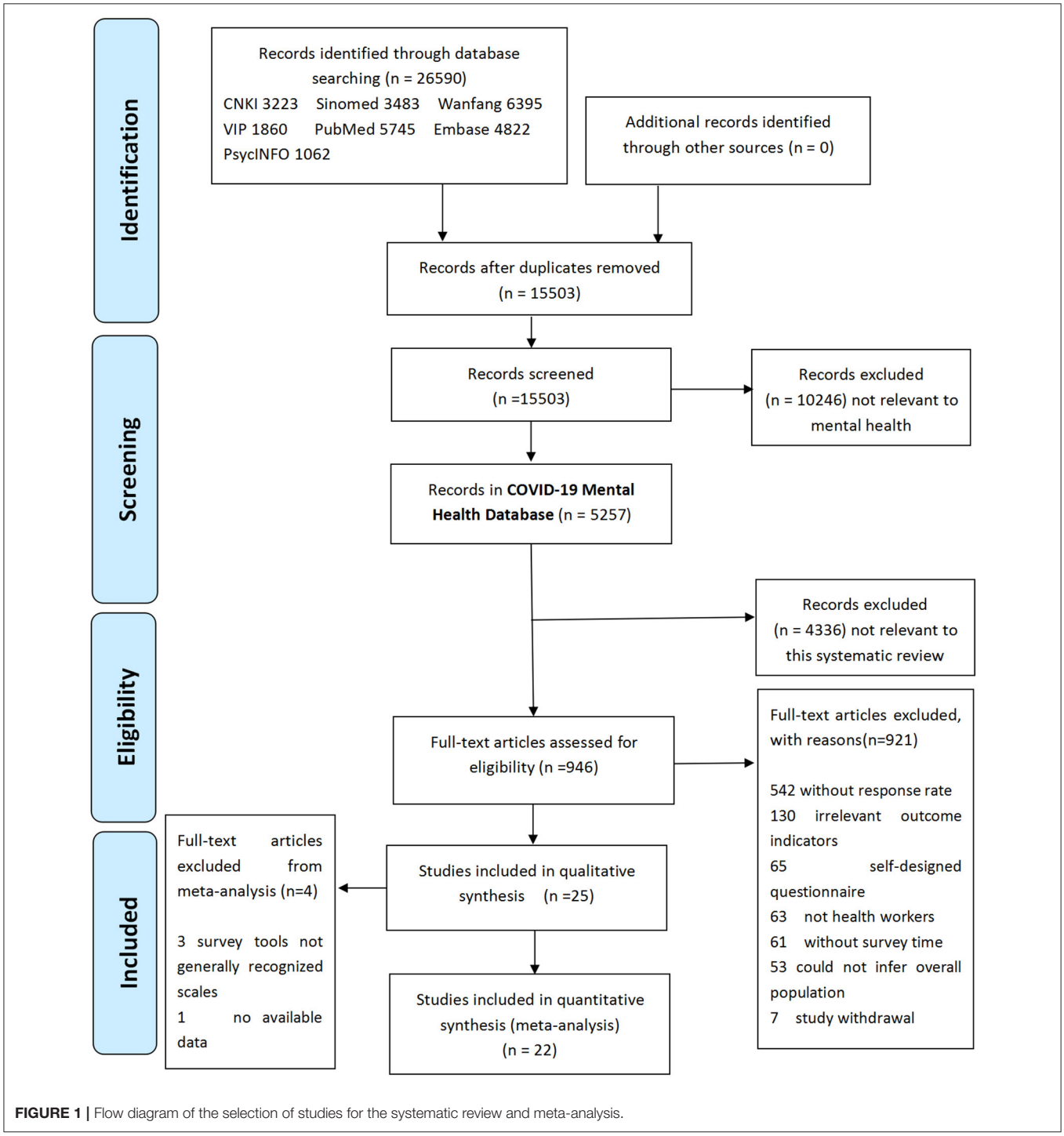

FIGURE 1 | Flow diagram of the selection of studies for the systematic review and meta-analysis.

Prevalence was tabulated as the number of cases detected divided by the sample size, along with standard errors, and all estimates were expressed as a percentage of the population. There were two conditions to meet in order for a given study to be included in the meta-analysis: (1) it should have used a generally recognized scale to determine the outcome rather than a self-designed questionnaire and (2) there should be accurate reporting of the number of people who have the outcome or the scores of all dimensions of specific scales. The inverse variance method by DerSimonian and Laird (adjusted) (DerSimonian and Laird, 2015) was used to calculate pooled prevalence and 95% confidence intervals for prevalence rates and estimate values. Heterogeneity between studies was tested using the I^2 statistic. Forest plots were used to display the results graphically. Due to the need for appropriate interventions for moderate and severe anxiety or depressive disorders, meta-analysis was conducted according to two groups (mild, moderate, and severe). In addition, a sensitivity analysis was performed to test the influence of possible outliers. Similarly, the presence of publication bias was tested using Begg's test and Egger's test. $P < 0.05$ will be considered statistically significant. The meta-analysis will be performed using Stata v 16.0.

RESULTS

Search Results

A total of 26,590 pieces of literature were obtained through preliminary COVID-19 mental health database screening, and 15,503 were left after elimination of duplicates. A total of 5,257 articles were obtained in COVID-19 Mental Health Database (Dynamic Version, date 2020-11-10) after eliminating obvious irrelevant review topics and abstracts. A total of 946 full-text articles from the COVID-19 Mental Health Database were reviewed and classified, and 25 studies were finally included in this review (see **Figure 1**).

Study Characteristics

In this review, 25 studies were identified through the search as eligible for inclusion. **Table 1** provides the characteristics of literature included in the systematic review. Of the 25 articles, 10 (Cai Z. et al., 2020; Hu et al., 2020; Lai et al., 2020; Li G. et al., 2020; Si et al., 2020; Tian et al., 2020; Wang S. et al., 2020; Xu X. et al., 2020; Yang et al., 2020; Zhu et al., 2020) were published in English, and 15 (Chen X. et al., 2020; Chen Y. et al., 2020; Gu et al., 2020; Guo et al., 2020; Huang et al., 2020; Li et al., 2020a,b; Liu et al., 2020a,b; Nong et al., 2020; Sun and Yu, 2020; Wei et al., 2020; Wu and Ding, 2020; Xu J. et al., 2020; Zheng and Zhu, 2020) were published in Chinese. Fourteen studies highlighted their study population as frontline HWs, six studies included only nurses, and one study surveyed residents. Fifteen study sites were located in Hubei Province, China. One study (Cai Z. et al., 2020) proceeds as a longitudinal study and contained two cross-sectional surveys. Twenty-five studies comprised 30,841 completed questionnaires. Online questionnaires were used in 18 studies (72.0%), which were sent out by researchers through *WeChat* or *Wenjuanxing* apps (similar to SurveyMonkey). Twenty-three studies (92.0%) used cluster sampling method. All the included cross-sectional studies were proceeded from the end of January to April 2020. The survey time of 19 studies (76.0%) was from the end of January 2020 to February 2020.

Methodological Quality Assessment

All of the selected articles were assessed for methodological quality. The quality score for each study is presented in **Table 2**. A total of 22 studies (88.0%) were of high quality, and three studies (12.0%) were of moderate quality.

Meta-Analysis of the Included Studies

A total of 22 studies were in the meta-analysis of pooled prevalence of anxiety disorders, and the scales used to measure anxiety included the Generalized Anxiety Scale-7 (GAD-7, $n = 13$, 59.1%), Self-rating Anxiety Scale (SAS, $n = 7$,31.8%), and Depression Anxiety Stress Scale-21 (DASS-21, $n = 2$, 9.1%).

A total of 18 studies were in the meta-analysis of pooled prevalence of depression disorders, and the scales for the depression survey included Patient Health Questionaire-9 (PHQ-9, $n = 12$, 66.7%), Self-rating Depression Scale (SDS, $n = 4$, 22.2%), and Depression Anxiety Stress Scale-21 (DASS-21, $n = 2$, 11.1%).

A total of nine studies were in the meta-analysis of pooled prevalence of stress disorders; the scales for stress disorder survey included Impact of Event Scale—Revised (IES-R, $n = 6$, 66.7%), Impact of Event Scale-6 (IES-6, $n = 1$,11.1%), the Post-traumatic Stress Disorder (PTSD) checklist—civilian version (PCL-C, $n = 1$, 11.1%), and PTSD-Rating Scale (PTSD-SS, $n = 1$, 11.1%).

According to D+L pooled estimated value of meta-analysis of studies involving HWs with a random effects model, the prevalence of anxiety, depression, and stress disorders was 34.4% (95%CI, 29.5–39.4%), 31.1% (95%CI, 24.5–37.7%), and 29.1% (95%CI, 24.3–33.8%), respectively, for HWs. The forest plots showed a pooled prevalence of anxiety (**Figure 2**), depression (**Figure 3**), and stress disorders (**Figure 4**) in HWs.

Due to the need for more active treatment in people with moderate to severe anxiety or depression, we calculated the pooled prevalence of mild disorders and moderate to above separately, and the results showed that the prevalence of mild anxiety and depression disorders was 26.1% (95%CI, 20.8–31.4%) and 22.3% (95%CI, 16.6–28.0%), respectively, for HWs, and the prevalence of moderate to above anxiety and depression disorders was 10.3% (95%CI, 8.2–12.5%), 31.1% (95%CI, 24.5–37.7%), and 10.5% (95%CI, 8.0–13.0%), respectively, for HWs.

The survey time of the included studies spanned more than 3 months. According to the process of epidemic prevention and control in China, the survey time was divided into stage I (late January–early February), stage II (mid-term February), and stage III (after late February). The pooled prevalence of anxiety disorders in the three stages was stage I−46.4% (95%CI, 42.9–49.9%), stage II−28.0% (95%CI, 23.9–32.1%), and stage III−27.6% (95%CI, 16.0–39.2%), respectively. The pooled prevalence of depression disorders in the three stages was stage I−46.5% (95%CI, 38.8–54.2%), stage II−27.1% (95%CI, 19.8–34.5%), and stage III−32.9% (95%CI, 16.2–49.5%), respectively. Due to few included studies to explore stress disorders, the

TABLE 1 | Characteristics of the included studies reporting on healthcare workers' psychosocial status during the COVID-19 pandemic.

No.	First author	Population	Medical facilities	Study location	Number of participants (*n*)	Response rate (%)	Sampling method	Survey form	Survey tools for anxiety, depression, stress	Completed questionnaire (*n*)	Completeness rate of data collection (%)	Gender (*n*)		Survey time
												Male	Female	
1	Zi-feng Li	Frontline nurses	A designated hospital for COVID-19	Yichang City, Hubei Province	773	100	Cluster sampling	Online questionnaire survey through *Wenjuanxing* APP	SAS	773	100	95	678	02/2020
2	Qiu-xiang Nong	Psychiatric nurses	Two psychiatric hospitals	Guangxi Province	92	100	Randomized cluster sampling	Questionnaire survey	SCL-90, SDS, SAS	92	100	29	63	31/01/2020–03/02/2020
3	Yu-ning Chen	Residents	The First Affiliated Hospital,Zhejiang University School of Medicine	Hangzhou City, Zhejiang Province	712	71.27	Cluster sampling	Questionnaire survey	PHQ-9, GAD-7	711	99.86	315	396	03/02/2020–16/02/2020
4	Na Zheng[a]	Non-frontline nurses	Tongji Hospital, Tongji Medical College	Wuhan City, Hubei Province	118	100	Cluster sampling	Questionnaire survey	SCL-90	118	100	2	116	20/01/2020–05/02/2020
5	Xiao-wen Gu	Frontline nurses	The Third People's Hospital of Shenzhen	Shenzhen City, Guangdong Province	564	100	Convenience and cluster sampling	Questionnaire survey	SAS, SDS	564	100	NR	NR	01/2020–02/2020
6	Wei Wei[a]	Nurses in operating room	The First Affiliated Hospital of Zhengzhou University	Zhengzhou City, Henan Province	401	96.39	Cluster sampling	Online questionnaire survey through *Wenjuanxing* APP	PQEPHE	401	100	66	335	03/02/2020–08/02/2020
7	Xiao-lei Liu	Nurses	Chinese PLA General Hospital	Beijing City	1,097	100	Cluster sampling	Online questionnaire survey	PHQ-9, GAD-7, SRQ-20	1,097	100	19	1,078	01/02/2020–18/02/2020
8	Jia-qi Xu	Nurses	Tongji Hospital, Tongji Medical College	Wuhan City, Hubei Province	136	100	Cluster sampling	Online questionnaire survey through *Wenjuanxing* APP	PHQ-9, GAD-7, Fear NRS	136	100	0	136	29/01/2020–31/01/2020
9	Ji-zheng Huang	Frontline HWs	A designated hospital for COVID-19	Fuyang City, Henan Province	230	93.50	Cluster sampling	Online questionnaire survey through *Wenjuanxing* APP	SAS, PTSD-SS	230	100	43	187	07/02/2020–14/02/2020
10	Xia Chen	Frontline HWs	National Aid Hubei Medical Team from Xinjiang Uygur Autonomous Region	Hubei Province	386	100	Cluster sampling	Online questionnaire survey	SAS	361	93.52	19	342	28/01/2020–29/02/2020

(Continued)

TABLE 1 | Continued

No.	First author	Population	Medical facilities	Study location	Number of participants (*n*)	Response rate (%)	Sampling method	Survey form	Survey tools for anxiety, depression, stress	Completed questionnaire (*n*)	Completeness rate of data collection (%)	Gender (*n*)		Survey time
												Male	Female	
11	Di Wu	Frontline HWs	National Aid Hubei Medical Team from Henan Province	Hubei Province	480	62.70	Cluster sampling	Online questionnaire survey	SQR	620	100	241	379	29/02/2020–01/03/2020
12	Zhen-xiao Sun	HWs in psychiatry department	Mental Health Center of Linyi City	Linyi City, Shandong Province	121	97.58	Random sampling	Questionnaire survey	PHQ-9,GAD-7	121	100	40	81	05/03/2020
13	Zheng Li	Frontline nurses	National Aid Hubei Medical Team from Shanxi Province	Hubei Province	133	100	Cluster sampling	Online questionnaire survey	DASS-21	130	97.74	9	121	06/02/2020–20/02/2020
14	Xiang-lai Liu	Frontline HWs	National Aid Hubei Medical Team from Hainan Province	Hubei Province	221	90.95	Cluster sampling	Online questionnaire survey through *Wenjuanxing* APP	SAS, SDS, SRQ-20, PCL-C	221	100	73	148	17/03/2020
15	Zhong-wei Guo	Frontline HWs	National Aid Hubei Medical Team from Zhejiang Province	Hubei Province	130	86.67	Cluster sampling	Online questionnaire survey through *Wenjuanxing* APP	PHQ-9, GAD-7	130	100	45	85	10/02/2020–12/02/2020
16	Xiao-ming Xu	Frontline HWs	Designated hospitals for COVID-19	Chongqing City	8,817	90.62	Cluster sampling	Online questionnaire survey through *Chongyixinli* platform	PHQ-9, GAD-7	8,817	100	1,943	6,874	14/02/2020–23/02/2020
17	S. Wang	HWs	Children's Healthcare Centre of Renmin Hospital of Wuhan University	Wuhan City, Hubei Province	129	52.44	Cluster sampling	Questionnaire survey	SAS, SDS	123	95.35	12	111	30/01/2020–07/02/2020
18	Ming-yu Si	HWs	Hospitals of seven Geographical regions in China	Seven provinces in mainland China	863	75.57	Purpose sampling	Online questionnaire survey	IES-6, DASS-21	863	100	253	610	23/02/2020–05/03/2020
19	Juan Yang	HWs	Five designated hospitals for COVID-19	Chongqing City	456	91.2	Cluster and random sampling	Online questionnaire survey	PHQ-9, GAD-7, IES-R	456	100	134	222	01/02/2020–14/02/2020
20	Zhong-xiang Cai	Nurses	Renmin Hospital of Wuhan University	Wuhan City, Hubei Province	709	72.94	Cluster sampling	Online questionnaire survey through *Wechat* APP	PHQ-9, GAD-7, IES-R	709	100	25	684	28/01/2020–02/02/2020

(Continued)

TABLE 1 | Continued

No.	First author	Population	Medical facilities	Study location	Number of participants (*n*)	Response rate (%)	Sampling method	Survey form	Survey tools for anxiety, depression, stress	Completed questionnaire (*n*)	Completeness rate of data collection (%)	Gender (*n*)		Survey time
												Male	Female	
		Nurses	Renmin Hospital of Wuhan University	Wuhan City, Hubei Province	621	63.89	Cluster sampling	Online questionnaire survey through *Wechat* APP	PHQ-9, GAD-7, IES-R	621	100	16	605	26/02/2020–28/02/2020
21	Teng-fei Tian	Frontline HWs	Beijing Xiaotangshan Hospital	Beijing City	845	79.94	Cluster sampling	Online questionnaire survey through *Wenjuanxing* APP	PSS-10, PHQ-9, GAD-7, ISI	845	100	131	714	06/04/2020–10/04/2020
22	De-ying Hu[a]	Frontline nurses	Wuhan Union Hospital and Huo Shen Shan Hospital	Wuhan City, Hubei Province	2,110	81.15	Cluster sampling	Online questionnaire survey through *Wenjuanxing* APP	SAS, SDS	2,014	95.45	260	1,754	13/02/2020–24/02/2020
23	Zhou Zhu	Frontline HWs	Tongji Hospital, Tongji Medical College	Wuhan City, Hubei Province	5,281	80.40	Cluster sampling	Online questionnaire survey through *Wenjuanxing* APP	PHQ-9, GAD-7, IES-R	5,062	95.85	758	4,304	08/02/2020–10/02/2020
24	Jian-bo Lai	Frontline HWs	34 hospitals equipped with fever clinics or wards for COVID-19	20 hospitals in Wuhan City, 7 hospitals in other regions of Hubei province, and 7 hospitals from 7 other provinces with a high incidence of COVID-19	1,257	68.69	Region-stratified and 2-stage cluster sampling	Questionnaire survey	PHQ-9, GAD-7, IES-R	1,257	100	293	964	29/01/2020–03/02/2020
25	Guo Li	Female frontline HWs	Tongji Hospital, Tongji Medical College	Wuhan City, Hubei Province	4,369	82.17	Cluster sampling	Online questionnaire survey through *Wenjuanxing* APP	PHQ-9, GAD-7, IES-R	4,369	100	0	4,369	08/02/2020–15/02/2020

DASS-21, depression anxiety stress scale-21; GAD-7, generalized anxiety scale-7; IES-R, impact of event scale—revised; NRS, numeric rating scale; PCL-C, the PTSD checklist—civilian version; PHQ-9, patient health questionaire-9; PQEPHE, the psychosocial questionnaire of emergency public health events; PSS, perceived stress scale; PTSD-SS, post-traumatic stress disorder self-rating scale; SAS, self-rating anxiety scale; SCL-90, symptom self-assessment scale; SDS, self-rating depression scale; SRQ-20, self-reporting questionnaire-20; SQR, stress reaction questionnaire.

[a] *The study was not included in the meta-analysis.*

TABLE 2 | Methodological quality assessment of the included studies in this systematic review.

No.	First author	a	b	c	d	e	f	g	h	i	j	k	Score	Overall quality
1	Zi-feng Li	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	9	High
2	Qiu-xiang Nong	Y	N	Y	Y	Y	Y	Y	N	N	Y	N	7	Moderate
3	Yu-ning Chen	Y	N	Y	Y	Y	Y	Y	N	N	Y	N	7	Moderate
4	Na Zheng	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	8	High
5	Xiao-wen Gu	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N	8	High
6	Wei	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	9	High
7	Xiao-lei Liu	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	8	High
8	Jia-qi Xu	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	9	High
9	Ji-zheng Huang	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N	8	High
10	Xia Chen	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N	8	High
11	Di Wu	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N	8	High
12	Zhen-xiao Sun	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N	8	High
13	Zheng Li	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	9	High
14	Xiang-lai Liu	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	9	High
15	Zhong-wei Guo	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N	8	High
16	Xiao-ming Xu	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	9	High
17	S. Wang	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N	8	High
18	Ming-yu Si	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N	8	High
19	Juan Yang	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N	8	High
20	Zhong-xiang Cai	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	10	High
21	Teng-fei Tian	Y	N	Y	Y	Y	Y	N	Y	N	Y	N	7	Moderate
22	De-ying Hu	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	9	High
23	Zhou Zhu	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	9	High
24	Jian-bo Lai	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	9	High
25	Guo Li	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N	8	High

a, define the source of information (survey, record review); b, list inclusion and exclusion criteria for exposed and unexposed subjects (cases and controls) or refer to previous publications; c, indicate the time period used for identifying patients; d, indicate whether or not the subjects were consecutive if not population-based; e, indicate if the evaluators of subjective components of study were masked to other aspects of the status of the participants; f, describe any assessments undertaken for quality assurance purposes (e.g., test/retest of primary outcome measurements); g, explain any patient exclusions from analysis; h, describe how confounding was assessed and/or controlled; i, if applicable, explain how missing data were handled in the analysis; j, summarize patient response rates and completeness of data collection; k, clarify what follow-up, if any, was expected and the percentage of patients for which incomplete data or follow-up was obtained.

pooled prevalence of stress disorders in the three stages could not be divided.

Sensitivity Analysis

Studies in the meta-analysis of anxiety and depression prevalence had considerable heterogeneity, and a sensitivity analysis was carried out to explore the origin of the heterogeneity. Subgroups of HWs were divided into frontline and overall HWs, working in Hubei Province and other regions in China, and being nurses and overall HWs. The results of the sensitivity analysis revealed that the prevalence of anxiety for frontline HWs was 34.8% (95%CI, 28.8–41.4%), higher than that for overall HWs (34.1%; 95%CI, 25.3–42.9%). The prevalence of anxiety for HWs in Hubei Province was 37.9% (95%CI, 28.7–47.1%), higher than those in other regions of China at 30.8% (95%CI, 25.1–36.5%). A subgroup of nurses was analyzed, and the results revealed that the anxiety prevalence for nurses was 44.1% (95%CI, 35.4–52.8%), significantly higher than that for overall HWs (29.0%; 95%CI, 23.4–34.7%), but the prevalence of depression for frontline HWs was 28.2% (95%CI, 18.8–37.6%), lower than that for overall HWs (34.1%; 95%CI, 24.4–43.9%). The prevalence of depression for HWs in Hubei Province was 27.5% (95%CI, 17.3–37.6%), lower than those in other regions of China at 34.7% (95%CI, 27.5–41.9%). The depression prevalence of nurses was 34.1% (95%CI, 17.5–50.7%), higher than for overall HWs (29.2%; 95%CI, 21.7–36.7%).

Publication Bias

For studies which included data on the prevalence of anxiety, the results were as follows: Begg's test result, $z = 0.62$; $P = 0.537$; Egger's test result, $P = 0.000$. For studies with depression prevalence, the results of Begg's test was $z = 1.29$, $P = 0.198$, and that of Egger's test was $P = 0.000$. For studies which included data on the prevalence of stress disorders, the results of Begg's test was $z = 0.52$, $P = 0.602$, and that of Egger's test was $P = 0.000$. The results suggested that the funnel plot of studies which included data on prevalence was asymmetric, and there may be not a publication bias other than the reasons for the asymmetry of the funnel plot, such as studies with a small sample.

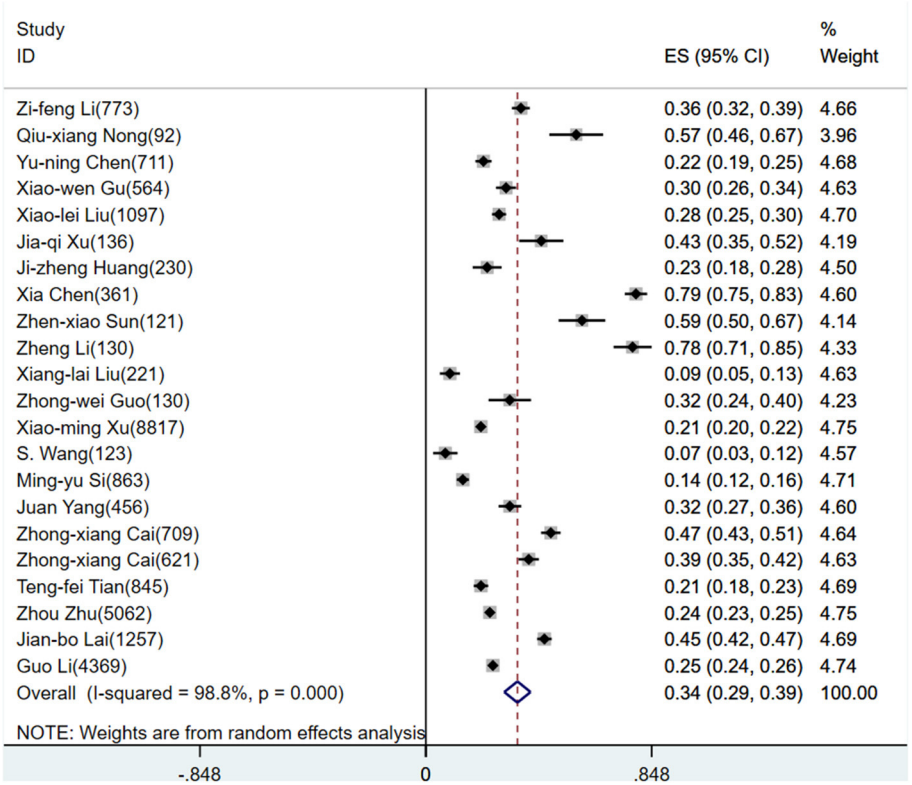

FIGURE 2 | Forest plot of anxiety prevalence rate in Chinese healthcare workers.

DISCUSSION

Our study constituted the first review of observational studies on the psychosocial impact of the COVID-19 outbreak on Chinese HWs and the changes professionals had faced due to the pandemic. The majority of population-based surveys carried out during the coronavirus pandemic have been conducted online and utilized self-assessment mental health tests. In order to obtain more accurate and representative samples, the majority of studies that we examined utilized cluster sampling. According to the survey times of the included studies, most of the research was conducted during the period when infection prevention measures were at their strictest in China. Based on the constructive information obtained for this study, our analysis aimed to guide the formulation of public health interventions designed to more effectively prevent and treat the social psychological health problems suffered by HWs resulting from the COVID-19 pandemic.

Assessing the Mental Health of Chinese Healthcare Workers

The findings of this review reveal that nearly one-third of healthcare workers may suffer from psychosocial problems such as anxiety, depression, and stress disorders. Focusing on social psychological changes, this study selected outcome indicators with more research data in the three aspects of anxiety, depression, and stress disorder. According to existing studies, sleep disorders have also been proven to be a common psychosocial problem experienced by healthcare workers (Zhao et al., 2020). The prevalence of viral diseases and the devastating symptoms of coronavirus have had a negative impact on the mental health of healthcare workers (Salazar De Pablo et al., 2020; Serrano-Ripoll et al., 2020).

Our review showed that the Chinese HWs' psychological states varied over time. In the early stages of the pandemic, healthcare workers experienced social psychological problems that were closely related to the sudden emergence of significant stressors. Previous studies have shown that during and after the outbreak of severe acute respiratory syndrome (SARS) in China, SARS survivors, as well as the general public, experienced symptoms of anxiety, depression, and PTSD (Cheng et al., 2004; Hong et al., 2009). As the COVID-19 pandemic was brought under control and our understanding of the SARS-CoV-2 virus deepened, the mental health of Chinese HWs had seemed to have improved. However, in order to evaluate the long-term impact of this pandemic on HWs' mental health, further follow-up studies are needed.

Factors Influencing the Mental Health of Chinese Healthcare Workers

In the results of this study, the prevalence of depression and anxiety among frontline HWs was not significantly higher

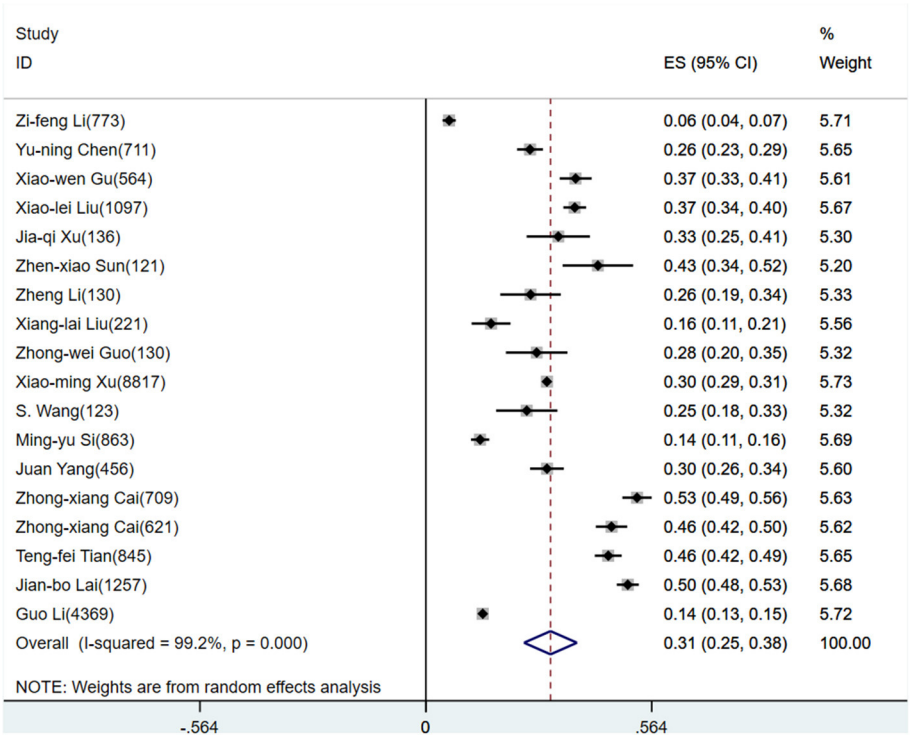

FIGURE 3 | Forest plot of depression prevalence in Chinese healthcare workers.

than that of non-frontline HWs, indicating a need to take into account the overall social psychological status of HWs. Indeed even HWs only indirectly affected by COVID-19 are under immense pressure. The frontline HWs covered in this study included members of several national medical teams that traveled across China to Hubei Province to support the local fight against the pandemic (Li et al., 2020; Liu et al., 2020; Wu and Ding, 2020). Although some exhibited clear symptoms of anxiety, there were no clear manifestations of low motivation caused by depression, which also reflects the teams' enthusiasm to voluntarily participate in the fight against the pandemic in Hubei Province. The COVID-19 pandemic in China started in Hubei Province, the province which ultimately experienced the highest number of diagnosed patients. Therefore, the prevalence of mental health problems among HWs in Hubei Province was significantly higher than that in other regions (Cai Z. et al., 2020; Li et al., 2020).

Frontline nurses were responsible for throat swab testing as well as daily care and treatment, and therefore, they were subject to the closest contact with potential and confirmed patients of COVID-19. As such, these nurses suffered from mental health problems that were worse than those of other HWs (Li G. et al., 2020). Mobile cabin hospitals were set up mainly to treat diagnosed patients with mild symptoms and were treated as temporary treatment centers during the pandemic. As the mobile cabin hospitals quickly received a large number of diagnosed patients with mild symptoms in a short period of time, nurses became responsible for the treatment of many more patients than under normal circumstances, which likely exerted additional physical and psychological pressure on them. One study showed that nurses dispatched to mobile cabin hospitals exhibited a significantly higher risk of experiencing mental health problems than nurses in other departments (Cai Z. et al., 2020).

This review also included a survey of research on the mental health state of resident doctors (Chen Y. et al., 2020). The results revealed concerning indicators regarding the mental health of resident doctors undergoing standard training. Although these doctors were not on the frontlines diagnosing COVID-19 patients and delivering treatment, they were still involved in important medical tasks. Moreover, because they were still receiving their professional training, it is likely that the pandemic will have an impact on the future of their personal and professional development. The study results showed that the higher the current degree of the resident doctor, the higher the degree of depression and anxiety (Chen Y. et al., 2020). Accordingly, it is necessary to pay special attention to the mental health states of young healthcare workers during the professional development period.

The studies included in this review showed that psychosocial resilience and psychosocial dilemmas were closely related to social support (Gu et al., 2020; Guo et al., 2020; Li et al.,

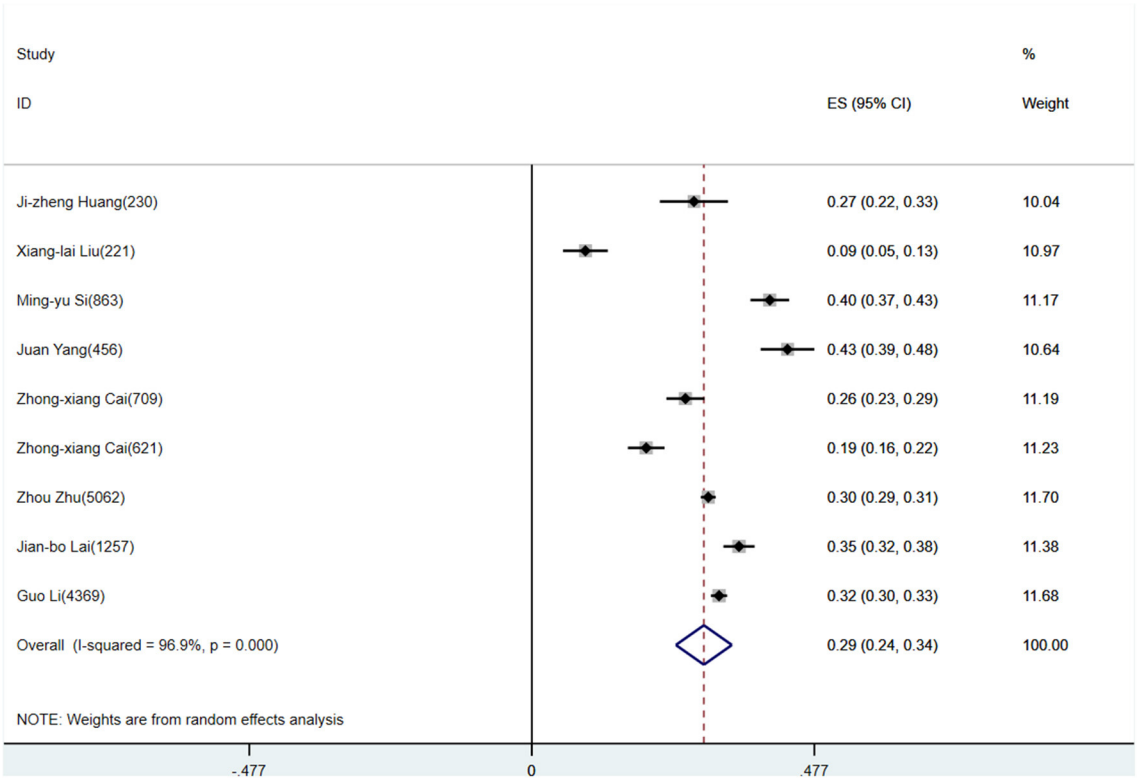

FIGURE 4 | Forest plot of stress disorders prevalence in Chinese healthcare workers.

2020; Liu et al., 2020; Wu and Ding, 2020). Adequate personal protective equipment and infection prevention training for healthcare workers have a positive effect on healthcare workers' mental health (Gu et al., 2020). All these findings indicated that the mental health of HWs was affected by a variety of factors. Therefore, strategies for alleviating healthcare workers' social psychological problems must fully consider levels of social support, economic conditions, and other related factors.

Improving the Mental Health of Healthcare Workers by Interventions

The COVID-19 pandemic has profoundly impacted all aspects of society (Holmes et al., 2020), and there is an urgent need to solve the health workers' psychosocial problems, propose potential public health interventions, and encourage people to change their lifestyles in order to improve their physical and mental health. Moreover, research on vulnerable groups must be incorporated when devising effective countermeasures. In order to avoid occupational exhaustion, a moderate level of work intensity must be maintained for both frontline and non-frontline HWs. Under the special infection prevention and control measures established during the pandemic, patients were treated in isolated spaces, especially during the early stage of the pandemic. Due to a lack of social support, more psychosocial interventions should have been provided to frontline medical staff, and remote psychological counseling services would have benefited HWs. During the pandemic, the public was required to maintain social distancing rules. Even HWs had to quarantine at home during non-working hours. During this period, workers had to maintain exercise routines and avoid focusing on negative information related to the pandemic.

Active mind–body therapies (AMBT), such as meditation, yoga, Tai Chi, and Qigong, are considered helpful practices for improving HWs' mental and physical health. Previous studies have shown that AMBT had certain therapeutic effects for those suffering from PTSD (Van der Kolk et al., 2014; Polusny et al., 2015; Duan-Porter et al., 2016; Possemato et al., 2016). Mind–body therapy can also alleviate the physical and psychological symptoms suffered by PTSD patients, allowing them to actively cope with pain and enhance their ability to practice healthy living habits (Possemato et al., 2016; Niles et al., 2018). In addition, these self-help physical and mental interventions can help HWs take their attention off stressors and initiate an active health enhancement cycle (Niles et al., 2018). Because of their low cost and simplicity, they are considered effective methods of supplementary intervention during a pandemic.

Strengths and Limitations

This study constitutes the first systematic review of research on Chinese healthcare workers' mental health, and the study synthesized the prevalence of anxiety, depression, and stress disorders among HWs through a meta-analysis. Meta-analysis

was used to explore the prevalence of psychological problems among HWs in different periods of the COVID-19 outbreak, and the research results have reflected changes in the mental states of Chinese HWs.

This review adopted relatively strict criteria of inclusion and exclusion. However, due to the characteristics of observational studies conducted during the pandemic, the studies covered in this review were significantly heterogeneous. This heterogeneity derives from the following aspects: the small sample capacity of some studies, the adoption of non-random sampling methods, and the use of survey scales with differing degrees and units of measurement. There was only one longitudinal study included in this review. Through analysis, it was found that longer-term follow-up and observation of the changes in the mental states of HWs are necessary. If possible, more longitudinal studies should be conducted. It is advisable for future longitudinal research to compare the psychosocial problems caused by the COVID-19 outbreak in different countries and regions as well as the similarities and differences in how countries coped with the effects of the outbreak. Such an approach would enable a more comprehensive understanding of the profound impact of the COVID-19 pandemic.

CONCLUSION

The Chinese HWs in the COVID-19 pandemic were prone to psychosocial problems; nearly one-third of HWs had different degrees of anxiety, depression, and stress disorder. Nurses and those working in Hubei Province had a higher prevalence of anxiety and depression. More longitudinal studies should be conducted to explore the mental health of HWs in different periods of the COVID-19 pandemic. People should be able to get help to cope with the psychological impact resulting from the pandemic.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

FD and J-pL designed the systematic review. FD and H-lL participated in searching, selecting studies, data extraction, and bias risk assessment and contributed to performing data analyses and the first draft of the manuscript. FD, H-lL, MY, C-lL, ND, YZ, NR, and J-pL were all involved in advising and critically revising the manuscript. All authors have read and approved the final manuscript.

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FD and H-lL had full access to the data, and all authors had final responsibility for the decision to submit for publication.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.645460/full#supplementary-material

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Impacts of COVID-19 on the Life and Work of Healthcare Workers During the Nationwide Partial Lockdown in Vietnam

Quan Thi Pham[1†], Xuan Thi Thanh Le[1†], Tam Chi Phan[2], Quang Nhat Nguyen[3,4], Nhung Kim Thi Ta[1], Anh Ngoc Nguyen[1], Thao Thanh Nguyen[1], Quynh Thi Nguyen[1], Huong Thi Le[1], Anh Mai Luong[5], David Koh[6,7], Men Thi Hoang[3,8], Hai Quang Pham[3,8], Linh Gia Vu[3,8], Trang Ha Nguyen[3,8], Bach Xuan Tran[1,9], Carl A. Latkin[9], Cyrus S. H. Ho[10] and Roger C. M. Ho[11,12,13]*

[1] Institute for Preventive Medicine and Public Health, Hanoi Medical University, Hanoi, Vietnam, [2] School of Pharmacy, University of Southern California, Los Angeles, CA, United States, [3] Institute for Global Health Innovations, Duy Tan University, Da Nang, Vietnam, [4] UFR Biosciences Department, Université Claude Bernard Lyon 1, Villeurbanne, France, [5] Viet Nam Health Environment Management Agency, Ministry of Health, Hanoi, Vietnam, [6] Pengiran Anak Puteri Rashidah Sa'adatul Bolkiah (PAPRSB), Institute of Health Science, Universiti Brunei Darussalam, Gadong, Brunei, [7] Saw Swee Hock School of Public Health, National University of Singapore, Singapore, Singapore, [8] Faculty of Medicine, Duy Tan University, Da Nang, Vietnam, [9] Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD, United States, [10] Department of Psychological Medicine, National University Hospital, Singapore, Singapore, [11] Center of Excellence in Evidence-Based Medicine, Nguyen Tat Thanh University, Ho Chi Minh City, Vietnam, [12] Department of Psychological Medicine, Yong Loo Lin School of Medicine, National University of Singapore, Singapore, Singapore, [13] Institute for Health Innovation and Technology (iHealthtech), National University of Singapore, Singapore, Singapore

Background: Healthcare workers are frontline responders facing a disproportionate increase in occupational responsibilities during the COVID-19 pandemic. Added work-related stress among healthcare personnel may lead to personal and work-related repercussions, such as burnout or decreased quality of care for patients; however, little is known about how the COVID-19 pandemic affects the daily work and life of these workers. This study aimed to evaluate the personal and occupational impacts of the COVID-19 induced partial lockdown in Vietnam among hospital staff.

Methods: A cross-sectional web-based study was carried out to collect demographic data and the personal and job impacts of respondents during the second week of national lockdown in April 2020. Snowball sampling technique was applied to recruit 742 hospital staff. The exploratory factor analysis (EFA) was used to examine the validity of the instrument.

Results: Of the 742 respondents, 21.2% agreed that "working attitude well-maintained," followed by 16.1% of respondents who reported that there were "enough employees at work." Only 3.2% of respondents agreed that "their work was appreciated by society." Furthermore, healthcare workers in the central region were less likely to have experienced "Avoidance of disclosure and discrimination related to COVID-19" than other areas (Coef. = − 0.25, CI: −0.42 to −0.07). Being women also had a negative association with scores in "Avoidance of disclosure and discrimination related to COVID 19" domain (Coef. = −0.27, CI: −0.43 to −0.12) while having a positive association with "negative

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Aristidis M. Tsatsakis, University of Crete, Greece

***Correspondence:**
Men Thi Hoang
hoangthimen@duytan.edu.vn

[†] These authors have contributed equally to this work

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attitude towards working conditions" domain (Coef. = 0.19, CI: 0.09 to 0.3). In addition, working in administrative offices (Coef. = 0.20; 95% CI = 0.05 to 0.36) and infectious departments (Coef. = 0.36; 95% CI = 0.09 to 0.63) had a positive association with "Increased work pressure due to COVID 19" domain.

Conclusion: These findings revealed marginal impacts of the COVID-19 pandemic on the work and life of hospital staff in Vietnam. Furthermore, this study highlighted the importance of implementing preventive strategies during the nationwide partial lockdown to manage hospital admissions and the burden on healthcare workers. Finally, this study characterizes targeted demographics that may benefit from appreciation by employers and society during a national pandemic.

Keywords: COVID-19, psychosocial impact, occupational impact, working conditions, healthcare workers, Vietnam

INTRODUCTION

The WHO has declared the COVID-19 pandemic as a global health emergency (WHO, 2020). As of June 20, 2021, there were 178,965,216 confirmed cases and 3,875,688 deaths across 210 countries, of which the United States (US) had been identified as the hardest hit by this pandemic (Worldometer, 2020). The unprecedented turbulence caused by COVID-19 has crippled health systems worldwide within months and generated tremendous pressure on multiple aspects of the lives of millions of people, particularly healthcare workers (Chew et al., 2020; Tran et al., 2020b). Due to working conditions that require close contact with patients with SARS-CoV-2, the virus that causes COVID-19 and its respiratory transmission mechanism, healthcare workers are more susceptible to SARS-CoV-2 infections. For instance, 20% of medical workers in Italy were infected with the virus, and more than 54 doctors died due to COVID-19 by the end of March. As of April 9, 2020, the Centers for Disease Control and Prevention (CDC) reported approximately 9,282 infections among healthcare workers and 27 deaths in the US (Cdc, 2020).

Understanding the impact of the COVID-19 pandemic among healthcare workers can guide policies and interventions that aim to maintain the attitude and psychological wellbeing of these workers (Konstantinos et al., 2021). Previous studies evaluating health-related effects of the pandemic revealed significantly increased incidence of anxiety and stress within the workforce (Agency, 2020; Huang et al., 2020; Lai et al., 2020; Lima et al., 2020). Regarding working challenges, Schwartz et al. (2020) indicated that, in China, the fear of being infected and work-related pressure were the key motivations for several healthcare workers to find other jobs (Schwartz et al., 2020). In contrast, Chen et al. (2020) showed that SARS-CoV-2 infection was not an immediate concern of healthcare workers, since they had already considered such a scenario in their decision to serve in the hospitals. In addition, the healthcare workers expected that their families would sympathize with their working environment and not be obsessed with the probability of being infected by them; however, healthcare staff admitted that they felt insecure due to the shortage of personal protective equipment (PPE). They also reported feeling helpless when treating severe patients with poor prognoses (Anderson et al., 2020; Chen et al., 2020). Many healthcare staff also expressed their need to have more breaks and better access to PPE. In addition, healthcare workers may require additional training to address situations in which patients refuse to isolate themselves in the hospitals or do not comply with medical protocols because of anxiety or lack of knowledge in patients about COVID-19 (Anderson et al., 2020; Chen et al., 2020). Recently, a systematic review found some psychological impacts on healthcare workers; thus, early psychological intervention is needed for protecting healthcare workers against the COVID-19 pandemic (Hooper et al., 2021).

Within the context of Vietnam, at the time of writing this artcile, five hospitals were epicenters of COVID-19 outbreaks (Ministry of Health of Vietnam, 2020b): Bach Mai Hospital, C Da Nang Hospital, VietNam National Cancer Hospital, National Hospital for Tropical Diseases, and Ho Chi Minh Hospital for Tropical Diseases (Vietnam, 2020). Given limited financial and human resources for healthcare, alongside the underdeveloped health infrastructure in Vietnam, Vietnamese healthcare workers might face adversities, including shortage of PPE, increased workload, and added responsibilities (Dang et al., 2020; Tran et al., 2020a). During the nationwide partial lockdown, healthcare workers spent more time at the hospitals, which might cause a lack of contact with their families, isolation, burnout, frustration, and discrimination (Dang et al., 2020; Kang et al., 2020a; Le et al., 2020).

To our knowledge, prior studies assessed the epidemiological prevalence, clinical characteristics of confirmed COVID-19 cases, and challenges in managing health sequelae; however, limited research has been available on the impacts of COVID-19 on the life and work of healthcare workers in Vietnam. Therefore, this study aims to examine how COVID-19 impacts the work-life quality of hospital staff. These findings may provide useful insights for informing future health policies aiming to tailor support for healthcare workers in the fight against this unpredictable pandemic.

METHODS

Study Design

A cross-sectional, hospital-based survey was carried out during 1 week of nationwide partial lockdown, particularly, from April 7 to 14, 2020, in Vietnam. The rationale for conducting research within this duration was that it overlapped with a full lockdown at Bach Mai Hospital that was implemented to mitigate the transmission of COVID-19. This period was considered a challenging time for hospital staff nationwide, as a leading hospital, equipped with modern and adequate equipment, becoming the largest pandemic cluster in the country. Thus, it was necessary to perform a rapid assessment to capture the impacts of the pandemic on the life and work of this forefront workforce.

Sample Size and Sampling Method

The snowball sampling technique was applied to recruit respondents. At the beginning of the recruitment process, a core staff group at the Institute of Preventive Medicine and Public Health, Hanoi Medical University was established. By providing the link to the survey through the computers or smartphones of the respondents, the core group was able to access their close contacts or other groups on social media networks, such as Facebook, Zalo applications. The key persons who had been involved in the study were instructed to invite other Vietnamese medical staff to join in the survey. Respondents were recruited according to the following inclusion criteria: (1) agreeing to engage in the research by approving the online informed consent forms, (2) being able to access the questionnaire on an online platform, namely, Surveymonkey, and (3) being able to read and answer the questionnaire. In this study, hospital staff were defined as healthcare workers serving in the hospitals, including doctors, nurses, and administrative staff. A total of 742 hospital staff working in 63 provinces of Vietnam were selected for this study during 1 week of data collection.

Measure and Instruments

A self-reported questionnaire consisting of 24 questions in the form of single-choice, multiple-choice, and open-ended questions on the effects of the COVID-19 pandemic on the personal lives and works of healthcare staff were sent to the respondents. The questionnaire was developed according to the one used for assessing life and job impacts due to the SARS pandemic (Koh et al., 2005).

Demographic Characteristics

We included questions to measure sociodemographic characteristics, such as age, gender (men/women), marital status (single/separated/windowed/married), educational level, and living areas (north/central/south).

Occupational Characteristics

Participants were asked about their current title (doctors/nurses/medical technicians/pharmacists/drivers/receptionists/administrative staff/others) and current work status, including years of experience, working places, and level of the hospitals they served.

Information Regarding the Impact of COVID-19 on the Personal Life and Work of Healthcare Workers

To identify the impacts of COVID-19 on the life and work of hospital staff, we asked the respondents to report their experiences related to COVID-19 using 14 multiple-choices questions, namely the following: (1) "I have to do work that I normally do not do"; (2) "I have additional workload"; (3) "I have to work overtime"; (4) "I feel more stressful at work"; (5) "there is conflict among colleagues"; (6) "I have been afraid of telling my family about the risk of exposure to SARS-CoV-2"; (7) "People avoid me because of my job"; (8) "I avoid telling other people about the nature of my job"; (9) "People avoid my family members because of my job"; (10) "my working attitude is not well maintained"; (11) "there are insufficient employees at my workplace to handle the different demands"; (12) "I do not feel appreciated by the hospital/clinic/my employer"; and (13) "I do not feel appreciated by the society." Each question had five options to respond (1 indicates "strongly disagree," 2 indicates "slightly agree," 3 indicates "somewhat agree," 4 indicates "mostly agree," and 5 indicates "totally agree").

Finally, the participants were asked to report their perceptions on the necessity of means of support (food and other necessities, PPE) and the sources of support (family/friends and relatives/colleagues/workplace/government/organizations, and other philanthropists) that they would like to receive.

Data Analysis

The data were analyzed using STATA 15.0 software (StataCorp LP, College Station, TX, USA). Descriptive statistics were used to report characteristic data covering mean, SD, percentage, and frequency. The exploratory factor analysis (EFA) was applied to assess the construct validity and define interpretable underlying sub-domains of measurement regarding perceived impacts of COVID-19 on the life and work of health workers. We also employed principal component analysis to extract said domains. A threshold defined by the screen test was set at an eigenvalue of 1.5. tTo increase the interpretability of sub-domains of the measurement, we used Orthogonal Varimax rotation with Kaisers' normalization to reorganize items in scales. The minimum factor loading cut-off point of this study was set at 0.43. A cross-loading in one item was performed and then assigned to the appropriate domain according to the overarching dimension and nature of the question. There were three sub-domains identified by EFA, namely the following: (1) avoidance of disclosure and discrimination related to COVID-19 (4 questions), (2) negative attitude towards working conditions (4 questions), and (3) increased work pressure due to COVID-19 (5 questions). Cronbach's alpha described the internal consistency reliability of each domain. Subsequently, we applied a multivariable regression model to identify associated factors within each domain of the EFA. To obtain reduced models, stepwise forward selection strategies were performed with a threshold of log-likelihood ratio test was equal to a p-value of 0.2. A p-value of <0.05 was considered statistically significant.

Ethical Consideration

The research was ethically approved by the Review Committee at the Institute for Preventive Medicine and Public Health, Hanoi Medical University, dated March 28, 2020. The purpose of the research and informed consent was written and obtained online from respondents, who decided to participate. Participation was voluntary, and anonymity was assured. Respondents could decline to participate or withdraw from the online survey at any time.

RESULTS

The sociodemographic characteristics of the respondents are presented in **Table 1**. Among 742 respondents who completed the survey, the majority were married (78.7%), living with family or friends (91.9%), and working in the North (71.6%). Approximately two-thirds (65.8%) of the respondents were women; the mean age was 36.3. Regarding occupational characteristics, approximately half of the respondents (51.1%) were doctors, followed by nurses (28.0%), and other titles, including technicians, pharmacists, and receptionists (20.9%); their accumulated working years were 11.4 (SD = 8.8 years) on average. Health staff serving at provincial hospitals and central hospitals accounted for 31.3 and 29.1% of the respondents, respectively.

Table 2 depicts the construct validity of the questionnaire with respect to the impacts of COVID 19 on the life and work of hospital staff. Three domains, namely "Avoidance of disclosure and discrimination related to COVID 19," "Negative attitude towards working conditions," and "Increased work pressure due to COVID 19" were determined from the EFA. The reliability of the three mentioned domains was good, with Cronbach's alpha values being 0.78, 0.80, and 0.81, respectively. **Table 2** also presents the proportion of participants who responded "Totally agree" with each item. The highest percentage was for item "Have to do work which never been done" (4.6%), while the item "Working attitude not maintained well" (0%) had the lowest percentage.

Table 3 displays the perception of support provided during the pandemic. The majority of respondents reported that the primary sources of providing them with necessary goods were their family, and friends and relatives (91.7 and 81.7%, respectively). Regarding PPE support, 95.1, 86.3, and 85.1% of respondents agreed that it should be provided by the workplace, the government, and other organizations, respectively. Most of the respondents said that it was necessary to organize morale-building activities to support them in the battle against COVID-19.

Factors associated with the perception of COVID-19 impact on life and work are presented in **Table 4**. Being women (Coef. = – 0.27; 95% CI = −0.43 to −0.12), working in the administrative office (Coef. = – 0.29; 95% CI = −0.5 to −0.07) and preventive medicine-public health-nutrition departments (Coef. = −0.32; 95% CI = −0.54 to −0.09) and working in the central region (Coef. = −0.25; 95% CI = −0.43 to −0.07) had a negative correlation with "avoidance of disclosure and discrimination related to COVID-19." Those who agreed that their friends and relatives were the sources of providing PPE (Coef. = 0.22; 95% CI = 0.07 to 0.38) had a negative association with "avoidance of disclosure and discrimination related to COVID-19," while receiving PPE from the government had a positive association with this domain (Coef. = −0.29; 95% CI = −0.51 to −0.06).

Female hospital staff (Coef. = 0.19, 95% CI = −0.09 to 0.3) were associated with increased scores in the "Negative attitude towards working conditions" domain. In contrast, being married (Coef. = −0.18, 95% CI = −0.29 to −0.06) and organizing advocacy activities (Coef. = −0.18, 95% CI = −0.24 to −0.12) were negatively associated with scores in this domain.

TABLE 1 | Sociodemographic characteristics of respondents.

	N	%
Region		
Northern	531	71.6
Central	149	20.1
South	62	8.4
Gender		
Men	254	34.2
Women	488	65.8
Marital status		
Single / Separated / Widowed	158	21.3
Married	584	78.7
Living with		
Family/friends	682	91.9
Alone	60	8.1
Education		
University and lower	453	61.1
Master/PhD	289	39.0
Job title		
Doctor	379	51.1
Nurse	208	28.0
Others	155	20.9
Department		
Emergency-Intensive care	63	8.5
Internal medicine	95	12.8
Surgery-Obstetrics-Pediatrics	91	12.3
Imaging Diagnosis-Scientific laboratory—Clinic	119	16.0
Administrative offices	110	14.8
Infectious disease-Infection control	42	5.7
Preventive medicine-Public Health-Nutrition	86	11.6
Others	136	18.3
Level of hospital		
Central level	216	29.1
Provincial level	232	31.3
District health center	101	13.6
Others	193	26.0
	Mean	**SD**
Age (years)	36.3	9.1
Years of career (years)	11.4	8.8

TABLE 2 | Impact on life and work of respondents due to COVID-19.

Item	Totally agree		Avoidance of disclosure and discrimination related to COVID-19	Negative attitude towards working conditions	Increased work pressure due to COVID- 19
	n	%			
Have to do work which never been done	16	4.6			0.83
Have to work overtime	14	4.0			0.87
Increased workload	14	4.0			0.84
Do not dare to tell your family about your risk	12	3.4	0.64		
Being avoided because of work	6	1.7	0.82		
Avoid sharing information about own job	6	1.7	0.74		
Relatives being avoided because of work	5	1.4	0.83		
More stressful at work	4	1.2			0.55
There is conflict between colleagues	3	0.9			0.48
There are not enough employees at work	1	0.3		0.78	
Not be appreciated by the unit leader	1	0.3		0.80	
Not be appreciated by society	1	0.3		0.74	
Working attitude is not maintain well	0	0.0		0.79	
Cronbach's alpha			0.78	0.80	0.81
Mean			2.7	2.3	2.3
SD			0.7	0.5	0.6

TABLE 3 | Perception of the support provided during the COVID-19 pandemic.

	n	%
Provided with necessary goods		
From family	320	91.7
From friends and relatives	285	81.7
From colleagues	269	77.1
From workplace	289	82.8
From the Government	291	83.4
From organizations and other philanthropists	277	79.4
Provided with adequate personal protective equipment		
From family	191	54.7
From friends and relatives	183	52.4
From colleagues	221	63.3
From workplace	332	95.1
From the Government	301	86.3
From organizations and other philanthropists	297	85.1
Organize advocacy activities	319	91.4

Age (Coef. = 0.01, 95% CI = 0.00 to 0.02), working in the administrative office (Coef. = 0.2, 95% CI = 0.05 to 0.36), and the infectious diseases-infection control department (Coef. = 0.36, 95% CI = 0.09 to 0.63), and being provided with necessity goods from the workplace (Coef. = 0.28, 95% CI = 0.07 to 0.49) were factors positively associated with "Increased work pressure due to COVID-19." Meanwhile, educational achievement being Masters or PhD (Coef. = −0.17, 95% CI = −0.31 to −0.03) and being provided with necessity goods from friends and relatives (Coef. = −0.29, 95% CI = −0.50 to −0.07) were negatively associated with "Increased work pressure due to COVID 19."

DISCUSSION

The virus SAR-CoV-2 can be transmitted in different ways, and all populations are susceptible to the virus (Xue-Yan Zhang et al., 2020). Patients suffering from COVID-19 diseases can have mild to life-threatening symptoms, such as acute respiratory symptoms (Aristides Tsatsakis et al., 2020). Neurological complications were also reported among COVID-19 patients (Pennisi et al., 2020).

To our knowledge, this study is among the first to assess the impact of the COVID-19 pandemic on the personal life and work of healthcare staff in Vietnam. Contrary to this hypothesis, however, the results showed that the life and work of healthcare staff were marginally affected by the pandemic. This result might be attributed to vigorous policy and actions of the Vietnamese government to control the pandemic. From these results, we have identified baseline and occupational demographics that need additional morale and employer support during the pandemic.

This study indicated that only 3.4% of respondents did not dare to share the risk of COVID-19 infection with their families, and 1.2% of them suffered from more work-related stress than before. The results contrasted with research in Wuhan, China. In Wuhan, when the COVID-19 epidemic spread, healthcare workers felt stressed and experienced serious mental problems; however, they were less likely to share their problems with their families (Kang et al., 2020b). A possible explanation for this difference is that the Vietnamese government responded rapidly, quarantined infected people, kept their indirect connections under surveillance, and mobilized existing resources at the early stages of the outbreak in January (Tran et al., 2020a,c). These necessary actions by the government minimized the burden on the health system, kept COVID-19 under control, and ultimately reduced the pressure on medical staff at the later stages of the outbreak (Black, 2020).

TABLE 4 | Multivariate regression for identifying factors associated with perception on life and job impacts due to COVID-19.

	Avoidance of disclosure and discrimination related to COVID-19		Negative attitude towards working conditions		Increased work pressure due to COVID-19	
	Coef.	**95% CI**	**Coef.**	**95% CI**	**Coef.**	**95% CI**
Region (vs. North)						
Central	−0.25***	−0.43; −0.07				
Gender (vs. men)						
Women	−0.27***	−0.43; −0.12	0.19***	0.09; 0.30		
Years of career (years)	−0.01	−0.01; 0.00				
Job title (vs. doctor)						
Nurse	0.14	-0.03; 0.32	−0.10	−0.22; 0.02	−0.14*	−0.28; 0.01
Others	0.19*	−0.01; 0.38				
Level of hospitals (vs central level)						
District health center	−0.15	−0.37; 0.07			0.12	−0.05; 0.29
Others	−0.14	−0.31; 0.03				
Marital status (vs. single/separated/widowed)						
Marriage			−0.18***	−0.29; −0.06		
Age					0.01***	0.00; 0.02
Education (vs. university and lower)						
Master/PhD					−0.17**	−0.31; −0.03
Living with (vs. family/friends)						
Alone					−0.13	−0.33; 0.07
Department (vs. emergency-intensive care)						
Internal medicine					0.14*	−0.03; 0.32
Administrative offices	−0.29***	−0.50; −0.07			0.20**	0.05; 0.36
Infectious disease-Infection control			0.18	−0.06; 0.42	0.36**	0.09; 0.63
Preventive medicine-Public health-Nutrition	−0.32***	−0.54; −0.09	0.11	−0.04; 0.27		
Others	−0.19*	−0.38; 0.00				
Provided with necessary goods (agree vs not agree)						
From family	0.23	−0.09; 0.54				
From friends and relatives	−0.24*	−0.50; 0.01			−0.29***	−0.50; −0.07
From colleagues					0.24**	0.03; 0.46
From workplace	0.23*	−0.01; 0.47			0.28***	0.07; 0.49
Provided with adequate personal protective equipment (agree vs. not agree)						
From friends and relatives	0.22***	0.07; 0.38				
From the Government	−0.29**	−0.51; −0.06				
From organizations and other philanthropists					0.15*	−0.01; 0.32
Organized advocacy activities (agree vs. not agree)			−0.18***	−0.24; −0.12		

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Noticeably, only 3.2% of respondents agreed that their work was appreciated by society. In Vietnam, healthcare workers often function in high-pressure environments but receive lower income compared with their counterparts in developed countries. The lack of financial incentives might lead healthcare workers to feel that their work is unappreciated by society. This result contrasted with the research of Koh in Singapore during the SARS epidemic (Koh et al., 2005). In Koh's study, 77% of health workers responded that they felt society highly appreciated their works. This finding implied the need for social encouragement towards Vietnamese healthcare workers, especially during the partial lockdown period.

The majority of respondents agreed that being provided necessary goods (by their family) and PPE (by their workplace) would help them overcome additional occupational burden of the pandemic. This positive attitude about COVID-19 was in line with the findings of Huynh Giao et al. (2020). A plausible reason for these results is that Vietnam had recorded more than 200 cases without mortality, and most of the confirmed cases were imported during this survey period (Ministry of Health

of Vietnam, 2020a). Providing adequate, necessary goods and support for PPE to health workers were considered as important factors in addressing their concerns about the risk of COVID-19 infection to themselves and their families (Dewey et al., 2020).

Our study indicated that healthcare workers in the central region were less likely to experience "avoidance of disclosure and discrimination related to COVID-19" than those working in other areas. An explanation for this result could be that community spread and confirmed cases of COVID-19 were concentrated in Hanoi and Ho Chi Minh City, two metropolitan cities in the north and the south of Vietnam, respectively. As a result, the risk of infection for health workers in the central region was lower than in other regions.

Female hospital staff had a negative association with scores of "avoidance of disclosure and discrimination related to COVID-19" domain and a positive association with "negative attitude towards working conditions" domain. An explanation for this result could be that women were willing to share their difficulties with others, and therefore, regarded as better adapted to the situation once they disclosed their problems (Derlega and Chaikin, 1976); however, these workers tended to have more negative score associations compared to male men participants. This was similar to the result of Wenham et al. (2020), which showed that women suffered more serious mental challenges than men during the COVID-19 pandemic. A possible reason was that the closure of schools to curb the spread of the virus increased domestic chores and responsibilities for women. Therefore, women healthcare workers had to strive to maintain work–family balance, which might lead to burnout and negative attitudes towards working conditions among women healthcare workers (Alon et al., 2020; Wenham et al., 2020).

Hospital staff face infection risks from both positive and asymptomatic patients because of their close, frequent contacts and longer-than-usual working hours in this pandemic (Li et al., 2003; Shih et al., 2007). Findings in this study showed that healthcare workers working in administrative offices and infectious departments had "Increased work pressure due to COVID-19" compared to those working in the emergency-intensive care department. This finding was understandable in the context of Vietnam, given that COVID-19 patients had mainly mild symptoms, with few severe cases requiring intensive care. As a result, hospital staff working in the emergency-intensive care unit would not be as overloaded as those working at the two mentioned departments. Married healthcare workers and those who agreed to organize advocacy activities were also less likely to have "negative attitude towards working conditions" than other groups. This finding was similar to a study in China, showing that family activities and entertainment increased morale and the quality of life in people struggling with the COVID-19 epidemic (Zhang and Ma, 2020). Our findings implied the need for increased family and social support for healthcare workers during pandemics like COVID-19.

This research has several strengths. One of these strengths is that this study is among the first to evaluate the impact of the COVID-19 pandemic on the personal life and work of health care workers in Vietnam during its first nationwide partial lockdown. Another strength is that this study elucidated factors associated with the personal and occupational impacts of the COVID-19 pandemic. Apart from the strengths mentioned above, this study contained several limitations. First, more than half of the study respondents were doctors and hospital staff that worked in northern Vietnam, suggesting sampling bias since this could not fairly represent the distribution of Vietnamese healthcare workers. Second, participants were recruited *via* a snowball sampling method and the survey was administered as a web-based survey, rather than random selection from a nationally represented sample frame. Third, the survey lasted for only 1 week, and might not fully capture the significant impact of the pandemic on the lives and work of respondents. Fourth, online self-reporting might cause recall bias and social desirability response biases. Overall, a cross-sectional design was unable to identify the longitudinal relationships between associated factors and their outcomes.

CONCLUSION

Contrary to previous literature and media anecdotes, this study indicated marginal impacts of the COVID-19 pandemic on the work and life of hospital staff during an unprecedented lockdown in Vietnam. This study also supported the intensive preventive and control measures at the early stages of the pandemic from the Vietnamese government that mitigated transmission of COVID-19 while decreasing the probability of drastic hospital admissions and severe diseases. From these results, we have identified baseline and occupational demographics that need additional morale and employer support during the pandemic. Healthcare workers those who are women, have single marital status, working in a non-central area of Vietnam, and do not work in the emergency-intensive care department should have more support from their employers and community.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The research was ethically approved by the Review Committee at Institute for Preventive Medicine and Public Health, Hanoi Medical University dated 28 March 2020. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

Conceptualization and writing—review and editing: QP, XL, TP, QN, NT, AN, TN, QN, HL, AL, DK, MH, HP, LV, TN, BT, CL, CH, and RH. Data curation: NT, QN, and TN. Data analysis: QP, XL, LV, and HP. Methodology: QP, XL, HL, AN, DK, and

BT. Supervision: XL, HL, BT, AL, and RH. Writing, original draft: QP, XL, TP, and QN. Project administration: QN, MH, and TN. All authors contributed to the article and approved the submitted version.

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