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Mental health in healthcare workers and its associations with psychosocial work conditions

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Mental health in healthcare workers and its associations with psychosocial work conditions

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Editorial: Mental health in healthcare workers and its associations with psychosocial work conditions

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Editorial on the Research Topic
Mental health in healthcare workers and its associations with psychosocial work conditions

Working conditions impact the mental health of healthcare workers (HCWs) and vice versa (1). This may affect safety in the exercise of the activities to be carried out, which could lead to a greater number of accidents at work and the quality of the service provided (2).

The mental health of HCWs is reported to be impaired to a greater or lesser extent in all countries of the world. Each country has its idiosyncrasies, and different levels of care for HCWs are applied within different countries and regions. At the same time, each job is unique and changing (3). Of particular relevance in this regard is the change in many of the working conditions of healthcare providers worldwide in their efforts to combat the effects of the COVID-19 pandemic (4).

The studies included within this Research Topic bring attention to how the mental health of HCWs has been assessed differently across contexts, from East to West.

Only one study was conducted in Africa, where Traoré et al. found that 3 out of 10 HCWs had high-stress levels, mainly due to the risk of being exposed to contamination and being the focus of contamination.

In Europe, the study by Bosma et al. is highlighted. It was carried out in the northern area of the Netherlands, and the total scores for anxiety during the COVID-19 pandemic were similar for HCWs and non-HCWs. This differs from the results reported by van der Noordt et al. during the first year of the pandemic in the same country. On its part, the study by Rypicz et al. showed that the level of education in healthcare correlated with a higher likelihood of experiencing stress and burnout, especially among nurses. In Germany, a study was carried out on healthcare assistants by Schrader et al. where, in March/April 2020, 29.5% of respondents reported feelings of very high or high psychological distress due to concerns about the patient's health, uncertainty about the new disease, work/family balance, and fear of infecting family members with COVID-19.

In turn, Echeverria et al. conducted a longitudinal study in Spain (April-May 2020 and September-October 2021) in which 29.5% of the sample felt that their mental health had improved during this time, 47.7% said it had not changed, and 22.7% reported that their mental health had worsened. Meanwhile, in Italy, 46.5% of HCWs working in vaccination centers reported that they had been victims of violence during the vaccination campaign, of which 35.5% of cases may have been related to a possible post-traumatic stress reaction, according to Brunelli et al..

In China, the study by Lv et al. showed that 64.71% of HCWs considered their occupational stress high or very high, with overly intense work as the primary stressor, being the prevalence of anxiety and depression among the HCWs of 45.2 and 41.4%, respectively, such as in the study of Liu et al.. In another sample of HCWs, the prevalence of symptoms of depression and anxiety among primary health care workers was 67.3% and 55.5%, respectively, with stress, social support, and self-efficacy being influential factors, according to Dong et al.. These data align with Cai et al.'s findings in primary care centers, where the burnout rate was 59.87%, influenced by work environment, professional pride, work intensity, and salary. In the study by Huang R. et al., 78.3% of resident physicians had experienced at least one traumatic event, with the rate being higher in subjects aged 26–30 years, females, and those with a higher number of working hours. Working hours were also positively associated with occupational stress in the study by Lu et al.. As expected, the results found by Xue et al. showed that nurses with burnout imagined fewer specific future events, positive events, and events related to relationships and achievement compared to nurses without burnout. Intention to rotate was another factor examined in this country, where 56% of nurses had a high intention to rotate, according to Zhang et al.. In turn, Qi et al. showed that mentally passive sedentary time was associated with psychological distress and insomnia. Regarding quality of life, most Chinese HCWs had a fair perception, which could be modified by night shifts, aerobic exercise, and personality traits, as reported by Huang J. et al.. In the case of Bai et al., the importance of an appropriate leadership style in reducing burnout was noted.

In Korea, according to Kim et al., 28.0% of nurses had moderate depression, while 9.6% had severe depression, associated with high levels of interleukin-6, interleukin-8, and interleukin-18, and low levels of interferon-gamma.

In another study by Yacoubian et al. on medical students in Lebanon, prevalence rates of high burnout were 37.2% for disengagement and 51.1% for exhaustion. Along the same lines, a study conducted by Thu Pham et al. on HCWs in Vietnam reported a prevalence of symptoms of depression, anxiety, and stress of 19.2%, 24.7%, and 13.9%, respectively. Factors such as shift work during the pandemic, caring for patients with COVID-19, and staff health status were associated with mental health problems. In Qatar, according to the study by Al-Qudimat et al., psychological, social, and workplace effects were shown to be significantly related to marital status, career, and hospital setting, while dealing with COVID-19 patients, level of education, and working hours were related to clinical safety.

In Turkey, Sarigül et al. assessed the relationships between general job stress, suicidal ideation, hopelessness, and job satisfaction.

In Australia, a study was carried out on frontline HCWs during the COVID-19 pandemic (Omicron wave) by En Chyi Lee et al.. It was found that 18.1% were identified as likely to have a mental health condition, and a further 15.3% were identified as having low wellbeing, with concerns about COVID-19 infection, relational stress, and younger age as risk factors.

A study carried out in four Latin American countries by Bonilla-Asalde et al. showed that the greater the fear of COVID-19, the greater the preventive behavior of HCWs toward COVID-19 infection. In Peru, a study on nurses was carried out by Soriano-Vázquez et al., where a positive relationship was found between emotional intelligence, conflict management, and job satisfaction. Another study on nurses by Morales-García et al. was conducted, which found that work engagement played a key mediating role between depression, self-efficacy, job performance, and life satisfaction. Meanwhile, in Brazil, Spröesser Alonso et al. found that 72.6% of the study participants experienced psychological distress.

A systematic review by Rizzo et al. found that nurses' burnout scores did not differ significantly before and during the pandemic. In the study by Yasin et al., 69.6% of nurses were satisfied with the personal, environmental, and psychological factors influencing their job satisfaction during the COVID-19 pandemic. Finally, García-Iglesias et al. identified several factors influencing mental health and sickness presenteeism during the COVID-19 pandemic, such as factors related to mental health, individual factors, factors related to the situation caused by COVID-19, and factors derived from working conditions.

Therefore, the mental health of HCWs can be affected in many ways: with symptoms of anxiety, depression, burnout or fear, poor wellbeing, mental and physical fatigue, low perception of health-related quality of life and self-perceived health, favoring practices such as presenteeism, poor work performance, and low job satisfaction, among others.

The conclusions drawn from the studies included in this Research Topic can be summarized as follows:

- The COVID-19 pandemic caused high stress among HCWs, although burnout scores did not differ significantly before, vs. during the pandemic.
- In addition to work-related factors, other social, individual, and organizational factors can influence the mental health and wellbeing of HCWs.
- Factors such as night shifts, working hours, caring for patients with COVID-19, staff health status, aerobic exercise conditioning, and personality traits may affect the mental health of HCWs.
- Psychological support for health center workers in responding to future epidemics would improve their mental health.

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administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. MY: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. JG-S: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. Y-SG: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Assessment of selected psychosocial risk factors: stress, job burnout, and bullying in the case of medical staff as part of workplace ergonomics during the COVID-19 pandemic—A prospective pilot study

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Background: The purpose of the pilot study conducted by the authors was to assess occupational risk in selected areas of psychosocial risk factors among health professions in a pilot study. Medical staff working in the healthcare sector experience stress, job burnout and bullying on a daily basis. Monitoring occupational risks in the above areas provides an opportunity to take appropriate preventive measures.

Methods: The prospective online survey included 143 health care workers from various professional groups. Eighteen participants did not complete the survey, and the results of 125 participants were eventually included in the analysis. The study used health and safety questionnaires in the healthcare sector, which are not widely used as screening tools in Poland.

Results: The following statistical methods were performed in the study: the Mann-Whitney test, Kruskal-Wallis test, Dunn's test. In addition, multivariate analysis was performed. The results obtained in the study indicate that the questionnaires used in the study can be widely used by employers or occupational medicine as screening tools.

Conclusions: Our findings show that level of education attainment in healthcare is correlated with higher chance of experiencing stress and burnout. Among the surveyed professions, nurses reported a higher amount of stress and burnout. Paramedics reported the highest chance of being bullied at work. This can be explained by their nature of work which requires directly interacting with patients and their families. In addition, it should be noted that the tools used can be successfully applied in workplaces as elements of workplace ergonomics assessment in the context of cognitive ergonomics.

KEYWORDS

risk factors, medical staff, ergonomics, working condition, safety

1. Introduction

Ergonomic research indicates that there is a cause-and-effect relationship between workplace ergonomics and the ability of staff to work. It appears that there are few studies from the healthcare sector that address ergonomic aspects of stress, job burnout or bullying (1, 2).

Healthcare workers during their daily work can experience excessive physical and mental exhaustion. This is associated with adverse consequences including an increased risk of developing mental health conditions like anxiety and depression. Negative impacts of burnout on mental health of healthcare workers have been highlighted in recent studies and the importance of maintaining a balance between personal life and work has been discussed. Additionally, evidence shows improving workplace ergonomics can improve psychosocial working conditions and prevent burnout (3).

Ergonomics deals with matching the needs of a job with the capabilities of the worker and the work environment to ensure the most efficient workplace while reducing the risk of injury (4). In addition, it is emphasized that ergonomics is gaining increasing recognition as an integral part of the system for ensuring fitness for work in the medical professions as well (5). It is increasingly noted that among the risk factors in the workplace are psychosocial factors, which play a significant role in ensuring a safe workplace. Psychosocial factors fall into the area of cognitive ergonomics, which includes perception, memory, reasoning and motor responses. They are extremely important because they affect interactions between people and other elements of the human-environment system (6–8).

One predictor of mental health among medical personnel is occupational burnout syndrome, which was defined in the 1970s by psychoanalyst Freudenberger (9–11). Occupational burnout is included in the 11th Revision of the International Classification of Diseases (ICD-11) as an occupational phenomenon—although it is not classified as a medical condition. It is defined as a conceptualized syndrome resulting from chronic workplace stress that has not been effectively managed. It is characterized by three dimensions: feelings of energy depletion or exhaustion, increased mental distance from one's job or feelings of negativity or cynicism about one's work, and decreased professional effectiveness (12). The scale of professional burnout is enormous. The results of studies conducted for years in the US indicate that professional burnout can affect up to 51% of doctors (13). Among nurses, the scale of the phenomenon is even greater, as globally professional burnout is said to be 15–60%, and in developed countries 49–57% (14, 15). Occupational burnout is strongly influenced by long-lasting stress levels, which among the medical profession are also very high (16).

Both stress and job burnout can influence the occurrence of bullying. Bullying in the workplace is a destructive phenomenon and disrupts the sense of security (17). It turns out that the phenomenon of bullying among medical professions is most prevalent in the professional group of nurses. They experience both verbal and physical violence (18). Rates of physical violence against doctors and nurses are 16.2 per 1,000 and 21.9 per 1,000, respectively. In the European Union, 52% of health care workers have experienced some type of aggression at work (19).

A review of the literature indicates that both occupational stress and burnout and bullying are common in the health care system. It is therefore important to monitor risk factors in this area. The authors attempted to assess occupational risk, additionally during the burden of the COVID-19 pandemic, which may have been an additional aggravating factor.

The purpose of the study conducted by the authors was to assess occupational risk in selected areas of psychosocial risk factors among health professions in a pilot study.

2. Materials and methods

2.1. Study design and setting

The prospective survey was conducted from November 1, 2021, to December 31, 2021, during the COVID-19 pandemic. The survey was conducted in an online format, using the electronic survey platform www.webankieta.pl. The survey is consisted of two parts:

a) Socio-demographic information of participants.
b) Participants' assessments of psychosocial risk factors.

The psychosocial risk factors section goes over three major themes and ach theme is consisted of 15 questions which are adopted from the European Commission's guide to health and safety risks in the healthcare sector [Europejska (20); the English-language version of the manual with questionnaires for each dimension of psychosocial factors can be found at the link: https://www.ilo.org/dyn/travail/docs/1965/osh.pdf]:

a) Workplace stresses;
b) Work related burnout;
c) Bullying at workplace.

Surveys chose either "applicable" or "not applicable" in response to psychosocial risk factors' questions. We used the aggregated scores to asses the severity of psychosocial risks. The risk levels were defined as follows:

a) no risk (1–5 marked answers "applicable")—the need to take action on individual elements.
b) increased risk (6–10 marked "applicable" answers)—structural and control analyses are recommended.
c) high risk (11–15 marked "applicable" answers)—need for urgent structural and control analyses.

The survey was distributed to medical staff at the Wroclaw University of Medical Sciences including physicians, dentists, nurses, midwives, paramedics, and physiotherapists. Potential participants received a link to the survey through their medical social media groups. Participation in the survey was voluntary and data was collected anonymously. Participants could withdraw anytime. An IP address filtering (a numerical identifier given to a network interface) was used to avoid collecting duplicate responses from a participants.

After data collection was completed, a database was prepared and used in the statistical analysis.

2.2. Study population

The inclusion criterion for this study was active practice of a medical profession at the time of the survey, i.e., November–December 2021, during the COVID-19 pandemic. The study targeted 143 potential participants and 18 of them did not complete the survey. Uncomplete results were excluded from statistical analysis.

2.3. Ethical considerations

The study was carried out in accordance with the tenets of the Declaration of Helsinki and guidelines of Good Clinical Practice (21). Written information about the study was provided as an introduction to the survey, with an emphasis on the voluntary and anonymous nature of participation and its guaranteed confidentiality. By answering the questionnaire, participants gave their consent to participate in the study. The research project was approved by the Independent Bioethics Committee at the Wroclaw Medical University (No. KB−613/2021).

2.4. Statistical analyzes

Quantitative analysis was carried out by calculating the mean, standard deviation, median, and quartiles. Additionally, nominal variables were subjected to prevalence analysis based on the number and percentage of occurrences of each value. Comparison of the values of quantitative variables in the two groups was performed using the Mann-Whitney test. Comparison of the values of quantitative variables in three or more groups was performed using the Kruskal-Wallis test. When statistically significant differences were detected, *post-hoc* analysis was performed with Dunn's test to identify statistically significantly different groups. Multivariate analysis of the effect of multiple variables on a quantitative variable was performed using linear regression. The results are presented in the form of regression model parameter values with 95% confidence intervals. The analysis assumed a significance level of 0.05. So, all p-values below 0.05 were interpreted as indicating significant relationships. The analysis was performed in R software, version 4.2.2 (22).

3. Results

3.1. Single factor analysis

The characteristics of the study group with detailed socio-demographic data are presented in Table 1. A general summary of the level of risk identified in the three areas studied is presented in Table 2. Based on the results of Table 2, it should be noted most of the participants reported a high risk in all three areas, experiencing stress, burnout syndromes, and bullying- 63.2, 65.6, and 50.4%, respectively. These results are very disturbing, considering that the average age of the respondents was 32.1 years (Me = 30), and more than half of the respondents (57.6%) described their length of service as between 1 and 5 years. These shows relatively young people, at the beginning of their careers, experiencing high levels of risk from the group of psychosocial factors.

After determining the overall level of risk, a detailed analysis of socio-demographic data in correlation with the studied areas of psychosocial factors was performed. Those socio-demographic parameters with statistically significant differences ($p < 0.05$) were analyzed in detail. Among others, the level of education was included in the analysis (Table 3), and it was revealed that the risk in the area of stress is significantly higher in those with a bachelor's or master's degree than in those with a high school education. In addition, the risk in the area of burnout is significantly higher in those with a bachelor's or master's degree than in those with a high school education. It should be noted that in the case of the correlation of stress and level of education, this applies mainly to the nurses. The reasons for such a correlation can be explained by the number of duties and managerial activities. Nurses with higher education very often have professional roles with greater responsibilities. Therefore, the risk of burnout among those healthcare workers may be higher. Interestingly, the risk in the area of stress is significantly higher among those with work experience of 6–10 years than other groups (Table 4). In contrast, the risk in the area of burnout is significantly lower among the group working 20–39 h/week than in the other groups (Table 5). It can conclude that standard working hours (i.e., about 40 h/week) are the most optimal, and that overtime/additional employment can result in job burnout. This is explained further in the following in the next analysis—in terms of risk in the area of stress, burnout, bullying, which is significantly higher among those who work in multiple positions (Table 6).

In the areas discussed, the variable "gender" showed no statistically significant differences.

3.2. Multivariate analysis

The next step was multivariate analyses. Included in these analyses were those variables that had a significant effect on a given risk area in the univariate analyses or were close to significance (i.e., had $p < 0.1$), as well as occupational group, which is the main variable in this analysis.

3.2.1. Stress

A multivariate linear regression model showed that significant ($p > 0.05$) independent predictors of risk in the area of stress are (Table 7):

a) Bachelor's degree: the regression parameter is 4.53, so it raises the risk by an average of 4.53 points relative to high school education.

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TABLE 1 Characteristics of the study group.

Parameter	Total ($N = 125$)	
Sex	Female	68 (54.40%)
	Male	57 (45.60%)
Age (years)	Mean (SD)	32.11 (7.65)
	Median (quartiles)	30 (26–36)
	Range	23–60
Marital status	Single	34 (27.20%)
	In relation to	91 (72.80%)
Residence	Country	27 (21.60%)
	City up to 50,000 inhabitants.	18 (14.40%)
	City of 50,000–150,000 inhabitants.	16 (12.80%)
	City of 150,000–500,000 inhabitants.	23 (18.40%)
	City with more than 500,000 inhabitants.	41 (32.80%)
Occupational group	Physiotherapist	5 (4.00%)
	Physician/dentist	24 (19.20%)
	Nurse	39 (31.20%)
	Midwife	5 (4.00%)
	Paramedic	51 (40.80%)
	Other	1 (0.80%)
Education	Secondary education	6 (4.80%)
	Bachelor's degree	44 (35.20%)
	Master's degree/medical doctor/dentist	68 (54.40%)
	PhD	7 (5.60%)
Seniority	Less than a year	6 (4.80%)
	1–5 years	72 (57.60%)
	6–10 years	19 (15.20%)
	11–15 years	12 (9.60%)
	16–20 years	7 (5.60%)
	More than 20 years	9 (7.20%)
Weekly working hours	20–39 h	18 (14.40%)
	40–59 h	57 (45.60%)
	60–79 h	38 (30.40%)
	80–99 h	9 (7.20%)
	100 h and more	3 (2.40%)
Place of employment	Hospital	86 (68.80%)
	Long-term care facilities	2 (1.60%)
	Primary health care	1 (0.80%)
	Others	36 (28.80%)
Works in shifts	No	24 (19.20%)
	Yes	101 (80.80%)
Type of ward	Surgical ward	46 (36.80%)
	Non-surgical ward	25 (20.00%)
	Not applicable	54 (43.20%)
Working in more than one place	No	53 (42.40%)
	Yes	72 (57.60%)

TABLE 2 Risk level results for each area.

Risk area	Risk level		
	No risk	Increased risk	High risk
Stress	9 (7.20%)	37 (29.60%)	79 (63.20%)
Burnout syndrome	6 (4.80%)	37 (29.60%)	82 (65.60%)
Bullying	12 (9.60%)	50 (40.00%)	63 (50.40%)

b) Master's degree/doctor/dentist: The regression parameter is 4.91, so it raises the risk by an average of 4.91 points relative to secondary education.
c) Work experience of 6–10 years: the regression parameter is 3.17, so it raises the risk by an average of 3.17 points relative to <1 year's experience.
d) Weekly working hours of 40–59 h: the regression parameter is 2.13, so it raises the risk by 2.13 points on average relative to working <40 h/week.
e) Weekly working hours of 80 h or more: the regression parameter is 2.15, so it raises the risk by an average of 2.15 points relative to working <40 h/week.
f) Working in more than one place: The regression parameter is 1.10, so it raises the risk by 1.10 points on average.

The correlations shown in the stress dimension that relate to educational level may be due to the fact that the vast majority of people have higher education. There are still nurses working in the health care system who have graduated from specialized schools—medical high schools. Medical personnel with master's degrees are more likely than those with bachelor's degrees to hold management positions, which further translates into higher stress levels. In turn, the weekly working hours—the greater, the higher the stress level is also a result of the fact that medical personnel often work in more than one place. Such behavior can determine a significant mental as well as physical burden. It should also be noted that the study was conducted during the pandemic period, when there was a shortage of staff, people worked beyond the norm to provide medical care to the needy.

3.2.2. Professional burnout

In terms of burnout, a multivariate linear regression model showed that significant ($p > 0.05$) independent predictors of risk in this area are (Table 8):

TABLE 3 Influence of education level on the incidence of stress risk, occupational burnout syndrome, and bullying.

Risk area	Education	*N*	Mean	SD	Median	Min	Max	*Q*1	*Q*3	*p*
Stress	Secondary education—A	6	7.17	2.86	6.0	4	12	6.00	8.25	$p = 0.049$*
	Bachelor's degree—B	44	11.05	2.72	12.0	2	15	10.00	13.00	B, C>A
	Master's degree/medical doctor/dentist—C	68	10.94	3.02	12.0	3	15	10.00	13.00	
	PhD—D	7	9.57	3.26	8.0	6	13	7.00	13.00	
Burnout syndrome	Secondary education—A	6	8.17	3.37	9.0	3	13	6.75	9.00	$p = 0.044$*
	Bachelor's degree—B	44	11.64	2.86	12.0	4	15	9.75	14.00	C, B>A
	Master's degree/medical doctor/dentist—C	68	11.81	2.78	13.0	3	15	10.75	14.00	
	PhD—D	7	11.00	2.65	12.0	6	14	10.00	12.50	
Bullying	Secondary education	6	7.50	3.89	8.0	3	11	4.25	11.00	$p = 0.303$
	Bachelor's degree	44	10.64	2.82	11.0	3	15	8.75	13.00	
	Master's degree/medical doctor/dentist—C	68	10.26	3.41	10.5	3	15	7.75	13.00	
	PhD	7	10.29	2.14	10.0	8	13	8.50	12.00	

p—Kruskal-Wallis test + *post-hoc* analysis (Dunn's test), SD, standard deviation; Q1, lower quartile; Q3, upper quartile.
*Statistically significant difference ($p < 0.05$).

TABLE 4 The impact of seniority on the incidence of stress risk, burnout syndrome, and bullying.

Risk area	Seniority	*N*	Mean	SD	Median	Min	Max	*Q*1	*Q*3	*p*
Stress	Less than a year—A	6	8.50	4.72	9.0	3	14	4.50	12.00	$p = 0.008$*
	1–5 years—B	72	10.38	3.04	11.0	2	15	10.00	12.00	C>E, D, B, F, A
	6–10 years—C	19	12.79	1.87	13.0	7	15	12.00	14.00	
	11–15 years—D	12	10.83	2.55	11.5	7	15	8.75	12.25	
	16–20 years—E	7	11.14	1.07	12.0	10	12	10.00	12.00	
	More than 20 years—F	9	10.11	3.41	11.0	6	14	6.00	13.00	
Burnout syndrome	Less than a year	6	10.00	4.10	9.0	6	15	6.75	13.50	$p = 0.278$
	1–5 years	72	11.38	3.13	12.0	3	15	10.00	14.00	
	6–10 years	19	12.68	2.00	14.0	10	15	10.00	14.00	
	11–15 years	12	12.08	2.39	13.0	6	14	11.50	14.00	
	16–20 years	7	11.43	1.72	12.0	9	13	10.50	12.50	
	More than 20 years	9	10.67	2.74	10.0	6	14	9.00	13.00	
Bullying	Less than a year	6	9.33	3.67	10.0	5	14	6.25	11.50	$p = 0.862$
	1–5 years	72	10.31	3.11	11.0	3	15	8.00	13.00	
	6–10 years	19	10.74	3.02	10.0	7	15	8.00	13.50	
	11–15 years	12	10.75	3.55	12.0	3	15	8.00	13.00	
	16–20 years	7	9.86	3.93	10.0	5	15	7.00	12.50	
	More than 20 years	9	9.22	3.67	9.0	4	14	6.00	13.00	

p—Kruskal-Wallis test + *post-hoc* analysis (Dunn's test), SD, standard deviation; Q1, lower quartile; Q3, upper quartile.
*Statistically significant difference ($p < 0.05$).

a) Bachelor's degree: the regression parameter is 4.42, so it raises the risk by an average of 4.42 points relative to high school education.
b) Master's degree/doctor/dentist: The regression parameter is 5.05, so it raises the risk by an average of 5.05 points relative to secondary education.
c) Doctoral degree: The regression parameter is 3.59, so it raises the risk by an average of 3.59 points relative to secondary education.
d) Weekly working hours of 40–59 h: the regression parameter is 1.84, so it raises the risk by 1.84 points on average relative to working <40 h/week.

TABLE 5 The impact of weekly working hours on the incidence of stress risk, burnout syndrome, and bullying.

Risk area	Weekly working hours	*N*	Mean	SD	Median	Min	Max	*Q1*	*Q3*	*p*
Stress	20–39 h	18	8.72	3.77	10.0	3	14	5.25	12.00	$p = 0.069$
	40–59 h	57	11.23	2.71	12.0	2	15	11.00	13.00	
	60–79 h	38	10.97	2.38	11.0	6	15	10.00	12.75	
	80 h and more	12	10.50	3.99	11.5	4	15	6.00	13.50	
Burnout syndrome	20–39 h—A	18	9.22	3.57	9.0	3	15	6.00	12.75	$p = 0.013$*
	40–59 h—B	57	11.77	2.56	12.0	3	15	10.00	14.00	C, D, B>A
	60–79 h—C	38	12.13	2.42	13.0	4	15	10.25	14.00	
	80 h and more—D	12	11.92	3.42	13.0	3	15	11.25	14.00	
Bullying	20–39 h	18	9.61	3.85	10.5	4	15	6.00	13.00	$p = 0.749$
	40–59 h	57	10.47	3.13	10.0	3	15	8.00	13.00	
	60–79 h	38	10.45	3.12	11.0	3	15	8.00	13.00	
	80 h and more	12	9.67	3.03	9.0	3	14	8.75	11.50	

p—Kruskal-Wallis test + *post-hoc* analysis (Dunn's test), SD, standard deviation; Q1, lower quartile; Q3, upper quartile.
*Statistically significant difference ($p < 0.05$).

TABLE 6 The impact of working more than one job on the incidence of stress risk, burnout syndrome, and bullying.

Risk area	Working in more than one place	*N*	Mean	SD	Median	Min	Max	*Q1*	*Q3*	*p*
Stress	No	53	9.91	3.48	11	2	15	7.00	13	$p = 0.044$*
	Yes	72	11.32	2.47	12	4	15	10.00	13	
Burnout syndrome	No	53	10.91	2.98	11	3	15	9.00	13	$p = 0.019$*
	Yes	72	11.99	2.77	13	3	15	10.75	14	
Bullying	No	53	9.58	3.22	10	3	15	7.00	12	$p = 0.042$*
	Yes	72	10.76	3.13	12	3	15	8.00	13	

p—Mann-Whitney test, SD, standard deviation; Q1, lower quartile; Q3, upper quartile.
*Statistically significant difference ($p < 0.05$).

e) Weekly working hours 60–79 h: The regression parameter is 2.21, so it raises the risk by an average of 2.21 points relative to working <40 h/week.
f) Weekly working hours of 80 h or more: the regression parameter is 3.18, so it raises the risk by an average of 3.18 points relative to working <40 h/week.
g) Place of employment other than a hospital: the regression parameter is −1.44, so it lowers the risk by an average of 1.44 points relative to hospital employment.

The problem of burnout among medical staff is widely studied. It is influenced by several factors: medics work too much (more than 40 h a week, in more than one place), we have a shortage of medical personnel (significant workload, rationing of care) and there is a lack of prevention in this area. Employers do not take measures to counteract professional burnout, and prc medicine does not give this problem the attention it deserves.

3.2.3. Bullying

In terms of bullying, a multivariate linear regression model showed that significant ($p > 0.05$) independent predictors of risk in this area are (Table 9):

a) Practicing as a paramedic: The regression parameter is 2.11, so it raises the risk by an average of 2.11 points relative to the nursing/midwifery profession.
b) Working in more than one place: The regression parameter is 1.39, so it raises the risk by 1.39 points on average.

Experiencing violence by medical personnel, especially during a pandemic, was not unusual. It was related to fear of the SARS-CoV-2 virus, the consequences of COVID-19 disease or fear for the health of their loved ones. People in highly stressful situations behave irrationally which may be related to the results of the study. It should be noted that medical personnel very often experience violence—both psychological (such as verbal) and physical. Paramedics, are the people who are on the front line at accidents or in hospital emergency departments. They often have to deal with patients who are under the influence of psychoactive substances, which can potentiate aggressive behavior.

4. Discussion

Medical staff are an essential part of the healthcare system, without them the provision of medical care is impossible. A safe

TABLE 7 Multivariate analysis—stress area.

Feature		Parameter	95% CI		p
Occupational group	Nurse/midwife	Ref.			
	Physician/dentist	−0.484	−1.865	0.897	0.494
	Paramedic	1.078	−0.136	2.292	0.085
	Other	0.661	−1.84	3.162	0.606
Residence	Country	Ref.			
	City up to 50,000 inhabitants	−1.174	−2.789	0.441	0.157
	City of 50,000–150,000 inhabitants	−0.457	−2.171	1.258	0.603
	City of 150,000–500,000 inhabitants	−0.929	−2.487	0.629	0.245
	City with more than 500,000 inhabitants	1.195	−0.168	2.558	0.089
Education	Secondary education	Ref.			
	Bachelor's degree	4.53	2.062	6.998	<0.001*
	Master's degree/medical doctor/dentist	4.911	2.338	7.484	<0.001*
	PhD	0.926	−2.199	4.051	0.563
Seniority	Less than a year	Ref.			
	1–5 years	1.14	−1.19	3.469	0.34
	6–10 years	3.176	0.542	5.81	0.02*
	11–15 years	1.932	−0.861	4.725	0.178
	16–20 years	2.121	−1.14	5.382	0.205
	More than 20 years	2.967	−0.131	6.065	0.063
Weekly working hours	20–39 h	Ref.			
	40–59 h	2.133	0.656	3.609	0.006*
	60–79 h	1.286	−0.304	2.876	0.116
	80 h and more	2.151	0.037	4.265	0.049*
Working in more than one place	No	Ref.			
	Yes	1.101	0.108	2.093	0.032*

p—multivariate linear regression.
*Relationship statistically significant ($p < 0.05$).

and healthy workplace is critical to maintaining the mental health of healthcare workers. It is the resultant of ergonomic conditions and principles in the workplace. Ensuring the above is not possible without monitoring occupational risks in selected areas. The authors of the minor paper decided to focus on selected factors from the area of psychosocial factors, and the study was carried out during the period of increased tension, stress or fear caused by the COVID-19 pandemic.

The results revealed a significant problem likely associated with the absence of coping strategies for psychosocial risk factors. With respect to stress, burnout, and bullying, over half of respondents were in the high-risk group −63.2, 65.6, and 50.4% of respondents, respectively.

Our research shows that burnout is common amongst health care workers treating patients with COVID-19. Age, gender, category of employment and place of practice contribute to the level of employee burnout (23). The study found that medical staff with higher levels of educational attainment are more likely to suffer from burnout syndrome than those with high school education.

Sirilla (24) showed that the level of burnout recorded in oncology nurses was inversely proportional to the level of education—the higher the level of education, the lower the level of burnout. Grisales-Romero et al. (25) exhibited a similar relationship. Moreover, Lou et al. showed that during the COVID-19 pandemic, nurses experienced more stress than doctors (26).

Another factor which may increase the risk of stress or burnout is workload—in terms of hours. Second jobs can increase the risk to mental health. Stehman's work points out that working more than 40 h per week, being on call or working at night can greatly accelerate the burnout process (27).

Stress and burn-out can be linked to bullying, which can lead to verbal and physical abuse. The results of the multivariate analysis showed that practice in the paramedic profession and working in more than one location are associated with a higher risk of workplace bullying. Campo's study found that 46.6% of paramedics believe they have been verbally abused in the past year, and nearly 18% have reported being bullied which is a low percentage of total incidents (28).

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TABLE 8 Multivariate analysis—area of professional burnout.

Feature		Parameter	95%CI		p
Occupational group	Nurse/Midwife	Ref.			
	Physician/dentist	−0.423	−1.822	0.976	0.554
	Paramedic	1.067	−0.317	2.451	0.134
	Other	0.977	−1.594	3.549	0.458
Education	Secondary education	Ref.			
	Bachelor's degree	4.424	1.935	6.912	0.001*
	Master's degree/medical doctor/dentist	5.058	2.561	7.554	<0.001*
	PhD	3.59	0.411	6.768	0.029*
Tygodniowy czas pracy	20–39 h	Ref.			
	40–59 h	1.841	0.313	3.368	0.02*
	60–79 h	2.211	0.643	3.779	0.007*
	80 h and more	3.184	1.107	5.261	0.003*
Place of employment	Hospital	Ref.			
	Other	−1.442	−2.824	−0.06	0.043*
Working in more than one place	No	Ref.			
	Yes	0.818	−0.173	1.809	0.108

p—multivariate linear regression.
*Relationship statistically significant ($p < 0.05$).

TABLE 9 Multivariate analysis—the area of bullying.

Feature		Parameter	95%CI		p
Occupational group	Nurse/midwife	Ref.			
	Physician/dentist	−0.399	−2.057	1.258	0.638
	Paramedic	2.117	0.441	3.793	0.015*
	Other	0.392	−2.576	3.36	0.796
Sex	Female	Ref.			
	Male	−0.941	−2.379	0.497	0.202
Seniority	Less than a year	Ref.			
	1–5 years	0.762	−2.021	3.546	0.592
	6–10 years	1.305	−1.755	4.365	0.405
	11–15 years	0.879	−2.354	4.111	0.595
	16–20 years	1.484	−2.439	5.407	0.46
	More than 20 years	−0.468	−3.88	2.944	0.788
Place of employment	Hospital	Ref.			
	Other	−1.103	−3.142	0.937	0.292
Type of ward	Surgical ward	Ref.			
	Non-surgical ward	1.591	−0.046	3.227	0.059
	Not applicable	−0.356	−2.322	1.61	0.723
Working in more than one place	No	Ref.			
	Yes	1.395	0.201	2.589	0.024*

p—multivariate linear regression.
*Relationship statistically significant ($p < 0.05$).

European Agency for Safety and Health at Work (EU-OSHA) highlights psychosocial risks, which can result, for example, from poor work planning, poor work organization and management, and an unfavorable social work environment. Psychosocial hazards can lead to negative mental, physical and social effects, such as work-related stress, burnout or depression (29). The European Agency for Safety and Health at Work (EU-OSHA) has commissioned a Flash Eurobarometer survey in April 2022 to obtain more information on the state of OSH in post-pandemic workplaces, including psychosocial risk factors. EU-OSHA has commissioned a Flash Eurobarometer survey in April 2022 to obtain more information on the state of OSH in post-pandemic workplaces, including psychosocial risk factors. Respondents to the survey (46% of those surveyed) indicated that they are exposed to severe time pressure or work overload, with the experience of violence or verbal abuse from patients mentioned by 16% of respondents across the EU. Interestingly, employees from countries such as Finland, Malta, Sweden and Denmark were more likely than Poles to discuss their mental health with their employer. More than 4 in 10 respondents across the EU agree that their stress at work has increased as a result of the COVID-19 pandemic (30). The above findings correspond with the results obtained in this study. The pandemic has contributed to an increase in psychosocial burden among workers, including those in the healthcare sector.

5. Conclusion

Our findings show that level of education attainment in healthcare is correlated with higher chance of experiencing stress and burnout. Among the surveyed professions, nurses reported a higher amount of stress and burnout. Paramedics reported the highest chance of being bullied at work. This can be explained by their nature of work which requires directly interacting with patients and their families.

Considering the high rate of reported stress, burnout, and bullying among healthcare workers, it is important to increase awareness of the staff about psychosocial risk factors occupational risks. Considering the current shortage of human resources and increasing demand of aging population in west for healthcare related services, investing in educational programs for medical staff to make them familiar with strategies for managing occupational stress, burnout, and bullying can result in better less turnover of the staff, better mental health, and eventually better patient outcome. Additionally, investing in workplace management enhancement programs and improving ergonomics can prepare us for next potential pandemic and improve medical staff work satisfaction.

Practical implications for employers in the health care sector. A small pilot study has shown that questionnaires for assessing psychosocial risk factors in the areas of stress, occupational burnout and violence can be used in workplaces as screening tools for preventive measures against the mental health of health care workers. Based on the results obtained, corrective measures can be implemented in the areas of stress re-education, occupational burnout or violence prevention. Studies show that workplace ergonomics has a huge impact on the health of employees, and it is the employer's responsibility to provide safe working conditions. This is especially important at a time when the health care system is facing a major challenge—an increase in demand for medical care and a shortage of medical staff.

Data availability statement

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

Author contributions

ŁR and AK: conceptualization. ŁR: methodology, software, formal analysis, visualization, project administration, and supervision. ŁR and HS: validation. PG: investigation. ŁR and PG: resources. ŁR, IW, and HS: data curation and writing—original draft preparation. ŁR, AK, and HS: writing—review and editing. ŁR, IW, AK, and PG: funding acquisition. 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.

Publisher's note

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Health-related quality of life in Chinese medical staff: a latent profile analysis

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Objective: To investigate subgroups of health-related quality of life (HRQoL) in the Chinese medical staff and identify the demographic factors associated with these profiles.

Methods: 574 Chinese medical staff were surveyed online. HRQoL was measured by using the 36-Item Short Form Health Survey, Version 2. Latent profile analysis (LPA) was used to identify the profiles of HRQoL. The associations between HRQoL profiles and covariates were assessed using multinomial logistic regression.

Results: Three HRQoL profiles were developed: low HRQoL at 15.6%, moderate HRQoL at 46.9%, and high HRQoL at 37.6%. Multinomial logistic regression showed night shift times, aerobic exercise conditioning, and personality type significantly predicted the profile membership.

Conclusion: Our findings develop earlier approaches that only used total scores to evaluate this group's HRQoL and help them with tailored interventions to promote better HRQoL.

KEYWORDS

health-related quality of life, China, medical staff, latent profile analysis, COVID-19

1. Introduction

As defined by the World Health Organization (WHO), the quality of life (QoL) concerns an individual's current situation and their morals, expectations, beliefs, and concerns—all of which are influenced by the complex relationship between an individual's physical health, mental health, social relationships, and environmental change (1–3). Health-related quality of life (HRQoL) mainly covers the health-related parts of QoL. In health economics, HRQoL is usually measured using a scale and serves as a barometer of personal, community, and socioeconomic development (4). The interest in HRQoL of medical staff has shown an increasing trend in recent years, along with the recognition of its impact on public health and medical development. The higher scores of HRQoL, the better general health and the fewer disorders or disabilities (5).

The nature of the work of healthcare professionals is both stressful and challenging, which can pose a threat to them and may impact their HRQoL (6, 7). In addition, the specific working environment and interpersonal relationships can impact the HRQoL of medical personnel (8). Studies have proved that medical staff was more likely to be stressed (6, 9), anxious, and depressed (10–12), especially since the outbreak of COVID-19. A meta-analysis also discovered consistent evidence for the widespread and profound impact of large outbreaks on the mental

health of frontline medical staff (13). Furthermore, medical staff is more likely to suffer from job burnout due to the enormous workload they experience in the workplace (14–16).

Further research supports the idea that the HRQoL of medical staff maintains and promotes their compassion and empathy for patients and is closely related to the quality of care they provide (17, 18). Consequently, understanding and measuring HRQoL among medical staff has recently emerged as a priority. Prevention of negative emotional and physical problems in health care workers and promotion of overall health is one of the priorities advocated by the state and public health authorities (19). Positive psychology holds that emphasizing a person's vitality and virtues is crucial. It promotes personal and social development by leveraging inner and constructive strengths. The ultimate goal of positive psychology is to pursue human happiness (20). However, most current studies on this particular group have focused on describing negative emotions such as anxiety, depression, and job burnout rather than overall HRQoL.

Currently, a variety of scales were used to measure human beings' HRQoL. The appropriate HRQoL measurement metrics, however, lack a standardized definition. The 36-Item Short Form Health Survey, Version 2 (SF-36 v2) has been used to measure this outcome (both mental health and physical health) and has its advantages (21, 22). It has been considered an appropriate tool for measuring HRQoL in different populations and is favored in terms of its psychometric properties and convenience for monitoring HRQoL (23, 24). Moreover, it also helps monitor HRQoL in the healthy population (25). Furthermore, most of the previous literature used composite scores on scales to assess the level of HRQoL of the medical staff, few studies used the SF-36v2 scale to measure (26, 27). Additionally, this approach does not allow for further population classification; it only offers a comprehensive assessment of the population's HRQoL. In addition, quantitative research on different HRQoL profiles in medical staff has received scant attention in the literature.

A method focused on the individual called latent profile analysis (LPA) uses continuous variables to divide samples into more meaningful subgroups based on similar characteristics (28). LPA is also a statistical method for determining whether heterogeneous subgroups exist within a population of interest. It can determine the underlying characteristics of individuals based on their response patterns to explicit topics to understand the characteristics of people with different profiles (29, 30). It is helpful to learn more about the population characteristics of different potential profiles by using LPA to explore HRQoL in medical staff and identify the sociodemographic correlates to the profiles of QoL. At present, there are few potential profile models of the HRQoL of medical staff. In conclusion, more LAP-based research needs to be investigated.

Therefore, the main goal of this study was to find the distinct profiles of HRQoL in Chinese medical staff using an LPA approach. Then, we studied the sociodemographics associated with profile membership. This study will provide fundamental evidence for public health to create targeted intervention strategies to improve HRQoL in medical staff.

2. Method

2.1. Study design

A multi-center cross-sectional study was carried out. And the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines were followed in this study.

2.2. Participants

An online survey was conducted by enrolling a convenience sample of medical staff mainly from six hospitals (the 1st Affiliated Hospital of Wenzhou Medical University, the 2nd Affiliated Hospital of Wenzhou Medical University, the 2nd Hospital of Dalian Medical University, the 2nd Affiliated Hospital of Zhongguo Medical University, Lishui People's Hospital, and Chenzhou 3rd People's Hospital) in China. Medical staff was eligible if they had legal rights and obligations to the hospital. Medical staff was excluded if they were unwilling to participate in the study or had severe mental health problems. Two were disqualified from the total 574 eligible participants who agreed to take part because their responses were not complete—resulting in a 572 (99.7%) valid sample size.

2.3. Data collection

Between May and July 2020, online questionnaires were collected anonymously from medical staff who met the criteria. Every Internet Protocol (IP) address was only permitted to access the survey once in order to avoid double enrollment. Each questionnaire took about 15–20 min to complete. The system would exclude questionnaires that took less than 10 min to complete.

2.4. Measures

2.4.1. Sociodemographic characteristics

The characteristics of medical staff included gender, age, marital status, education level, professional title, department, position, employment status, work time per day, night shift times per week, individual income monthly, exercise condition and self-reported personality.

2.4.2. Health-related quality of life

The SF-36v2 was used to assess self-perceived HRQoL. The eight dimensions of physical functions (PF), role-physical (RP), physical pain (PP), health in general (HG), vitality (VT), social functions (SF), role-emotional (RE), and mental health (MH) accounted for 10 items, 4 items, 2 items, 5 items, 4 items, 2 items, 3 items, and 5 items, respectively, for a total of 36 items. The physical component summary (PCS) and the mental component summary (MCS) are the two subscales among the eight dimensions. The present study showed satisfactory reliability (Cronbach's $\alpha = 0.861$).

2.5. Ethical consideration

The study followed the ethical principles of the Helsinki declaration (31). The institution the corresponding author was associated with approved our study through its institutional review board (LCKY2019-288). Before formally starting to fill out the questionnaire, participants will be shown a statement about informed consent, the purpose of the study, and the content of the study. Participants have the right to decide whether or not to continue filling out the questionnaire. All patients gave informed consent.

2.6. Statistical analysis

The following versions of softwares were used to analyze the data: Mplus version 8.3 (Muthen & Muthen, Los Angeles, CA, Unites States), SPSS version 25.0 (IBM, Armonk, NY, Unites States), and Stata version 14.1 (StataCorp LP, 1985–2015). All variables were first subjected to descriptive statistics. Second, different LPA models were developed to explore the profiles of HRQoL among 572 medical staff. The Akaike information criterion (AIC), Bayesian information criterion (BIC), adjusted Bayesian information criterion (aBIC), and the Lo–Mendell–Rubin adjusted likelihood ratio test (LMRT) were used to determine the ideal number of profiles (32). Lower values for the AIC, BIC, and aBIC signify a better-fitting model. Models with different numbers of latent profiles were compared using LMRT. When a k-class model showed a non-significant value, a k-1 class model should be accepted. Entropy was used to evaluate the classification precision of the model, varying between 0 and 1, with larger values being better. When the number exceeds 0.80, the classification accuracy has been determined to be adequate. Item means were examined using Analysis of Variance (ANOVA) to determine if profiles derived from LPA differed significantly. Third, when the best profile model was determined, each profile was named according to its distributions. The Chi-squared test was used to determine how the various profiles differed in terms of sociodemographic traits, and Bonferroni method for multiple comparisons. Multinomial logistic regression was used to adjust confounding factors. All variables with univariate p values <0.05 were chosen as independent variables for the multinomial regression models.

3. Results

3.1. Descriptive statistics

There were 521 female participants (91.1%) and 51 male participants (8.9%). Nurses and doctors accounted for 474 (82.9%) and 59 (10.3%), respectively. The mean age of the medical staff was 34.18 ± 6.36 (range 21–55). The majority of participants said they had a college degree (73.8%, $n = 422$) or higher in education (11.2%, $n = 64$), were married (81.8%, $n = 464$), with primary (44.2%, $n = 253$) or medium (46.0%, $n = 263$) professional title, and were officially employed by the hospital (68.2%, $n = 390$). More than half participants reported working more than 8 h a day (65.2%, $n = 373$) and one night shift per week (50.0%, $n = 286$). Individual participants' monthly incomes were as follows: 237 (41.4%) reported having an income of 6,000 RMB or less, 143 (25.0%) reported having an income between 6,000 RMB and 8,000 RMB, and 192 (33.6%) reported having an income of >8,000 RMB. Most participants never exercised (43.2%, $n = 247$) or exercised 1–2 h per day (41.8%, $n = 239$). As for personality, approximately 24.1% ($n = 138$) participants considered themselves extroverted, 22.9% ($n = 131$) considered themselves introverted, and 54.5% ($n = 303$) considered themselves intermediate. Table 1 displayed all of the remaining general data.

Table 2 displayed the descriptive statistics and correlations of the grouping variables used. The highest mean was for BP, and the lowest mean was for VT, with little difference between the means of the eight subgroup variables. High positive correlations between RP and RE, GH and VT, GH and MH, VT and MH, SF and RE, and SF and RH were found in the results of the correlation analysis.

3.2. Latent profile analysis

A one-to-five classification was present, according to information-based fit indices (Table 3). Figure 1 showed that AIC, BIC, and aBIC gradually improved (number decreased) as the number of profiles increased, and it displayed the trend of entropy. Considering both LMRT and BLRT showed significance in profiles 2 and 3. Based on the analysis of the available data, the three-profile model was selected for this study (33). It had a suitable entropy value of 0.841, indicating a distinct classification. The mean posterior probabilities that participants pertained to the latent profile where they were assigned were 91.6–95.0%, indicating that the three-profile models were credible (Table 4).

Following that, the names of the three profiles were determined by their characterized patterns of HRQoL. And named C1–C3 as "Low HRQoL," "Moderate HRQoL," and "High HRQoL" individually, as seen in Figure 2 and Table 5. Significant mean differences between the manifest indicators for each profile were revealed by the three-profile solution (Table 5). The high HRQoL profile made up the second most common proportion of participants ($n = 215$, 37.6%). The moderate HRQoL profile was the largest profile ($n = 268$, 46.9%). The low HRQoL profile was the third most prevalent profile ($n = 89$, 15.6%). The tendencies of the three HRQoL profiles were illustrated in Figure 3.

3.3. Predictor of latent profile membership

The Chi-squared test results revealed significant differences in work time per day ($\chi^2 = 7.012$, $p = 0.030$), night shift times per week ($\chi^2 = 11.238$, $p = 0.024$), exercise ($\chi^2 = 17.023$, $p = 0.002$), and personality ($\chi^2 = 12.060$, $p < 0.017$) between the three profiles (Table 1).

With the low HRQoL group as the reference group, multinomial logistic regression was further used to investigate the sociodemographic predictors of profile membership, and significant influencing factors in the Chi-square test were included (Table 6). In comparison to the low HRQoL group, medical staff with introverted traits (OR: 0.495; CI: 0.268, 0.915) had lower odds of being in the high HRQoL group. Compared to those who exercise more than 3 h per week, medical staff who never exercise (OR: 0.250; CI: 0.098, 0.638) had lower odds of being in the high HRQoL group than the high HRQoL group. Moreover, medical staff with no night shift per week (OR: 2.299; CI: 1.089, 4.855) were more likely to fall into the high HRQoL group than the low HRQoL group.

4. Discussion

By using LPA analysis, three profiles representing the level of HRQoL of Chinese medical staff were created for the present study. They were low HRQoL, moderate HRQoL, and high HRQoL, which accounted for 15.6, 46.9, and 37.6%, respectively. According to our findings, the majority of participants were in the moderate HRQoL group and exhibited comparatively moderate levels of physical

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TABLE 1 Comparison of socio-demographic characteristics among different health-related quality of life (HRQoL) profiles (n=572).

Variables		Total sample	Low HRQoL	Moderate HRQoL	High HRQoL	χ^2	p
Gender						4.255	0.119
	Male	51(8.9)	4(4.5)	22(8.2)	25(11.6)		
	Female	521(91.1)	85(95.5)	246(91.8)	190(88.4)		
Age						3.486	0.480
	20–29	142(24.8)	22(24.7)	67(25.0)	53(24.7)		
	30–39	324(56.6)	55(61.8)	154(57.5)	115(53.5)		
	≥40	106(18.5)	12(13.5)	47(17.5)	47(21.9)		
Marital status						1.603	0.822
	Single	99(17.3)	19(21.3)	46(17.2)	34(15.8)		
	Married	464(81.8)	69(77.5)	218(81.3)	177(82.3)		
	Divorce	9(1.6)	1(1.1)	4(1.5)	4(1.9)		
Education						2.138	0.710
	Below college	86(15.0)	12(13.5)	39(14.6)	35(16.3)		
	College degree	422(73.8)	70(78.8)	199(74.3)	153(71.2)		
	Above college	64(11.2)	7(7.9)	30(11.2)	27(12.6)		
Professional title						3.304	0.508
	Primary	253 (44.2)	44(49.4)	120(44.8)	89(41.4)		
	Medium	263(46.0)	40(44.9)	119(44.4)	104(48.4)		
	High	56(9.8)	5(5.6)	29(10.8)	22(10.2)		
Department						16.990	0.386
	Medical	89(15.6)	22(24.7)	41(15.3)	26(12.1)		
	Surgical	61(10.7)	7(7.9)	33(12.3)	21(9.8)		
	Pediatric	30(5.2)	4(4.5)	14(5.2)	12(5.6)		
	Obstetrics and Gynecology	41(7.2)	6(6.7)	15(5.6)	20(9.3)		
	Emergency room	111(19.4)	14(15.7)	47(17.5)	50(23.3)		
	Operating room	18(3.1)	2(2.2)	10(3.7)	6(2.8)		
	ICU	26(4.5)	2(2.2)	16(6.0)	8 (3.7)		
	NICU	14(2.4)	3(3.4)	7(2.6)	4(1.9)		
	Others	182(31.8)	29(32.6)	85(31.7)	68(31.6)		
Position						4.063	0.397
	Doctor	59(10.3)	7(7.9)	29(10.8)	23(10.7)		
	Nurse	474(82.9)	79(88.8)	222(82.8)	173(80.5)		
	Others	39(6.8)	3(3.4)	17(6.3)	19(8.8)		
Employment status						0.890	0.641
	Official	390(68.2)	57(64.0)	186(69.4)	147(68.4)		
	Contract/temporary	182(31.8)	32(36.0)	82(30.6)	68(31.6)		
Work time per day						7.012	0.030
	<8	199(34.8)	25(28.1)	85(31.7)	89(41.4)		
	≥8	373(65.2)	64(71.9)	183(68.3)	126(58.6)		
Night shift times per week						11.238	0.024
	0	147(25.7)	16(18.0)	60(22.4)	71(33.0)		
	1	286(50.0)	46(51.7)	143(53.4)	97(45.1)		
	≥2	139(24.3)	27(30.3)	65(24.3)	47(21.9)		

(Continued)

TABLE 1 (Continued)

Variables		Total sample	Low HRQoL	Moderate HRQoL	High HRQoL	χ^2	*p*
Income per month						7.518	0.111
	<6,000	237(41.4)	45(50.6)	113(42.2)	79(36.7)		
	6,000–8,000	143(25.0)	18(20.2)	73(27.2)	52(24.2)		
	>8,000	192(33.6)	26(29.2)	82(30.6)	84(39.1)		
Exercise						17.023	0.002
	Never	247(43.2)	49(55.1)	121(45.1)	77(35.8)		
	1-2 h/week	239(41.8)	34(38.2)	113(42.2)	92(42.8)		
	≥3 h/week	86(15.0)	6(6.7)	34(12.7)	46(21.4)		
Personality						12.060	0.017
	Extroverted	138(24.1)	18(20.2)	57(21.3)	63(29.3)		
	Introverted	131(22.9)	30(33.7)	63(23.5)	38(17.7)		
	Intermediate	303(54.5)	41(46.1)	148(55.2)	114(53.0)		

Data presented as frequency (percentage).

TABLE 2 Descriptive statistics and correlations.

Variables	M	SD	PF	RP	BP	GH	VT	SF	RE
PF	47.60	9.38	1						
RP	47.04	10.78	0.414***	1					
BP	47.79	9.25	0.372***	0.353***	1				
GH	44.51	9.28	0.356***	0.269***	0.441***	1			
VT	40.35	10.94	0.357***	0.276***	0.418***	0.628***	1		
SF	44.62	11.04	0.362***	0.461***	0.482***	0.434***	0.493***	1	
RE	44.83	12.85	0.376***	0.667***	0.332***	0.321***	0.417***	0.544***	1
MH	40.43	10.97	0.319***	0.290***	0.422***	0.581***	0.777***	0.589***	0.487***

M, mean; SD, standard deviation; PF, physical functioning; RP, role-physical; BP, bodily pain; GH, general health; VT, vitality; SF, social functioning; RE, role-emotional; MH, mental health.
***$P<0.001$.

TABLE 3 Fit statistics for the latent class model with 1–5 classes.

	AIC	BIC	aBIC	Entropy	LMRT	BLRT	Latent class probability
					p value	*p* value	
1 class	34530.769	34600.355	34549.562				
2 class	33281.312	33390.040	33310.676	0.856	<0.001	<0.001	0.46329/0.53671
3 class	32991.884	33139.755	33031.820	0.841	0.0213	<0.001	0.15559/0.46853/0.37587
4 class	32821.123	33008.136	32871.630	0.825	0.0452	<0.001	0.13811/0.25000/0.24825/0.36364
5 class	32673.388	32899.543	32734.466	0.858	0.0972	<0.001	0.25175/0.01923/0.26573/0.11014/0.35315

AIC, Akaike information criteria; BIC, Bayesian information criteria; aBIC, adjusted Bayesian information criterion.
LMRT, Lo–Mendell–Rubin likelihood ratio test; BLRT, Bootstrapped likelihood ratio test.

functions, role-physical, physical pain, general health, vitality, social functions, role-emotional, and mental health. Overall, it is important to value and improve the level of HRQoL among medical staff.

Medical staff in the low HRQoL profile represented the smallest percentage of the overall sample in the present study. Focusing on each dimension indicates that the average score for MH was only about 26 in the low HRQoL group, which is a large gap from the scores of the high HRQoL group (higher than 50), showing a bipartition trend. This suggests a potential need to tailor interventions to medical staff's mental health condition. The study by Liu et al. (34) can support our view that of the 1,090 Chinese medical professionals, 13.3, 18.4, and 23.9% suffered from anxiety, depression, or both, respectively.

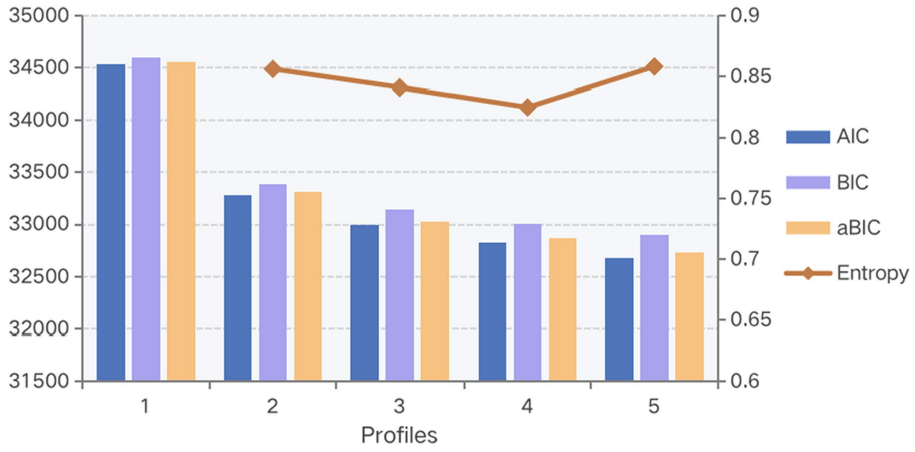

FIGURE 1
Comparison of the information criteria.

TABLE 4 Average latent class probabilities for most likely latent class membership (Row) by latent class (Column).

	C1	C2	C3
C1	0.924	0.076	0.000
C2	0.041	0.916	0.043
C3	0.000	0.050	0.950

Since the questionnaire was collected during the COVID-19 epidemic, those who were unprepared for a sudden outbreak are likely to experience mental health issues, especially the special population of medical staff, who dealt with greater challenges and stress (35). In conclusion, our study demonstrates the importance of mental health in improving the HRQoL of medical professionals. So among the various aspects of HRQoL, mental health needs the most attention in the present study.

It is worth noting that the third dimension-BP, had the highest mean score among all three profiles of HRQoL, followed by the second dimension-RP. This could be a result of the fact that, in comparison to other jobs, medical professionals will adopt more healthy behaviors, such as giving up smoking and drinking alcohol, putting more emphasis on eating well, and exercising more as they become more knowledgeable about diseases and health-related issues. Previous studies have also confirmed this view. A study by Liu et al. (36) revealed that healthcare workers are more concerned about food safety following a pandemic outbreak. A meta-analysis also suggested that interventions aimed at lifestyle change are more likely to improve nurses' HRQoL (37). In other words, healthcare professionals who prioritize their own health will adopt healthier habits and lifestyles, enhancing their physical well-being, lessening physical discomfort, and ultimately enhancing their general HRQoL accordingly.

Multiple regression showed in the current research that factors influencing the HRQoL of medical staff included the work time per day and the nightshifts per week, respectively. The absence of nightshifts was a protective factor for the HRQoL of medical staff. In addition, we found that VT was the second lowest dimension in the three HRQoL profiles. The specific 4 items for this dimension are "Did you feel full of pep?" "Did you have a lot of energy?" "Did you feel worn out?" and "Did you feel tired?" The findings mentioned above imply that a lower VT score may be linked to long working hours, high intensity, stress brought on by frequently working nights, physical overdraft, and burnout. It's consistent with the study by Silva et al. (38). Among medical staff, the dimensions with the lowest mean scores in the SF-36 were VT. A study from Italy also found that night nurses had lower HRQoL in all dimensions than the general population (39). As a result, by altering scheduling practices, better allocating human resources, and changing management paradigms, healthcare administrators can enhance the HRQoL for healthcare workers. It is important to note that a previous study (40) identified effort-reward imbalance as a significant factor contributing to work stress and fatigue in medical staff. Based on Siegrist's effort-reward imbalance model (ERI) (41), the subsequent study can further explore the relevant factors influencing the psychological dimensions of this population. By the way, even though the univariate analysis demonstrated that work time per day was statistically significant, it was excluded from the logistic regression model. It probably due to the sample size is not large enough. Future studies could include a larger sample of medical staff for analysis.

This study also noted that the HRQoL of medical staff was related to exercise condition and personality type. As in previous studies (42, 43), medical personnel with exercise habits were more likely to maintain higher levels of mental well-being and physical health. Heidke et al. (44) found that physical inactivity was negatively related to HRQoL. These results support the statement in the present study that a higher frequency of weekly exercise is a protective factor for the HRQoL of medical personnel. Therefore, medical professionals can increase their HRQoL by increasing weekly exercise frequency. In addition, extroverts were more likely absent of depression and had high mental well-being (45). Consistent with previous research, individuals with introverted personalities were more likely to be in the low HRQoL group than those with intermediate personalities in the present study. Hence, introversion may be a risk factor for the HRQoL of medical staff. This suggests a potential need to tailor interventions according to personality differences.

A series of our findings can help provide medical staff with interventions for improving HRQoL. As HRQoL is sometimes used interchangeably with mental well-being. The majority of the

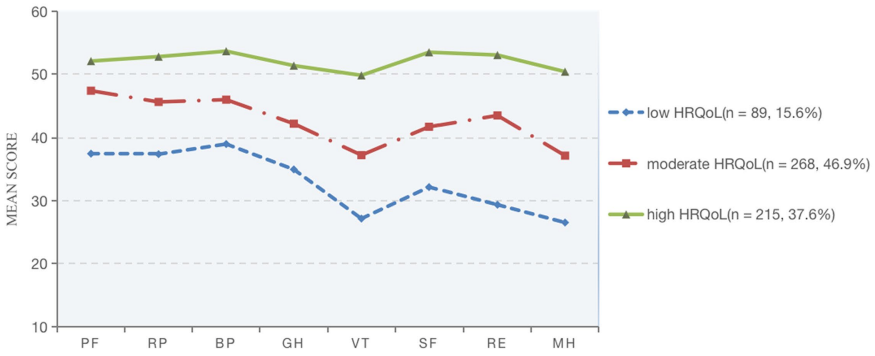

FIGURE 2
Item means for the three-profile mode of HRQoL. PF, physical functioning; RP, role-physical; BP, bodily pain; GH, general health; VT, vitality; SF, social functioning; RE, role-emotional; MH, mental health.

TABLE 5 Descriptive statistics for health-related quality of life (HRQoL) disaggregated by latent profile class.

Variable	Class 1 Low HRQoL *n*=89, 15.6%		Class 2 Moderate HRQoL *n*=268, 46.9%		Class 3 High HRQoL *n*=215, 37.6%		*F*
	M	SE	M	SE	M	SE	
PF	37.483	1.802	47.506	0.818	52.095	0.387	63.608***
RP	37.404	1.627	45.717	1.146	52.806	0.649	87.574***
BP	39.015	0.990	46.083	0.921	53.672	0.507	58.409***
GH	34.973	1.601	42.255	0.582	51.374	0.657	51.051***
VT	27.146	2.592	37.251	0.621	49.827	0.712	52.697***
SF	32.162	1.243	41.763	1.049	53.502	0.604	62.869***
RE	29.354	1.671	43.566	1.466	53.059	0.633	99.544***
MH	26.517	1.936	37.170	0.793	50.409	0.626	46.226***

***$p < 0.001$. PF, physical functioning; RP, role-physical; BP, bodily pain; GH, general health; VT, vitality; SF, social functioning; RE, role-emotional; MH, mental health.

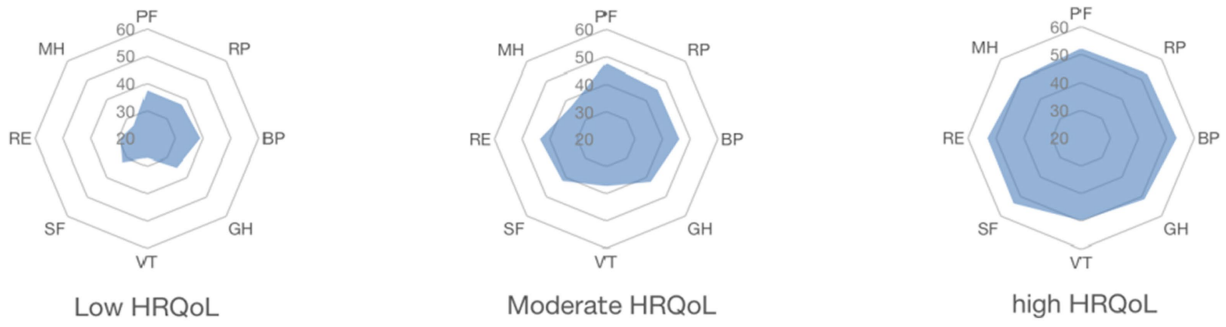

FIGURE 3
The tendencies of three distinctive HRQoL. PF, physical functioning; RP, role-physical; BP, bodily pain; GH, general health; VT, vitality; SF, social functioning; RE, role-emotional; MH, mental health.

interventions available today for healthcare professionals focus on psychological issues like anxiety and depression and how to control them. There are relatively few interventions that specifically address how to improve the quality of life of healthcare professionals. Consequently, it is imperative to develop interventions that take into consideration the relevant characteristics and cultural identity of Chinese medical personnel. Considering the findings of our study, future research might focus on enhancing the physical condition of

TABLE 6 Odds ratios for the covariates predicting latent profile membership.

Covariate		Moderate HRQoL vs. Low HRQoL			High HRQoL vs. Low HRQoL		
		OR	95%CI	*P*	OR	95%CI	*P*
Worktime							
	<8	0.940	0.544–1.625	0.824	0.651	0.371–1.143	0.135
	≥8	Ref	Ref	Ref	Ref	Ref	Ref
Night shift times per week							
	0	1.568	0.757–3.247	0.226	2.299	1.089–4.855	0.029
	1	1.333	0.749–2.373	0.328	1.176	0.635–2.179	0.606
	≥2	Ref	Ref	Ref	Ref	Ref	Ref
Exercise							
	never	0.469	0.183–1.197	0.113	0.250	0.098–0.638	0.004
	1-2 h/week	0.610	0.235–1.582	0.309	0.400	0.155–1.032	0.058
	≥3 h/week	Ref	Ref	Ref	Ref	Ref	Ref
Personality							
	Extroverted	0.854	0.452–1.614	0.627	1.183	0.620–2.258	0.610
	Introverted	0.603	0.344–1.059	0.078	0.495	0.268–0.915	0.025
	Intermediate	Ref	Ref	Ref	Ref	Ref	Ref

OR, odds ratio; CI, confidence interval. Low HRQoL as a refer.

medical personnel. Despite the fact that most medical professionals are knowledgeable about health issues, the intense work demands and lack of personal time present some challenges for this group in managing their own health. Psychological interventions can be used to alleviate symptoms like fatigue. For instance, mindfulness reduces the emotional burden on the nurse, which in turn reduces the level of burnout (46). And resilience training also showed a positive effect on medical staff's anxiety and stress (47). However, psychological interventions typically need to be carried out over a longer period of time and by qualified psychologists. Our vision can be placed on the availability of direct and simple physical interventions to alleviate their fatigue and tiredness levels. This has immediate implications for medical professionals.

4.1. Strengths and limitations

Some contributions stem from the present study. The present findings reveal heterogeneity in the healthcare worker sample, implying the need for suitable quality of life improvement programs for various healthcare groups. As far as we are aware, there have not been any studies using LPA to investigate the variables affecting healthcare workers' HRQoL. We can use the profile membership information provided by LPA to identify groups of healthcare professionals with various HRQoL traits. Integrating medical staff's HRQoL traits with demographic characteristics in subsequent studies to find more targeted intervention plans. However, certain limitations should be taken into account. On the one hand, we cannot determine how profiles may change or stabilize over time or how profiles would predict the long-term HRQoL of medical staff due to the cross-sectional design of the current study. Further longitudinal studies can be performed to gather information on how medical staff's HRQoL evolves over time. On the other hand, in the absence of objective assessment criteria, the level of HRQoL is self-reported results. Recall bias may affect study results. A multi-information strategy would be advantageous for upcoming research. What's more, the extrapolation of the results may be somewhat constrained because the current study only focused on the population of Chinese healthcare workers. Nevertheless, convenience sampling can be unreliable and limit the generalization of research findings to other population groups; we consider to incorporate design-based principles such as randomization or systematic sampling into future survey designs.

5. Conclusion

The current study explored different profiles of HRQoL among Chinese medical staff to analyze the level of HRQoL of this population more specifically and we finally found three different levels of HRQoL traits among Chinese medical staff. The results of our study are important to the development of public health today.

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 study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Research Ethics Committee of the Second Affiliated Hospital of Wenzhou Medical University (LCKY2019-288). Informed consent was obtained from all subjects involved in the study.

Author contributions

JH and JZ wrote the main manuscript text. YR, HZ, and WG contributed to the data collection. JH contributed to the data analysis. AD contributed to the study design and had full access to all the data in the study, taking responsibility for the data analysis's accuracy and the data's integrity, and contributing to revising the article and final approval. 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.

Publisher's note

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Occupational stress of physicians and nurses in emergency departments after contracting COVID-19 and its influencing factors: a cross-sectional study

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Background: Occupational stress is one of the major occupational health hazards globally. This study investigated the current situation of and factors influencing the occupational stress of physicians and nurses in emergency departments (EDs) after contracting coronavirus disease (COVID-19).

Methods: An online questionnaire survey was conducted among physicians and nurses in EDs in China between January 5 and 8, 2023. A general descriptive analysis of variables was conducted, the differences in the occupational stress of physicians and nurses in EDs with different characteristics were analyzed using the chi-square test, and factors influencing occupational stress were investigated using generalized ordinal logistic regression.

Results: Of the 1924 physicians and nurses in EDs who contracted COVID-19, 64.71% considered their occupational stress high or very high, with overly intense work as the primary stressor. Those with ≥ 10 years of work tenure, working in tertiary hospitals and with higher professional titles were more stressed, while females, nurses, those with a master's degree or higher, and those who continued to work after contracting COVID-19 were less stressed. There were differences in the predictors of occupational stress between physicians and nurses.

Conclusion: China's physicians and nurses in EDs had high occupational stress after contracting COVID-19. Attention should be given to the occupational mental health of physicians and nurses in EDs, and training on the prevention and treatment of COVID-19 infection should be strengthened.

KEYWORDS

occupational stress, emergency department, physicians and nurses, COVID-19 infection, influencing factors

Introduction

Occupational stress is the physiological and psychological response that occurs when occupational demands exceed an individual's capabilities (1). According to the World Health Organization, stress often occurs when employees perceive a lack of relevant knowledge and abilities to perform assigned tasks, low support from superiors and colleagues, or a loss of control over work processes (2). Occupational stress has been recognized as one of the major occupational health hazards that affects practitioners around the world (3), seriously endangering individuals' physical and mental health (e.g., stroke and anxiety) (4, 5) and affecting organizational stability (e.g., absenteeism and turnover) (6, 7). Evidence suggests that various factors are linked to occupational stress, with common risk factors having been proven to be high work volume, long working hours, and high work intensity (8). In addition, occupational stress varies by sociodemographic characteristics, such as sex and education (9, 10).

Personnel in the medical field usually face a more stressful environment than those in other industries. The fact that health personnel in emergency departments (EDs) mainly treat critically ill patients and have a high workload leads to more pronounced occupational stress among physicians and nurses in these departments (8, 11). The daily need to make quick decisions in life-threatening situations, constant exposure to the death or suffering of patients, and the inability to provide adequate and appropriate medical care to patients greatly increase the burden on emergency health workers and contribute to a stressful work environment (12–14). Occupational stress among health workers in EDs should therefore be considered important.

The ongoing coronavirus disease (COVID-19) pandemic has placed a heavy burden on medical and healthcare systems around the world in the past three years. While the outbreak of the COVID-19 pandemic has changed the work environment for all employees, health workers must always be prepared to perform their duties. On December 7, 2022, the Chinese government promulgated the Notice on Further Optimizing the Implementation of Prevention and Control Measures for the COVID-19 Epidemic (15), proposing to further accurately divide risk areas, to avoid conducting nucleic acid testing of all populations by administrative region, and to scientifically classify and treat patients infected with COVID-19. EDs are important for responding to the COVID-19 epidemic and treating critically ill patients. After adjustment to the epidemic prevention policy, a surge of COVID-19 cases and an increase in the risk of infection have brought higher requirements and new challenges to physicians and nurses. Long working hours, an intense work environment, work overload, fear of COVID-19 infection, concerns about the health of family and friends, limited training and experience in the prevention and treatment of COVID-19 infection, and constant adjustments to and changes in treatment plans (16, 17) all have the potential to increase the stress of physicians and nurses in EDs.

A better understanding of the current status of occupational stress among physicians and nurses in EDs is conductive to developing targeted strategies for the improvement of mental health. However, to date, only very limited studies have been conducted to investigate the occupational stress of frontline physicians and nurses in EDs in the fight against the COVID-19 epidemic and the influencing factors (18–21), with the fear of contracting COVID-19 for themselves or their families being significantly associated with higher occupational health. Furthermore, research on the occupational stress of physicians and nurses in EDs after contracting COVID-19 and the influencing factors has not been reported. To fill this research gap, in this study, we aimed to investigate the current status of occupational stress of Chinese physicians and nurses in EDs who contracted COVID-19 and explore the influencing factors. This research is helpful to provide an empirical basis and suggestions for physicians and nurses in EDs to cope with occupational stress.

Abbreviations: COVID-19, coronavirus disease; EDs, emergency departments.

Methods

Study design and population

A cross-sectional study was conducted between January 5, 2023, and January 8, 2023. The convenience sampling method was used to recruit the study population. The Emergency Medicine Branch of the Chinese Medical Association organized an online conference on training and sharing experience in emergency medicine during the epidemic for physicians and nurses in EDs from 31 provinces/municipalities/autonomous regions in China (excluding Hong Kong, Macau, and Taiwan) from December 25, 2022, to January 6, 2023. This special training conference was conducted in a voluntary manner. We distributed an electronic questionnaire to participants through the conference WeChat group on January 5, 2023, collected responses on a voluntary basis, and closed the questionnaire submission system on January 8, 2023. A total of 2,447 questionnaires were collected, with respondents covering 29 provinces/municipalities/autonomous regions except Qinghai and Tibet. The questionnaires for six nonemergency physicians and nurses were excluded. The remaining 1,924 confirmed samples were further screened based on whether they were infected with COVID-19 between December 1, 2022, and the time of the questionnaire survey.

This study was approved by the Ethics Committee of Hainan Medical College (No. HYLL-2022-426), and all participants provided informed consent and voluntarily participated in the investigation.

Measurement

Dependent variable

Although some occupational stress scales have been reported and confirmed the validity in the previously published literature (22–24), no specific standardized questionnaire or scale is available for health workers in EDs in China. Additionally, because health workers in EDs experienced a heavy workload during the COVID-19 pandemic in China, the time required to complete the questionnaire should be shortened as much as possible. Thus, with reference to a previous study among emergency medical personnel during the COVID-19 pandemic (18), occupational stress was measured using the following item: "Have you felt stressed at work recently?" Responses of "no stress," "low stress," "average stress," "high stress," and "very high stress" were scored 1, 2, 3, 4, and 5 points, respectively. Based on

literature reviews (8, 17–20) and our team's own research experiences during the COVID-19 pandemic, a multiple-choice item with eight options was used to further investigate stressors. The options were as follows: (1) worried about being infected and unable to go to work; (2) concerned about having been infected and feeling very fatigued at work; (3) work intensity is too high; (4) too many severely ill patients; (5) work environment is depressing; (6) current knowledge and skills fail to meet the needs of patients; (7) worried about COVID-19-infected family members and failed to balance work and family; and (8) other.

Independent variables

The independent variables in this study were mainly sociodemographic characteristics and work characteristics, including age, years of work tenure, sex, occupation, highest education level, hospital level, professional title, and work status after contracting COVID-19.

Quality control

The questionnaire was designed based on literature research (8, 17–20), expert consultations, and a group discussion. First, a literature review was performed and we developed a questionnaire. Next, two physicians practicing in EDs, two nurses practicing in EDs, two healthcare administrators practicing in hospitals, a social medicine professor, and an epidemiology professor with at least five years of work experience were selected to assess the questionnaire content. The main suggestion given by the experts was to refine the questionnaire to reduce the completion time. Then, six members of our research team conducted a group discussion to clarify the instructions of the questionnaire and its distribution. To ensure that all questions were clear and understandable, a pre-survey of 30 physicians and nurses in EDs in Haikou was conducted before the formal survey. Some statements in the instructions of the questionnaire were found to be vague, and the questionnaire was further revised based on their feedback. The survey was then conducted electronically using Wenjuanxing, a Chinese online questionnaire survey platform, with the help of the Emergency Medicine Branch of the Chinese Medical Association. The same device or account could only be used to complete the questionnaire once, and all questions had to be answered before submission.

Statistical analysis

Data analysis was performed using Stata 17.0. Quantitative variables were described as means and standard deviations, and categorical variables were presented as frequencies and constituent ratios. The chi-square test was used to compare the differences in occupational stress for different variables. The statistically significant variables were included in an ordinal logistic regression model of the factors influencing occupational stress and did not pass the parallelism test. Therefore, a generalized ordinal logistic regression analysis that satisfied the partial proportional odds assumption was performed using the gologit2 command (25). The dependent variable, occupational stress, was a categorical ordinal variable with five levels and led to four logit models, namely (1), 2, 3, 4, and 5 vs. 1 (2), 3, 4, and 5 vs. 1 and 2 (3), 4 and 5 vs. 1, 2, and 3, and (4) 5 vs. 1, 2, 3, and 4, which were generated to compare the probability of being in a higher category with the probability of being below that category. Furthermore, a stratified analysis was conducted to identify the determinants of occupational stress among physicians and nurses in EDs. Differences were considered statistically significant at a two-sided threshold of $p < 0.05$.

Results

The 1,924 physicians and nurses in EDs had a mean age of 40.49 ± 4.93 years, with the majority (84.62%) under 45 years. The respondents had worked for a mean of 12.91 ± 6.44 years, with the majority (64.55%) having a work tenure of 10 years or more. Males and females accounted for 48.34 and 51.66%, respectively, physicians and nurses accounted for 57.69 and 42.31%, respectively, more than half (51.61%) had a bachelor's degree, approximately two-thirds (66.63%) worked in tertiary hospitals, many (46.93%) had junior professional titles and below, and nearly one-fifth continued to work after contracting COVID-19. Details are shown in Table 1.

Only 8.37% indicated that they had "no stress," and those with "low stress," "average stress," "high stress," and "very high stress" accounted for 11.85, 15.07, 32.33, and 32.38%, respectively. The chi-square test showed a statistically significant distribution ($p < 0.05$) of occupational stress among physicians and nurses in EDs in terms of age, years of work tenure, sex, occupation, highest education level, hospital rank, professional title, and whether they continued to work after contracting COVID-19 (Table 1). Table 2 presents the sources of occupational stress of physicians and nurses in EDs, with overly intense work (77.08%), contracting COVID-19 themselves, being very fatigued at work (69.82%), and too many critically ill patients (62.00%) being the 3 main stressors.

Table 3 shows the results of the generalized ordinal logistic regression of the factors influencing the occupational stress of physicians and nurses in EDs. In all models, years of work tenure, occupation, and whether they continued to work after contracting COVID-19 were all statistically significant. Work tenure of 10 years or longer was a risk factor for occupational stress, and its effect increased when the occupational stress level moved from low to high. The largest effect was identified in Model 3 ($b = 1.09$, $p < 0.01$), and decreased in Model 4. Working as a nurse and continuing to work after contracting COVID-19 were protective factors against occupational stress. The effect of occupation weakened when the occupational stress level moved from low to high; the smallest effect was identified in Model 3 ($b = -0.30$, $p = 0.03$), and increased in Model 4. The effect of whether to continue working after contracting COVID-19 strengthened when the occupational stress level moved from low to high; the largest effect was identified in Model 3 ($b = -1.28$, $p < 0.01$), and decreased in Model 4. The highest education level and hospital level were not statistically significant in Model 1 but were statistically significant in Models 2 to 4. Individuals with a master's degree or higher had less occupational stress, and those working in tertiary hospitals had more occupational stress. Furthermore, in Models 2 and 3, occupational stress was significantly lower for females than for males. Model 4 shows that the higher the professional title, the greater the occupational stress. However, age was not significantly associated with occupational stress of physicians and nurses in EDs.

TABLE 1 Descriptive statistics and univariate analysis of the differences in occupational stress among physicians and nurses in the emergency department.

Variables	Frequency (%)	Occupational stress					χ^2
		1	2	3	4	5	
Total	1924 (100.00)	161 (8.37)	228 (11.85)	290 (15.07)	622 (32.33)	623 (32.38)	
Age, years							30.38*
< 45	1,628 (84.62)	147 (9.03)	211 (12.96)	254 (15.60)	519 (31.88)	497 (30.53)	
≥ 45	296 (15.38)	14 (4.73)	17 (5.74)	36 (12.16)	103 (34.80)	126 (42.57)	
Work tenure, years							300.63*
< 10	682 (35.45)	103 (15.10)	151 (22.14)	158 (23.17)	134 (19.65)	136 (19.94)	
≥ 10	1,242 (64.55)	58 (4.67)	77 (6.20)	132 (10.63)	488 (39.29)	487 (39.21)	
Sex							28.59*
Male	930 (48.34)	60 (6.45)	84 (9.03)	141 (15.16)	308 (33.12)	337 (36.24)	
Female	994 (51.66)	101 (10.16)	144 (14.49)	149 (14.99)	314 (31.59)	286 (28.77)	
Occupation							31.34*
Physician	1,110 (57.69)	68 (6.13)	121 (10.90)	167 (15.05)	350 (31.53)	404 (36.40)	
Nurse	814 (42.31)	93 (11.43)	107 (13.14)	123 (15.11)	272 (33.42)	219 (26.90)	
Education level							116.13*
Associate's degree or vocational diploma#	491 (25.52)	54 (11.00)	48 (9.78)	75 (15.27)	163 (33.20)	151 (30.75)	
Bachelor's degree	993 (51.61)	62 (6.24)	95 (9.57)	106 (10.67)	366 (36.86)	364 (36.66)	
Master's degree or higher	440 (22.87)	45 (10.23)	85 (19.32)	109 (24.77)	93 (21.14)	108 (24.55)	
Level of hospital							88.00*
Others	105 (5.46)	14 (13.33)	24 (22.86)	28 (26.67)	21 (20.00)	18 (17.14)	
Secondary hospital	537 (27.91)	61 (11.36)	88 (16.39)	95 (17.69)	136 (25.33)	157 (29.24)	
Tertiary hospital	1,282 (66.63)	86 (6.71)	116 (9.05)	167 (13.03)	465 (36.27)	448 (34.95)	
Professional title							29.14*
Elementary or below	903 (46.93)	80 (8.86)	114 (12.62)	141 (15.61)	318 (35.22)	250 (27.69)	
Intermediate	620 (32.22)	46 (7.42)	61 (9.84)	90 (14.52)	208 (33.55)	215 (34.68)	
Senior	401 (20.84)	35 (8.73)	53 (13.22)	59 (14.71)	96 (23.94)	158 (39.40)	
Continued working after contracting COVID-19							271.18*
No	1,540 (80.04)	91 (5.91)	128 (8.31)	189 (12.27)	557 (36.17)	575 (37.34)	
Yes	384 (19.96)	70 (18.23)	100 (26.04)	101 (26.30)	65 (16.93)	48 (12.50)	

*$p < 0.05$.

#Physicians and nurses in the emergency department who have acquired associate's degrees or vocational diplomas. An associate degree requires 3 years of education in college after graduation from senior middle school (grade year 10 to year 12), or 5 years of education in college after graduation from junior middle school (grade year 7 to year 9). A vocational diploma requires 2 years of education in vocational schools after graduation from senior middle school, or 3 years of education in vocational schools after graduation from junior middle school.

The results of stratified generalized ordinal logistic regression show that the predictors of occupational stress varied between physicians and nurses in EDs (Appendix Table S1). Work tenure, education level, level of hospital, professional title, and whether individuals continued working after contracting COVID-19 were common factors associated with occupational stress of physicians and nurses. Nevertheless, the effect of education level and professional title on occupational stress was opposite between physicians and nurses in EDs; specifically, higher education levels indicated lower occupational stress in physicians and higher occupational stress in nurses, while higher professional titles indicated higher occupational stress in physicians and lower occupational stress in nurses. Age and sex were another two factors associated with occupational stress among physicians in EDs.

Discussion

This study found that 91.63% of physicians and nurses in EDs felt stressed at work after contracting COVID-19 and that nearly two-thirds felt highly and very highly stressed. In the context of the COVID-19 pandemic, previous studies have reported a lower incidence of stress. Çınar et al. (20) surveyed 169 emergency department nurses in Turkey and found that 44.6% had higher than average perceived stress. Cui et al. (19) analyzed 453 EDs and fever clinics in Jiangsu Province, China, and reported that 32.23% of nurses had high stress. A meta-analysis revealed that frontline medical workers who cared for COVID-19 patients had a stress incidence of 45% (26). Differences in stress levels may be related to COVID-19 infection status, study area, samples, and measurement tools. Overall,

TABLE 2 Distribution of the source of occupational stress among physicians and nurses in the emergency department.

Items	*N*	%
Total	1763	100.00
Worried about getting infected and not going to work	677	38.40
Having been infected with COVID-19 and especially tired at work	1,231	69.82
Intensive work	1,359	77.08
Too many critical patients	1,093	62.00
Depressing work environment	916	51.96
Knowledge and skills cannot meet the needs of patients	542	30.74
Unable to juggle work and family due to family members being infected with COVID-19	873	49.52
Other	17	0.96

physicians and nurses who contracted COVID-19 in Chinese EDs were under high occupational stress. The COVID-19 pandemic affected the stress levels of physicians and nurses in EDs, made them work under stressful conditions, and increased the risk of psychological problems (17). Hospital administrators should pay close attention to the stress of physicians and nurses in EDs, train them to cope with the COVID-19 epidemic, and improve their mental health.

The primary source of occupational stress among physicians and nurses in EDs was overly high work intensity. An excessive number of critically ill patients was also an important stressor, indicating that physicians and nurses in EDs had a high workload. After adjustments to the epidemic prevention policy, the number of COVID-19 cases increased sharply as did the demand for medical treatment, thereby increasing the workload of personnel at EDs. Furthermore, the infection of medical workers led to a shortage of human resources in EDs, making it difficult to keep up with the supply of medical services; therefore, the medical personnel on duty were overworked. A survey by Şanlıtürk et al. (27) of intensive care nurses during the COVID-19 pandemic found similar results, with 78.6% of nurses reporting that stress stemmed from a heavy workload and prolonged fatigue. Mirzaei et al. (21) found that the highest level of job stress was related to the demand area among ED nurses and emergency medical services staff, and increasing the workload led to job stress. The COVID-19 pandemic changed the functioning of hospitals and specialist clinics, especially burdening the already overloaded health workforce in EDs. It is necessary to strengthen the overall planning of medical resources, coordinate work shifts, and mobilize physicians and nurses from other departments to participate in emergency treatment when necessary.

Having contracted COVID-19 themselves and being very fatigued at work were important sources of occupational stress, an option chosen by 69.82% of physicians and nurses in EDs. In addition, multivariate analysis showed that continuing to work after contracting COVID-19 was a protective factor against occupational stress. In this study, 19.96% of physicians and nurses in EDs continued to work after contracting COVID-19, indicating that the physicians and nurses in EDs who had contracted COVID-19 but continued work despite feeling fatigued during work were more resilient to stress. Because this was a cross-sectional study, a causal relationship could not be determined, and it is possible that individuals with less occupational stress tended to continue to work despite being infected.

Previous studies on years of work tenure or sex differences in the occupational stress of medical workers have led to inconsistent results. Povedano-Jimenez et al. (28) noted that males with more than 10 years of work tenure showed greater coping skills in difficult and stressful situations. In contrast, a study by Tian et al. (29) on Chinese emergency physicians showed that male sex and long work tenure were positively correlated with high occupational stress. However, Mirzaei et al. (21) reported that gender and work experience were not significant factors that affected the occupational stress of ED nurses and emergency medical services staff. Our study found that work tenure of 10 years or longer was a risk factor for occupational stress. COVID-19 is an emerging infectious disease, and previous skills and clinical experience in emergency medicine acquired over time may not be applicable in the response to the COVID-19 epidemic. Hence, work experience played a limited role. In addition, the results of this study revealed that females had less occupational stress than males. In contrast, most previous studies have shown that occupational stress was more prevalent among female medical workers, who were more affected by the double burden from both family and work (18, 20, 27). One possible explanation for our finding may be that women received dual psychological support despite being affected by work and family disturbances. Further research is needed on the relationship between sex and occupational stress.

The generalized ordinal logistic regression analysis results showed that in EDs, physicians had significantly higher occupational stress than nurses. There are differences between physicians and nurses in the nature of their work; physicians are mainly responsible for diagnosing diseases and developing treatment plans, and nurses mainly play a supportive role by carrying out physicians' plans. As a result, patients and their families have higher expectations of physicians, which may increase the stress of physicians to some extent. Studies have shown that physicians were more likely to report adverse psychological consequences of occupational stress than nurses (30, 31). Therefore, focus should be placed on physicians to provide them with adequate psychological support, develop their resilience to stress, and offer timely interventions when psychological problems are identified.

The results of stratified analysis indicated that the predictors of occupational stress differed between physicians and nurses in EDs. Intriguingly, education level and professional title had opposite effects on occupational stress between physicians and nurses. Physicians with lower education levels and higher professional titles reported higher occupational stress. A low level of education usually indicates a lack of competence to cope with the diagnosis and treatment of diseases, and patients prefer to seek higher-quality health care from those who have higher professional titles (32), both of which may contribute to a higher level of occupational stress among physicians. For nurses, higher education levels and lower professional titles were associated with higher occupational stress. Although higher education increases an individual's knowledge and skills, it is expected to improve the quality of health services with the growth of people's expectations (33). Better-educated people are often in more challenging situations and perform more specialized work, increasing the level of occupational stress (34). The role of nurses with low professional titles was limited during the COVID-19 pandemic, which may have caused them to lack a sense of presence and led to stress. More research is needed to

TABLE 3 Generalized ordered logistic regression model for the factors associated with occupational stress among physicians and nurses in the emergency department.

Variables	Model 1: 2, 3, 4, 5 vs. 1			Model 2: 3, 4, 5 vs. 1, 2			Model 3: 4, 5 vs. 1, 2, 3			Model 4: 5 vs. 1, 2, 3, 4		
	b	95% CI	*z*	*b*	95% CI	*z*	*b*	95% CI	*z*	*b*	95% CI	*z*
Age, years (ref: < 45)												
≥ 45	0.31	−0.29, 0.91	1.03	0.30	−0.13, 0.73	1.35	0.20	−0.13, 0.53	1.17	0.00	−0.29, 0.30	0.03
Work tenure, years (ref: < 10)												
≥ 10	0.73	0.37, 1.09	3.98*	1.00	0.73, 1.26	7.37*	1.09	0.85, 1.33	9.00*	0.42	0.16, 0.68	3.14*
Sex (ref: male)												
Female	−0.14	−0.53, 0.25	−0.71	−0.38	−0.66, −0.10	−2.65*	−0.25	−0.50, −0.01	−2.03*	−0.05	−0.31, 0.20	−0.42
Occupation (ref: physician)												
Nurse	−0.50	−0.98, −0.01	−2.02*	−0.43	−0.74, −0.11	−2.67*	−0.30	−0.57, −0.03	−2.14*	−0.35	−0.63, −0.07	−2.41*
Education level (ref: associate's degree or vocational diploma[#])												
Bachelor's degree	0.38	−0.04, 0.81	1.77	0.08	−0.23, 0.39	0.50	0.30	0.04, 0.56	2.28*	0.08	−0.17, 0.32	0.62
Master's degree or higher	−0.02	−0.61, 0.58	−0.05	−0.54	−0.92, −0.15	−2.73*	−0.62	−0.95, −0.29	−3.69*	−0.40	−0.74, −0.06	−2.29*
Level of hospital (ref: others)												
Secondary hospital	0.03	−0.61, 0.67	0.09	0.20	−0.27, 0.67	0.83	0.47	0.00, 0.93	1.98*	0.42	−0.14, 0.98	1.47
Tertiary hospital	0.38	−0.24, 1.01	1.21	0.68	0.23, 1.13	2.96*	0.99	0.55, 1.44	4.38*	0.66	0.12, 1.20	2.40*
Professional title (ref: elementary or below)												
Intermediate	0.06	−0.33, 0.45	0.28	0.09	−0.19, 0.38	0.66	0.02	−0.22, 0.26	0.15	0.26	0.03, 0.49	2.21*
Senior	−0.07	−0.50, 0.36	−0.31	−0.15	−0.46, 0.17	−0.92	−0.11	−0.39, 0.17	−0.74	0.55	0.26, 0.85	3.70*
Whether to continue working after contracting COVID-19 (ref: no)												
Yes	−0.80	−1.14, −0.45	−4.52*	−1.05	−1.31, −0.78	−7.85*	−1.28	−1.54, −1.02	−9.50*	−1.20	−1.54, −0.85	−6.80*
Constant	2.09	1.25, 2.92	4.91*	1.11	0.53, 1.68	3.77*	−0.29	−0.82, 0.25	−1.05	−1.42	−2.04, −0.81	−4.56*

*$p < 0.05$.

[#]Physicians and nurses in the emergency department who have acquired associate's degrees or vocational diplomas. An associate degree requires 3 years of education in college after graduation from senior middle school (grade year 10 to year 12), or 5 years of education in college after graduation from junior middle school (grade year 7 to year 9). A vocational diploma requires 2 years of education in vocational schools after graduation from senior middle school, or 3 years of education in vocational schools after graduation from junior middle school.

explore the determinants of occupational stress among physicians and nurses in EDs.

Strengths and limitations

This study is the first to investigate the occupational stress of physicians and nurses in EDs after they contracted COVID-19 and to analyze the stressors and influencing factors. The findings may serve as a reference for other countries and other groups of medical workers. Notably, this study had some limitations. First, the cross-sectional study design limited causal inferences. Second, the collection of self-reported data may reduce the objectivity of the information. Third, there may be other influencing factors (e.g., psychological factors and workload) that were not examined. Fourth, convenience sampling limited the representativeness of the sample and the generalizability of our findings.

Implications for research and practice

To better deliver medical and healthcare services during the COVID-19 pandemic, it is vital to protect the physical and mental health of physicians and nurses. The results of this study suggest that we should pay close attention to the psychological status of physicians and nurses, strengthen training for COVID-19 diagnosis and treatment, and flexibly allocate medical resources. This study provides scientific evidence for the research and management of the occupational stress of physicians and nurses in EDs and offers a reference for the management of

occupational stress of physicians and nurses under similar public health emergencies.

Conclusion

Chinese physicians and nurses in EDs had a high level of occupational stress after contracting COVID-19, with heavy workloads and fatigue at work after infection as the main stressors. Age, years of work tenure, sex, occupation, education level, hospital level, professional title, and continuing to work after contracting COVID-19 were the factors that influenced the occupational stress of physicians and nurses in EDs.

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 Ethics Committee of Hainan Medical College (No. HYLL-2022-426). All participants provided informed consent and voluntarily participated in the investigation. The patients/participants provided their verbal informed consent to participate in this study.

Author contributions

CL and YG conceived and designed the study. CL, SY, HH, and XH participated in the acquisition of data. CL and JF analyzed the data. HH and XH gave advice on methodology. YG and JF wrote the draft of the paper. XH is the guarantor of this work and has full access to all the data in the study and takes responsibility for its integrity and the accuracy of the data analysis. All authors contributed to writing, reviewing, or revising the paper and read and approved the final manuscript.

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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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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1169764/full#supplementary-material

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Association of working hours and cumulative fatigue among Chinese primary health care professionals

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Introduction: The association between long working hours and cumulative fatigue is widely acknowledged in the literature. However, there are few studies on the mediating effect of working hours on cumulative fatigue using occupational stress as a mediating variable. The present study aimed at investigating the mediating role of occupational stress in the relationship between working hours and cumulative fatigue in a sample of 1,327 primary health care professionals.

Methods: The Core Occupational Stress Scale and the Workers' Fatigue Accumulation Self-Diagnosis Scale were utilized in this study. The mediating effect of occupational stress was examined using hierarchical regression analysis and the Bootstrap test.

Results: Working hours were positively associated with cumulative fatigue via occupational stress ($p<0.01$). Occupational stress was found to partially mediate the relationship between working hours and cumulative fatigue, with a mediating effect of 0.078 (95% CI: 0.043–0.115, $p<0.01$), and the percentage of occupational stress mediating effect was 28.3%.

Discussion: Working hours can be associated with cumulative fatigue either directly or indirectly via occupational stress. As a result, by reducing occupational stress, primary health care professionals may reduce the cumulative fatigue symptoms caused by long hours of work.

KEYWORDS

working hours, cumulative fatigue, occupational stress, primary health care, mediating effect

1. Introduction

It is a very serious problem about the shortage of personnel in China's primary health care system, which has added a significant workload to the primary health care professionals (1). Furthermore, the main duty of these employees is to provide healthcare services to patients and the public. Primary health care workers often have longer working hours than other occupational

groups to ensure prompt service delivery and nursing work. They are also more likely to work overtime. Survey results indicate that over half (54%) of registered nurses in the United States work over 39 h per week, and 19.3% work 48 h or more per week (2). Long working hours have not yet been defined uniformly across nations. In the EU, workers' weekly working hours, including overtime hours, that exceed 48 h are considered long working hours (3). In South Korea, the Labor Standards Act defines long working hours as exceeding 52 h per week (4). And in China, the Labor Law provides in Article 36 that the country implements a working hour system in which laborers work no more than 8 h per day and no more than 44 h per week on average, and working more than 8 h per day or more than 44 h per week is defined as long working hours (5). Another study examining the working hours of doctors in Guangdong Province, China found that 68.5% of them worked more than 40 h per week (6). A sizable number of studies have shown that extended working hours can have negative impacts on the health of professional workers (7). A sizable number of studies have shown that extended working hours can have negative impacts on the health of professional workers (8). The generation of fatigue, including cumulative fatigue, is the most common, and the longer the working hours, the greater the degree of cumulative fatigue (9). Cumulative fatigue in professional groups is a condition in which an individual suffers from physical overwork, long-term emotional stress, or a lack of sleep, resulting in a decline, deteriorating health, emotional disturbance, or a decrease in work efficiency (10). Long hours of work have been found to have a greater impact on the professional population's cumulative fatigue, and limiting excessively long working hours may help alleviate the negative effects of accumulated fatigue (11).

There was a period of normalization of epidemic prevention and control in China during the investigation and study period of September 2021 to December 2022, and primary healthcare professionals played an important role in responding to the new Coronavirus (12). Professionals of primary health care systems were responsible for basic work, as well as epidemic prevention and control during this time. Basic work includes community health education, monitoring chronic disease and infectious disease, taking care of older adult patients, managing vaccination, and more. Epidemic prevention and control work includes virus screening, public place disinfection, and health education to prevent COVID-19. These strict normalization policy for epidemic prevention places a significant burden on primary health care professionals, such as an increasing number of outpatient visits, resulting in extended working hours (13). Overtime working occurs frequently, causing professionals to experience increased fatigue and occupational stress (14). According to some studies, working hours are linked to symptoms like occupational stress and cumulative fatigue, and occupational stress have an intermediary effect on working hours and cumulative fatigue (15). Occupational stress, also known as occupational pressure, is an adverse reaction caused by workplace requirements and career duties that exceed the ability of the occupational group, including physiological and psychological reactions (16). The researchers found that long-term occupational stress could negatively impact physical health, such as hormone imbalance and hypertension. And it also causes mental health damage, such as depression (17). According to some studies, relieving the professionals' occupational stress will reduce fatigue caused by long-term work (18). Therefore, this study discussed how primary health care professionals' occupational stress affected the role of working hours in cumulative fatigue and proposed measures to address the cumulative fatigue and occupational stress of the primary health care professionals.

Previous studies have examined the relationship between the professional population's cumulative fatigue and working time, as well as the effects of occupational stress and cumulative fatigue on employees. It has also been found that working time and occupational stress are significantly correlated (19). However, no studies have examined the impact of occupational stress as a mediating variable between working time and cumulative fatigue. Furthermore, previous research did not consider the primary health care professionals as research target. This study addressed the above limitations, including the lack of considerations on mediation factors and sampling specificity, by thoroughly investigating the relationship between working time, cumulative fatigue, and occupational stress among primary health care system professionals. The study also investigated the role and mechanism of occupational stress as mediating variables at primary health care professionals between working time and cumulative fatigue. It is anticipated that this study will examine primary health care professionals' working time, cumulative fatigue, and occupational stress; second, to find out how working hours are related to cumulative fatigue, occupational stress among primary health care professionals. And then, to investigate how, as a mediating variable, the occupational stress of primary health care professionals influences the effect of working hours on cumulative fatigue. After that, to present ideas on how to solve the cumulative fatigue of professionals in the primary health care system, particularly how to alleviate the cumulative fatigue by addressing the symptoms of occupational stress of professionals when working hours cannot be reduced.

2. Methods and materials

2.1. Participants

This was a cross-sectional study that began in September 2021 and lasted until December 2021. The survey was conducted in Guangdong Province, China, using a multi-stage stratified sampling method. According to the Guangdong Provincial Bureau of Statistics, the Gross Domestic Product (GDP) of each prefecture-level city was divided into three parts: economically good (more than 125 billion), economically medium (28–125 billion), and economically poor (less than 28 billion). Each GDP level was assigned four primary medical and health institutions at random, including district-level health bureaus, district-level centers for disease control and prevention, community health service centers, and public hospitals below the district level. All doctors, nurses, and medical technicians at the selected primary health institutions were surveyed. Over a week, the WeChat app was used to survey every employee of the institution online. Following the completion of the questionnaire by survey respondents, a staff member in each primary medical and health institution would be responsible for collecting the questionnaire information and reporting it to data processing personnel. This research object's inclusion criteria were: the age was over 18 years old, and participant had been continuously working on current position

for more than half a year. The survey included all employees from 12 primary health institutions in 10 cities, for a total of 1,430 people ($n = 1{,}430$). Upon completion of the survey, a total of 1,327 questionnaires were deemed eligible for analysis, resulting in a commendable response rate of 92.8%.

2.2. Basic investigation

Participants' investigation information was collected via online questionnaires, including basic information and occupation information. The basic information was age, gender, marital status, and education level. And the occupation information was personal monthly income, whether they are on duty, and whether they work night shift. Respondents' daily working hours were inquired about in terms of working hours. There is currently no agreed-upon definition of long working hours. This study refers to laws and policies such as China's "People's Republic of China Labor Law," "Regulations on Working Hours of State Council Employees," and related concepts of overtime work in the International Labor Organization (ILO). Working more than 8 h per day or 44 h per week is considered excessive (5). The related variable invested in this study is the working hours per day of the research participants.

2.3. Measurement of cumulative fatigue

The "Self-diagnosis Questionnaire for Workers' Fatigue Accumulation Degree" developed by the Japanese Ministry of Health, Labor, and Welfare was used to assess cumulative fatigue in this study (20). This scale is used to assess the accumulation of fatigue and overwork in the occupational population. Researchers in China have used this scale to measure the fatigue of the subjects in previous studies, and it is widely used. Previously, some Chinese researchers applied this scale to a machinery manufacturing plant, investigated the overwork status of factory workers, and proposed preventive measures for employee overwork (21).

The "evaluation of subjective symptoms" and the "evaluation of work conditions" dimensions comprise the Self-Diagnostic Questionnaire of Workers' Fatigue Accumulation Level. These two dimensions each have 13 entries and 7 entries, for a total of 20 entries. The scores of the 13 items were added up in the "Assessment of subjective symptoms" dimension, and the total score was divided into four grades, with a total score of less than 5 being grade I and a total score of 5 to 10 being grade II. A total score of 11 to 20 is considered grade III, while a total score of more than 20 is considered grade IV. In the dimension "Working Status Evaluation," the scores of the seven items are added up and divided into four grades. A total score of 0 represents grade A, a total score of 1–2 represents grade B, a total score of 3–5 is graded as C, and a score of more than 5 is graded as D. Subsequently, the cumulative fatigue score is calculated using the "Work Burden Score Scale" in conjunction with the classification of the two dimensions. The level of cumulative fatigue score shows the degree of fatigue in the occupational group. When the score reaches 2 points, it means that the employee has symptoms of cumulative fatigue. The reliability test results of this scale: the Cronbach's α coefficients for the total scale and the two dimensions of this scale are 0.892, 0.895, and 0.711, respectively. The validity test includes 20 items on the scale, and the results are as follows: The KMO was 0.921, the Bartlett sphericity test 2 value was 9,981.76 ($p < 0.01$), the cumulative variance contribution rate of the scale's common factor was 51.07%, and the factor loading value of each item ranged from 0.439 to 0.852.

2.4. Measurement of occupational stress

The "Core Occupational Stress Scale" (COSS) developed by the Chinese Center for Disease Control and Prevention and the Institute of Poison Control was used to assess occupational stress levels in this study (22). This scale has been used in a survey of occupational groups in China as a tool to measure employee occupational stress, and the results have been positive. There are four dimensions of COSS: "social support," "organization and reward," "demand and effort," and "autonomy." It has 17 items when added up from the four dimensions. The COSS employs the Likert 5-point scoring methodology, whereby respondents are presented with five response options ranging from "completely disagree" (1 point) to "disagree" (2 points), "basically agree" (3 points), "agree" (4 points), and "strongly agree" (5 points). The dimensions "social support" and "autonomy" use the reverse scoring method, while the dimensions "organization and return" and "requirement and effort" use the forward scoring method. Finally, the total occupational stress score is calculated by adding the scores of the 17 items in the four dimensions. The level of occupational stress score indicates the employee's level of occupational stress, and a score of occupational stress above 50 indicates that the employee has occupational stress. The reliability test results of the "Core Occupational Stress Scale" showed that the Cronbach's α coefficients of the total scale and the four dimensions were 0.681, 0.882, 0.754, 0.841, and 0.832, respectively. The scale comprised 17 items, and the statistical results yielded a KMO measure of 0.835, indicating an adequate sample size for factor analysis. Additionally, the Bartlett's test of sphericity achieved a significant value of 9,541.23 ($p < 0.01$), indicating that the correlation structure between the items was suitable for factor analysis. Furthermore, the factor loading coefficients of each item ranged from 0.488 to 0.922, indicating a satisfactory level of item convergence.

2.5. Statistical analysis

Following the collection of questionnaire information from each institution, data processing personnel screened the questionnaires and classified those with a missing item rate greater than 20% as invalid questionnaires, while including the remaining questionnaires as valid questionnaires in the database. Epi Data version 3.1 software was used for data entry. To avoid errors during quality control, two people entered data in parallel. SPSS version 22.0 software (IBM, Armonk, NY, United States) was used for data analysis. Since the normal distribution was not satisfied when the data was tested for normality, the median (Q1, Q3) was used for descriptive statistics. The Mann–Whitney U test was used to determine the significance of two graded variables: "gender," "education level," "marital status," "whether shift work," and "whether work night shift." The Kruskal–Wallis H test was used to test the significance of multiple graded variables, including "age," "*per capita* monthly income," and "position." The correlation between working hours, occupational stress, and cumulative fatigue was then examined

using Spearman correlation analysis. In the next step, hierarchical regression analysis is used, with cumulative fatigue as the dependent variable, and basic conditions, daily working hours, and occupational stress as independent variables into the mediation effect model to analyze the effect of each link on the dependent variable. Finally, to test the mediating effect of occupational stress between working hours and cumulative fatigue, Model 4 was used in the Process 4.1 plug-in in SPSS for the Bootstrap method (23). The predictor variable is the daily working hours of employees in the primary health system, the outcome variable is the employees' cumulative fatigue score, the mediator variable is the employees' occupational stress level, and the control variables are age, education level, occupation, shift work, and whether to work night shift. The total effect of working hours on cumulative fatigue is divided into direct and indirect effects in the model. The total effect refers to the effect of the predictive variable employee's working hours on the outcome variable cumulative fatigue when the mediator variable occupational stress is not controlled. The direct effect is the effect of the predictive variable employee's working hours on the outcome variable cumulative fatigue when the mediator variable cumulative fatigue is controlled. The indirect effect refers to the effect of the predictive variable employee's working hours on the outcome variable cumulative fatigue through the mediating variable occupational stress, also known as the mediating effect. Two-tailed test level $\alpha = 0.05$. The methodology framework of investigation and statistics is shown in Figure 1.

3. Results

3.1. Basic information of participants

Among all research subjects, 28.5% were men and 71.5% were women; 31.3% were under the age of 30, 36.5% were between the ages of 31 and 39, and the remaining 32.2% were over the age of 40. In the occupational survey, 32.3% of the participants were doctors, 41.3% were nurses, and 26.4% were medical technicians. Of all participants, 43.9% of health system workers worked shifts, while 41.4% worked night shifts (Table 1).

3.2. Factors of working hours, cumulative fatigue, and occupational stress

Employees in the primary health care system worked an average of 8.5 h per day, with 33.5% of working hours being excessive. According to the analysis results, there was a statistically significant difference in the working hours of primary health care professionals from various educational backgrounds and occupations ($p < 0.05$).

The average occupational stress score among employees in the primary health care system was 45.0 (40.0, 50.0), with a 27.5% detection rate. Furthermore, the occupational stress level of primary health care workers who must work shifts and night shifts was significantly higher than that of workers who worked during normal business hours ($p < 0.05$).

The average cumulative fatigue score of primary health system staff was 2.0 (0.0, 4.0), with cumulative fatigue accounting for 57.5% of all staff. The results showed that there seemed to be statistically significant differences in the cumulative fatigue degree of primary health care workers of various ages, education levels, and occupations ($p < 0.05$). The cumulative fatigue was more severe among primary health care professionals under the age of 30, with a bachelor's degree or higher, and who are doctors. At the same time, the cumulative fatigue of primary health care workers who must work shifts and nights was significantly higher than that of workers who worked regular hours ($p < 0.05$). Details are shown in Table 1.

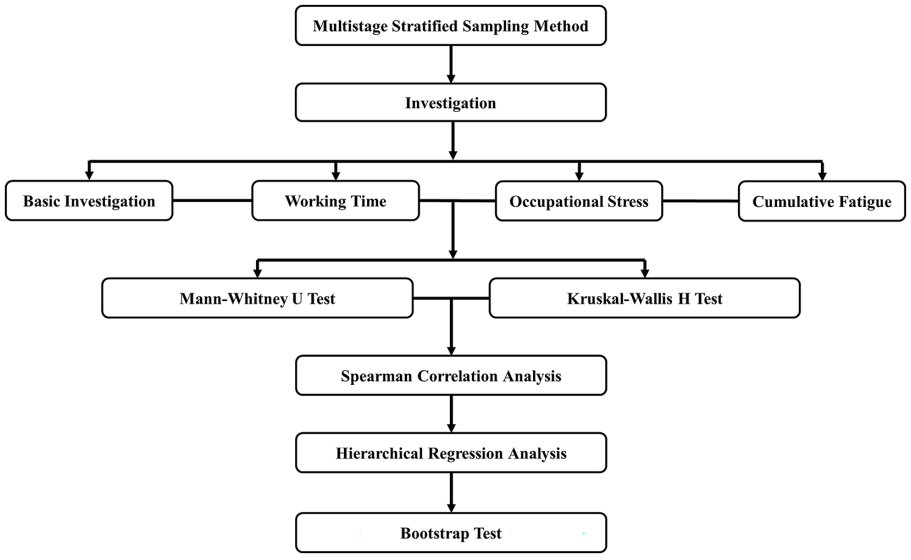

FIGURE 1
The methodology framework of investigation and statistics.

TABLE 1 Characteristics and scores of working time, cumulative fatigue, and occupational stress among participants.

Variables	Counts (Ratio/%)	Working hours			Occupational stress			Cumulative fatigue		
		Score	Z/H	*p*	Total/ Score	Z/H	*p*	Total/ Score	Z/H	*p*
Gender			−2.144	0.032		−0.365	0.715		−1.633	0.102
Male	378 (28.5)	8.0 (8.0,10.0)			44.5 (39.0,50.0)			2.0 (0.0,4.0)		
Female	949 (71.5)	8.0 (8.0,9.0)			45.0 (40.0,50.0)			2.0 (0.0,4.0)		
Age/Year			2.041	0.360		4.301	0.116		19.806	**<0.001**
≤30	416 (31.3)	8.0 (8.0,9.0)			45.0 (39.0,50.0)			2.0 (0.0,4.0)		
31–40	484 (36.5)	8.0 (8.0,9.0)			45.0 (40.0,51.0)			2.0 (0.0,4.0)		
≥41	427 (33.2)	8.0 (8.0,9.0)			44.0 (39.0,49.0)			1.0 (0.0,4.0)		
Education level			−2.607	**0.009**		−0.760	0.448		−3.721	**<0.001**
Junior college or below	634 (47.1)	8.0 (8.0,9.0)			45.0 (40.0,50.0)			2.0 (0.0,4.0)		
Bachelor or above	693 (52.9)	8.0 (8.0,9.0)			44.0 (39.0,50.0)			2.0 (0.0,4.0)		
Marital status			−0.623	0.533		−0.492	0.623	c	−1.442	0.149
Unmarried	329 (24.8)	8.0 (8.0,9.0)			45.0 (39.0,50.0)			2.0 (0.0,4.0)		
Married	998 (75.2)	8.0 (8.0,9.0)			45.0 (40.0,50.0)			2.0 (0.0,4.0)		
Monthly income/ USD			3.198	0.202		17.406	**<0.001**		1.053	0.591
≤700	488 (36.8)	8.0 (8.0,9.0)			46.0 (41.0,51.0)			2.0 (0.0,4.0)		
701–999	412 (31.0)	8.0 (8.0,9.0)			45.0 (40.0,50.0)			2.0 (0.0,4.0)		
≥1,000	427 (32.2)	8.0 (8.0,9.0)			43.0 (38.0,49.0)			2.0 (0.0,4.0)		
Occupation			14.512	**0.001**		10.574	**0.005**		20.079	**<0.001**
Doctor	428 (32.3)	8.0 (8.0,10.0)			46.0 (40.0,51.8)			2.0 (0.3,4.0)		
Nurse	548 (41.3)	8.0 (8.0,9.0)			45.0 (40.0,50.0)			2.0 (0.0,4.0)		
Medical technician	351 (26.4)	8.0 (7.0,9.0)			44.0 (39.0,49.0)			1.0 (0.0,4.0)		
Shift or not			−3.857	**<0.001**		−4.644	**<0.001**		−4.642	**<0.001**
No	745 (56.1)	8.0 (7.0,9.0)			44.0 (39.0,49.0)			2.0 (0.0,4.0)		
Yes	582 (43.9)	8.0 (8.0,9.0)			46.0 (40.0,51.0)			2.5 (0.0,4.0)		
Night shift			−6.816	**<0.001**		−4.606	**<0.001**		−9.112	**<0.001**
No	777 (58.6)	8.0 (7.0,9.0)						1.0 (0.0,4.0)		
Yes	550 (41.4)	8.0 (8.0,10.0)						3.0 (1.0,4.3)		

The bold values means $p < 0.05$.

3.3. Correlation of working hours, occupational stress, and cumulative fatigue

The results of Spearman correlation analysis showed that primary health care professionals' working hours are positively correlated with occupational stress and cumulative fatigue. Occupational stress and cumulative fatigue symptoms were more severe in primary health care workers who work longer hours ($r = 0.190$, 0.365, $p < 0.01$). At the same time, occupational stress among primary health care professionals was found to be positively related to cumulative fatigue, with the higher the occupational stress score, the more severe the symptoms of cumulative fatigue ($r = 0.546$, $p < 0.01$). Details are given in Table 2.

3.4. Stratified regression analysis on working hours, occupational stress, and cumulative fatigue

According to previous studies, education level, occupation, and shift work may be the confounders, which need to be considered in the research (24–26). And with the findings in Table 1, among the basic information of employees in the primary health care system, the factors that significantly affect cumulative fatigue include the employees' age, education level, occupation, shift, and night shift. The tolerance range of each factor was 0.583–0.969, and the variance inflation factor (VIF) ranges from 1.032–1.714, according to the multicollinearity analysis of these factors. As a result, there was no

TABLE 2 Correlation analysis of working time, occupational stress, and cumulative fatigue.

Variables	Working hours	COSS	Cumulative fatigue
Working hours	1.000		
COSS	0.190**	1.000	
Cumulative fatigue	0.365**	0.546**	1.000

PS: **means $p < 0.01$, and COSS means the Core Occupational Stress Scale, the same as below.

collinearity between the variables, and hierarchical regression analysis can be performed. Using cumulative fatigue score as the dependent variable, the first layer of the regression model included confounders as control variables, such as "age," "education level," "occupation," "whether shift work" and "whether work night shift." Based on the first step, "working hours" was included as a second-level variable in the regression model in the second step. Working hours were found to be positively associated with cumulative fatigue, and the variance explanation for cumulative fatigue symptoms was 7.7%. The scores of the four dimensions of occupational stress were then included in the regression model as the third layer of variables based on the second step. The findings revealed that the scores of "demand and effort" and "organization and reward" were positively correlated with the cumulative fatigue of employees, while the scores of "social supports" and "autonomy" were negatively associated with the cumulative fatigue scores of employees in the primary health system, with occupational stress accounting for 26.2% of the variation in accumulated fatigue, as shown in Table 3.

3.5. Mediation of occupational stress between working hours and cumulative fatigue

The results in Table 3 showed that the predictive variable working hours had a significant predictive effect on the outcome variable cumulative fatigue ($t = 7.468$, $p < 0.01$), and when the mediator variable occupational stress was put in, the predictive variable working hours still had a significant predictive effect on the outcome variable cumulative fatigue ($t = 6.170$, $p < 0.01$). In this model, whether the predictor variable was included in the 95% confidence interval of Bootstrap was used to determine whether there was a mediating effect. As shown in Tables 4, 5, the upper and lower limits of the 95% confidence intervals for the direct effect of primary health system employees' working hours on cumulative fatigue and the mediating effect of occupational stress do not include 0, indicating that professionals' working hours could not only predict cumulative fatigue directly, but also indirectly through the mediating role of occupational stress. The direct and mediating effects were 0.198 (95% CI: 0.135–0.261, $p < 0.01$) and 0.078 (95% CI: 0.043–0.115, $p < 0.01$), respectively, and the percentage of occupational stress was 28.3%.

To determine if there was a difference in the mediating effect across groups with various degrees of occupational stress, participants were divided into two groups based on the median: low occupational stress (COSS score less than 45) and high occupational stress (COSS score higher than or equal to 45). The influence of work stress as a moderator was evaluated between the two groups. As shown in Table 6. In the high occupational stress group, the direct effect and mediating effect values were 0.218 (95% CI: 0.140–0.295, $p < 0.01$), 0.037 (95% CI: 0.008–0.071, $p < 0.01$), and the mediating effect percentage was 14.37%. In the low occupational stress group, the direct and mediating effect values were 0.342 (95% CI: 0.249–0.434, $p < 0.01$), 0.030 (95% CI: 0.010–0.052, $p < 0.01$), and the mediating effect percentage was 8.06%. The mediating effect of occupational stress was greater in the high occupational stress group, and the effect of alleviating cumulative fatigue caused by working hours was better by reducing occupational stress.

Figure 2 depicts the mediation effect's path map. Among them, c represented the total effect of the predictor variable working hours on the outcome variable cumulative fatigue, with a value of 0.276 ($p < 0.05$); a represented the predictor variable working hours on the mediator variable occupational stress, with a value of 0.633 ($p < 0.05$); b represented the effect of the mediator variable occupational stress on the outcome variable cumulative fatigue, with an effect value of 0.123 ($p < 0.05$); c' was the direct effect of the predictor variable working hours on the outcome variable cumulative fatigue after introducing the mediator variable occupational stress, with an effect value of 0.198 ($p < 0.05$).

4. Discussion

To sum up, the primary health care professionals' average daily working time was 8.5 h, with a work overtime rate of 33.5%. An average occupational stress score was 45.0 (40.0, 50.0), with 27.5% participants having occupational stress symptoms. And the average score of professionals' cumulative fatigue was 2.0 (0.0, 4.0), with a 57.5% detection rate. The primary health care professionals' working hours were positively associated with cumulative fatigue. And the professionals' working hours were also positively associated with cumulative fatigue through the mediation effect of occupational stress.

4.1. Effect of working hours on cumulative fatigue

According to the findings of this study, 33.5% of professionals in the primary health care system work more than 8 h per day. Doctors or those with higher education work longer hours daily. Furthermore, primary health care employees who require shifts and night shifts have significantly longer daily working hours than those who do not ($p < 0.05$). Due to the specific characteristics of their jobs, health care professionals need to provide care to patients around the clock, so atypical working hours have become the norm for medical staff (27). Especially for primary doctors, some researchers surveyed that the average working hours of doctors across the United States was 52.2 h per week, which exceeded the standard for the longest working hours (28). Furthermore, Japanese researchers conducted a survey of cardiovascular doctors' working hours, and the results revealed that 75.5% of doctors worked more than 60 h per week (29). At the same time, the study's findings indicate that primary health care professionals with a bachelor's degree or higher, who are doctors and must work shifts and night shifts, have longer working hours, which is consistent with the findings of other researchers.

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TABLE 3 Stratified regression analysis on working hours, occupational stress, and cumulative fatigue.

Variables	Block 1		Block 2		Block 3	
	β	VIF	β	VIF	β	VIF
Age/Year (≤30 as reference)						
31–40	0.037	1.561	0.037	1.561	−0.014	1.585
≥41	−0.042	1.539	−0.042	1.539	−0.071**	1.567
Education level (Junior college or below as reference)						
Bachelor or above	0.082**	1.182	0.068*	1.184	0.058*	1.227
Occupation (doctor as reference)						
Nurse	−0.053	1.474	−0.039	1.476	−0.013	1.491
Medical technician	−0.094**	1.400	−0.073*	1.406	−0.020	1.424
Shift or not (shift as reference)						
No shift	−0.066	1.771	−0.059	1.771	−0.052	1.846
Night shift or not (night shift as reference)						
No night shift	0.284**	1.722	0.235**	1.752	0.199**	1.758
Working hours			0.282**	1.034	0.149**	1.135
Occupational stress						
Social support					−0.214**	1.174
Organization and reward					0.071*	1.385
Demand and effort					0.406**	1.380
Autonomy					−0.071**	1.079
F	18.459		121.315		150.340	
Adjusted R^2	0.084		0.161		0.423	
ΔR^2	0.089		0.077		0.262	

PS: *means $p < 0.05$, **means $p < 0.01$ (two-tailed).

According to the findings of this study, 57.5% of professionals in the primary health care system have cumulative fatigue, which means that more than half of them have symptoms of cumulative fatigue. The study's findings revealed that the likelihood of cumulative fatigue symptoms was higher among primary health system workers who were younger, had higher education, were doctors, and required shift and night shifts, which was consistent with the findings of other researchers (30, 31). Furthermore, the proportion of cumulative fatigue measured in this study is higher than the proportion of work fatigue measured by Zhan Y. X. et al. using the Fatigue Scale-14 scale (35.06%) (32), as well as that of Dyrbye L. N. et al. using the Maslach Burnout Inventory (MBI) Human Results Services Survey (35.3%) (33).

According to the findings of the preceding study, professionals in the primary health care system work longer hours and experience more severe cumulative fatigue symptoms. Due to the broad scope of work in the primary health system, many tasks are heavy, and the probability of cumulative fatigue among professionals also increases. Overtime work has become an unavoidable phenomenon in the healthcare industry. Furthermore, because of the recent COVID-19 pandemic, many employees are in the stage after recovery, and their poor physical condition may have a negative impact on work, resulting in cumulative fatigue (34). The findings of this study show a positive relationship between working hours and cumulative fatigue among health care professionals, which is consistent with previous research findings. The study revealed that the longer the working hours, the more severe the cumulative fatigue symptoms among primary health care professionals. As a result, health care system managers can improve by limiting working hours and reducing fatigue to reduce professionals' cumulative fatigue symptoms. First and foremost, health care system managers should limit employees' continuous working hours; for example, they should not work for 10 consecutive hours, plan employees' shift schedules reasonably, allow rest at least 10 h between shifts, and reduce the number of unnecessary night shifts (29,

TABLE 4 The test results of occupational stress in the mediation model between working hours and cumulative fatigue.

Outcome variable	Predictor variable	Fit index		Coefficient significance	
		R^2	F	t	β
Cumulative fatigue	Working hours	0.193	45.102	7.468	0.276**
Occupational stress	Working hours	0.072	14.509	4.169	0.633**
Cumulative fatigue	Occupational stress	0.400	109.657	21.290	0.123**
	Working hours			6.170	0.198**

PS: **$p < 0.01$ (two-tailed).

TABLE 5 Decomposition table of total effect, direct effect, and mediation effect.

Variables	Effect value	Standard error of indirect effect	95% confidence interval		Relative effect value
			Lower limit	Upper limit	
Total effect	0.276	0.006	0.131	0.154	
Indirect effect	0.078	0.018	0.043	0.115	28.3%
Direct effect	0.198	0.032	0.135	0.261	71.7%

TABLE 6 Decomposition table of total effect, direct effect, and mediation effect among professionals with different occupational stress levels.

COSS	Variables	Effect value	Standard error of indirect effect	95% confidence interval		Relative effect value
				Lower limit	Upper limit	
High level	Total effect	0.254	0.042	0.171	0.337	
	Indirect effect	0.037	0.164	0.008	0.071	14.37%
	Direct effect	0.218	0.040	0.140	0.295	85.63%
Low level	Total effect	0.372	0.048	0.274	0.466	
	Indirect effect	0.030	0.011	0.010	0.052	8.06%
	Direct effect	0.342	0.047	0.249	0.434	91.94%

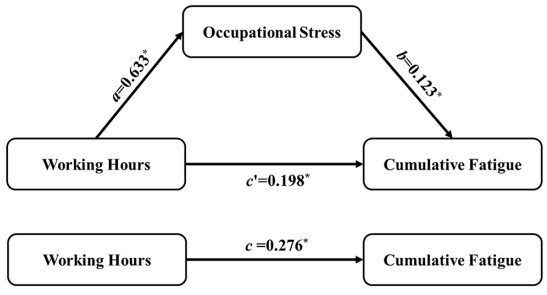

FIGURE 2
The mediating model of occupational stress between working hour and cumulative fatigue.

35). Studies have also shown that naps reduce workers' fatigue, so health care managers can provide facilities for workers to take short breaks in the workplace (36). Furthermore, health care system managers can strengthen professionals' health management, encourage them to do more physical exercise to improve their physical fitness, which can also relieve fatigue (37).

4.2. The mediating role of occupational stress

According to the findings of the study, 27.5% of primary health care professionals experience occupational stress, which means nearly one-third of all employees experience occupational stress. This is a phenomenon that health care administrators must be aware of. According to the findings of the analysis, there are statistically significant differences in the occupational stress levels of primary health care workers with different monthly incomes and occupations ($p < 0.05$). Occupational stress is more visible among primary health care workers who earn less than US$700 per month and are doctors. A previous researcher used the same COSS scale to measure occupational stress, and the detection rate was 27%, which is similar to this result (38). At the same time, another researcher used the Depression, Anxiety, and Stress Scale (DASS-21) Questionnaire to assess healthcare and administrative staff, and the probability of occupational stress is similar to ours, with a detection rate of 28.6% (39). The present study's findings indicate that certain factors, such as low monthly income, occupational role as a doctor, and requirement of shift and night shift work, contribute significantly to the experience of occupational stress among primary health care workers. These findings align with previous research in the field. Furthermore, sustained occupational stress in this population can lead to mental exhaustion and physical symptoms, ultimately resulting in the development of cumulative fatigue (40). In this study, occupational stress serves as a mediator variable, mediating the relationship between working hours and cumulative fatigue of employees in the primary health care system. The analysis of the mediating effect results in Table 3 shows that occupational stress of primary health care employees plays a partial mediating role, with a 28.3% mediating effect percentage. As a result, by reducing occupational stress in the primary health care system, it is possible to reduce the cumulative fatigue symptoms of professionals caused by long hours of work.

The work of the primary health care system demands extensive professional skills and a high level of patient responsibility. Due to the medical industry's extremely low tolerance for errors, employees must dedicate themselves to their work for extended periods. Even during non-working hours, professionals must engage in learning activities to enhance their professional ability, placing them under considerable occupational pressure. As a result, excessive investment of time and energy in their work can lead to fatigue. In comparison to medical and health personnel in developed countries, Chinese primary health care professionals have also dedicated a significant amount of time and energy. While the Chinese health industry's salary and welfare levels still need to be improved (41). Some studies have confirmed that the

disparity between investment and return is a significant factor influencing occupational stress (42). As a result, health care managers can implement a scientific performance appraisal and salary distribution system to try to achieve a balance between effort and reward, reduce occupational stress among primary health care workers, and relieve cumulative fatigue. Previous research has found that mindfulness meditation therapy is a potentially effective intervention for reducing occupational stress across various occupations. This form of therapy can enhance an individual's attention and self-regulation abilities, ultimately improving cognitive, emotional, and behavioral functioning, and reducing psychological stress (43). When employees' work tasks in the health system cannot be relieved, system managers can hire trained meditation teachers to provide collective training and guidance to primary health care professionals, thereby relieving occupational stress and reducing cumulative fatigue caused by long hours of work. Moreover, it is important for health care system managers to be mindful of their employees' psychological well-being. They may engage professional psychotherapy teams to offer consultation services, and provide group mental health lectures to alleviate occupational stress and mitigate cumulative fatigue resulting from long hours of work. Managers of the health care systems can also offer regular health check-ups to detect early signs of physical illnesses among employees, provide logistical support to those who require it, and adjust workload and working hours to alleviate employees' cumulative fatigue symptoms. The primary health care professionals should also exercise consciously to improve their physical fitness, and maintain a balance between work and rest in order to alleviate the symptoms of cumulative fatigue.

5. Conclusion and prospects

The present study aimed to examine the association between working hours, occupational stress, and cumulative fatigue symptoms in primary health care professionals. To summarize, working hours of the primary health care professionals would affect cumulative fatigue, and occupational stress could affect the influence of working hours on cumulative fatigue as a mediator variable. Long working hours result in occupational stress, which leaded to cumulative fatigue symptoms. Occupational stress was found to partially mediate the relationship between working hours and cumulative fatigue, with a mediating effect of 0.078 (95% CI: 0.043–0.115, $p < 0.01$), and the percentage of occupational stress mediating effect was 28.3%.To mitigate this, measures such as mindfulness meditation, group psychological counseling, health check-ups, improving salary systems, and rationally arranging working hours and shifts could be taken to reduce occupational stress and alleviate the symptoms of cumulative fatigue. Additionally, a mediating effect model was used to investigate the role of occupational stress as a mediator between working hours and cumulative fatigue symptoms. This study also offered practical recommendations and guidance to health care administrators, as well as a theoretical and practical foundation for workers' occupational stress and cumulative fatigue.

For future studies, more longitudinal research is required to establish causal relationships. Furthermore, because this stud y only conducted surveys in Guangdong Province, China, it is necessary to be cautious when extrapolating the results to primary health care workers throughout the country. Future studies could expand the scope of the research by conducting surveys nationwide.

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 Medical Ethical Review Committee of the National Institute for Occupational Health and Poison Control of the Chinese Center for Disease Control and Prevention (protocol code NIOHP202108, 6/14/2022).

Author contributions

YL: software, formal analysis, and original draft preparation. ZL: validation, formal analysis, and review and editing. QC and JW: investigation and resources. YF: data curation and investigation. YY and YC: resources and review and editing. TZ, LW, and YX: validation and review and editing. DZ: investigation, resources, and project administration. XY: validation, review and editing, and funding acquisition. All authors contributed to the article and approved the submitted version.

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Conflict of interest

YY and YC were employed by Resproly Pharmaceutical Technology Co. Ltd.

The remaining 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.

Publisher's note

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High stress related to COVID-19 among health workers in the Plateau Central healthcare region (BURKINA FASO): a cross-sectional study

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Background: The COVID-19 pandemic challenged the mental wellbeing of health workers. The objective of this study was to assess health workers' perceived stress during the response to COVID-19 in the Central Plateau region (Burkina Faso).

Methods: We conducted a cross-sectional study of health workers in the Central Plateau health region from September 20 to October 20, 2021. Agents' perceived stress was assessed by the Perceived Stress Scale (PSS-10). Factors associated with high stress (PSS-10 score $\geq$ 27) were identified by logistic regression.

Results: A total of 272 officers participated in the survey. The mean PSS-10 score was 29.3 points (standard deviation: 6.2). Three out of ten agents (68%) had a high level of stress. The main sources of stress were the risk of being exposed to contamination (70%) and being the source of contamination (78%). Working at the referral health center [adjusted odds ratio (aOR): 2.29; 95% confidence interval (95% CI): 1.19–4.41], the hospital as the main source of COVID-19 information (aOR: 1.17; 95% CI: 1.01-3.04), fear of COVID-19 patients being managed at one's center (aOR: 1.8; 95% CI: 1.06–3.07) were factors associated with high health worker stress levels during the first wave of COVID-19.

Conclusion: The COVID-19 pandemic caused high stress among health care workers in Burkina Faso. Psychological support for health center workers in responding to future epidemics would improve their mental health.

KEYWORDS

COVID-19, PSS-10, stress, health workers, Plateau Central healthcare region

Background

The pandemic of SARS-CoV-2 (Severe Acute Respiratoy Syndrome Coronavirus 2) infection, responsible for COVID-19 disease, by its sudden, global and uncertain character, also proves to be very anxiety-provoking for the general public and makes it necessary to evaluate its consequences on mental health (1–8). As of August 7, 2022, 584,211,310 cases have been detected and 6,417,886 deaths recorded worldwide (9). In Burkina Faso, since the confirmation of the first case on March 09, 2020 in Ouagadougou, the spread of the disease was fearfull due to the highly contagious nature of the virus, the inadequacies of our health system and the intensity of socio-economic exchanges. Up to now, the country has experienced two waves (10). Recent data reported 21.128 confirmed cases and 387 deaths (9). As of the end of September 2021, in the country there were a total of 14,199 positive cases diagnosed since the beginning of the epidemic and 181 deaths (case-fatality at 1.27%; average age of deceased = 69.7 years, 69% of deaths ≥ 60 years) (11). WHO reported for the country as of August 31, 2020, the contamination of 122 (8.8%) health workers out of a total of 1,375 confirmed cases with COVID-19 (12). At the end of September 2021, the Central Plateau region had 116 confirmed cases of COVID-19, including one (1) death (11). The management of severe cases of COVID-19 in the country was carried out in the tertiary level hospitals of the capital Ouagadougou and the city of Bobo Dioulasso. The regional hospital of Ziniaré, the reference hospital of the Central Plateau region, located 35 km from the capital Ouagadougou, referred all severe cases requiring resuscitation to the university hospitals of the city of Ouagadougou.

The Figure 1 shows the progression of COVID-19 cases in Burkina Faso, especially the peaks/waves and the period of study conduction (from September 20 to October 20, 2021) (13).

In the response to COVID-19, frontline health workers are inevitably at risk of SARS-CoV-2 infection (7, 14–16). They have a 3.4 times higher risk of contracting COVID-19, a higher risk of death compared to people living in the general community (17, 18). The fear of being infected is significant and related to the perceived risk of lethality. This fear generates stress, which affects all socio-professional categories independently of exposure to COVID-19 (5, 14, 19). Chaotic communication, in addition to supply problems (Polymerase Chain Reaction test, anti-COVID-19 drugs, personal protective equipment) was also a factor in increasing stress (4–6, 20). The reorganization of family life, isolation or social stigmatization in case of a positive test, the care of children who have left school, and the fear of contaminating family members, especially the elderly, are other sources of anxiety outside the hospital environment (1–6).

Studies of hospital staff in Europe, Asia and North America have found that caregivers involved in the care of COVID-19 positive patients have moderate to severe anxiety manifestations related to the infection itself, and to the fear of contamination of close contacts (7, 8, 14, 16, 19, 21–28).

To date, although the literature reports that health care workers, on the front line of the response, generally share the highest burden (1–6), few studies have assessed the impact of COVID-19 among hospital staff in Burkina Faso. This impact is usually underestimated in particular in developing countries (28). We provide information to answer the following question. What is the level of stress related to COVID-19 among health care workers in the Central Plateau health region? The objective of this study was to assess the extent of stress experienced by actors in the response to COVID-19 in the Plateau Central healthcare region of Burkina Faso.

Materials and methods

Type, period and setting of study

We conducted a cross-sectional study in the health districts and the regional hospital center of Plateau Central healthcare region of Burkina Faso from September 20 to October 20, 2021. The Plateau Central healthcare region has three health districts (Ziniaré, Boussé, and Zorgho) and one regional hospital. The population of the health region is estimated at 1,022,628 inhabitants. The Health Department staff during the study period was 1,355 (29). Recent cumulative data reported 187 confirmed cases of COVID-19 in the Plateau Central healthcare region (30).

Burkina Faso is a landlocked country in West Africa surrounded by six countries: Mali to the northwest, Niger to the northeast, Benin and Togo to the southeast, Ghana to the south and Côte d'Ivoire to the southwest. It has an area of 274,200 km^2 and an estimated population of 21,509,443 in 2021 (31).

According to the World Health Organization, the health system is defined in three reference levels according to the technical platform (health care offer). The first level is local. It is the first contact level (nursing and medical care) and the first reference level (general medicine or medical specialty) and includes the sector and the health district, respectively. At this level, medical and nursing care is provided, respectively, in medical centers with a surgical unit (CMA), medical centers and health and social promotion centers (CSPS), dispensaries, and medical offices. At this first level of the health pyramid, community health centers are set up if access to health care and services is difficult. The second level is regional. It includes regional university or non-university hospital centers and polyclinics/clinics. This is the second level of reference. The third level is national. It includes national university hospitals and non-university hospitals that provide third-level care (32). This is the third level of reference. Among these neighboring countries, Burkina Faso is one of the first countries, along with Togo, to record confirmed cases of COVID-19 in 2020.

All personnel working at public healthcare centers (health care workers and administrative personnel) were eligible to complete the survey.

Abbreviations: AOR, Adjusted odds ratio; OR, Odds ratio; CI, Confidence interval; HSPC, Health and Social Promotion Center; PCR, Polymerase Chain Reaction test Perceived; Stress Scale 10, PSS-10; RHC, Regional Hospital Center; HD, Healthcare District; MCS, Medical Center with Surgical Branch; MC, Medical Center; SARS-CoV-2, Severe Acute Respiratory Syndrome Coronavirus 2.

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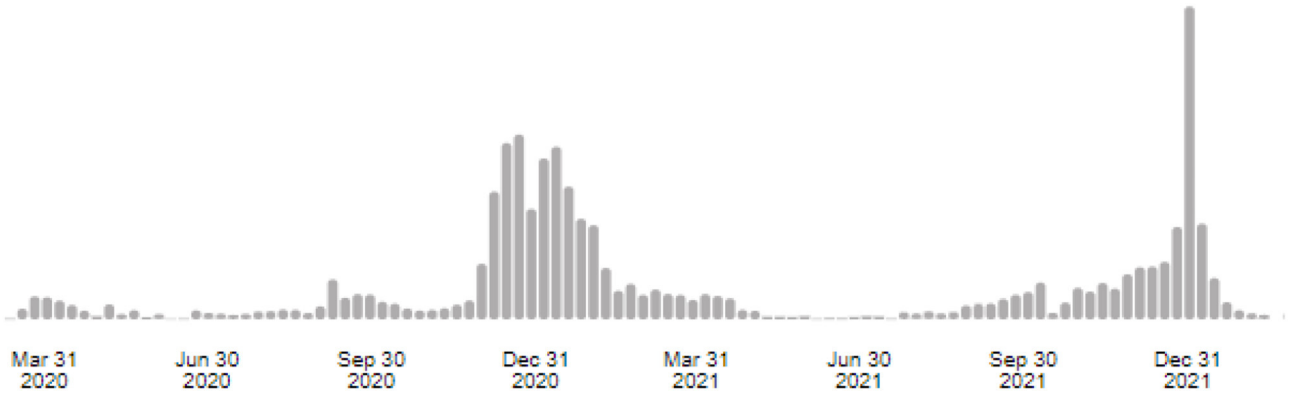

FIGURE 1
Progression of COVID-19 cases in Burkina Faso (13).

Data collection

An anonymous questionnaire previously tested in the internal medicine department of the Yalgado Ouédraogo Teaching Hospital, one of the national referral hospitals in the city of Ouagadougou. It is a multipurpose department with two wards and a day hospital. About thirty hospital practitioners and students at the end of their medical studies responded to the questionnaire. After the questionnaire was sent to the managers of all the public healthcare centers in the health region.

Beforehand, a circular from the regional management of the central plateau, signed by the Regional Director of Health, announced the study to the practitioners in the region. Using the close-up strategy, the questionnaires were given to the different managers of the health structures concerned (chief doctors of the three health districts and director of the regional reference center). Under the supervision of the latter, the questionnaires were distributed to the health workers through the heads of department and unit managers and the head nurses. The completed forms were returned by the investigation team in reverse order by grouping the forms and forwarding them.

Variables

The study outcome was the stress experienced by the workers assessed by the Perceived Stress Scale 10 (PSS-10) (33) and by a subjective stress rating scale. PSS-10 assesses the extent to which a person has perceived life as unpredictable, uncontrollable and overloaded during the past month. This scale consists of 10 questions. The questions are about the respondent's feelings and thoughts during the past month. Each question is rated from 0 to 4. By summing the responses to the ten questions, a score is calculated. This score was defined as low, moderate and high, respectively, when it was between 0 and 13, between 14 and 26 and between 27 and 40. The subjective stress rating scale had 10 points [1 (lower) to 10 (highest)]. The subjective stress was qualified as low, moderate and severe for 1 to 3, 4 to 6 and 7 to 10 points, respectively. The perceived stress and PSS-10 were assessed retrospectively for the most stressful period since the advent of COVID-19. On a 10-point scale, infectious risk was rated by health care staff. This risk was qualified as low, moderate and severe for 1 to 3, 4 to 6 and 7 to 10 points, respectively. Socio-demographic characteristics, psychiatric history, medical history, knowledge and perceptions of COVID-19 and perceived stress were also collected.

Data analysis

The dependent variable was perceived stress as measured by the PSS10 coded in two modalities (low or moderate/high). For descriptive analysis, categorical variables were presented by their frequency and percentage; quantitative variables by their mean and standard deviation. Factors associated with high stress according to PSS10 (>27) during the period in which the stress was most felt were analyzed using logistic regression (34). Among the various measures of stress, the Perceived Stress Scale (PSS) is widely used and has been the subject of numerous studies. These studies have demonstrated its satisfactory psychometric qualities (35–42). Relevant independent variables were selected for univariate and multivariate analysis. Factors associated in the univariate analysis at the 20% threshold were selected for the multivariate analysis. The final model was obtained by the stepwise manual descending strategy. The significance level in the final model was 5%. All these analyses were performed with STATA version 15.1.

Ethical considerations

For this study, approval and authorization from the Central Plateau regional health directorate and all health district officials (chief physicians) and the regional hospital center (general manager) were obtained before the survey was conducted. Attached is the survey authorization from the Central Plateau Regional Health Department.

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Written consent was obtained from the participants before any response to the self-administered questionnaire.

Results

Overall, 800 questionnaires were sent to health care workers and 272 subjects (34%) responded to the questionnaire. The mean age of the study participants was 37.11 years [Standard Deviation (SD): 6.33 years] with extremes of 20 and 56 years. The majority of subjects was men (160, 58.82%). The average seniority of the staff was 8.97 years (standard deviation: 6.24 years) with extremes of one and 32 years. Seven (2.57%) workers had a psychiatric history. Table 1 reports the socio-demographic characteristics and medical history of the study participants.

Two hundred and twenty (80.88%) participants were aware of COVID-19 through the media. The infectious risk of COVID was reported by 270 (99.26%) subjects. In this context, 64 (23.53%) respondents had been tested for COVID-19 at least once. Of these, 13 (20.31%) had reported testing positive. Among respondents, 58 (21.40%) reported having helped manage a COVID-19 positive patient. Exposure to possible COVID-19 contamination by patients was found in 114 (41.91%) of them. Table 2 presents the perceptions of the study participants about COVID-19.

The mean PSS-10 score was 29.30 (Standard deviation: 6.22 points). Among respondents, 185 (68.01%) had a high level of stress according to the PSS-10. The subjective stress rating scale found high levels of stress in 186 (68.63%) respondents. The period of greatest stress for 206 (78.33%) respondents was during the first wave of the pandemic in Burkina Faso (March to June 2020). The sources of stress were the fear of seeing a large number of COVID-19 positive patients in hospitals for 164 (60.29%), the risk to be exposed to contamination (190, 69.85%) and to be the source of contamination (213, 78.31%). Table 3 presents the symptoms, sources and stressors related to COVID-19.

In univariate analysis, the level of the health pyramid, getting information from scientific sources, hospital sources, the fear of seeing severe cases of COVID-19 positive patients in hospitals, the risk of being a source of contamination for one's close relatives, and have been tested for COVID-19 were the variables statistically associated with high stress among subjects working in the health sector during the first wave of COVID-19 in Burkina Faso. The positivity of a close relative to COVID-19, as well as that of a colleague and the risk of being exposed to contamination through close relatives or friends, were also variables statistically associated with high stress among health workers in the Plateau Central healthcare area during the first wave of COVID-19 in Burkina Faso.

In multivariate analysis, the level of health center in the health pyramid [adjusted Odds Ratio (aOR): 2,29; 95% Confidence Interval (95%CI): 1,19–4,41], the hospital as a source of information [aOR = 1.17; 95% CI (1.01–3.04)], and the fear of seeing severe cases of COVID-19 hospitalized in the health center (aOR: 1,8; 95% CI: 1,06–3,07) were the factors independently associated with high stress according to PSS-10 among health workers in the Plateau Central healthcare region during the first wave of COVID-19 in Burkina Faso (Table 4).

TABLE 1 Socio-demographic characteristics and medical history of public health center staff in the Plateau Central healthcare region (Burkina Faso).

	Frequency	Percentage (%)
Healthcare decision area		
Regional Hospital Center of Ziniaré	82	30.15
Healthcare District of Boussé	56	20.59
Healthcare District of Ziniaré	64	23.53
Healthcare District of Zorgho	70	25.74
Level of the healthcare pyramid		
Health and Social Promotion Center	159	58.46
Medical Center with Surgical Branch/Medical Center	33	12.50
Regional Hospital Center	79	29.04
Type of personnel		
Non-caregiver	20	7.35
Medical staff	31	11.40
Paramedical staff	221	81.25
Age (years)		
<35	90	33.09
[35–45]	149	54.78
[45–55]	31	11.40
≥55	2	0.74
Gender		
Male	160	58.82
Female	112	41.18
Seniority in the position (years)		
<5	73	27.34
[5–10]	85	31.84
≥10	109	40.82
Social status		
Lives alone	36	13.33
Lives in a family with children	217	80.37
Living with people at risk (diabetic, hypertensive patients)	17	6.30
Level of education		
Middle school	160	59.26
College	110	40.74
Psychiatric history		
Yes	7	2.57
No	265	97.43
Other types of medical history		
Diabetes	6	2.21
Hypertension	19	6.99
Tuberculosis	3	1.1
Hepatitis	1	0.37
Other	13	4.78

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TABLE 2 Public health center staff perception and COVID-19 experience in the Plateau Central healthcare area (Burkina Faso).

	Frequency	Percentage
Is COVID-19 an infectious risk?		
I do not know	1	0.37
No	1	0.37
Yes	270	99.26
Infectious risk gradation scale [points]		
No risk and low risk [1–3 points]	27	9.96
Moderate risk [4–6 points]	44	16.24
High risk [7–10 points]	200	73.80
Have been tested for COVID-19		
I do not know	4	1.47
No	204	75.00
Yes	64	23.53
Result of the COVID-19 test		
I do not know	7	10.94
Negative	44	68.75
Positive	13	20.31
Management of a COVID-19 patient		
I do not know	2	0.74
No	211	77.86
Yes	58	21.40
A relative tested COVID-19 positive		
I do not know	13	4.78
No	193	70.96
Yes	66	24.26
A colleague tested COVID-19 positive		
I do not know	3	1.10
No	186	68.38
Yes	83	30.51
Exposure to a risk of contamination by COVID-19		
One of your relatives (family, friends)	74	27.21
One of your colleagues	89	32.72
One of your patients	114	41.91
No	81	29.78
I do not know	8	2.94
Sources of information on COVID-19		
Scientific	84	30.88
Governmental	142	52.21
Hospital	123	44.85
Media	220	80.88
Surroundings	55	20.22

TABLE 3 COVID-19-related stress experienced by public health workers in the Plateau Central healthcare region (Burkina Faso) on COVID-19.

	Frequency	Percentage
Stress felt since the COVID-19		
I do not know	2	0.74
No	16	5.88
Yes	254	93.38
Stress related to the COVID-19		
I do not know	10	3.92
No	22	8.63
Yes	223	87.45
Subjective grading of stress experienced during the first wave [points]		
Low [1–3 points]	25	9.23
Moderate [4–6 points]	60	22.14
High [7–10 points]	186	68.63
Gradation of stress experienced according to the PSS-10 during the first wave [points]		
Low [0–14 points]	1	0.37
Moderate [14–27 points]	86	31.62
High [27–40 points]	185	68.01
Period of highest stress level		
March 2020 to June 2020	206	78.33
July 2020 to October 2020	17	6.46
November 2020 to January 2021	24	9.13
January 2021 to present day	16	6.08
Stress factors or sources of stress in COVID-19		
Fear of COVID-19 positive patients hospitalized in the health center	164	60.29
Risk of being contaminated	190	69.85
Risk of infecting family and friends	213	78.31
Risk of death from COVID-19	99	36.40
Severity of COVID-19	72	26.47
Insufficient or conflicting information on COVID-19	85	31.25
Lack of personal protective equipment	94	34.56
Lack of PCR tests at the beginning of the epidemic	79	29.04

Discussion

In light of the paucity of studies that have assessed the impact of COVID-19 among hospital workers in Africa, this study from Burkina Faso could have a significant added value to the literature. It is helpful to highlight the stress experienced by actors in response to COVID-19 using the Perceived Stress Scale 10 (PSS-10) in a developing country.

The majority of health care center staff in the Plateau Central healthcare area included in this study were unanimous about the potential infectious risk of COVID-19 in health care settings.

A high level of stress, both subjective and with the PSS-10 score (68%), was also experienced during the first wave of the pandemic in Burkina Faso. The COVID-19 pandemic was a source of stress and had an effect on staff in both their social and professional spheres. However, a small proportion of workers reported having been tested for COVID-19. The level of the health center in the healthcare pyramid, hospital (health center) as a source of information, fear of seeing hospitalized severe case of COVID-19 in the health center were independently associated with high stress among health care center staff in the Plateau Central healthcare region during the first wave of COVID-19 in Burkina Faso.

To break the chain of transmission of SARS-CoV-2 in Burkina Faso, decisions were implemented by health authorities, including barrier and social distancing measures, as well as containment (20). These decisions followed the declaration of the epidemic in Burkina Faso, corresponding to the start and first wave from March to June 2020. It was during this period that staff reported experiencing the highest level of stress (78.33%).

During the first wave of the COVID-19 pandemic, seven out of ten experienced high stress level in Burkina Faso. This pandemic was unique in that it was sudden, uncertain and unknown (1–6). The African continent did not experience the impact predicted in the beginning of the COVID-19 pandemic. However, the health system has still experienced shocks (43, 44). In Burkina Faso, the response to the COVID-19 pandemic took place in a context marked by the inadequacy of the health system in terms of infrastructure and logistics. The humanitarian needs due to insecurity were also making the settings of the COVID-19 response harder (20). The management of the COVID-19 pandemic in the country was also marked by controversies both in the community and among health care workers (20). Indeed, at the early stage of the pandemic the first reported case of death caused a national outcry and was the cause of media chaos and increased stress at the beginning of the pandemic (44). The first wave was associated with panic, anxiety, fear of infection and fear of death. Our study confirms this as a source of stress for workers. Indeed, in multivariate analysis, government information relayed in hospitals would significantly increase the risk of high stress among health care workers in the Plateau Central healthcare area [aOR = 1.17; 95% CI (1.01–3.04)].

In this anxiety-provoking environment, only one in five health care center staff had been tested for COVID-19. Of these, 24% reported having tested positive for COVID-19. This low proportion of screening could be explained by the fact that at the beginning of the pandemic, only suspected cases or contacts of confirmed or probable cases were screened. Gradually, frontline workers in the pandemic response and people at risk were targeted for screening. In our study, working in the regional hospital (the reference health center of the region) significantly increased the risk of stress in health workers (aOR: 2.29; CI95% [1.19–4.41]). This association could be explained by the fear of testing positive in a context of organizational inadequacy and lack of treatment. Indeed, during the first wave, the contact subjects were quarantined and forbidden to visit their relatives (20), which could aggravate the stress felt. The management of positive cases was only hospital-based and severe cases required oxygen therapy which was often unavailable. Data from the literature show that front-line health workers are inevitably exposed to the risks of SARS-CoV-2 infection (15). They have a 3.4 times higher risk of contracting COVID-19 compared to people living in the general community (17). The WHO reports that infection of health workers accounts for 5% of positive cases in Africa (45). This incidence in African countries is highly variable, but is increasing (46). In Tunisia, the rate of positivity among front-line workers was 14.4% (47). In Burkina Faso, it was 8.8% (12).

In addition, a small proportion (21.40%) of the participants in this study was involve in the management of a patient tested positive for COVID-19. This low proportion can be explained by the fact that at the beginning of the pandemic in Burkina Faso, the management of COVID-19 cases was done in university hospitals, then in regional hospitals before being decentralized to health and social promotion centers and home-based care. The late decentralization of the management of COVID-19 positive cases to the regional and local levels of the health system may have contributed to increased stress among workers by creating a myth about the coronavirus disease among these staff who were not initially involved in the response but were overwhelmed with information about the measures or precautions to be taken in the services and the restrictions observed in society (20).

The pandemic of coronavirus (COVID-19) has a social and psychological impact on the mental health of health workers worldwide (1–8). However, few studies have been conducted in developing countries. Methodological differences also make it difficult to compare with the results of our study.

Nevertheless, data from the literature reveal a significant increase in stress-related symptoms (Anxiety, Depressive Symptoms, Insomnia, Burnout, and Functional Impairment) among health care workers during the COVID-19 pandemic. This stress is increased due to their pre-existing limited access and resources, imposed by the colonial system, and their management of the new coronavirus, in certain vulnerable subgroups (health care workers) who are likely to require psychological interventions). Indeed significant associations were observed between attitude toward interprofessional teamwork, gender, marital status, occupation, work experience, current work location (clinics), spiritual influences, perceived competence, difficulties in daily life, income level, confidence in individual instincts, level of control over aspects of resilience, provision of COVID-19 patient care, history of COVID-19 testing, history of COVID-19 testing or infection, and availability of mental health support in the workplace (7, 8, 14, 16, 19, 24–28, 48).

Interpretation of our results must take into account certain limitations. Our data were collected only in the Plateau Central healthcare area. Our sample is therefore not representative of all health workers in Burkina Faso. Above one third of the questionnaires sent out were returned. Participation in the study was voluntary. These expose to a potential selection bias that could underestimate or overestimate the proportion of workers with high levels of stress. We assessed the stress reported by the workers in a subjective and objective manner by collecting their statements. This method of data collection may expose potential information bias. We believe, however, that this bias was minimized by the fact that we used completely anonymous validated self-questionnaires. Despite these limitations, our study is original and is the first to

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TABLE 4 Factors associated with stress as measured by the PSS-10 among public health workers in the Plateau Central healthcare region (Burkina Faso) during COVID-19 1st wave.

	Stress experienced during the first wave according to PSS10 score					
	Univariate			Multivariate		
	OR	CI 95%	*p*-value	aOR	CI 95%	*p*-value
Gender						
Male	1	-	-			
Female	0.85	[0.51–1.43]	0.56			
Level of the healthcare pyramid			<0.01			
Health centers at the district level*	1	-	-			
Regional hospital center	2.53	[1.34–4.78]	<0.01	2.29	[1.19–4.41]	0.01
Type of personnel			0.10			
Non-caregiver	1	-	-			
Medical staff	1.73	[0.43–6.97]	0.43			
Paramedical staff	0.62	[0.21–1.78]	0.37			
Age (in years)			0.60			
<35	1	-	-			
[35–45]	1.29	[0.73–2.26]	0.36			
[45–55]	0.83	[0.35–1.93]	0.66			
≥ 55	0.52	[0.03–8.68]	0.65			
Seniority in the position (years)			0.76			
<5	1	-	-			
[5–10]	0.77	0.39–1.49	0.47			
≥10	0.85	0.44–1.61	0.63			
Social status			0.90			
Lives alone	1	-	-			
Lives in a family with children	1.11	0.52–2.37	0.76			
Living with people at risk s(Diabetic, hypertensive, patients)	0.91	0.27–3.08	0.88			
Level of education						
Middle school	1	-	-			
College	1.43	0.84–2.44	0.18			
Sources of information's about COVID-19						
Scientific (ref: no)	2.33	[1.27–4.29]	<0.01			
Governmental (ref: no)	1.54	[0,92–2,58]	0.09			
Hospital (ref: no)	2.02	[1.18–3.43]	<0.01	1.17	[1.01–3.04]	0.04
Media (ref: no)	1.42	[0.76–2.67]	0.26			
Surroundings (ref: no)	1.48	[0.76–2.89]	0.24			
Infectious risk gradation scale [points]						
No risk and low risk [0–3 points]	1	-	-			
Moderate risk [4–6 points]	2	[0.69–5.72]	0.19			
High risk [7–10 points]	1.16	[0.50–2.68]	0.71			
Have been tested for COVID-19 (ref: no)						
Yes	3.13	[1.50–6.52]	<0.01			

(Continued)

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TABLE 4 (Continued)

	Stress experienced during the first wave according to PSS10 score					
	Univariate			Multivariate		
	OR	CI 95%	*p*-value	aOR	CI 95%	*p*-value
Positivity of a relative to COVID-19 screening test (ref: no)						
Yes	2.39	[1.19–4.78]	0.01			
Positivity of a colleague at COVID-19 screening test (ref: no)						
Yes	2.52	[1.35–4.70]	<0.01			
Management of a COVID-19 patient (ref: no)						
Yes	1.79	[0.90–3.53]	0.09			
Subjective grading of stress experienced during the first wave [points]						
Low [0–3 points]	1	-	-			
Moderate [4–6 points]	1.38	[0.54–3.54]	0.49			
High [7–10 points]	2.44	[1.04–5.70]	0.03			
Stress factors or sources of stress in COVID-19						
Fear of COVID-19 positive patients hospitalized in the health center	1.80	[1.07–3.02]	0.02	1,80	[1.06–3.07]	0.02
Risk of being contaminated by family and friends (ref: no)	1.45	[0.84–2.50]	0.17			
Risk of infecting family and friends ref: no)	1.96	[1.08–3.55]	0.02			
Risk of death from COVID-19 (ref: no)	0.90	[0.53–1.53]	0.71			
Severity of COVID-19 (ref: no)	1.58	[0.86–2.90]	0.14			
Insufficient or conflicting information on COVID-19 (ref: no)	0.74	[0.43–1.27]	0.28			
Lack of personal protective equipment (ref: no)	1.36	[0.78–2.35]	0.26			
Lack of PCR tests at the beginning of the epidemic (ref: no)	1.56	[0.87–2.82]	0.13	2.25	[1.15–4.35]	0.01

*Health center at a district level were Health and Social Promotion Center, Medical Center with Surgical Branch and Medical Center. The final level of referral for health care in the region is the regional hospital.

estimate the level of stress in a subjective and objective manner among health workers in Burkina Faso. These data will fill the knowledge gap in the field and allow the health system to better prepare for the response to future epidemics.

Conclusion

The COVID-19 pandemic caused high stress among health workers in Burkina Faso, mainly during the first wave. Psychological support for health center workers in the response to future epidemics would improve their mental health.

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 Regional Healthcare Directorate of the Plateau Central healthcare region, Burkina Faso. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

ST, DD, and BP conceived the study, participated in its design, and helped to draft the manuscript. YL, WK, W-L-SO, DKam, WS, DKab, AO, SS, MZ, BO, and OG helped in the coordination. All authors read and approved the final manuscript.

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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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Fear of COVID-19, risk perception and preventive behavior in health workers: a cross-sectional analysis in middle-income Latin American countries

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The aim of this study was to examine the association between fear of COVID-19 and risk perception with preventive behavior in health professionals from four Latin American countries. An analytical cross-sectional study was conducted. Health professionals with on-site care in Colombia, Ecuador, Guatemala, and Peru were surveyed. Information was collected through an online self-report questionnaire. The main variables were preventive behavior as the dependent variable and fear of COVID-19 and risk perception as independent variables. Linear regression was used, and unstandardized beta coefficient and value of ps were calculated. Four hundred and thirty-five health professionals were included, the majority were aged 42 years or older (45.29, 95%CI: 40.65–50.01) and female (67.82, 95%CI: 63.27–72.05). It was shown that the greater the fear of COVID-19, the greater the preventive behavior of COVID-19 infection (B =2.21, p =0.002 for total behavior; B =1.12, p =0.037 for additional protection at work; B =1.11, p <0.010 for hand washing). The risk perception of COVID-19 infection had a slight direct relationship with preventive behaviours (B =0.28, p =0.021 for total behavior; B =0.13, p =0.015 for hand washing), with the exception of the preventive behavior of using additional protection at work (p =0.339). We found that fear and risk perception are associated with increased practice of hand washing and use of additional protection at work. Further studies are required on the influence of working conditions, job performance and the occurrence of mental health problems in frontline personnel with regard to COVID-19.

KEYWORDS

COVID-19, SARS-CoV-2, health personnel, fear to COVID-19, behavior

Introduction

Since the beginning of the pandemic, COVID-19 has caused significant damage to health systems around the world, including financial, material and, mainly, human lives losses (1, 2). All this, despite the strict measures promoted by the authorities to prevent transmission (3), such as

strict social distancing, lockdowns and educational campaigns (4). In addition, the accelerated speed with which the virus spread created challenges in health care systems that forced health care workers to deal with both clinical and non-clinical stressors (5). This scenery is even more challenging in Latin America, where there are other points to concern, such as deep social inequalities, economic instability, and deficient health care services (6).

Fear is one of the first mental reactions appearing in an epidemic. This phenomenon allows us to survive and confront the unknown (7). This situation impacts HCWs (8–10), adding enormous psychological pressure. Although, it may be beneficial because it encourages them to follow preventive measures such as hand washing and social distancing (11). However, the exposition to fear for long periods can involve pathological mechanisms, affecting the well-being and the ability to provide adequate treatment and care (12). The context of COVID-19 was complex and triggered fear in the global population, especially WHCs. A systematic review concluded that WHCs have 19.51 as pooled mean score according to the FCV-19S scale. This value was the highest score in comparison with the general population and university students (13). The increasing mortality and morbidity associated with COVID-19 (14) have caused fear of acquiring the disease and, above all, of dying for it (15–17). Additionally to this, HCWs confront the fear of bringing the virus to family members (8, 18) the constant loss of colleagues to the disease (19), and the shortage of personal protective equipment (PPE).

Evidence from previous outbreaks (20–22), together with evidence in the COVID-19 pandemic (23–25), suggests that these triggers have significant short- and long-term effects on the mental health of healthcare workers. Furthermore, fear of COVID-19 correlates with other mental illnesses such as anxiety, traumatic stress, distress (strong association), and depression (moderate association) (26). Some studies have shown a potential association between fear of COVID-19 and suicidal thoughts and insomnia. (27).

Therefore, the impact of the COVID-19 pandemic on the mental health of HCWs is multiple and has potential long-term effects that the healthcare system may face going forward. This is why it is very important to take care of the mental health of these professionals (14). However, there is still little evidence of the relationship between these outcomes on a region such a Latin America. Therefore, the aim of this study was to examine the association between fear of COVID-19 and risk perception with preventive behavior in health professionals from four Latin American countries.

Materials and methods

Study design and area

An observational analytical cross-sectional study was carried out during the COVID-19 pandemic in health personnel from 4 Latin American (LA) countries: Colombia, Ecuador, Guatemala, and Peru. Latin America is made up of 20 countries, with notable cultural, economic and political differences (28). For example, according to gross national income (GNI), Colombia, Ecuador, Guatemala and Peru are upper middle-income countries (29).

Sample size

A total of 481 health professionals with on-site care in the 4 LA countries (Colombia, Ecuador, Guatemala, and Peru) were surveyed, using snowball sampling due to the difficult access to this population in times of COVID-19. Snowball sampling is a method commonly used in research to generate a network of participants through referrals from contacts who specialize in the study's topic. In the context of COVID-19, the accessibility to the study population was hindered by isolation measures and preventive restrictions. Therefore, snowball sampling was utilized to overcome these challenges and identify eligible participants for the study. The inclusion criteria for this study are to be a physician, nurse, or other health professional providing care in person, and to be 18 years of age or older, and to agree to participate in the study by signing the informed consent form, and to complete at least 50% of the questionnaire. From the 481 participants, 46 health professionals were excluded due to missing data, resulting in a final sample of 435 (90.443%) participants distributed in Colombia ($n = 79$), Ecuador ($n = 121$), Guatemala ($n = 80$) and Peru ($n = 155$).

Study variables and instruments

The main study variables were preventive behavior as the dependent variable, fear of COVID-19 and risk perception as independent variables. Preventive behavior was obtained from 5 self-reported items about protective attitudes toward COVID-19 grouped according to the use of protection additional to the mask (3 items) and hand washing (2 items). The items use a Likert scale with 5 answer categories (0 = Rarely, up to 4 = Always), with final scores for the variable ranging from 0 to 20 points (additional mask use = 0 to 12 points and hand washing = 0 to 8 points).

Fear of COVID-19 was obtained from 3 self-report items about the fear of becoming infected, infecting one's family, and dying from COVID-19, where these items had a dichotomous response scale (0 = No; 1 = Yes), with final scores ranging from 0 to 3 points.

The risk perception of COVID-19 was obtained from 4 self-report items about the existence of risk situations of direct contact with patients in care of this disease within the work environment. The items had a dichotomous response scale (0 = No; 1 = Yes), with a final score of 0 to 4 points.

All the items of the variables were housed in the supplementary section (Appendix A). Likewise, the variables used had item reliability values (α, KR-20, and Omega >0.50) and factorial structure that were adequate for the development of this study (Appendix B), as well as acceptable values of goodness of fit indicators obtained from confirmatory factor analysis (CFI > 0.90, TLI > 0.90, RMSEA<0.08, SRMR<0.08) (Appendix C).

The study covariates were age in tertiles (21 to 33, 34 to 41 and 42 or more), gender (male and female), civil status (married/cohabitant, single and others), number of children (no children, 1 child, 2 or more children), work time (in years), and mental exhaustion (No and Yes).

Procedure

During the period between March and July 2021, health professionals with on-site care (physicians, nurses, rehabilitators, among others) were invited to participate through the Ministries of Health of the participating countries. It was important to assess the variables among healthcare professionals in the 4 countries in which data were collected, as the period from March to July 2021 reflected critical points of COVID-19 infection and mortality cases in these countries (30–33). The research team was contacted to inform about the objective of the study and to request their voluntary participation. The information was collected through the Google Forms ® platform, with an average duration of 10 min for completion. The authors ensured that the participants truly determined COVID-19 health professionals through a virtual process of presenting their work cards and the information related to their work area and the daily activities they carry out; all this information was verified before submitting the Google Form. Finally, those who completed the form were asked to refer other possible participants until the study sample was reached.

Statistical analysis

The analysis of this study began by answering to the characterization of the main variables and covariates by reporting frequency/percentages or mean/standard deviation tables, depending on the type of variable involved. Then, in order to identify whether there were significant differences according to countries, the Chi-Square, Fisher's Exact or ANOVA test was used, as appropriate, and for the latter, the Tukey *post hoc* test was performed to identify the country with the best scores obtained.

To answer to the aim of examining the association of fear of COVID-19 and risk perception with preventive behavior (dimensions and total) of health professionals, we used linear regression, presenting two models with unstandardized coefficient and value of ps. The first or crude model examines separately the independent variables and covariates against preventive behavior. In the final or adjusted model, a pooled model was presented with all the main independent variables and covariates that were significant in the crude model. In both models the adjustment according to country was used and the variables were significant with a $p < 0.05$. To perform a combined analysis of all countries, we first examined the measurement invariance analysis for each scale, which confirmed that the data had a similar response pattern across countries ($\Delta < 0.010$) (Appendix D).These analyses were performed in the Stata 15.0 software (StataCorp, 2017) (34).

Additionally, for the generation of variables, reliability was taken into account through Cronbach's alpha and internal construct validity through exploratory factor analysis using the Robust Maximum Likelihood Estimator (MLR) with rotation reporting their factor loadings (Appendix B). Cronbach's alpha and factor loadings are adequate with values greater than 0.80 and 0.49, respectively, (35). These analyses were performed using the Rstudio software (Rstudio®, Boston, MA, United States).

Ethical aspects

Participation was voluntary, anonymous, and written informed consent was provided within the questionnaire at the beginning of the study. The ethical guidelines of the Helsinki Declaration were followed, and the information protocol was approved by the ethics committee of the Norbert Wiener University issued in the Register Report No. 085-2020.

Results

Participants

The characteristics of the 435 health professionals were that the majority were 42 years of age or older (45.29, 95% CI: 40.65–50.01), female (67.82, 95% CI: 63.27–72.05), with marital status married/cohabiting (57.24, 95%CI: 52.52–61.82), with no children (43.91, 95%CI: 39.30–48.63), with a mean working time of 7.29 years (SD = 6.92) and existence of mental exhaustion (90.34, 95%CI: 87.18–92.79) (Table 1).

The main variables show that the mean score of fear of COVID-19 according to the total sample was 1.65 (SD = 10.04), risk perception was 3.15 (SD = 0.94). The mean score for additional protective behaviours at work reported was 7.43 (SD = 2.16), hand washing reported was 5.59 (SD = 1.15); meanwhile, the total score for all preventive behaviours was 13.02 (SD = 2.44).Furthermore, it was found that there were significant differences, albeit with low effect sizes, between countries in relation to the scores obtained by health personnel, particularly in terms of age (V′ Cramer = 0.165), risk perception (Omega-Squared = 0.152), and preventive measures (Omega-Squared = 0.146). The risk perception in Ecuador was higher than in Guatemala ($p < 0.001$), while Guatemala reported higher scores than Ecuador ($p < 0.001$). Peruvian health professionals showed higher scores than Ecuadorian professionals in terms of preventive behavior ($p < 0.001$) (see Appendix E).

Table 2 shows the characterization of the main variables of the study, which indicates that more than three quarters of the health professionals showed signs of fear of COVID-19 infection (93.10% were concerned about becoming infected, 95.63% were concerned about returning home and infecting their family, and 88.51% were concerned about the possibility of dying from the disease). Likewise, more than three quarters reported indications of risk perception to COVID-19 disease (e.g., 87.82% had direct contact with suspected or confirmed COVID-19 patients in aerosol generation procedures and 81.15% had direct contact with the environment of confirmed COVID-19 patients). Regarding preventive behavior, more than three fifths showed indications of always using additional protection at work (e.g., 73.56% always used face shield or goggles and 72.97% used gloves for care at work), while more than four fifths of the health personnel reported that they always perform hand washing (e.g., 91.95% performed hygiene after exposure to body fluids of any type of patient).

TABLE 1 Comparison of the characteristics of the study sample, fear of COVID-19, risk perception and preventive behaviours among health personnel according to countries.

Variables	Total (*n* =435)	Colombia (*n* =79)	Ecuador (*n* =121)	Guatemala (*n* =80)	Peru (*n* =155)	*p*-value	V′ cramer
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)		
Age in tertiles							
21–33 years	153 (35.17%)	20 (25.32%)	53 (43.80%)	31 (38.75%)	49 (31.61%)	0.001	0.165
34–41 years	85 (19.54%)	26 (32.91%)	23 (19.01%)	17 (21.25%)	19 (12.26%)		
42–more	197 (45.29%)	33 (41.77%)	45 (37.19%)	32 (40.00%)	87 (56.13%)		
Gender[1]							
Female	295 (67.82%)	58 (73.42%)	92 (76.03%)	48 (60.00%)	97 (62.58%)	0.028	0.114
Male	140 (32.28%)	21 (26.58%)	29 (23.97%)	32 (40.00%)	58 (37.42%)		
Civil status[2]							
Married/cohabitant	249 (57.24%)	39 (49.37%)	87 (71.90%)	50 (62.50%)	73 (47.10%)	<0.001	0.212
Single	161 (37.01%)	38 (48.10%)	21 (17.36%)	30 (37.50%)	72 (46.45%)		
Other	25 (5.75%)	2 (2.53%)	13 (10.74%)	0 (0.00%)	10 (6.45%)		
Number of children[1]							
No children	191 (43.91%)	50 (63.29%)	29 (23.97%)	38 (47.50%)	74 (47.74%)	<0.001	0.130
One child	85 (19.54%)	8 (10.13%)	22 (18.18%)	22 (27.50%)	33 (21.29%)		
Two or more children	159 (36.55%)	21 (26.58%)	70 (57.85%)	20 (25.00%)	48 (30.97%)		
Time working (in years)[3]							
Me (Sd)	7.29 (6.92)	5.36 (4.59)	7.25 (7.08)	5.61 (5.04)	9.18 (8.09)	<0.001	0.117
Mental exhaustion[1]							
No	42 (9.66%)	7 (8.86%)	20 (16.53%)	3 (3.75%)	12 (7.74%)	0.015	0.123
Yes	393 (90, 34%)	72 (91.14%)	101 (83.47%)	77 (96.25%)	143 (92.26%)		
Fear of COVID-19[3]							
Me (Sd)	1.65 (1.04)	1.75 (0.78)	1.52 (0.43)	1.63 (0.76)	1.36 (0.58)	0.237	0.015
Risk perception to COVID-19[3]							
Me (Sd)	3.15 (0.94)	3.41 (1.18)	2.73 (1.57)	3.55 (1.16)	3.14 (1.29)	<0.001	0.152
Preventive behaviours: additional protection at work[3]							
Me (Sd)	7.43 (2.16)	7.99 (1.68)	6.71 (2.48)	7.43 (2.52)	7.72 (1.73)	<0.001	0.156
Preventive behaviours: hand washing[3]							
Me (Sd)	5.59 (1.15)	5.6 (1.12)	5.62 (1.12)	5.60 (1.24)	5.55 (1.16)	0.800	0.032
Preventive behaviours: total[3]							
Me (Sd)	13.02 (2.44)	13.58 (1.92)	12.33 (2.66)	13.03 (2.97)	13.27 (2.05)	<0.001	0.146

Me, mean; SD, standard deviation.
[1]The Chi-square test was used.
[2]The Fisher Exact test was used.
[3]The ANOVA test was used and Omega-squared.

Association between fear of COVID-19, risk perception with preventive behavior

Table 3 in the model adjusted only by country (Model 1) reported that fear of COVID-19 and perception were significantly associated with preventive behavior according to dimensions and total. However, for the final model that included significant covariates (Model 2) the independent variables of fear of COVID-19 and risk perception had a slight decrease in the coefficients of association with respect to preventive behavior. It was evidenced that in health personnel the main exposure variable was fear of COVID-19, reporting that the greater the fear of COVID-19, the greater the preventive behavior of infection to COVID-19 ($B = 1.75$, $p = 0.039$ for total behavior; $B = 1.11$, $p = 0.046$ for additional protection at work; $B = 1.09$, $p = 0.034$ for hand washing). The risk perception of COVID-19 infection had a slight direct relationship with preventive behaviours ($B = 0.31$, $p = 0.041$ for total behavior; $B = 0.20$, $p = 0.026$ for hand washing), with the exception of the preventive behavior of using additional protection at work ($p = 0.459$).

TABLE 2 Prevalence of fear of COVID-19, risk perception and preventive behavior in health professionals (n =435).

Variables	n (%)
Fear of COVID-19	
Are you afraid/concerned that you might become infected?	
No	30 (6.90%)
Yes	405 (93.10%)
Are you afraid/concerned about returning home and infecting your family?	
No	19 (4.47%)
Yes	416 (95.63%)
Are you afraid/concerned that you might die from COVID-19?	
No	50 (11.49%)
Yes	385 (88.51%)
Risk perception	
Have you provided direct care to a confirmed patient with COVID-19?	
No	123 (28.30%)
Yes	312 (71.70%)
Did you have face-to-face contact (within 1 meter) with a confirmed COVID-19 patient in a health care facility?	
No	112 (25.80%)
Yes	323 (74.20%)
Were you present when any aerosol generation procedure was performed on suspected or confirmed cases of COVID-19?	
No	53 (12.28%)
Yes	382 (87.82%)
Did you have direct contact with the environment where the confirmed COVID-19 patient was cared for? For example, bed, bedding, medical equipment, bathroom?	
No	82 (18.95%)
Yes	353 (81.15%)
Preventive practices	
D1: Additional protection at work	
Do you use disposable gloves in the workplace?	
Rarely	34 (7.82%)
Occasionally	54 (12.41%)
Most of the time	30 (6.90%)
Always	317 (72.97%)
Do you use face shield or goggles in the workplace?	
Rarely	21 (4.83%)
Occasionally	32 (7.36%)
Most of the time	62 (14.25%)
Always	320 (73.56%)
Do you wear a disposable gown in the workplace?	
Rarely	38 (8.74%)
Occasionally	49 (11.26%)
Most of the time	38 (8.74%)
Always	310 (71.26%)
D2: Hand washing	
During patient care, do you perform hand hygiene before and after touching the patient even though you use gloves?	
Rarely	9 (2.06%)
Occasionally	23 (5.29%)
Most of the time	36 (8.28%)

(Continued)

TABLE 2 (Continued)

Variables	*n* (%)
Always	367 (84.37%)
Do you perform hand hygiene after exposure to body fluids of patients who were unsuspected or confirmed COVID-19 cases?	
Rarely	7 (1.61%)
Occasionally	18 (4.14%)
Most of the time	10 (2.30%)
Always	400 (91.95%)

Discussion

This study aimed to examine the association between fear and risk perception of COVID-19 and preventive behavior in health professionals from Latin American countries in order to provide basic data to respond to the mental health problems faced by health personnel in middle-income countries. In the presence of emerging events or conditions, such as the case of the pandemic, health professionals have been required to use their emotional and cognitive resources to ensure adaptive mechanisms in their clinical practice and daily life.

Among the 435 professionals included in the study, 90.34% exhibited mental exhaustion as a result of COVID-19, which is significantly higher than the rates reported in previous studies (5, 28, 29, 36). This difference can be attributed to the fact that the sample was obtained from various Latin American countries, which have been among the hardest hit by the pandemic due to limited resources to address it (37). This situation has led to higher rates of psychological problems among healthcare professionals in the region compared to other parts of the world, such as Europe and Asia (38).

In this study, high frequencies of mental exhaustion were found in each of the countries, a situation that differs from several studies conducted worldwide (9, 39). In addition, it was found that 83.47% of the Ecuadorian health professionals included had mental exhaustion. This also differs from the reports in the available evidence (40, 41). The same difference was found in Peruvian health professionals, where 92.26% had mental exhaustion, which is far from what was previously reported (42). It should be noted that these marked differences between the findings of this study and those reported in the evidence may be mostly due to the type of sampling applied, which does not guarantee the representativeness of the population of health professionals in Colombia, Ecuador, Guatemala, and Peru.

The available literature reports that the main factors associated with mental exhaustion are the inadequate organization and structure of the work, as well as the ability to cope with and manage stressors in COVID-19 care centers (43). Likewise, other studies found that the work overload to which health professionals were subjected during the first waves of the pandemic was a predisposing factor to mental fatigue (44).

Finally, a 2020 study found that the lack of personal protective equipment was associated with mental fatigue, fear of COVID-19 and anxiety symptoms in frontline personnel (45). We should keep in mind that, according to the World Health Organization, workers who do not receive enough support and who have limited control over how they can cope with work demands are more likely to have work-related stress, which affects their mental health and performance (46). These associated factors reported in the cited studies may explain the increased risk perception to COVID-19 experienced by frontline care professionals. This relates to what was found in this study since more than 75% of the included professionals reported indications of risk perception to COVID-19 disease; furthermore, the association between fear of COVID-19 and risk perception has been previously reported (15). However, unlike our study, the studies cited were conducted in a single country, so it is recommended to conduct multicenter studies to assess whether these risk factors for mental exhaustion are present in more Latin American countries for a better understanding of the problem.

An overall mean fear of COVID-19 scores of 1.80 was found, with Colombia being the country that had the highest average with 1.89, while for Peru the average was 1.84. Besides, the average overall risk perception score was 3.15, with Guatemala being the country with the highest average with 3.55, while Peru had 3.14 These results show the high levels of fear and risk perception present among health personnel, which has been previously reported (4, 47), where high levels of fear of getting COVID-19 or infecting family members, risk perception and death were found. We did not find studies evaluating these rates in Latin American countries; however, a study that included dentists from all over the world evaluated the fear of COVID-19 experienced by these professionals and found that more than 78% reported that they do feel it (48), which reinforces what was found in this study.

It was found that the average global score for preventive behaviours was 13.02 and that Colombia had the highest average. Also, the use of additional protection at work was the preventive behavior with the highest average score, and Colombia and Peru were the countries with the highest scores. Due to several research in the area, it has been established that the incorporation of preventive measures such as hand washing, the use of masks and face shields are the main and most effective measures for preventing COVID 19 infection. In this regard, external factors such as the dissemination and training in the use of clinical practice guidelines, the dissemination of information in institutional and mass media and the availability of supplies in the workplace have an impact on the incorporation of protective measures during care in clinical scenarios (49).

This study found that 93.1% reported feeling fear of becoming infected, while 95.63% felt fear of infecting their family. This coincides with what has been reported in other studies, where they found that the main fear of health professionals was to return home and infect their family, followed by the fear of becoming infected (39, 50, 51). This reaffirms the fact that health personnel are exposed to multiple stressors and concern factors, where the most affected are the personnel who work in the first line of care against COVID-19, making transit to other scenarios of the daily life of this population (18).

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TABLE 3 Association between fear of COVID-19 and risk perception with preventive behavior of health personnel (n =435).

Variable	Preventive behavior					
	Additional protection at work		Hand washing		Overall	
	B (95%IC)	*p*-value	B (95%IC)	*p*-value	B (95%IC)	*p*-value
Model 1 Age in tertiles						
21–33 years	Ref		Ref		Ref	
34–41 years	1.83 (0.45–3.21)	**0.024**	0.19 (−0.28–0.67)	**0.024**	2.03 (0.79–3.26)	**0.014**
42 to more	1.74 (−0.05–3.53)	0.054	0.31 (0.01–0.63)	0.048	2.06 (0.56–3.55)	**0.022**
Gender						
Female	Ref		Ref		Ref	
Male	−0.09 (−0.93–0.75)	0.749	−0.15 (−0.50–0.19)	0.238	−0.25 (−1.37–0.87)	0.526
Civil Status						
Married/cohabitant	Ref		Ref		Ref	
Single	0.17 (−0.41–0.75)	0.42	−0.05 (−0.54–0.44)	0.75	0.12 (−0.42–0.66)	0.539
Other	0.03 (−1.76–1.82)	0.96	0.21 (−0.16–0.58)	0.175	0.24 (−1.87–2.35)	0.745
Number of children						
No children	Ref		Ref		Ref	
One child	1.20 (−0.81–3.21)	0.153	0.25 (−0.62–1.12)	0.428	1.45 (−0.24–3.14)	0.071
Two or more children	2.21 (0.11–4.31)	**0.044**	0.02 (−0.73–0.77)	0.949	2.23 (0.09–4.37)	**0.045**
Time working (in years)	0.01 (−0.04–0.45)	0.895	0.01 (0.01–0.17)	**0.033**	0.01 (−0.04–0.06)	0.521
Mental Exhaustion						
No	Ref		Ref		Ref	
Yes	1.74 (0.49–2.99)	**0.021**	−0.27 (−0.58–0.03)	0.065	1.15 (0.16–2.14)	0.034
Fear of COVID-19	1.17 (0.68–2.10)	0.042	1.03 (0.80–1.96)	0.037	1.92 (1.53–2.54)	0.023
Risk perception	0.37 (0.10–0.63)	0.022	0.23 (0.11–0.35)	0.010	0.60 (0.36–0.83)	0.004
Model 2 Age in tertiles						
21–33 years	Ref		Ref		Ref	
34–41 years	1.48 (0.2–2.76)	0.035	−0.11 (−0.41–0.19)	0.297	1.34 (0.14–2.55)	0.038
42 to more	1.21 (0.14–2.3)	0.037	0.03 (−0.35–0.43)	0.782	1.32 (0.47–2.16)	0.016
Gender						
Female	Ref		Ref		Ref	
Male	–	–	–	–	–	–
Civil Status						
Married/cohabitant	Ref		Ref		Ref	
Single	–	–	–	–	–	–
Other	–	–	–	–	–	–
Number of children						
No children	Ref		Ref			
One child	0.72 (−0.88–2.33)	0.248	–	–	0.65 (−0.2–1.5)	0.093
Two or more children	1.68 (0.63–2.73)	0.015	–	–	1.45 (1.02–1.88)	0.002
Time working (in years)			**0.01 (−0.01–0.02)**	**0.079**	–	–
Mental Exhaustion						
No	Ref		Ref		0.42 (−0.62–1.47)	0.288
Yes	1.1 (0.59–1.61)	0.006	–	–	0.42 (−0.62–1.47)	0.288
Fear of COVID-19	1.11 (0.85–1.78)	0.046	1.09 (0.68–1.13)	0.034	1.75 (1.35–2.53)	0.039
Risk perception	0.15 (−0.35–0.68)	0.459	0.20 (0.05–0.78)	0.026	0.31 (0.03–0.0.62)	0.041

B, unstandardized coefficient; CI, confidence intervals.

[a]Model 1 was the crude model only taking into account the adjustment by country.

[b]Model 2 was adjusted by country and covariates that were significant in the crude model ($p < 0.05$).

The p-values in bold are reported to be significant in both model 1 and 2.

Furthermore, we found an association between fear of COVID-19 and the risk perception with preventive behaviours, where the greater the fear or perceived risk perception, the greater the attitude of taking preventive actions, as reported in other studies (15, 47, 49, 52).

This study has limitations: (1) The sampling applied was non-probabilistic, which does not guarantee the representativeness of the study population of the countries included and, therefore, it is not possible to extrapolate the results (2) Since an online survey was applied to report mental exhaustion, the result is subject to the subjectivity of the person completing the survey for no test or diagnostic procedure was applied. (3) Another limitation was the development of the questionnaires for this study, which were based on the policies proposed by the World Health Organization of COVID-19 for use in the work of health professionals. Although questionnaires for many of our study variables already exist, such as the Fear of COVID-19 Scale (35) and Preventive COVID-19 Infection Behaviours Scale (53), it was taken into account that, during the research development period, there were no brief questionnaires specifically designed for our study population in the work and in the context of the pandemic. Nevertheless, despite the limitations, this study is relevant because it is one of the first to report the rates of fear, risk perception, and preventive behaviour in health professionals in Latin American countries.

In conclusion, we found that fear and risk perception are associated with increased practice of hand washing and use of additional protection at work. Nevertheless, further studies on the subject are needed because working conditions during the pandemic greatly influence the work performance and mental health of frontline staff in the face of COVID-19; therefore, a better understanding of the subject will allow better decisions to be made and avoid medium- and long-term complications for the health care system in Latin America.

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 information protocol was approved by the ethics committee of the Norbert Wiener University issued in the Register Report No. 085-2020. The participants provided their written informed consent to participate in this study.

Author contributions

OR-L, CB-A, and IR-L: conceptualization and supervision. OR-L, CB-A, IR-L, EC-A, and MI-Z: methodology. RL, CB-A, IR-L, EC-A, MI-Z, and RP-L: formal analysis. OR-L, CB-A, IR-L, EC-A, RP-L, MI-Z, FC, and LS: investigation, writing—original draft preparation, and writing—review and editing. OR-L and CB-A: project administration. All authors have read and agreed to the published version of the manuscript.

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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.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1171246/full#supplementary-material

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How serving helps leading: mediators between servant leadership and affective commitment

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Introduction: Servant leadership has long been associated with maintaining employee's affective commitment, yet the underlying mechanism remains unclear. Research from non-western cultures remains scarce.

Methods: This study sought to fill in such research gap by introducing insights from social exchange theory perspective, and examined two potential mediators (viz., psychological safety and job burnout) with a largescale, representative Chinese sample.

Results: A total of 931 staffs in a Chinese hospital were surveyed, and structural equation models revealed that psychological safety (indirect effect=0.052, 95% Bootstrap CI=[0.002, 0.101]) and job burnout (indirect effect=0.277, 95% Bootstrap CI=[0.226, 0.331]) parallelly (and partially) mediated the effect of servant leadership on affective commitment. Moreover, these effects held the same between permanent and temporary staffs, as well as between male and female staffs.

Discussion: Results suggested that a leader's orientation to care, validate, and respond to their followers' needs was effective in creating a psychological safe environment and downplaying job burnout in workplace, in exchange to which, followers remained affectively committed to their organization in a long term. Not only did this study contribute to existing literature by providing non-western data for service leadership research, it also provided a deeper understanding of associated mechanisms of how servant leadership might cast on talent retain and organizational development in a long term. These mechanisms shed light on how serving helps leading and advocate servant leadership for hospitals, as well as other serving organizations.

KEYWORDS

servant leadership, affective commitment, job burnout, psychological safety, mediation model

Introduction

Human resources are the most important factor in various organizations (Specchia et al., 2021), despite the pervasive existence of many management dilemmas, e.g., high employee turnover, low workplace engagement, and lack of organizational ownership especially in recent decade (Gile et al., 2022; Stanimirović and Pribaković, 2022; Ekingen et al., 2023). One crucial factor to prevent these dilemmas is the maintenance of employees' affective commitment, which was found negatively related to both turnover intentions and actual turnover behaviors, and

positively related to job performance and willingness to stay in the current organization (Fleig-Palmer and Rathert, 2015; Deschênes, 2023; Lado et al., 2023). As affective commitment is associated with various favorable organizational and personal outcomes [e.g., job performance, organizational citizenship behaviors, absenteeism, and turnover (Heffner and Rentsch, 2001)], only by retaining talents can organizations remain core competencies, and promote faster and better growth (Mercurio, 2015).

Previous research suggested that servant leadership was a strong positive predictor of affective commitment (Fernandez and Pitts, 2007; Higgs and Rowland, 2010; Van der Voet et al., 2016). Yet these findings were somewhat limited in its lack of non-western research samples and its lack of underlying mechanisms (Avolio et al., 2009; Higgs and Rowland, 2010). In response to which, this study examined the association of servant leadership and affective commitment in a Chinese public, comprehensive hospital, and further examined two potential mediators (*viz.*, psychological safety and job burnout) from a social exchange theory perspective.

Theoretical background and hypotheses

Affective commitment is the core of organizational commitments (Mercurio, 2015; Noraazian and Khalip, 2016), it refers to employees' (emotional) dependence on the organization, and the extent to which employees have the same values and objectives as the organization leads (Haider et al., 2019). Employees high in affective commitment believe in and accept the organization's goals and values, intend to stay with the organization in a long-term, and commit to providing quality service on behalf of the organization (Shao et al., 2022).

Previous research reveals that servant leadership plays an important role in retaining employees' affective commitment among various challenges (He et al., 2008; Mercurio, 2015; Goestjahjanti et al., 2022). More importantly, social exchange theory (SET) proposes that social exchange processes involve a series of interdependent and contingent interactions that evokes workplace obligation (Blau, 1974; Richard and Emerson, 1976), for which leadership plays an important role (Liden et al., 1997).

From servant leadership to affective commitment

Servant leaders care for their followers' personal needs and interests, and focus on the benefits of organizations and communities rather than their own interests (Eva et al., 2019). Compared to others (e.g., transformational leadership), this type of leadership is more likely to create social exchange relationships between leaders and their followers. According to SET, it is expected that when servant leaders provided employees with good working atmospheres, opportunities to improve professional skills, emotional support in need, in exchange, employees might develop a sense of identity and belonging to the organization (Cropanzano and Mitchell, 2005; Dahleez et al., 2021). Hence, it was hypothesized that *servant leadership positively affected affective commitment* (H1). In addition, this positive association could be mediated by (increasing) psychological safety and/or (decreasing) job burnout in workplace. Rationales were articulated below.

Psychological safety: willingness to exchange

Psychological safety refers to the belief that workplace is safe for interpersonal risk-taking such that presenting of self-image, career, or status is free from the fear of adverse effects (Edmondson, 1999; Frazier et al., 2017). When employees have a high level of psychological safety, they feel free to speak their minds, actively exchange work-related knowledge and information, and are energized, creative, and effective in performance even in rapidly changing environments such as healthcare revolution (Edmondson and Lei, 2014).

Servant leadership has a positive effect on the attitudes and behaviors of employees, with leaders putting employees' interests first, helping them develop and grow, and building good relationships with their followers. The recognition of being cared for, respected, and helped by their leaders might also grant the psychological safety to take challenges, seize opportunities, even taking risks to introduce different ideas; should there be any concern for adverse consequences related, employees are less fearful as they trust their servant leaders to "get their back" (Yan and Xiao, 2016). Therefore, it was presumed that servant leadership could increase employees' psychological safety. According to SET, exchange relationships are characterized by the mutual caring of both parties' interests (*cf.* Clark). With psychological safety granted, employees would be more willingly in taking responsibilities, stepping-out of comfort zones, and even bringing-about beneficial changes in the organization (Edmondson and Lei, 2014). In other words, employees who felt high in psychological safety in workplace would trust, identify, and dedicate more to the organization, resulting in both personal and organizational growth that could reinforce their affective bonding to the organization (Chandrasekaran and Mishra, 2012; Frazier et al., 2017; Li et al., 2022). Therefore, it was hypothesized that *servant leadership could boost affective commitment by enhancing the experience of psychological safety* (H2).

Job burnout: resources to exchange

Job burnout is a progressive psychological response to chronic job-related stress and includes three components: emotional exhaustion, which refers to the excessive depletion of one's emotional resources, resulting in feelings of emotional and physical burden and strain; depersonalization, which refers to a decreased ability to empathize with clients, and a cold, overly distant attitude; and a decreased sense of personal accomplishment, which refers to a loss of job satisfaction and competency (Lombardero-Posada et al., 2022; Yıldırım et al., 2023). Healthcare providers are exposed to many stressors including but not limited to challenges of clinical work, competing demands, conflicting roles, and relationships with leadership (Demin et al., 2017), which resulted in high prevalence of job burnout in this industry (Hall et al., 2016; Chirico et al., 2023). Especially with the shortage of human resources after the global Covid-19 pandemic, occupational hardship involving burnout, anxiety, and lack of career-related psychological security had become more and more prevalent(Chirico et al., 2022).

Studies have shown that servant leadership is negatively associated with job burnout, especially among medical staffs (Cai et al., 2013;

Harju et al., 2018; Ma et al., 2021). Servant leadership is very likely to minimize the chances of having emotional exhaustion, depersonalization, or lack of personal accomplishment, because leaders of this type of care not only the performance but also the well-being of their followers'. More importantly, employees with less job burnout have more resources to reward the organization, such as passionate, devoted, and skilled workplace performance. In such healthy social exchange processes, chances are high that employees would like to serve the organization in long-term, as working here becomes rewarding and enjoyable (Blau, 1974; Richard and Emerson, 1976). In other words, employees with servant leaders are less likely to have their organizational commitment jeopardized by the violation of their identification to the organization (Spence Laschinger et al., 2009). Therefore, it was hypothesized that *servant leadership could boost affective commitment by reducing the experience of job burnout* (H3).

Finally, job burnout could be a function of age or gender given employees at different life stages or in different family roles could face various life work conflicts, psychological safety could be a function of profession or career stage due to different organizational roles (Artz et al., 2022). Possibilities that the proposed mediation effects could be conditioned by demographic and/or professional characteristics could not be rule out in advance. Therefore, this study intended to explore whether the proposed model differed at demographic and/or professional features.

The present study

The objectives of the current study were to (a) examine the proposed parallel mediation effects of psychological safety and job burnout on the relationship from servant leadership to employee's affective commitment; and (b) to explore the potential differences of the above associations among different demographic and professional characteristics. In short, this study served as a possible extension of the social exchange theory, such that it examined whether servant leadership could evoke beneficial exchange processes via increasing psychological safety (the willingness to exchange) and decreasing job burnout (the resources to exchange).

Methods

Participants and procedure

A convenience sampling was conducted at a local comprehensive, second-grade hospital in Shanghai, China November 2021. This hospital consisted of various clinical departments[1] it was typically representative of the general hospitals of its level in China. All staffs ($n = 1925$) were invited to participate, and a total of 931 valid responses ($M_{age} = 35.58$ years, $SD = 9.26$; 80.42% were female) were collected. All participants provided informed consent.

This Research was approved by the Research Ethics Committee of Shanghai Jiao Tong University School of Medicine (reference ID: SJTUPN-202202). Hospital department heads were contacted in advance to introduce the purpose and procedure of this study. They were also instructed to encourage employees to participate in this anonymous, online survey distributed via a mature Chinese online survey platform (Wenjuanxing, Changsha, China). Multiple procedures were adopted to prevent common method bias frequently observed in self-report surveys, including, (a) the randomization of question orders, and (b) the insertion of reverse coded questions. In addition, the response window was specified as 3 days after the release of the survey link, all respondents were encouraged to response in a one-time and in privacy. Hospital staffs were further required to not to discuss the study or their own responses with each other until the study ended.

Measures

Well established psychological scales were adopted to measure servant leadership, psychological safety, job burnout, and affective commitment. The original English versions were translated into Chinese following standard procedures of translation and back-translation. Wording was modified to fit the Chinese healthcare environment, when necessary. All translated scales were tested for content and construct validity, and three items were removed for low factor loadings and cross-loadings on multiple dimensions (see Supplementary Table 1 for details). For each construct, a composite score was created by averaging all items such that higher scores indicate higher levels of that construct.

Servant leadership

Twenty-seven items were adapted from Liden et al.'s (2008) servant leadership scale (e.g., "My manager does what she/he can do to make my job easier."; 1 = *strongly disagree* to 5 = *strongly agree*) (Liden et al., 2008) with one original item excluded.

Psychological safety

Seven items were adapted from Edmondson's (1999) psychological safety scale (e.g., "If you make a mistake in your department, it is often held against you."; 1 = *very strongly disagree* to 7 = *very strongly agree*) (Edmondson, 1999).

Job burnout

Twenty items were adapted from the Maslach Burnout Inventory–Human Service Survey (MBI-HSS; e.g., "I feel depressed at work."; 1 = *never* to 7 = *every day*) (Maslach, 1996) with two original items excluded.

Affective commitment

Six items were adapted from Meyer et al.'s (1993) affective commitment scale (e.g., "I would be very happy to spend the rest of my career with this hospital."; 1 = *very strongly disagree* to 7 = *very strongly agree*) (Meyer et al., 1993).

Finally, participants were also asked to report their age, gender, marital status, education level, occupation, and annual income.

1 This hospital consisted of 14 clinical departments (e.g., surgery, internal medicine, gynecology, and pediatrics), 4 medical technology departments (*viz.*, multidisciplinary laboratories, medical imaging services, pharmacology/pharmacy), 15 administrative departments (e.g., medical affairs, hospital infection management), and over 1,000 hospital beds.

Analytical scheme

All analyses were conducted in SPSS 26.0, Jamovi 2.3.21, and SPSS AMOS 26.0. Psychometric properties of the translated scales were examined before hypothesis testing. Reliability was examined via internal consistency, and a McDonald's $\omega > 0.700$ was considered acceptable (Trizano-Hermosilla and Alvarado, 2016). Validity was examined via confirmatory factor analysis (CFA). Scales were individually analyzed according to theoretical structures, and model fits and factor loadings were evaluated in conjunction to assess structural validities against pre-determined criteria (namely, goodness-of-fit index (GFI), comparative fit index (CFI), and Tucker-Lewis index (TLI) > 0.900; $\chi^2/df < 3$, and root mean square error of approximation (RMSEA) < 0.080) (Lt and Bentler, 1996; Schermelleh-Engel et al., 2003). In addition, scales were modeled together upon their own factor models to examine the convergent and discriminate validities via average variance extracted (Fornell and Larcker, 1981) [AVE; which was expected to be larger than the correlation coefficients among the corresponding factors and composite reliability (CR > 0.700) (Peterson and Kim, 2013)]. Harman's single-factor test was used to probe common method bias (Podsakoff et al., 2003; Tehseen et al., 2017).

For hypothesis testing, the proposed parallel mediation effects were examined using SPSS PROCESS macros 22.0 (Model 4; bootstrap samples = 5,000) (Hayes, 2017). Variance inflation factor (VIF) was adopted to evaluate multicollinearity, and given the cross-sectional design, a relatively strict cut-off value was determined prior to data analysis such that a VIF smaller than 2.5 was considered acceptable.

Results

Sample characteristics were reported in Table 1.[2] Descriptive statistics, McDonald's ωs, and bivariate correlations of key variables are presented in Table 2. In psychometric tests, one item from servant leadership scale was excluded due to unsatisfactory factor loading and two were excluded from job burnout scale due to cross loading (see Supplementary Table 1 for details). After revision, all translated scales exhibited satisfactory reliability (McDonald's ωs ≥ 0.792), and well-supported structural and discriminate validities (model fit: $\chi^2/df = 3.924$, CFI = 0.923, TLI = 0.919, RMSEA = 0.057, SRMR = 0.064; see Figure 1; Table 2). The first factor revealed by the Harman's single-factor test did not capture most of the variance (45.95%), suggesting no substantial common method bias.

Mediating effects of psychological safety and job burnout

Mediation analysis was performed to examine whether staff members' psychological safety and job burnout (in parallel) mediated the effect of employees' perceived servant leadership on their affective commitment, with shift type and income level as control variables (Table 3). VIFs were below 2.00 for all independent variables, suggesting no substantial multicollinearity. Servant leadership was positively associated with affective commitment while psychological safety and job burnout simultaneously and partially mediated the above association. Specifically, after accounting for the indirect effects via psychological safety and job burnout, the direct effect remained significant. Together, this mediation effect accounted for 61.055% of the total effect from servant leadership to affective commitment. A further contrast of the two indirect effects suggested that the mediation effect via job burnout was stronger than the effect via psychological safety (Figure 2).

Multi-group analyses

Multi-group analyses were conducted to examine whether the above mediation model held equivalently for (a) male versus female participants, (b) permanent staff versus temporary staff participants.[3] Critical ratios for parameter differences were adopted for path comparisons. Results revealed that the negative effect of servant leadership on job burnout, the negative effect of job burnout on affective commitment, and the positive effect of psychological safety on affective commitment were greater in terms of the magnitudes for temporary staffs than for permanent staffs (Figure 3). However, the two mediation effects were not significantly different between the two groups (Bs < −0.002, $p > 0.071$). And accordingly, the total indirect effect was not significantly different ($B = -0.162$, $p = 0.132$, 95% CI = [−0.385, 0.047]) between the two groups, either. No gender difference was found across all pairs of paths (see Supplementary Table 2 for details).

Discussion

The results of this study revealed that, as predicted, psychological safety and job burnout parallelly mediated the relationship between servant leadership and affective commitment such that servant leadership could enhance affective commitment by increasing employees' psychological safety and reducing job burnout. These mediation effects held the same between permanent and temporary staffs, and between male and female staffs.

Results supported the proposed mediators (*viz.*, psychological safety and job burnout), suggesting that servant leadership could promote employees' affective commitment via not only creating a psychological safe environment (Edmondson and Lei, 2014; Azam et al., 2017; Frazier et al., 2017; Li et al., 2022) but also granting resources to recover from work stress. Furthermore, it is noteworthy that indirect effect via job burnout was somewhat stronger than that via psychological safety. One possible reason was that healthy leaderships could help employees practice self-regulation and develop coping flexibility especially when job resources were drained (Bakker and de Vries, 2021), which could be applied to a variety of different scenarios, including those where voice-ups were encouraged.

2 Data would be available upon requests toward the correspondence authors.

3 Permanent staff group (n=664) and temporary staff group (n=267).

TABLE 1 Sociodemographic characteristics and affective commitment distribution across these characteristics.

Demographic characteristics	*n* (%)	*M*	*SD*	*F*/*t*	*p*
Gender					
Female	758 (80.418)	4.731	1.064	0.333	0.564
Male	173 (18.582)	4.940	1.088		
Age group					
<30	292 (31.364)	4.854	1.091	2.305	0.075
31 ~ 40	361 (38.776)	4.859	1.142		
41 ~ 50	210 (22.556)	4.943	1.007		
>50	60 (6.445)	5.231	0.987		
Marital status					
Single	264 (28.357)	4.805	1.137	1.683	0.195
Married	667 (71.644)	4.939	1.063		
Education					
High-school or below	271 (29.108)	4.935	1.143	0.385	0.681
Bachelor's degree	522 (56.068)	4.900	1.072		
Postgraduate	138 (14.823)	4.836	1.022		
Profession					
Doctor	217 (23.308)	4.835 [a, b]	1.015	9.754	< 0.001
Nurse	567 (60.902)	5.009 [a]	1.079		
Medical technicians	147 (15.789)	4.582 [b]	1.148		
Job title					
Senior	68 (7.304)	5.240 [a]	0.931	3.547	0.014
Intermediate	363 (38.990)	4.882 [a]	1.094		
Junior	452 (48.550)	4.840 [a, b]	1.081		
Other	48 (5.156)	5.142 [a]	1.181		
Type of contract					
Permanent	664 (71.321)	4.913	1.075	0.990	0.320
Temporary	267 (28.679)	4.871	1.112		
Annual income					
100,000 or below	244 (26.208)	4.863	1.115	1.230	0.298
100–200,000	598 (64.232)	4.908	1.086		
200,000–300,000	81 (8.700)	4.895	0.994		
300,000 or above	8 (0.859)	5.604	0.926		
Shift type					
Dayshift	341(36.627)	5.122 [a]	1.043	11.395	< 0.001
Two shifts	165 (17.723)	4.757 [b]	1.093		
Three shifts	425 (45.650)	4.780 [b]	1.090		

Annual income was in Chinese Yuan. Group means with different superscriptions were significantly different from each other.

TABLE 2 Descriptive statistics, reliabilities, and bi-variate correlations between variables of interest.

	M	*SD*	McDonald's ω	1	2	3	4	Composite reliability
1 Servant leadership	3.683	0.942	0.990	(0.636)				0.988
2 Psychological safety	5.039	1.116	0.896	0.604	(0.616)			0.918
3 Job burnout	2.920	0.819	0.918	−0.509	−0.554	(0.461)		0.962
4 Affective commitment	4.901	1.086	0.792	0.467	0.443	−0.605	(0.727)	0.941

All correlations were significant at $p < 0.001$. Values on the diagonal represent AVE.

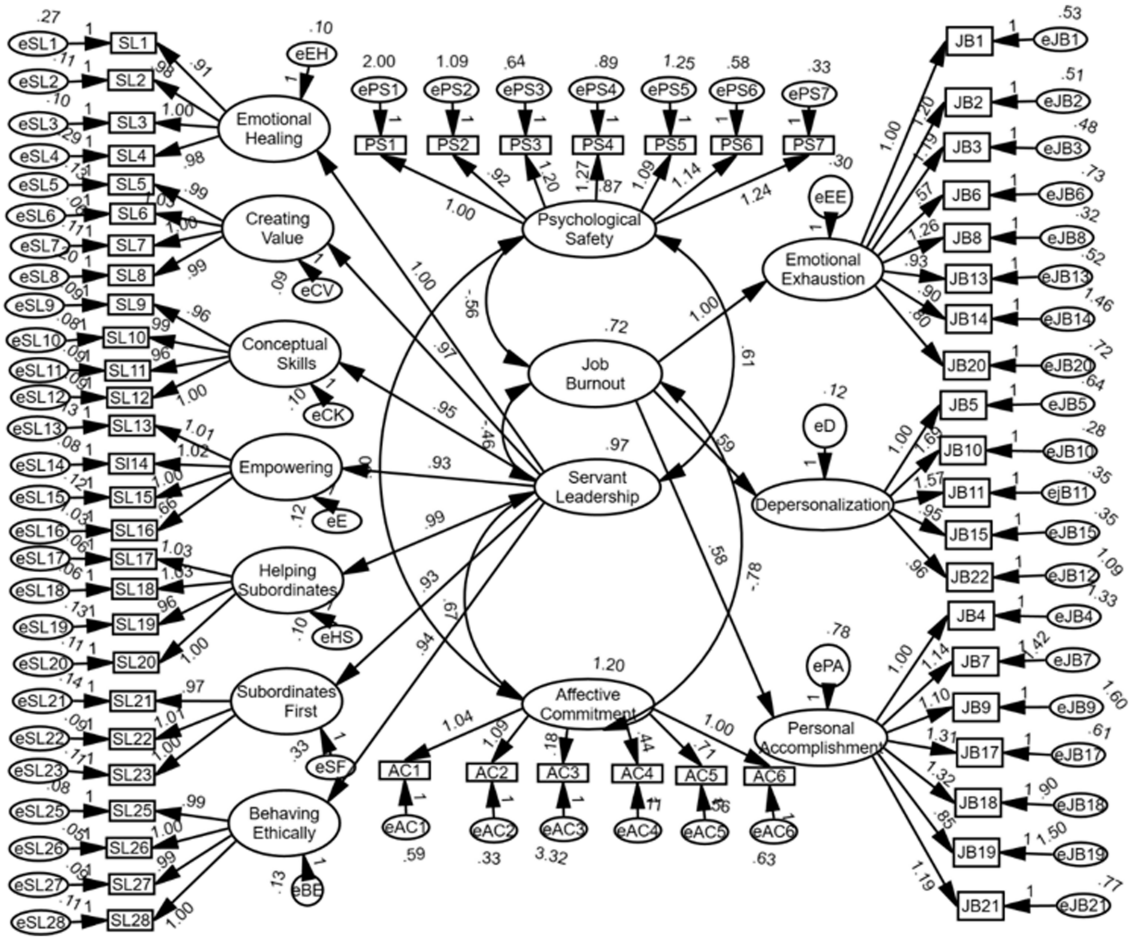

FIGURE 1
Discriminate validity test result. SL, servant leadership; PS, psychological safety; JB, job burnout; AC, affective commitment.

TABLE 3 Results of the mediation model.

	Whole sample				Permanent staffs				Temporary staffs			
	B	*SE*	LLCI	ULCI	*B*	*SE*	LLCI	ULCI	*B*	*SE*	LLCI	ULCI
Total effect (SL → AC)	0.538	0.034	0.471	0.605	0.496	0.039	0.420	0.573	0.681	0.071	0.541	0.820
Direct effect (SL → AC)	0.210	0.039	0.134	0.285	0.227	0.045	0.138	0.315	0.170	0.078	0.016	0.323
Total indirect effect	0.327	0.031	0.271	0.393	0.270	0.035	0.204	0.340	0.511	0.076	0.375	0.668
Path 1:SL → PS → AC	0.052	0.025	0.002	0.101	0.033	0.029	−0.025	0.091	0.113	0.053	0.013	0.220
Path 2:SL → JB → AC	0.277	0.027	0.226	0.331	0.237	0.028	0.184	0.294	0.398	0.070	0.273	0.544
Contrast of paths 1 vs. 2	−0.224	0.042	−0.309	−0.144	−0.204	0.046	−0.295	−0.116	−0.285	0.098	−0.486	−0.103

n = 908. SL, servant leadership; PS, psychological safety; JB, job burnout; AC, affective commitment. LLCI and ULCI stand for lower and higher limit of the 95% bootstrapping confidence interval, respectively.

Therefore, job burnout outperformed psychological safety as the mediator here.

Although overall mediation effects held the same between temporary and permanent staffs, path analyses revealed that servant leadership decreased job burnout to a larger extent for the former than for the latter. This subtle difference suggested a strategic provision of servant leadership-oriented management toward temporary staffs, for that these staffs tended to be less stable and less resourceful in workplace and therefore more vulnerable to job burnout, yet as results revealed, these staffs tended to benefit more from caring leaders, compared to their permanent counterparts.

Theoretical implications

Previous research on servant leadership mainly focused on the antecedences and consequences, little research attention was directed to the mechanisms why and how serving helps leading. As

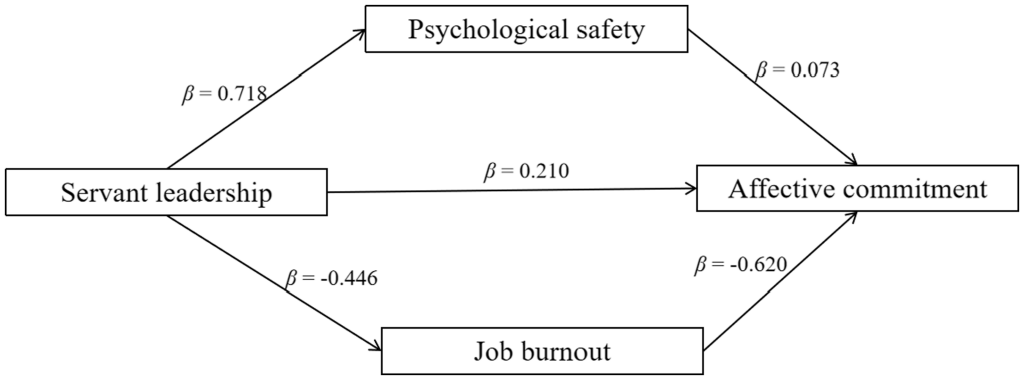

FIGURE 2
Results for the mediation analysis. Standardized coefficients were reported. All coefficients were significant at $p<0.001$.

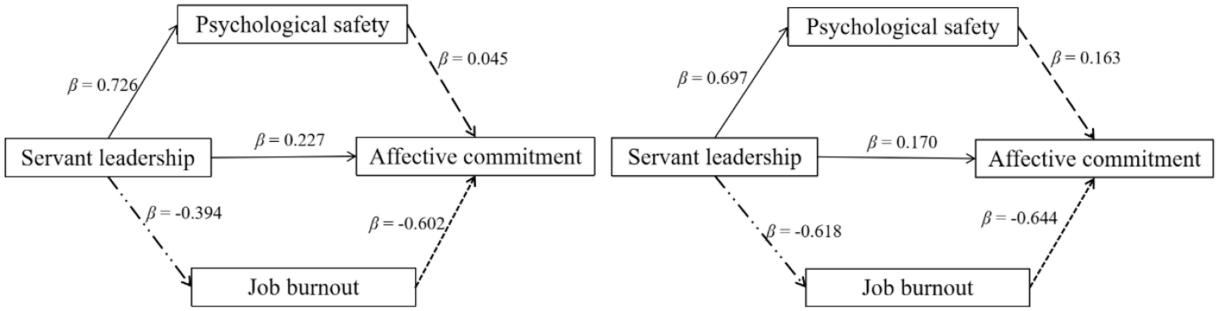

FIGURE 3
Comparing the mediation effects between permanent (left panel) versus temporary (right panel) staffs. Standardized coefficients were reported. All coefficients were significant at $p<0.001$. Solid lines indicate no statistical difference between the corresponding effects for permanent and temporary staffs.

researchers pointed out, this field would benefit from in-depth examination of the mechanism(s) associated with servant leadership (Eva et al., 2019). In responding to which, this study examined and revealed that serving others' needs brought benefits via not only organizational psychological climate but also followers' affective well-being. Additionally, this study contributed to existing literature by providing non-western data for the examination of servant leadership.

A distinguishable feature of this study was that it examined behavioral tendencies (servant leadership and affective commitment) instead of concrete behaviors in social exchange processes (Cook et al., 2013). From leaders' end, a servant orientation provides an umbrella test of resources such as love (i.e., an expression of affectionate regard, warmth, or comfort), status (i.e., an evaluative judgment that conveys prestige, regard, or esteem), and information (i.e., advice, opinions, instruction, or enlightenment) among the six types of critical resources proposed by the resource theory of social exchange (Tolin et al., 2003). From subordinates' end, affective commitment is one of the socioemotional outcomes that address's one's social and esteem needs and conveys a sense of being valued and/or treated with dignity (Shore et al., 2001; Cook et al., 2013). While concrete behaviors (e.g., short-term monetary reward or cooperation) might be more convenient to measure, behavioral tendencies granted more generalizability in research findings. More importantly, the theoretical model tested here shed more light on those long-term, socioemotional outcomes rather than short-term, tangible ones, which were more important for the organizational development (Cook et al., 2013). Results added new empirical evidence of social exchange theory in leadership research. Using psychological safety and job burnout as proxies, results also highlighted that servant leadership contributed to beneficial social exchange processes via the securing of both willingness and resources from employee's perspective.

Practical implications

Based on the results of this study, some practical implications are suggested. First, psychological safety and burnout significantly mediated the relationship between servant leadership and affective commitment, suggesting that managers need to appreciate how their servant leadership behaviors affect employees' affective commitment. It is essential to clearly understand that servant leadership is an important part of employees' increased affective commitment. The more followers perceive servant behavior, the more likely they are to commit to staying with the organization. In addition, this study shows that influencing affective commitment through burnout is stronger

than psychological safety, suggesting that managers should prioritize reducing employee burnout. Finally, the mediation model holds across groups, suggesting that employees of different genders and employment forms can increase their affective commitment through servant leadership in the hospital context.

Study limitation and future direction

Several limitations need consideration. First, the cross-sectional design limited the examination of the causal relationships among the investigated variables, longitudinal studies are recommended to further the understanding of the mechanisms revealed here. Second, this study focused on the effects of servant leadership behaviors on individual-level mediators, while team-level mediators might play important roles as well, e.g., collaborative team atmosphere inspired by servant leadership's other-interests orientation. Future studies might consider integrating mechanisms at both individual- and team-levels. Thirdly, authors encouraged some replication of the current findings in hospitals with different specialties and scales, as well as in other serving organizations to examine the generalizability of the theoretical model. Fourthly, though psychological safety and job burnout could proximate well the willingness and resources to exchange, authors recommended future research to adopt other variables (e.g., citizenship behaviors) for conceptual replication. Finally, this study focused on the perceived servant leadership, future studies could further examine actual levels (e.g., leaders' self-report) to provide a comprehensive picture as well.

Conclusion

This study revealed that servant leadership could promote hospital employees' affective commitment by (increasing) psychological safety and (decreasing) job burnout, and job burnout outperformed psychological safety as the mediator. Our findings make significant contributions to the field of servant leadership and shed light on several new research directions.

Data availability statement

Data would be available upon request made to corresponding authors.

Ethics statement

The studies involving human participants were reviewed and approved by the Research Ethics Committee of Shanghai Jiao Tong University School of Medicine (reference ID: SJTUPN-202202). The patients/participants provided their written informed consent to participate in this study.

Author contributions

MB, SL, ZZ, and XZ contributed to conception and design of the study, and organized the database. MB, XH, TJ, and CY performed the statistical analysis. MB wrote the first draft of the manuscript. SL, XZ, and XH wrote sections of the manuscript. All authors contributed to manuscript revision, read, 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.

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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.2023.1170490/full#supplementary-material

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Key predictors of psychological distress and wellbeing in Australian frontline healthcare workers during COVID-19 (Omicron wave)

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Introduction: The COVID-19 pandemic has led to significant challenges for frontline healthcare workers' (FHW), raising many mental health and wellbeing concerns for this cohort. To facilitate identification of risk and protective factors to inform treatment and interventions, this study investigated key predictors of psychological distress and subjective wellbeing in FHWs.

Methods: During the Omicron wave of the COVID-19 pandemic (January 2022), Victorian (Australia) doctors, nurses, allied health and non-medical staff from Emergency Departments, Intensive Care units, Aged Care, Hospital In The Home, and COVID Wards completed a cross-sectional survey consisting of the Kessler 6 item (Psychological Distress), Personal Wellbeing Index (Subjective Wellbeing), Coronavirus Health Impact Survey tool (COVID-19 related factors) and occupational factors. Multivariable linear regressions were used to evaluate unadjusted and adjusted associations. Relative weight analysis was used to compare and identify key predictors.

Results: Out of 167 participants, 18.1% screened positive for a probable mental illness and a further 15.3% screened positive for low wellbeing. Key risk factors for greater psychological distress included COVID infection worries, relationship stress and younger age. For both psychological distress and lower wellbeing, health status and supervisor support were key protective factors, while infection risks were key risk factors. Only positive changes in relationship quality was protective of lower wellbeing.

Conclusion: This study highlights the significance of social determinants and individual level factors alongside work related factors, in influencing FHWs' mental health and wellbeing during public health crises, such as the COVID-19 pandemic. Findings suggest that future interventions and supports should take a more holistic approach that considers work, social and individual level factors when supporting FHWs' mental health and wellbeing.

KEYWORDS

healthcare, doctors, nurses, COVID, pandemic, public and global mental health, risk factors, protective factors indent: first line: 1.27cm formatted: normal

Introduction

Since the beginning of the COVID-19 pandemic, healthcare systems have been under significant pressure, leading to unprecedented challenges for healthcare workers worldwide. During this time, high rates of COVID-19 infections have led to concerning surges in hospital admissions (Verelst et al., 2020; Berger et al., 2022). This has translated into an increased and prolonged risk of COVID-19 infection among healthcare workers (Nguyen et al., 2020; Quigley et al., 2021; World Health Organisation, 2021), as well as a surge in their workloads (Billings et al., 2021; Spányik et al., 2022) and a complete change in their working procedures (Digby et al., 2021; Hunt et al., 2022). Under these conditions, healthcare workers have been working under significant challenges, both physically and mentally.

Existing research suggests that working in hospitals during the pandemic have contributed to high rates of burnout (Magnavita et al., 2021), insomnia (Salari et al., 2020; Sahebi et al., 2021; Lee et al., 2023) and psychological distress. High prevalence of mental health disorders have also been documented in this cohort, such as depression (Yan et al., 2021; Lee et al., 2023), anxiety (Raoofi et al., 2021; Yan et al., 2021; Lee et al., 2023), and PTSD (Yan et al., 2021; Lee et al., 2023). Emerging evidence also links healthcare roles during the pandemic with a deterioration in overall wellbeing, suggesting that COVID-19 impacts on healthcare workers have spanned across multiple life domains during this time (McGuinness et al., 2022). This is concerning as COVID-19 outbreaks are persisting and continue to escalate the stress on healthcare systems worldwide (World Health Organisation, 2022), placing healthcare workers at high risk of continued and cumulative impacts on their mental health and wellbeing.

Healthcare workers working in frontline settings with high-risk COVID-19 infections may be particularly vulnerable, such as those working in emergency departments, intensive care units and COVID wards, as proximity to risk during disasters can significantly increase an individual's vulnerability to mental illness (May and Wisco, 2016). Studies of coronavirus outbreaks support this contention, highlighting that healthcare workers directly caring for infected patients in frontline settings have high risks of mental health impacts (De Brier et al., 2020; Kisely et al., 2020; Muller et al., 2020). These findings were also consistent during the COVID-19 pandemic, with studies demonstrating that frontline healthcare workers (FHWs) experienced more anxiety, depression, and traumatic stress than their non-frontline counterparts (Lai et al., 2020; Wang et al., 2020; Kim and Lee, 2022). Long-term mental health consequences are also a concern as findings on past coronavirus outbreaks suggest that some FHWs can be affected up to 2 years after outbreaks (Liu et al., 2012; Galli et al., 2020; Chau et al., 2021). Given these findings, there is a clear need to identify FHWs at greatest risk and key predictors of their psychological distress and wellbeing to inform interventions and supports that are critical during the COVID-19 pandemic and future infectious disease outbreaks.

Most studies strongly support that work-related stressors are key predictors of psychological distress in FHWs during the COVID-19 pandemic, such as work-related infection risks, level of work experience and organisational support (De Brier et al., 2020; Kisely et al., 2020; al Falasi et al., 2021). Thus, recommendations and interventions for FHWs to date have largely revolved around workplace supports and enhancing infection control procedures. However, the impacts of the COVID-19 pandemic have been wide-ranging, and few have investigated other important determinants of FHWs' mental health beyond work, such as social and pandemic related determinants. Studies on the general community have shown that pandemic and social stressors can also lead to significantly greater distress and lower wellbeing. These stressors include lockdowns (Westrupp et al., 2021a,b), community infection risks (Fitzpatrick et al., 2020; Kim et al., 2022) and relational impacts (Cassinat et al., 2021; Sheen et al., 2021; Wang et al., 2021). Emerging qualitative evidence also support these findings in FHWs, showing that these social stressors have placed significant burden on FHWs during the COVID-19 pandemic (Schaffer et al., 2022; Sheen et al., 2022). These findings, therefore, highlight the need to further our understanding of key predictors of psychological distress and wellbeing amongst FHWs during the COVID-19 pandemic that considers stressors beyond work, such as pandemic and social stressors.

Nevertheless, studies have largely been conducted early in the pandemic and there is currently a dearth of research on more recent waves of COVID-19 outbreaks, such as the Omicron wave. Updated findings is thus necessary, especially when the extended nature of the COVID-19 pandemic places FHWs at high risk of continued and cumulative mental health and wellbeing impacts. Continued understanding and investigation into key predictors of FHWs' psychological distress and wellbeing during the COVID-19 pandemic is critical to inform and enhance the effectiveness of future interventions and facilitate targeted interventions for highly vulnerable FHWs, during the COVID-19 pandemic and in future infectious disease outbreaks.

Research aims

This study aimed to investigate key predictors of psychological distress and subjective wellbeing among FHWs during the COVID-19 pandemic. Specifically, this study aimed to examine to what extent did demographics, health factors, COVID-infection factors, occupational factors, lockdown stressors and relational factors have an effect on psychological distress and subjective wellbeing in FHWs during the COVID-19 pandemic.

Methods

This study followed and adhered to the reporting guidelines of the STROBE guidelines for cross-sectional studies (Supplementary File S1).

Study design

This study used cross-sectional data collected in the third timepoint of a longitudinal cohort study on FHWs' working in Victoria, Australia. The data used in this study was collected between late January 2022 to early March 2022 using an online survey, administered on RedCap.

Recruitment

Participants were recruited state-wide in Victoria (Australia) from a large metropolitan health service (Eastern Health), and five major Australian healthcare associations: Australian medical association Vic (AMAVic), Australian Nursing and Midwifery Federation Vic (ANMFVic), Aged & Community Care Providers Association (ACCPA), Victorian Healthcare Association (VHA) and Health Services Union (HSU). Participants were eligible to participate if they worked in any capacity in Victorian (Australia) hospitals and in any of the following departments: the Emergency Departments, Intensive Care Units, COVID Wards, Hospital in the Home or Aged Care. These departments were chosen to represent frontline healthcare working sites and to recruit FHWs, as they posed the highest risk of COVID-19 infection in Victoria, Australia.

Ethics

Study and ethics approval (HEAG 2020-296) was obtained from Deakin University High Risk Ethics Committee, Eastern Health's Ethics Committee, and all partnering healthcare associations prior to the commencement of recruitment and data collection. Participants provided their consent and voluntarily participated. To ensure confidentiality, participant's data were all de-identified prior to data-analysis.

Context

During the data collection period, the general community were experiencing the easing of COVID-19 restrictions in Victoria, Australia (Premier of Victoria, 2022a). However, Victoria (Australia) was just coming out of the Omicron wave and largest ever surge of positive COVID-19 cases and hospitalisation since the start of the COVID-19 pandemic, which started in November and peaked in mid-January 2022 (State Government of Victoria, 2023). As such, the Victorian government declared a code brown emergency due to the influx of COVID-19 patients in hospitals (Premier of Victoria, 2022b). This meant that hospitals could configure or shutdown non-essential services to free staff, redeploy staff to higher priority departments, and ask staff to return from leave.

Measures

The survey collected data using individual items and scales from the Coronavirus Health Impact Survey tool (CRISIS) (Nikolaidis et al., 2021). Individual CRISIS items used in the survey included two *demographic* items: age and gender, two *health* related items: self-reported physical health and pre-COVID-19 mental health, two *lockdown* related items: self-reported stress with lockdown restrictions and time spent outdoors, and three *COVID-infection* related items: self-reported risk of infection from work, risk of infection from the community, and COVID-19 diagnosis.

A modified version of the *COVID-19 infection worries* scale from the CRISIS tool was also used in the survey. *COVID-19 infection worries* was measured using a validated scale score of four items measuring to what extent participants were worried about (1) being infected, (2) their family being infected, and the impacts of infection on their (3) mental health and (4) physical health. The original scale was found to have high internally consistency with a coefficient Omega of >0.8 and good unidimensionality (CFI > 0.95) (Nikolaidis et al., 2021). In our study, to reflect worries of infection more accurately, we removed the items that related to reading and talking about COVID-19, and hope that the pandemic will end soon. Our modified version had good internal consistency (McDonald's $\omega = 0.88$) and unidimensionality (CFI = 0.96).

To measure relational factors, two items from the CRISIS tool measuring (1) *changes in relationship quality* with regards to family and (2) *changes in relationship quality* with regards to social contacts were combined to avoid multi-collinearity in regression models and derive a single scale score of overall *changes in relationship quality*. This scale showed moderate internal consistency (McDonald's $\omega = 0.60$). Overall *relationship stress* was measured using a single scale score derived from the mean of two items measuring (1) *relationship stress* with regards to family and (2) *relationship stress* with regards to friends (5-point Likert scale, 1 = Not at all to 5 = Extremely). This scale showed good internal consistency (McDonald's $\omega = 0.76$).

To measure occupational factors, participants were asked to specify their occupation, whether they provided direct care to COVID-19 patients in the last 2 weeks, and a self-report rating of their supervisor's support for mental health and wellbeing during the COVID-19 pandemic.

To measure psychological distress participants responded on a Likert scale from 1 (none of the time) to 4 (all of the time) to items on the Kessler Psychological Distress Scale- Six item (K6) scale, which has good internal consistency and reliability with a Cronbach's alpha of 0.89 (Kessler et al., 2003). In this study Cronbach's alpha and McDonald's Omega was both 0.88 and CFI was 0.95 showing good internal consistency and unidimensionality. Scores were summed to produce a final score. A cut-point of 19 was used to indicate the presence of a probable mental health disorder. This cut-point has been shown to have high specificity (96%) but lower sensitivity (36%) in detecting health disorder diagnosed through clinical interviews (Kessler et al., 2003). The Kessler Psychological Distress Scale has also shown to have good measurement invariance across different age groups (Sunderland et al., 2013) and gender (Drapeau et al., 2010), as well being validated across a wide range of populations from different countries and culture (Donker et al., 2010; Oakley Browne et al., 2010; Andersen et al., 2011; Fernandes et al., 2011; Bu et al., 2017), including Australia (Slade et al., 2011).

To measure Subjective wellbeing participants completed the Personal Wellbeing Index (PWI), which has shown to have good internal consistency and reliability with a Cronbach's alpha between 0.7 to 0.85 in the Australian population. Test–retest reliability over 1 to 2 weeks have shown to be good with an intra-class correlation of 0.84. In this study, internal consistency (Cronbach's alpha = 0.92, McDonald's Omega = 0.92) and unidimensionality of the PWI was good (CFI = 0.98). The PWI has seven domains that consistently form one factor, explaining 50% of the variance in the domain "satisfaction as a whole" in the Australian population (International Wellbeing Group, 2013). The seven domains are measured on a Likert scale from 0 (no satisfaction at all) to 10 (completely satisfied), which were totaled, averaged, and multiplied by 10 to produce the single mean PWI score. The PWI has been validated in Australia (International

TABLE 1 Minimum sufficient adjusted sets (MSAS) for each predictor examined in each regression models.

Predictor variables	MSAS*
Age	N/A
Gender	N/A
Pre-COVID mental health	Age, occupation, gender
Physical health	Age, COVID diagnosis, Pre-COVID mental health, occupation, gender, supervisor support
Occupation	Age, gender
Direct care	Age, occupation, gender
Supervisor support	Age, direct care, pre-COVID mental health, occupation, gender
Community infection risk	Age, COVID diagnosis, pre-COVID mental health, physical health, gender
Work infection risk	Age, community infection risk, COVID diagnosis, direct care, pre-COVID mental health, occupation, physical health, gender, supervisor support
COVID-19 infection worries	Age, community infection risk, COVID diagnosis, direct care, pre-COVID mental health, occupation, physical health, gender, supervisor support, work infection risk
COVID diagnosis	Age, direct care, gender, supervisor support
Outdoors time	COVID infection worries, age, community infection risk, COVID diagnosis, pre-COVID mental health, physical health, gender, work infection risk
Stress from lockdown restrictions	COVID infection worries, age, community infection risk, COVID diagnosis, pre-COVID mental health, occupation, physical health, changes in relationship quality, gender, supervisor support, work infection risk
Relationship stress	COVID infection worries, age, community infection risk, COVID diagnosis, pre-COVID mental health, outdoors time, physical health, changes in relationship quality, gender, stress from lockdown restrictions, supervisor support, work infection risk
Changes in relationship quality	COVID infection worries, age, community infection risk, COVID diagnosis, pre-COVID mental health, outdoors time, physical health, gender, supervisor support, work infection risk

*Minimally sufficient adjustment set: the minimum number of covariates needed to identify the total effect without inducing biasing associations.

Wellbeing Group, 2013) and across a wide range of countries and cultures, showing good measurement invariance (Żemojtel-Piotrowska et al., 2017; Jovanović et al., 2019).

Data analysis procedure

To address missing values observed in the data, missing data were multiply imputed in R using the MICE package (van Buuren and Groothuis-Oudshoorn, 2011). Fifty imputations were conducted and 5 iterations, which was conservative given that missingness did not exceed 11%. To assist imputations, auxiliary variables were used in the imputation. Outcome variables (i.e., K6 and PWI total scores) were not imputed and were only computed after imputation to reduce any potential bias during the imputation process. All analyses were conducted and pooled using Rubin's rule (Rubin, 2004).

T-tests were used to compare sample means with normative data that was nationally representative of the Australian population and collected at similar timepoints as the current study. Normative data was taken from the Australian Unity Wellbeing Index national 2022 report (Khor et al., 2022) for PWI scores and the Australian National University national COVID-19 tracking poll (Biddle and Gray, 2022) for K6 scores. Univariate associations between predictors and outcome variables were analysed using unadjusted linear regressions.

Multivariable linear regression was used to estimate the total effect (i.e., includes both the direct and indirect effects) of each predictor on psychological distress and subjective wellbeing while adjusting for covariates. For each predictor, a minimally sufficient adjustment set (MSAS) was identified. MSAS is the minimum set of covariates to adjust in models to estimate the total effect and avoid distorted and biasing associations that can occur in typical regression models where covariate adjustment is based only on significance of results (Rohrer, 2018; Griffith et al., 2020). To identify MSAS for each predicter, directed acyclic graphs (DAG) were developed (Rohrer, 2018), using DAGitty[1] (Textor et al., 2016). The DAG is a graph that represents a theoretical framework around the causal relationships between variables, which is represented by arrows that are "directed" and imply a casual sequence. Once the theoretical framework was developed, Daggity applied the Pearl's single and back door criterion (Pearl, 2009; Rohrer, 2018) to find the MSAS for each predictor's model. When developing the DAG, the authors followed current recommendations (Tennant et al., 2021) and to ensure that omitted relationships were justified, all assumed relationships were tested for conditional independence in the data using polychoric correlations with the Lavaan package (Rosseel, 2012) in R based on current protocols (Ankan et al., 2021). The final relationships assumed in our DAG are presented in the supplements (Supplementary File S2). Multivariate linear regressions were then conducted individually, controlling for each predictors' MSAS (see Table 1 for MSAS for each predictor).

Regression models were tested for heteroscedasticity using Breusch-Pagan test. Only subjective wellbeing models were found to be significantly heteroscedastic. Thus, utilising the sandwich package in R (Zeileis, 2004; Zeileis et al., 2020), Heteroscedasticity-Consistent (HC) standard errors, specifically the recommended HC3 estimator (Long and Ervin, 2000), were used in subjective wellbeing regression models. Using Gpower 3.1, *post hoc* power analysis showed that at alpha level 0.05, the sample size was large enough to detect statistical significance in effects (R^2) above 4.7% for psychological distress and 4.6% for subjective wellbeing.

1 https://www.dagitty.net/

To identify key predictors and compare the unique contribution of each predictors' total effect on K6 and PWI scores, relative importance analysis was conducted using relaimpo R package using the Lindemann-Merenda-Gold (LMG) method (Groemping, 2006). This analysis partitions variance explained in outcome variables by averaging over orderings and accounting for intercorrelations among covariates. This produces an unbiased R^2 for individual predictors that is decomposed and adjusts for other covariates, which is not typically accounted for in common estimates of decomposed R^2 that are biased by multi-collinearity (Groemping, 2006; Tonidandel and LeBreton, 2011).

Significance thresholds were all set at 0.05 for all analyses. Confidence intervals (95% CI) were computed by bootstrapping based on 1,000 bootstrap resamples from each of the 50 imputed datasets in R (Schomaker and Heumann, 2018) and pooling them together using Rubin's rule (Rubin, 2004).

Results

Descriptive statistics

One hundred and seventy-two Victorian frontline healthcare workers completed the survey. Two participants that noted "other" as their gender and three responses that did not identify their gender were removed due to extreme uneven distribution in analyses with gender as a predictor, leaving a total of 167 responses. Details of participants' characteristics are displayed in Table 2. In brief, the majority of respondents were female (88.6%), nurses and midwives (70.1%), and working in ICU (32.9%). When compared to previous data obtained from a large state-wide health service (Holton et al., 2020), the sample shows a good representation of the nursing population but an overrepresentation of allied health staff and under representation of physicians. Most respondents worked in public hospitals (92.3%). Only 17.4% of participants had been diagnosed with COVID-19 since the start of the pandemic. Approximately half of participants (55.1%) worked directly with COVID-19 patients.

The K6 measure was completed by 161 participants. Mean psychological distress among participants was 13.70 (SD = 4.96), which was significantly higher (t = 5.4, $p < 0.001$) compared to normative data (Normative mean = 11.6) that was collected during the same period as this study (Biddle and Gray, 2022). Using the recommended cut off of 19, 18.1% of the sample screened positive for a probable mental health disorder.

The PWI measure was completed by 163 participants. Mean SWI was 67.17 (SD = 18.22), significantly lower ($p < 0.001$) than aggregated normative data (normative mean = 75.5; Khor et al., 2022). Overall, 25 participants had SWI mean scores lower than 50, indicating that 15.3% of participants were experiencing concerningly low levels of wellbeing. Sample means were also consistently significantly lower ($p < 0.05$) than normative data in all sub-domains except for standard of living ($p < 0.05$; Figure 1). Based on Cohens' D effect sizes, these significant mean differences were small (Cohens' D: 0.2–0.5) for all sub-domains except for future security (Cohens' D < 0.2), which was negligible.

TABLE 2 Participant characteristics.

	n (%)
Total sample	167 (100%)*
Age	Mean (SD) = 42.2 (11.3)
Gender	
Male	19 (11.4%)
Female	148 (88.6%)
Occupation	
Physician	16 (9.6%)
Nurse and midwives	117 (70.1%)
Allied health	25 (15.0%)
Non-medical staff	9 (5.4%)
Ward	
ICU	55 (32.9%)
ED	45 (26.9%)
COVID related wards	27 (16.2%)
Hospital in the home	11 (6.6%)
Aged care	21 (12.6%)
Multiple departments	8 (4.8%)
Private or public hospital	
Private	11 (7.7%)
Public	131 (92.3%)
Covid diagnosis	
No	138 (82.6%)
Yes	29 (17.4%)
Provided direct care to COVID patients	
No	75 (44.9%)
Yes	92 (55.1%)
K6	
≤19	131 (81.9%)
≥19	29 (18.1%)
PWI	
≥70	85 (52.1%)
50–70	53 (31.5%)
≤50	25 (15.3%)

* = Not all values sum to total due to missingness.

Regression and relative importance analysis-Psychological distress (K6) and Regression and relative importance analysis-Subjective wellbeing (PWI)

The results for the adjusted and unadjusted regression analyses, and relative importance analysis for psychological distress are displayed in Table 3. In the multivariate models adjusting for the MSAS, significant total effects were found for age, both health factors, supervisor support, all COVID infection related factors and

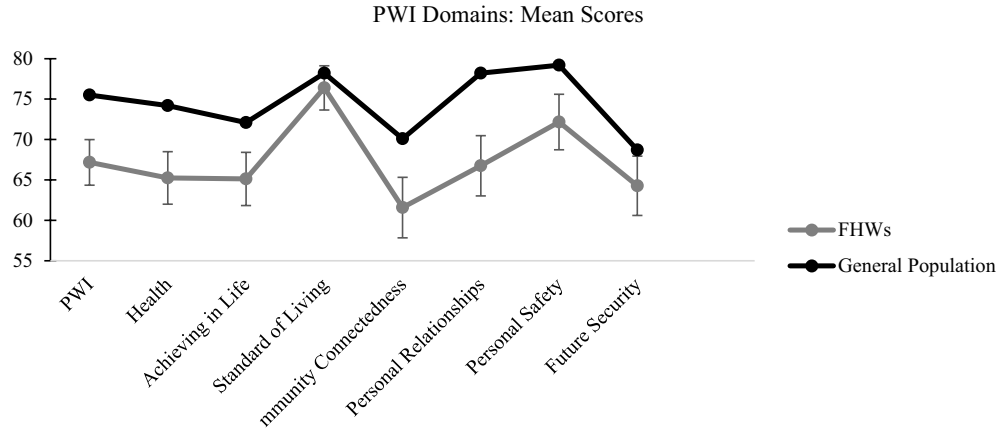

FIGURE 1
Means and standard deviations for FHWs in this study and the Australian Unity Wellbeing Index Norm on the PWI and sub-domains.

relationship stress. Results show that younger age, higher perceived work infection risk, high perceived community infection risk, more COVID infection worries, a previous positive COVID-diagnosis and more relationship stress were significant risk factors and associated with higher levels of psychological distress. Better supervisor support, better pre-covid mental health, and better physical health were found to be protective and significantly associated with lower psychological distress.

Based on the results of the relative importance analysis, COVID worries (R^2=17.66%) explained the most unique variance in psychological distress and was considered a large effect based on Cohen's proposed magnitude for R^2 effect sizes. All other significant predictors explained moderate amounts of unique variance in psychological distress, R^2 ranging from 2.76 to 8.63% (Predictor ranking displayed in Figure 2).

Regression and relative importance analysis-PWI

The results for the PWI and its sub-domains' regression analyses are presented in Tables 4–6. After adjusting for the MSAS, significant total effects on PWI were found for both health factors, occupation, supervisor support, work infection risk and changes in relationship quality. Results show that a higher rating of pre-COVID mental health, physical health and supervisor support were all significantly associated with a higher overall subjective wellbeing. Positive changes in relationship quality were also associated with a higher subjective wellbeing. Being a nurse was associated with a lower subjective wellbeing, however, only when compared to allied health staff. Higher perceived work infection risk was associated with lower subjective wellbeing. When analysed within the PWI sub-domains, pre-COVID mental health, physical health and supervisor support were consistently significant predictors in all domains except for personal relationships, where supervisor support had no significant effect. In terms of occupation, being a nurse was associated with a lower satisfaction in standard of living, and future security when compared to allied health, and a lower satisfaction of health when compared to non-medical staff. Nurses also had lower satisfaction in their achievement in life when compared to physicians. Work infection risk was only a significant predictor of standard of living, personal safety, and future security. Relationship quality was only predictive of standard of living, personal relationships, and community connectedness.

Based on the relative importance analysis, physical health had a large effect (R^2 =20.60%) and explained the most variance in overall subjective wellbeing. The other significant predictors explained moderate amounts of variance in subjective wellbeing, ranging from 2.67 to 11.41% in R^2. Physical health also consistently explained the most variance in all domains, except for achieving in life, where pre-COVID-mental health explained the most variance. Ranking of predictors variance explained in overall subjective wellbeing and in its sub-domains are shown in Figure 3.

Discussion

To the authors knowledge, this study is one of the first Australian, and one of few studies globally, to investigate COVID-19's mental health and wellbeing impacts on FHWs in 2022 during the Omicron wave. Specifically, the current study investigated the predictors of psychological distress and subjective wellbeing in Victorian (Australia) FHWs during the Omicron wave in January 2022. When compared to population norms assessed during the same time (Biddle and Gray, 2022; Khor et al., 2022), sample means in this study showed significantly higher psychological distress and lower wellbeing. Findings also identified multifactorial predictors of FHWs' psychological distress and wellbeing during the Omicron wave, which included COVID infection related factors, age, health factors, relational factors, and supervisor support.

Consistent with previous findings, this study affirms the need for interventions targeting infection related factors during the COVID-19 pandemic and future infectious disease outbreaks. Specifically, infection risks and COVID-19 diagnosis were found to be predictive of psychological distress, with COVID-19 infection worries identified as the strongest independent risk factor. Notably, the effect of COVID-19 infection worries on FHWs' psychological distress was found to be independent of perceived risk of infection or a COVID-19

TABLE 3 Results of the unadjusted (univariate) and adjusted (multivariate) regressions for psychological distress.

	Psychological distress				
	Unadjusted	Adjusted			
	B	B	LL	UL	R^2
Age	−0.11**	−0.11**	−0.18	−0.05	6.67%
Gender (ref = male)	1.84	1.84	−0.37	4.05	1.31%
Pre-COVID mental health	−1.13**	−1.21**	−2.11	−0.32	5.09%
Physical health	−1.75***	−1.15**	−2.11	−0.18	6.99%
Occupation (ref = nurses)					
Allied health	−1.16	−1.64	−3.74	0.46	3.38%
Non-med	−3.45	−3.11	−6.74	0.53	3.38%
Physicians	−1.89	−1.66	−4.31	0.98	3.38%
Supervisor support	−1.15***	−1.06***	−1.69	−0.43	7.88%
Direct care (ref = no direct care)	0.51	−0.02	−1.57	1.53	0.11%
Work infection risk	1.51***	0.90**	0.19	1.61	6.21%
Community infection risk	1.28**	1.14**	0.44	1.83	6.15%
COVID-19 infection worries	2.57***	1.79***	0.87	2.70	17.66%
COVID diagnosis (ref = no diagnosis)	2.29*	2.14*	0.08	4.20	2.76%
Outdoors's time	−1.15***	−0.51	−1.10	0.08	4.21%
Stress from lockdown restrictions	1.78***	0.68	−0.33	1.69	3.83%
Relationship stress	2.15***	0.97**	0.22	1.71	8.63%
Changes in relationship quality	−1.40*	−0.62	−1.52	0.28	1.68%

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$, LL = lower limit of bootstrapped 95%CI, UL = upper limit of bootstrapped 95%CI.

diagnosis. This suggest that psychological distress associated with COVID-19 worries may persist at high levels among FHWs even when risk of infection is minimal. This likely explains why despite improvements in infection control procedures, increased vaccination uptake and an overall decrease in infection rates (Braun et al., 2021; Damluji et al., 2021; Dunbar et al., 2021), there continues to be persisting anxiety around COVID-19 infections among FHWs (Hendricksen et al., 2022; Feng et al., 2023; Scott et al., 2023). It appears that more needs to be done to manage FHWs' concerns and anxieties with being infected, which seems to be wide-ranging. Studies suggest that, in addition to health concerns, FHWs also have significant worries around the social impacts of COVID-19 infections, such as social isolation, infecting vulnerable family members, disrupted family routines and for some, being stigmatised after infection (Schaffer et al., 2022; Sheen et al., 2022). These findings highlight the need to go beyond infection control when attempting to reduce anxiety in FHWs around COVID-19 infections, such as integrating supports focused on mitigating the social impacts of being infected, as well as psychological interventions that target FHWs' anxiety management around COVID.

In this study, younger FHWs have also been found to be an at-risk group for higher levels of psychological distress, consistent with previous findings on FHWs (Kisely et al., 2020; Moitra et al., 2021; Czepiel et al., 2022), as well as on the general public (Xiong et al., 2020; Dragioti et al., 2022). With regards to younger FHWs, it has been suggested that their vulnerability to psychological distress may be due to their lack of specialised experience and training (Lee et al., 2021; Van Wert et al., 2022), which is not only essential for infection control, but to also protect against mental health issues as they can likely bolster confidence at work and mitigate infection related anxieties (De Brier et al., 2020; Kisely et al., 2020). Additionally, given the high rates of psychological distress in the general public (Xiong et al., 2020; Dragioti et al., 2022), it is important to consider the social impacts of the pandemic on younger FHWs. Studies on the general public have found concerning levels of loneliness among younger adults that have led to increased distress (Li and Wang, 2020). It is likely that as emerging adults, they have yet to develop strong social connections and supports, which are important to protect against mental health impacts during traumatic events such as the COVID-19 pandemic (McGuire et al., 2018; Kaniasty et al., 2020). This is significant as social support has been implicated to play an important role in FHWs' mental health resilience, especially in younger FHWs (Hou et al., 2020). Nevertheless, it is evident that younger FHWs are in need of targeted interventions and, given recent findings, it appears that social support interventions may be beneficial, especially when tailored to enhance their confidence at work, improve work related stress management and increase their social connectedness and support at work (Mohamed et al., 2022; Musgrove et al., 2022).

With regards to wellbeing, health factors have emerged as the strongest predictor. Specifically, better physical health and mental health status were found to be highly protective of lower wellbeing, which also extended to psychological distress, however, to a lower extent. This indicates that better health states can potentially buffer COVID-19 impacts on FHWs' mental health, as well as their wellbeing across multiple life domains. Wellbeing findings in particular, are noteworthy as the few studies that have considered it confirms that FHWs' wellbeing has been disproportionately affected compared to the general public during the COVID-19 pandemic (McFadden et al., 2021; McGuinness et al., 2022). Adding to this, the current study found that wellbeing impacts on FHWs were evident across a wide range of life domains, including their health, relationships, community connectedness, future security, life achievements and safety. To date wellbeing outcomes in FHWs have been largely overlooked and many may conflate wellbeing and mental health outcomes together.

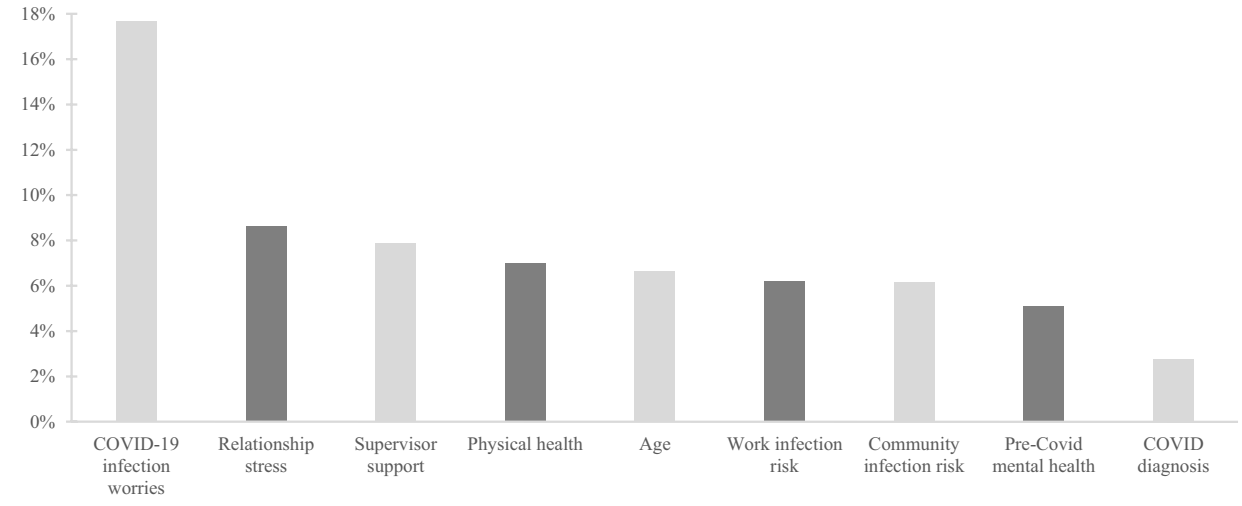

FIGURE 2
Relative importance analysis-psychological distress.

However, this study shows that wellbeing intervention targets needs to be considered on its own as key predictors identified for wellbeing were different to those for psychological distress. Health status as a key predictor suggest that wellbeing interventions may require more long-term approaches that maintain optimal physical and mental health. This could involve targeting persisting issues that have been documented to affect health statuses in FHWs regardless of infectious disease outbreaks, such as burnout and excessive workloads (Kim et al., 2011; Adriaenssens et al., 2015; Salvagioni et al., 2017; Verougstraete and Hachimi Idrissi, 2020).

This study has also found relational factors as important indicators of psychological distress and wellbeing among FHWs. We found that greater familial and social relationship stress was a risk factor for psychological distress, while positive changes to these relationships were protective of lower wellbeing. These findings further support the notion that social factors play a critical role in FHWs' mental health and wellbeing (Lim et al., 2010; McKinley et al., 2019). It highlights the importance of not only enhancing social relationships but also safeguarding it for FHWs during times of crisis. This is important because it is well documented that, while FHWs have poor help seeking behaviour with regards to mental health (Halter Margaret, 2004; Brooks et al., 2011; Galbraith et al., 2014; Wijeratne et al., 2021), they rely heavily on social support to manage it (Labrague, 2021; Schug et al., 2021). Thus, during times when widespread stigma and social rejection of FHWs are common, such as infectious disease outbreaks (Gómez-Durán et al., 2020; Schubert et al., 2021; Yuan et al., 2021; Ding et al., 2022), they can easily be left isolated and more vulnerable to mental health and wellbeing issues. Moreover, healthcare work during this time may have also placed additional stressors on FHWs' social contacts and personal relationships, such as increased familial anxiety due to infection risks, poor work-life balance and stigma as a FHW family (Ali et al., 2020; Evanoff et al., 2020; Schaffer et al., 2022; Sheen et al., 2022). FHWs are currently experiencing tremendous challenges, and these findings underscore the importance of protecting FHWs social relationships, which can have multi-fold effects on their mental health and wellbeing.

Lastly, another key predictor of both mental health and wellbeing in FHWs to consider is supervisor support. In line with previous studies (Evanoff et al., 2020; Feingold et al., 2021; Greco et al., 2022), findings show that support from supervisors during the pandemic can play an important role in influencing FHWs mental health and wellbeing. This echoes the call for increased focus on supervisors' capabilities with regards to supporting FHWs' mental health and wellbeing (Carmassi et al., 2020; Hennein et al., 2021). While providing extensive mental health support may be out of scope for supervisors, they are still in unique positions to provide a range of social, work, and emotional support directly to FHWs that can influence their mental health and wellbeing. For example, Evanoff et al. (2020) found that family specific supervisory support was strongly associated with better mental health and wellbeing among FHWs. Another study also found that ethical leadership from supervisors was significantly associated with lower levels of work-related stress, which includes promoting and modelling openness, integrity, and trustworthiness (Zhou et al., 2015). It is also important to note that supervisors themselves have been experiencing additional stress and psychological burden beyond those experienced by their staff during the pandemic (Middleton et al., 2021), likely due to the additional support they are required to provide their staff. Thus, it follows that to ensure organisational support for FHWs are effectively implemented and managed, organisations need to consider strategies to elevate the additional burden on supervisors during this time. Nevertheless, supervisor support is likely an important pathway for organisations to influence FHWs mental health and wellbeing, and therefore should be a core focus in organisational mental health and wellbeing strategies.

Limitations

When interpreting findings in this study, several limitations should be considered. Firstly, as a cross-sectional study, it is not evident that the distress observed in this study is indicative of an acute reaction or persisting distress, which should be investigated

TABLE 4 Results of the unadjusted (univariate) and adjusted (multivariate) regressions for PWI, standard of living, and health domains.

	Personal wellbeing index					Standard of living					Health				
	Unadjusted	Adjusted				Unadjusted	Adjusted				Unadjusted	Adjusted			
	B	B	LL	UL	R^2	B	B	LL	UL	R^2	B	B	LL	UL	R^2
Age	0.08	0.08	−0.16	0.31	0.22%	0.14	0.14	−0.09	0.36	0.73%	0.07	0.07	−0.22	0.35	0.12%
Gender (ref = male)	−4.47	−4.47	−11.46	2.51	0.57%	−0.24	−0.24	−11.58	11.11	0.00%	−5.55	−5.55	−14.79	3.69	0.64%
Pre-COVID mental health	6.45***	6.48***	3.06	9.90	11.41%	5.26**	5.28**	1.94	8.62	7.83%	6.98***	7.18***	3.38	10.98	9.98%
Physical health	10.28***	8.35***	4.70	12.00	20.60%	7.8***	5.77***	2.60	8.94	11.55%	13.6***	12.64***	7.88	17.40	29.28%
Occupation (ref = nurses)															
Allied health	6.69*	7.28*	0.12	14.44	2.67%	7.09*	7.57*	0.60	14.55	3.07%	6.39	7.00	−1.53	15.54	2.61%
Non-med	1.62	1.16	−9.97	12.30	2.67%	−3.8	−4.37	−15.28	6.54	3.07%	10.53*	10.12*	1.31	18.93	2.61%
Physicians	7.49	6.49	−2.31	15.29	2.67%	5.09	5.79	−5.93	17.52	3.07%	7.19	5.6	−7.59	18.78	2.61%
Supervisor support	3.88***	3.37***	1.34	5.39	6.61%	3.77***	3.12***	1.38	4.86	6.21%	3.24**	2.9*	0.46	5.34	3.45%
Direct care (ref = no direct care)	−2.92	−2.27	−7.94	3.41	0.51%	−6.36*	−6.04*	−11.30	−0.78	2.92%	0.06	1.42	−5.30	8.14	0.05%
Work infection risk	−4.05**	−2.52*	−4.87	−0.17	3.32%	−4.64***	−2.85*	−5.29	−0.40	4.60%	−2.46	−1.5	−4.03	1.03	0.79%
Community infection risk	−1.9	−2.49	−5.26	0.28	1.63%	−1.92	−2.46	−5.26	0.35	1.62%	−1.8	−2.3	−5.09	0.50	1.11%
COVID-19 infection worries	−4.31**	−1.15	−3.64	1.35	2.31%	−2.84*	0.81	−1.50	3.12	0.77%	−5.15**	−2.72	−5.84	0.40	3.13%
COVID diagnosis (ref = no diagnosis)	−2.31	−3.18	−10.77	4.41	0.35%	3.29	2.62	−4.42	9.66	0.39%	−0.67	−1.22	−9.88	7.43	0.03%
Outdoors's time	4.73***	1.64	−0.59	3.87	5.26%	5.21***	2.92*	0.70	5.15	8.01%	4.79***	0.83	−1.77	3.43	3.63%
Stress from lockdown restrictions	−3.68	−0.28	−3.60	3.03	0.86%	−2.85	0.02	−2.83	2.86	0.49%	−3.91	−0.66	−4.31	2.99	0.80%
Relationship stress	−5.99***	−2.54	−5.29	0.21	4.80%	−4.61**	−1.91	−4.77	0.95	2.74%	−6.15***	−1.31	−4.78	2.17	3.29%
Changes in relationship quality	7.35**	4.5*	1.19	7.81	4.82%	7.55**	5.23*	1.29	9.17	5.75%	7.3**	3.64	−0.52	7.80	3.12%

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$, LL = lower limit of bootstrapped 95%CI, UL = upper limit of bootstrapped 95%CI.

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TABLE 5 Results of the unadjusted (univariate) and adjusted (multivariate) regressions for achieving in life, personal relationships, and personal safety domains.

	Achieving in life					Personal relationships					Personal safety				
	Unadjusted	Adjusted				Unadjusted	Adjusted				Unadjusted	Adjusted			
	B	B	LL	UL	R^2	B	B	LL	UL	R^2	B	B	LL	UL	R^2
Age	−0.01	−0.01	−0.30	0.28	0.02%	0.07	0.07	−0.26	0.41	0.12%	−0.01	−0.01	−0.31	0.28	0.02%
Gender (ref = male)	−9.04*	−9.04*	−16.80	−1.28	1.65%	−1.21	−1.21	−13.30	10.88	0.02%	−2.47	−2.47	−10.89	5.94	0.11%
Pre-COVID mental health	8.16***	8.04***	4.55	11.53	12.73%	6.36**	6.65**	2.35	10.95	6.47%	6.97***	7.02***	3.03	11.00	8.80%
Physical health	9.5***	5.98**	2.41	9.55	10.71%	11.17***	10.33***	5.26	15.39	15.12%	9.15***	6.86***	2.74	10.97	10.23%
Occupation (ref = nurses)															
Allied health	6.92	7.48	−0.18	15.14	3.65%	3.32	3.73	−5.00	12.46	0.40%	6.67	6.9	−1.93	15.74	1.42%
Non-med	4.39	4.13	−9.18	17.43	3.65%	4.12	3.82	−13.04	20.68	0.40%	−1.64	−1.76	−16.57	13.05	1.42%
Physicians	13.72**	11.37*	1.94	20.80	3.65%	−0.54	−1.2	−13.82	11.43	0.40%	4.81	3.99	−7.92	15.91	1.42%
Supervisor support	3.48**	2.67*	0.48	4.85	3.41%	2.81*	2.52	−0.24	5.28	2.00%	3.03*	2.62*	0.05	5.19	2.67%
Direct care (ref = no direct care)	−3	−2.35	−9.00	4.30	0.39%	−4.06	−3.62	−11.36	4.12	0.61%	−2.21	−1.96	−9.24	5.31	0.21%
Work infection risk	−3.77*	−2.03	−5.05	0.99	1.92%	−2.17	−0.88	−4.28	2.51	0.40%	−4.76**	−3.61*	−7.06	−0.17	3.61%
Community infection risk	−0.62	−1.76	−5.25	1.72	0.43%	−3.05	−3.8	−7.65	0.04	2.10%	−1.92	−3.08	−6.79	0.63	1.35%
COVID-19 infection worries	−4.77**	−1.93	−5.12	1.26	2.36%	−2.63	0.67	−3.22	4.55	0.35%	−6.22***	−3.66	−7.59	0.26	4.58%
COVID diagnosis (ref = no diagnosis)	−1.28	−2.52	−11.02	5.99	0.12%	−2.53	−3.2	−12.89	6.48	0.21%	−3.15	−4.03	−13.93	5.87	0.38%
Outdoors's time	4.48**	1.87	−1.03	4.77	3.46%	6.24***	3.38*	0.25	6.51	6.21%	3.51*	0.03	−2.98	3.04	1.45%
Stress from lockdown restrictions	−4.62	−1.27	−5.59	3.05	1.21%	−1.44	1.27	−3.14	5.67	0.12%	−4.3	−0.22	−4.83	4.38	0.81%
Relationship stress	−5.8***	−2.55	−6.12	1.01	3.23%	−6.14**	−2.5	−6.43	1.42	2.93%	−6.24**	−2.87	−6.95	1.21	3.59%
Changes in relationship quality	6.68*	4.55	0.11	9.00	3.01%	11.06***	7.96**	3.15	12.77	7.02%	5.96*	3.32	−1.33	7.97	1.93%

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$, LL = lower limit of bootstrapped 95%CI, UL = upper limit of bootstrapped 95%CI.

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TABLE 6 Results of the unadjusted (univariate) and adjusted (multivariate) regressions for Community Connectedness and Future Security domains.

	Community connectedness					Future Security				
	Unadjusted	Adjusted				Unadjusted	Adjusted			
	B	B	LL	UL	R^2	B	B	LL	UL	R^2
Age	0.18	0.18	−0.13	0.49	0.70%	0.1	0.1	−0.22	0.43	0.23%
Gender (ref = male)	−5.72	−5.72	−14.05	2.62	0.51%	−7.1	−7.1	−16.16	1.97	0.83%
Pre-COVID mental health	5.41**	5.45**	1.47	9.43	4.47%	6.03**	5.75**	0.76	10.75	5.51%
Physical health	10.09***	8.42**	3.28	13.56	11.22%	10.65***	8.45***	3.48	13.41	12.50%
Occupation (ref = nurses)										
Allied health	6.53	7.52	−2.57	17.60	1.55%	9.93*	10.76*	1.67	19.84	5.00%
Non-med	2.75	1.89	−13.47	17.25	1.55%	−5	−5.68	−20.84	9.48	5.00%
Physicians	7.86	6.69	−6.67	20.04	1.55%	14.33*	13.16	0.01	26.31	5.00%
Supervisor support	5.04***	4.65**	1.85	7.45	6.57%	5.76***	5.09***	2.22	7.95	8.66%
Direct care (ref = no direct care)	−2.23	−1.24	−8.90	6.42	0.13%	−2.64	−2.09	−9.93	5.75	0.25%
Work infection risk	−4.74*	−3.05	−6.83	0.74	2.59%	−5.83**	−3.74*	−7.26	−0.21	4.17%
Community infection risk	−1.98	−1.92	−6.01	2.18	0.74%	−1.98	−2.13	−5.55	1.28	0.85%
COVID-19 infection worries	−3.9*	−0.2	−4.00	3.59	0.86%	−4.66**	−0.97	−4.53	2.58	1.47%
COVID diagnosis (ref = no diagnosis)	−3.32	−4.07	−12.98	4.84	0.35%	−8.5	−9.81	−19.51	−0.12	2.18%
Outdoors's time	4.07*	0.92	−2.17	4.01	2.01%	4.82**	1.55	−1.42	4.51	3.14%
Stress from lockdown restrictions	−4.16	−0.91	−5.93	4.12	0.71%	−4.47	−0.19	−4.77	4.39	0.74%
Relationship stress	−8.09***	−5.48*	−9.92	−1.05	6.39%	−4.94*	−1.15	−5.32	3.01	1.47%
Changes in relationship quality	8.14**	5.43*	0.85	10.00	3.51%	4.75	1.4	−3.06	5.86	0.82%

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$, LL = lower limit of bootstrapped 95%CI, UL = upper limit of bootstrapped 95%CI.

further in longitudinal studies. Additionally, causal links between variables should be interpreted with caution. While the use of DAGs in this study provides a framework around causality between investigated variables, it relies on the assumptions in the DAGs. Other models may exist and the model in this study is not intended to be a proposal for a theoretical framework around FHWs' mental health and wellbeing. The use of the DAG in this study is intended to be a way to systematically adjust for covariates to estimate effects and provide transparency around assumed relationships (Ferguson et al., 2020). Secondly, mediation analysis was beyond the scope of this study, however, the results points to several mediating relationships among the investigated variables and should be considered when interpreting results and in future research. It is thus recommended that future research investigate these mediating relationships further through structural equation modelling or mediation analyses. Thirdly; there was a low representation of physicians, which may have impacted the generalisability of results for this cohort. Lastly, due to the small sample size, precision of estimates may be weak, thus effects and mean differences with population norms should be interpreted and generalised with caution.

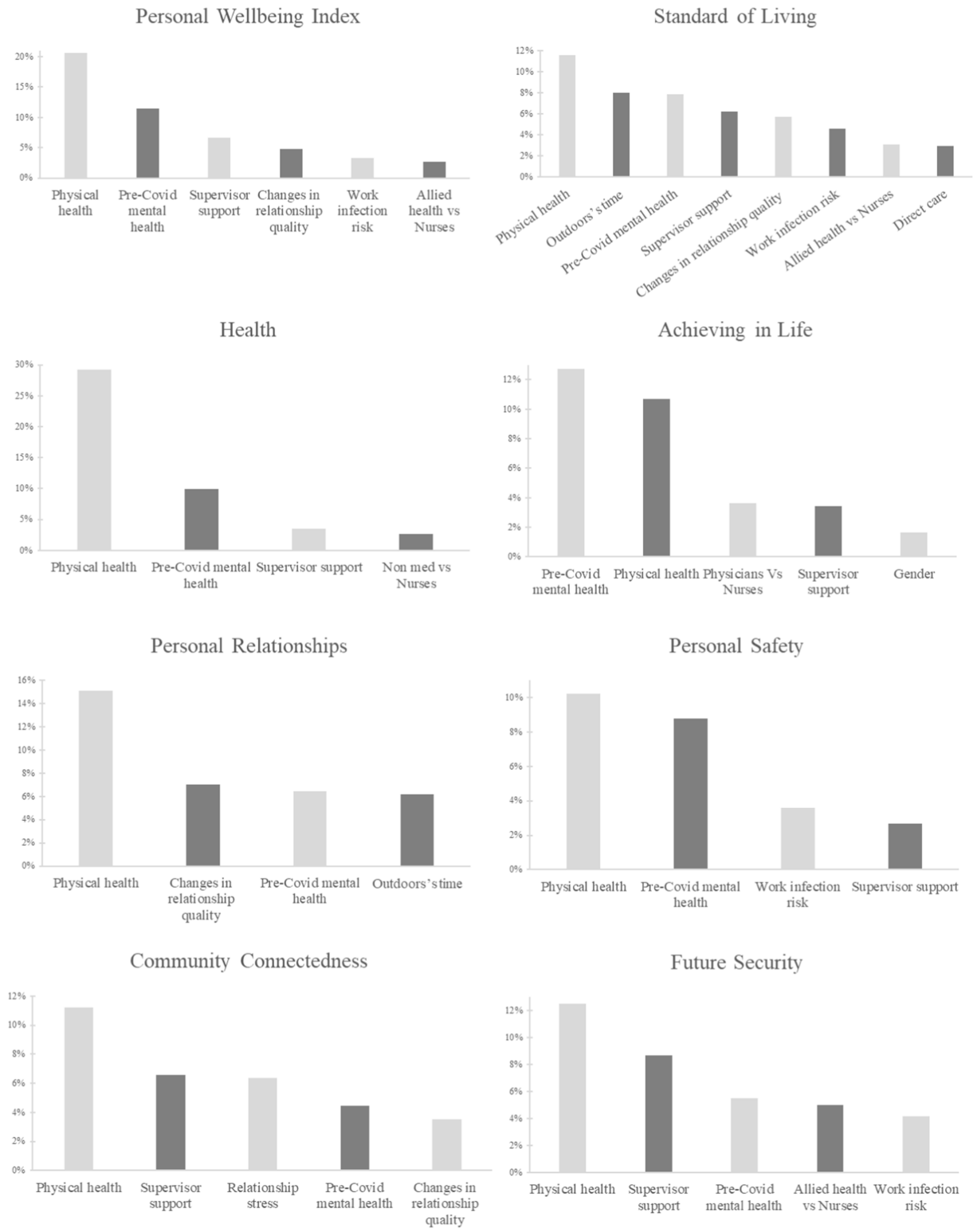

FIGURE 3
Relative importance analysis-subjective wellbeing and sub-domains.

Conclusion

In sum, the COVID-19 pandemic continues to place undue pressure on FHWs' mental health and wellbeing. Findings indicate that FHWs mental health and wellbeing are associated with a wide range of factors that includes work-related and social determinants. It is thus important to consider a wide range of factors, including those beyond work, when developing targeted interventions and

support for FHWs' mental health and wellbeing, to ensure their effectiveness. Nevertheless, findings reinforce the need for ongoing research, development, and implementation of targeted interventions for FHWs who continue to face significant challenges.

Data availability statement

The datasets presented in this article are not readily available because the datasets investigated and presented in this study are not available for public use as ethical approvals for this study does not include public availability of participants data. Requests to access the datasets should be directed to brian.lee@deakin.edu.au.

Ethics statement

The studies involving human participants were reviewed and approved by Deakin University High Risk Ethics Committee and Eastern Health's Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

Author contributions

BL, ML, LB, CAO, and JS was involved in the conceptualisation and design of this study. BL was responsible for the formal analysis, data curation, and investigation under the supervision of ML, LB, CAO, and JS. BL prepared the original manuscript draft, which was then review and edited by ML, LB, CAO and JS. 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.

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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.2023.1200839/full#supplementary-material

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A survey-based study about burnout among postgraduate medical trainees: implications for leaders in healthcare management

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Introduction: The goal of the study is to assess burnout among postgraduate medical trainees, evaluate the association with sociodemographic features and offer potential wellness strategies for leaders responsible for their education, training, management, and wellbeing.

Methods: The Oldenburg Burnout Inventory was used. The web-based, voluntary, and anonymous survey was sent to postgraduate medical trainees from various specialties and all years of training in a tertiary medical center in Beirut, Lebanon. Additional questions were added after the survey regarding reporting channels for burnout and possible interventions for wellbeing.

Results: The total number of valid responses are 188. The prevalence rates of high burnout are 37.2% for disengagement and 51.1% for exhaustion. There is a significant difference between the mean of exhaustion and gender (p =0.003). There is a significant difference between the mean of disengagement and year of training (p =0.017). There is a significant difference between the mean of exhaustion and year of training (p =0.029). There is a significant difference between the frequency of disengagement and year of training (p =0.027).

Conclusion: The study reveals how postgraduate medical training program is impacted by the existing challenges from social, health, and financial standpoint, along with the instabilities encountered such as multiple wars and port blast in 2020 and how these variables aggravate burnout. Burnout severely impacts the education and training of PGMT and promoting wellbeing can help reverse the process. Findings contribute to establishing effective strategic interventions for leaders in healthcare management to adopt.

KEYWORDS

burnout, postgraduate medical trainees, wellbeing, wellness, leadership

Introduction

Burnout is a psychological syndrome and an occupational problem provoked by long-lasting interpersonal stressors (1). The keyword emerged in a novel called "A Burnt-Out Case" by Graham Greene with its English version published in 1961 (2) but was not related to occupation back then. Herbert Freudenberger used the term as a popular metaphor and concept for mental

exhaustion experienced by the social volunteers who worked in the Free Clinic movement that he created in San Francisco, the United States (US) in 1967 to serve the young population (3). Freudenberger mentioned that he used the definition of burnout in the article from "the dictionary" without specifying the name of the dictionary in the references (2, 3). He defined burnout as failing, wearing out, or becoming exhausted due to applying a lot of energy, strength, and resources (3). Burnout is a condition of depersonalization, emotional exhaustion and low personal accomplishment and can cause deteriorated quality of care or service, personal dysfunction, fatigue, insomnia and other problems (4).

The medical field has experienced a rapid upsurge in mental ailment and burnout due to the coronavirus disease 2019 (COVID-19) pandemic with a negative impact on the residency and fellowship training (5). Burnout is common in medicine with an estimated $4.6 billion a year linked to physician turnover and decreased productivity caused by physician burnout in the US (6). Costs pertinent to burnout are greater in the younger section of physicians in the US (those aged under 55 years) (7). Burnout was added in the 11th Revision of the International Classification of Diseases (ICD-11) as a professional phenomenon that is set by the World Health Organization (8).

Lebanon has experienced one of the most disastrous times with breakdown of various sectors such as economic, financial, health, and social (9). The precipitous decline of the national currency by over 80%, the 200% increase in prices, the deterioration of the financial industry, and the exodus of competent workers are all problems that the country faces (9). Additional difficulties include shortages of medicine, rising drug prices, high cost of treating chronic diseases, and a sharp spike in prices of all oil derivatives. The Beirut port explosion in August 2020 claimed the lives of over 220 people and destroyed the city. The nation had previously been impacted by numerous civil wars, an influx of Palestinian and Syrian refugees, establishments of camps for displaced people, and an increase in unemployment and poverty (9). All these elements trigger burnout and distress among postgraduate medical trainees (PGMT) (comprising residents and fellows).

Wellbeing is an imperative occupational strength since it is linked to employee satisfaction and effectiveness, safety behavior (10), proper functional management and organizational success. Thus, it is crucial to pay attention to the wellbeing of PGMT especially in a country that has all those challenges to maintain resource-efficient training and education (11). By such, it is important that leaders do not overlook the wellbeing of trainees. The primary aim of the study is to assess the sociodemographic features of PGMT and their connection to burnout by a validated and well-recognized questionnaire called the Oldenburg Burnout Inventory (OLBI) and by adding questions related to burnout and wellness activities. The secondary objective is to generate wellness initiatives for leaders to follow to combat burnout. The following study aims to expose the several unresolved issues in burnout research in healthcare among PGMT especially in an unstable country and how this can be compared to other countries and how the results can help prevent burnout and promote wellbeing.

Methods

The study was conducted in a tertiary medical facility with 20 residency training programs in Beirut, Lebanon. The teaching team includes a program director, a program coordinator, and staff from the Graduate Medical Education office. For some programs, the years of training range from Post Graduate Year (PGY) 1 through PGY5 (the digits reflect the year of training, for example, PGY1 implies first year); for surgical sub-specialties, the years of training range from PGY1 to PGY6. The seventh year (PGY7) is for fellows. The programs are accredited by the Accreditation Council for Graduate Medical Education – International (ACGME-I). The medical center has been negatively impacted by the outbreak, collapse of the economy, port explosion in addition to other conditions. All parts of the structured training program have been unfavorably affected due to the interruption of cross-hospital rotations and missed education agendas, termination of elective surgery, decreased outpatient clinics and relocation of PGMT to other obligations during the pandemic.

The Institutional Review Board (IRB) of the university approved the study. The Lime Survey portal was utilized to send the emails. This portal was provided by the institution after securing consent from the IRB to conduct the study. The names and emails of PGMT were provided by the Graduate Medical Education office that possesses the files of all PGMT in the institution. The names and emails were not shared to the research team but only to the employee responsible for the Lime Survey. Three additional reminders were sent 1 week after the initial email. The inclusion criteria were met by male and female PGMT aged 18 years old or above, hired by the medical center, and who gave their consent to take part in the survey. The email included the names of the research team with the objectives of the study. It mentioned that the survey was voluntary and anonymous, and that it did not contain any personal identifiers. Those who were interested in participating were instructed to click the link in the email. There was no written consent to prevent gathering participant identifying information. Prior to finishing the survey, the participants had to confirm their agreement to participate. Valid surveys were integrated in the analysis and missing surveys were omitted.

The questionnaire was anonymous and web-based to calculate burnout by the OLBI (12). This instrument is available for non-commercial research use. The OLBI is a validated tool and includes two dimensions: disengagement and exhaustion. The two dimensions have 16 questions in total while each one has eight questions. There are four items which are phrased negatively, and four items which are phrased positively in each dimension. Ratings are done based on a Likert Scale from one to four (1 = strongly agree, 2 = agree, 3 = disagree, 4 = strongly disagree) (12). Items marked with "R" are reversed before the average scores for each sub-scale are measured in this way (1 = 4, 2 = 3, 3 = 2, 4 = 1). The cut-off scores for the OLBI are exhaustion $\geq$2.85 and disengagement $\geq$2.6 for very high burnout of personnel set by the author of the inventory (10). Moreover, we added questions after the OLBI to investigate some parts that were not captured by the OLBI. The participants had to answer these questions after completing the main survey and could not submit prior to completing these questions. The first question investigated whether trainees would report if they had burnout and if they answered yes, they were asked who they would report to. The next question was to choose three reasons for burnout from mentioned options that were given for them to select, and the next question was to indicate useful ways to lessen burnout from mentioned options that were given for them to select, and the last part was to list wellness programs that they considered helpful and beneficial during uncertain times. This question was open-ended wherein the participants could write and express their insights.

To ensure accuracy, the data was gathered in Microsoft Excel using the double-entry method. The Statistical Package for the Social

Sciences (SPSS) (IBM Corp. Released 2020. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp) was utilized for statistical analysis. To assess the internal consistency of the survey items, Cronbach's alpha was used. The dependent variable is burnout presented with both dimensions (disengagement and exhaustion). The independent variables are gender, relationship status and year of training. Since the sample age range (26–32) was narrow, it was not included in our analysis because a preceding study done in Lebanon did not find any association between age and burnout (13).

In the descriptive analysis, frequencies and percentages were utilized for categorical data and mean and standard deviation (SD) for continuous data. We used the one-way analysis of variance (ANOVA) to compare between three groups or more, and the independent t-test to compare means between two groups. To determine the strength of the correlation between the demographic data and the dimensions, binary logistic regression was used. A p value of <0.05 is considered statistically significant. The overall Cronbach's alpha for the inventory is 0.754.

Patient and public involvement

There was no patient or public involvement in any way in this study.

Results

After removing missing items, which resulted in the exclusion of every variable with a single missing value, the final valid number contained 188 participants (response rate = 48.32%). The descriptive data are shown in Table 1. PGMT comprise male and female residents or fellows working in the institution at the time of the survey and are above 18 years old. The sample is constituted by females 113 (60.1%) and males 75 (39.9%). Almost half of the sample is single (55.3%), 26.6% in a relationship, 17.0% married and 1.1% divorced. Table 2 indicates the complete scales seen in frequencies, percentages, mean and SD scores. The three questions with the highest mean are: "There are days when I feel tired before I arrive at work" (mean = 3.39), "After my work, I usually feel worn out and weary" (mean = 2.95) and "I can tolerate the pressure of my work very well" (mean = 2.91).

TABLE 1 Demographic characteristics of the trainees (N =188).

	Frequency (%)
Gender	
Females	113 (60.1)
Males	75 (39.9)
Relationship status	
Single	104 (55.3)
In a relationship	50 (26.6)
Married	32 (17.0)
Divorced/separated	2 (1.1)
Year of training	
PGY1	52 (27.7)
PGY2	26 (13.8)
PGY3	42 (22.3)
PGY4	35 (18.6)
PGY5	17 (9.0)
PGY6	14 (7.4)
PGY7	2 (1.1)

The prevalence rates of high burnout are 37.2% by disengagement and 51.1% by exhaustion. The independent t-test between the two dimensions and gender shows that there is no significant difference between the mean of disengagement and gender (p = 0.204). There is a significant difference between the mean of exhaustion and gender wherein the mean of female PGMT is 2.86 (SD = 0.35) versus the mean of male PGMT which is 2.69 (SD = 0.41) (p = 0.003).

The one-way ANOVA test between the mean of the two dimensions and relationship status shows that there is no significant difference between the mean of disengagement and relationship status (p = 0.477) and that there is no significant difference between the mean of exhaustion and relationship status (p = 0.105). On the other hand, Table 3 presents the one-way ANOVA test between the mean of the two dimensions and year of training and shows that there is a significant difference between the mean of disengagement and year of training with the mean of PGY3 being the highest (mean = 2.54; SD = 0.46), and the mean of PGY7 being the lowest (mean = 1.56; SD = 0.08), (p = 0.017). There is a significant difference between the mean of exhaustion and year of training with the mean of PGY3 being the highest (mean = 2.86; SD = 0.34) and the mean of PGY7 being the lowest (mean = 2.06; SD = 0.61), (p = 0.029). *Post hoc* analysis for the analysis of variance shows no significant differences between the different years of training when compared with the two dimensions.

Chi-square analysis is done between the cut-off points of the two dimensions and the different variables. In this case, 1 implies high burnout as per the cut-off points (exhaustion ≥2.85 and disengagement ≥2.6) (10). For the year of training, PGY6 and PGY7 are grouped together since PGY7 group includes only 2 participants and PGY6 group contains 14 participants. Their sum is used in this test to yield better results. According to the disengagement cut-off score, 41.6% of female trainees have high burnout and 30.7% of male trainees have high burnout (p = 0.166). According to the exhaustion cut-off score, 56.6% of female trainees and 42.7% of male trainees have high burnout (p = 0.074). According to the disengagement cut-off score, 34.6% of single trainees, 42.0% of those in a relationship and 40.6% of married trainees have high burnout (p = 0.544), while for the exhaustion cut-off score, 46.2% of single trainees, 62.0% of those in a relationship and 53.1% of married ones have high burnout (p = 0.136). According to the disengagement cut-off score, 30.8% of PGY1, 34.6% of PGY2, 52.4% of PGY3, 48.6% of PGY4, 23.5% of PGY5 and 12.5% of PGY6 and PGY7 trainees have high burnout (p = 0.027). The exhaustion cut-off score is not significant (p = 0.338).

Binary logistic regression is presented in Table 4. The references used are female for gender, single for relationship status and PGY1 for year of training. Compared to PGY1, the unadjusted odds ratio of burnout depicted by disengagement for PGY3 is 2.475 (p = 0.035). The remaining results are not statistically significant. After adjusting for relationship status, the odds ratio (0.621) for gender is kept the same for

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TABLE 2 Frequency distribution, mean and SD of the OLBI (*N* =188) (®=reversed question).

		Frequency (%)				Mean	SD
		Strongly agree	Agree	Disagree	Strongly disagree		
1	I always find new and interesting aspects in my work	32 (17.0)	121 (64.4)	33 (17.6)	2 (1.1)	2.03	0.62
2	There are days when I feel tired before I arrive at work®	86 (45.7)	91 (48.4)	10 (5.3)	1 (0.5)	3.39	0.61
3	It happens more and more often that I talk about my work in a negative way®	45 (23.9)	74 (39.4)	57 (30.3)	12 (6.4)	2.19	0.87
4	After work, I tend to need more time than in the past in order to relax and feel better®	86 (45.7)	62 (33.0)	40 (21.3)	0 (0.0)	1.76	0.78
5	I can tolerate the pressure of my work very well	6 (3.2)	36 (19.1)	114 (60.6)	32 (17.0)	2.91	0.69
6	Lately, I tend to think less at work and do my job almost mechanically®	25 (13.3)	74 (39.4)	75 (39.9)	14 (7.4)	2.59	0.81
7	I find my work to be a positive challenge	24 (12.8)	125 (66.5)	38 (20.2)	1 (0.5)	2.09	0.58
8	During my work, I often feel emotionally drained®	37 (19.7)	83 (44.1)	64 (34.0)	4 (2.1)	2.81	0.76
9	Over time, one can become disconnected from this type of work®	25 (13.3)	84 (44.7)	73 (38.8)	6 (3.2)	2.68	0.74
10	After working, I have enough energy for my leisure activities	7 (3.7)	57 (30.3)	74 (39.4)	50 (26.6)	2.89	0.84
11	Sometimes I feel sickened by my work tasks®	31 (16.5)	103 (54.8)	49 (26.1)	5 (2.7)	2.85	0.71
12	After my work, I usually feel worn out and weary®	40 (21.3)	99 (52.7)	49 (26.1)	0 (0.0)	2.95	0.68
13	This is the only type of work that I can imagine myself doing	62 (33.0)	66 (35.1)	50 (26.6)	10 (5.3)	2.04	0.90
14	Usually, I can manage the amount of my work well	42 (22.3)	129 (68.6)	17 (9.0)	0 (0.0)	1.87	0.54
15	I feel more and more engaged in my work	20 (10.6)	111 (59.0)	52 (27.7)	5 (2.7)	2.22	0.66
16	When I work, I usually feel energized	15 (8.0)	110 (58.5)	58 (30.9)	5 (2.7)	2.28	0.64

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TABLE 3 One-way ANOVA test between the mean of the two dimensions and year of training.

	Year of training	N	Mean	SD	*p* value
Disengagement	PGY1	52	2.35	0.48	0.017
	PGY2	26	2.48	0.56	
	PGY3	42	2.54	0.46	
	PGY4	35	2.47	0.43	
	PGY5	17	2.24	0.36	
	PGY6	14	2.25	0.38	
	PGY7	2	1.56	0.08	
Exhaustion	PGY1	52	2.85	0.33	0.029
	PGY2	26	2.82	0.47	
	PGY3	42	2.86	0.34	
	PGY4	35	2.75	0.40	
	PGY5	17	2.73	0.29	
	PGY6	14	2.60	0.44	
	PGY7	2	2.06	0.61	

TABLE 4 Unadjusted odds ratios for the two dimensions.

		Odd ratios	95% Confidence interval	*p* value
Disengagement	Males (Female = reference)	0.621	0.335–1.151	0.130
	In a relationship (Single = reference)	1.368	0.685–2.732	0.375
	Married	1.292	0.573–2.914	0.536
	Divorced	0.000	0.000	0.999
	PGY2 (PGY1 = reference)	1.191	0.438–3.237	0.732
	PGY3	2.475	1.063–5.760	0.035
	PGY4	2.125	0.876–5.157	0.096
	PGY5	0.692	0.195–2.455	0.569
	PGY6-7	0.321	0.065–1.583	0.163
Exhaustion	Males (Female = reference)	0.570	0.316–1.028	0.062
	In a relationship (Single = reference)	1.904	0.956–3.791	0.067
	Married	1.322	0.593–2.926	0.491
	Divorced	0.000	0.000	0.999
	PGY2 (PGY1 = reference)	1.167	0.454–2.997	0.749
	PGY3	1.471	0.647–3.345	0.358
	PGY4	1.059	0.449–2.495	0.896
	PGY5	1.125	0.376–3.368	0.833
	PGY6-7	0.333	0.095–1.170	0.086

disengagement (p = 0.035). The same is noted when adjusting for year of training wherein the odds of ratio of gender is kept the same. After adjusting for relationship status, the odds ratio for gender (0.570) is kept the same for exhaustion (p = 0.062). The same is noted when adjusting for year of training wherein the odds of ratio of gender is kept the same.

Table 5 shows the additional questions that were addressed. Most residents are hesitant to report that they have burnout (65.4% versus 34.6%). For those who answered that they would report if they had burnout, most stated that they would inform their fellow residents or senior residents with a lesser extent the program director. The top reasons for burnout cited are working hours, salary, and working conditions. Reducing inefficient and administrative duties, receiving financial support, and having more vacations are stated as top reasons to help decrease burnout.

Discussion

This descriptive study aims to determine the prevalence of burnout and analyze its relationship with sociodemographic characteristics during the COVID-19 pandemic and the extreme conditions experienced by PGMT in Lebanon. The prevalence

TABLE 5 Additional questions added after the OLBI.

Questions	Yes *N* (%)	No *N* (%)
If you ever feel burnout, will you report it? (*N* = 188)	65 (34.6%)	123 (65.4%)
	Multiple choice answers	%
If yes, then to who? (You can choose more than one) (*N* = 65)	Resident/fellow at the same level	25.5%
	Senior/chief resident/fellow	20.2%
	Program director	13.8%
	Program coordinator	5.3%
	Division head/chairperson	4.3%
Please list top three reasons for burnout from work (*N* = 188)	Working hours	72.9%
	Salary	57.4%
	Working conditions	50.0%
	Faculty members (not necessarily all)	41.0%
	Rotation structure	36.7%
	Other residents/fellows (not necessarily all)	35.1%
	Patients	22.9%
	Other staff who you regularly work with	21.8%
Which ways are useful to reduce the symptoms of burnout during uncertain times? (You can choose more than one) (*N* = 188)	Reducing inefficient work processes and non-physician clerical work	77.1%
	Receiving financial support (increase in salary/stipend) by the organization	73.4%
	Offering more annual leaves when needed	50.0%
	Reducing working hours (even less than 80 hours per week, averaged over a four-week period)	47.3%
	Implementing free wellness programs (yoga, exercises, swimming, hiking, etc.)	40.4%
	Receiving moral support by program director on regular basis during meetings	37.8%
	Social gatherings/outings in presence of program director and/or chairperson	32.4%
	Regularly assessing burnout through evaluations to be shared with program director	27.1%
	Regular online/physical lectures or discussions with mental health specialists	13.8%
	Providing personal protective equipment and training on safety measures during the COVID-19 pandemic	6.9%
	Answers	
Please list wellness programs that you consider helpful and beneficial during uncertain times (*N* = 106)	Most answers revolve around exercising, hiking and some wellness activities such as yoga or meditation or having some free time for oneself or for activities with friends. Other elements include childcare, activities involving music (dancing classes), and cognitive behavioral therapy. Additional items are support from seniors, group discussion, faculty meetings, financial support and better payment, flexible working hours/more breaks, and group activities (such as sightseeing, outings with the department team, etc.).	

rate of high burnout among PGMT is 51.1% by exhaustion and 37.2% by disengagement. This is in lieu of the uncertain and challenging conditions in the country which have affected trainees dramatically. The questions from the OLBI with the highest mean scores revolve around feeling tired even before starting to work, feeling worn out after work even though they mentioned that they were able to tolerate the pressure of work.

Several other studies have utilized other inventories like the Copenhagen Burnout Inventory. A study of 113 PGMT in Pakistan showed that the mean of personal burnout was 49.74, while the mean of work-related burnout was 46.99, and the mean of client-related burnout was 46.13 (14). A different study conducted in India among 210 PGMT found that personal burnout was 51.8%, work-related burnout was 37.2% (calculated among 151 PGMT),

and client-related burnout was 22.47% (calculated among 91 PGMT) (15). The prevalence of personal burnout was 41.6% in another study of 245 PGMT in Sri Lanka while the prevalence of work-related burnout was 30.6 and 8.9% for client-related burnout (16).

A study utilized the OLBI and showed that 116 psychiatric residents in Romania had the following burnout scores: high burnout in 22.4% of residents, moderate burnout in 51.7% of residents, and low burnout in 25.9% of residents, while 25% had high disengagement and 23.3% had high exhaustion (17). Different burnout scores suggest various explanations. The instruments used may partially account for the variation in the prevalence rate of burnout (18). Moreover, training specialty exhibits a drastic role in determining burnout. For instance, certain specialties have less emergency exposure or confrontations than other specialties, and hence may report less burnout (15).

The significant difference between the mean of exhaustion and gender indicates that female trainees are at higher risk of burnout or other mental health problems, as shown in many studies (19). Although 56.6% of female trainees report high burnout by exhaustion, the result is not statistically significant. The same is noted with disengagement wherein 41.6% of female trainees have high burnout, in comparison with males, but not statistically significant. This can be elucidated by disparities in gender characters, responsibilities and cultural variances (15) wherein female PGMT particularly married ones may report more burnout. This is due to exhaustion and overtiredness from their extra responsibilities and disruption of the work-life balance. The one-way ANOVA indicates a significant difference between both the mean of disengagement and the mean of exhaustion with year of training. Since 63.8% of trainees are in the first 3 years of training, this might partially explain the noted difference, meaning that trainees needed time to adjust and tolerate and get used to the training process.

The additional questions addressed revealed several concerns and limitations. Most trainees stated that they would not report if they had burnout, which might be due to lack of trust in leaders or lack of hope that any improvement will happen. Other trainees mentioned that there should be a proper reporting channel for unprofessional behavior instigated by peers or faculty members. This shows that leaders should work hard on attempting to gain the trust of trainees to ensure a smooth and ethical training process. Such an attitude may be partly due to the COVID-19 pandemic that brought up many issues in general and disrupted the normal behavior of professionals and progression of daily functions. Other challenges that trainees reported were low salaries, limited childcare for those who have family responsibilities, and decreased education and surgical training. This may be true in various medical institutions in the same country and perhaps in different countries. This had coincided with other published studies wherein 47% of participants were anxious about overlooked educational prospects (20). Another point to address was to minimize unnecessary administrative and clerical duties that are time-consuming and increase burnout among PGMT.

The following represents important quotes from the participants that are essential and can serve as a guideline for leaders to consider for empowerment of PGMT and for proper management of their education and training. This was the last additional question from the extra questions that we added after the OLBI and was open-ended wherein the participants had the freedom to express themselves and address any concern.

Fear of raising the issue of burnout due to concern from leaders, as one participant mentioned:

> *"Reporting burnout to my attending in this institution has fired back negatively on me around 4 months ago and destroyed my evaluation. It is a shame. It even gave a picture of me being a "bad time manager."*

Encouraging trainees to report unprofessional attitude in a confidential manner, as one participant mentioned:

> *"Residents, particularly junior residents, and interns should be empowered to report unprofessional and downright toxic/malignant behavior from their senior residents and attendings. There needs to be an active effort in ridding certain departments of the toxic blame culture and stop normalizing hazing-like behavior."*

Trainees do not perceive wellness activities as effective against mitigating burnout, as one participant reported:

> *"Wellness programs are useless to be honest. They are meant to talk and talk with no action being done. I am stressed when I come to work. I do not have any stressors outside my work life. The salary does not help also nor do the attendings. Your chiefs think they can boss you around just because they are 1 year older. They do not listen, do not negotiate, do not help, and think we only live in the hospital. I have wanted to quit so many times because of the stresses of the workplace."*

> *"We can state infinite wellness programs, apply them, and then think that these have eradicated/reduced burnout and have created a better working environment. But the main objective of these feedback is to change and transform the way we educate our residents. Every resident would work his heart out if he is given, in return, the appropriate amount of medical experience and education. Hence the need for a proper patient load, which will create a better working environment."*

Promoting good rapport with leadership:

> *"Let us fix priorities before providing yoga classes. Good relationship with faculty members, constructive criticism, educational lectures. Reduction of clerkship work at the clinics and including clinical case discussion sessions. Engaging faculty members in teaching us rather than relying on the fellows to prepare all the lectures."*

Increasing salary to make ends meet if funding is available:

> *"Increasing salaries because we feel we are short of money and need to do extra work (which we cannot do), which makes us frustrated and demotivated. Second thing is getting the people to do activities aside from just working."*

Another participant added:

> *"Money helps. More money means I can have a nice meal, or travel or buy something I could not afford or have a nanny at home so I can rest. Money makes a difference."*

Increasing patient load to enhance training:

> *"More operations – working with patients/staff and doing unfulfilling tasks while having a diminishing OR exposure because of the financial situation is exhausting."*

Providing childcare for trainees with children and family responsibilities:

> *"On-site day care for our kids when we take 10 min off to do pumping for our newborns at home it is okay if we work less than 80 h a week; does not make us bad doctors. All the surveys and the talks are useless; do something about it."*

Practical implications

We have outlined potential support strategies to preserve trainees' wellbeing based on the above results.

- Educational support: well-organized and disciplined rotations among specialties and sponsoring institutions; wide-ranging instructive curriculum; advanced skills training in the operating room and medical wards; committed laboratory or wet/dry skills lab training sessions.
- Training support: reliable coverage schedules; flexible hours for those who have burnout symptoms and financial support for additional training, research, and academic conferences.
- Social support: continuous appreciation to elevate morale and productivity; support for partners and dependents; accessible childcare assistance; meal support and discounts on available programs (gym membership, food services, home appliances, etc).
- Moral support: personalized contact with leaders (open door policy, attentive listening, and problem-solving skills), and available counseling services. Open communication and awareness about mental health, wellbeing, and burnout.

This could be achieved by attempting to reduce hospital fees to acceptable costs to increase the patient load and promote the possibility for learning and practicing. Leaders should focus on positive reinforcement by (1) eliminating the old school non-constructive negative feedback, (2) giving mandatory lectures to faculty members on how to deal with trainees' concerns and engaging in proper problem management and positive communication, and (3) investing in surgical apprentice on cadavers, cadaveric dissection, and simulation labs for any kind of interventions. This would set more frequent faculty member to resident "give and take" relationships, wherein both ends would fulfill their roles to one another with mutual respect. In other words, PGMT should feel supported by their institution, and the latter should invest in enhancing their medical experience, confidence, and training, to finally graduate excellent doctors.

Strategies could include de-stigmatizing mental health and normalizing its access. At this point, creating health initiatives such as supportive workplace environment with coworkers does not seem appealing or welcoming, and thus leaders should resort to other options. Our study has shown that PGMT opt for practical solutions and not lectured based interventions. They want pragmatic solutions that will specifically benefit their educational experience and in turn ameliorate their wellbeing. The above quotes illustrate how their top priorities are education and experience and not mindfulness activities. This requires dedicated, structured, and constructive reforming of the wellness curriculum. Leaders should work extensively in trying to adopt practices that aim to involve faculty members in teaching process and apply assessment wherein PGMT evaluate faculty in a confidential way while attempting to address pitfalls. This can also entail regular meetings with PGMT and faculty members to increase mentoring and yield a better teaching experience. By encouraging good interpersonal interactions, prompt problem solving, and operational planning, leaders could increase trainee operational autonomy and empowerment.

Future research should examine how wellness initiatives affect burnout before, during, and after the COVID-19 outbreak, compare burnout across specialties and highlight the influence of wellness proposals and their consequences on wellbeing. Attention must be given to the following areas: identifying burnout, giving PGMT the confidence to approach their leaders for support, establishing workload, enhancing scheduling, and working environment, and supporting psychological and mental wellbeing. More research is essential to address many unresolved concerns, such as uncovering all potential strategies that trainees may use to prevent burnout or mitigate its effects (21).

The study has several limitations. The Maslach Burnout Inventory (1) or the Copenhagen Burnout Inventory (14) have been used in research to measure burnout and this could yield different results. The study was performed in one medical center, and this limits generalization to other centers that have similar training programs. We can only identify correlations because the cross-sectional approach does not assess burnout over time. The lack of regular comparisons of outcomes from pandemics such as before, during and after the outbreak could be useful but difficult to get. Selection bias, or the possibility that survey completion was more likely done by trainees with free time, can result in underreporting of burnout. Response bias occurs when participants with burnout are less prone to completing the survey. Participants may respond in a way that they believe others would prefer them to, which causes reporter bias. Due to the difficult circumstances, PGMT can be hesitant or discouraged from completing surveys, thus, we cannot determine whether the participants provided honest responses, but we can only assume so.

Conclusion

Burnout among PGMT is a critical concern, especially in a country that has enfolded in a crisis and is struggling to survive among many other challenges. The COVID-19 outbreak has interrupted all sections of day-to-day life, especially the healthcare

sector which is at the front of this turmoil. There is a necessity to mitigate burnout among PGMT during such difficult times. It is the duty of leaders to recognize and foster a culture and environment where wellbeing can prosper to support PGMT at this stage. These measures comprise offering psychological and moral support, setting better working hours, adjusting salaries, and providing better teaching and training options.

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 Institutional Review Board (IRB) of the American University of Beirut Medical Center (AUBMC) (SBS-2021-0219). The ethics committee waived the requirement of written informed consent for participation.

Author contributions

AE, JD, and AH: conceptualization, methodology, formal analysis, investigation, and writing—original draft preparation. AY, JD, ED, and AE: validation, project administration, visualization, and writing—review and editing. ED and AE: resources and supervision. AY and ED: data curation. 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.

Publisher's note

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The relationships between burnout, general wellbeing, and psychological detachment with turnover intention in Chinese nurses: a cross-sectional study

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Background: It is critical to minimize nurse turnover to improve the quality of care and patient safety. In-depth investigation is required to better understand the factors related to nurses' turnover intentions.

Aim: This study aimed to determine the relationships between burnout, general wellbeing, and psychological detachment with turnover intention among nurses in China.

Methods: A cross-sectional survey using convenience sampling was conducted in one hospital in China between January 2023 and March 2023. A total of 536 nurses were surveyed using the General Wellbeing Schedule (GWB), the Maslach Burnout Inventory scale (MBI), the Psychological Detachment scale, and the Turnover Intention scale. The collected data were analyzed using SPSS 26.0 statistical software. The chi-square test and binary logistic regression analysis were used to explore the factors related to turnover intention.

Results: Our data demonstrated that the turnover intention scores were 13 (10, 15.75), with 56% of nurses exhibiting a high level of turnover intention. Binary logistic regression analysis results indicated that being on a contract (OR = 4.385, 95% CI = 2.196–8.754), working in the pediatrics (OR = 2.392, 95% CI = 1.267–4.514) or obstetrics (OR = 2.423, 95% CI = 1.145–5.126) department, and experiencing burnout (OR = 1.024, 95% CI = 1.008–1.041) were associated with a heightened level of turnover intention. Conversely, organizational satisfaction (OR = 0.162, 95% CI = 0.033–0.787) and general wellbeing (OR = 0.967, 95% CI = 0.946–0.989) were identified as factors that hindered the intention to leave.

Conclusions: Findings from this study suggest that nurses were employed on a contract basis, working in pediatric or obstetric departments, expressing dissatisfaction with the organization, reporting low general wellbeing, and experiencing high levels of burnout that require special attention. The identification of these risk factors can inform targeted interventions and support programs aimed at improving the wellbeing and retention of nurses in these settings.

KEYWORDS

psychological detachment, turnover intention, nursing, burnout, general wellbeing

1. Introduction

Nurses constitute the predominant occupational cohort in the healthcare sector, making up approximately 59% of the workforce; however, current trends show a projected shortage of 5.7 million nurses by 2030 (1), and nurse departures affect the global healthcare sector. In China, a rapidly aging population, nurse outflow, and an unbalanced distribution of the nursing workforce across the country make the shortage a long-term issue (2). A survey of the current WHO data reveals that China's nurse population density is still below the level of global distribution (3.75 nurses per 1,000 population) and much lower than that of developed countries, including the USA (14.6 nurses per 1,000 population) and the UK (8.2 nurses per 1,000 population) (1). Nursing staff shortages directly increase the workload of nurses in service, thereby negatively impacting job satisfaction and increasing the possibility of nurses exiting (3). In addition, patient safety and medical care quality are both affected by nurse staffing shortages, which also cut into the clinic's profit margin (4). While there are various factors attributed to the shortage of nurses, the principal factor is widely acknowledged to be the significant turnover of nursing staff (5). Nurses' turnover intention can significantly predict departure behavior (6). The likelihood that a nurse will leave his or her current organization or institution is defined as turnover intention (7). Nurses in different countries vary greatly in their degree of intention from 43% in Lebanon to 74% in Iceland (8). One study showed that a wide range of approximately 4% to 54% of nurses considered leaving the profession (9). The proportion of nurses in China who reported intention to leave ranged from 20% to 70% (10–12). Although much research has been conducted on the topic, the situation has clearly not improved, and more research is needed in this area to reduce nurse dropout rates (13).

Burnout significantly impacts nurse turnover (14), and high levels of burnout are a significant factor in nurses' turnover intention (15, 16). Burnout refers to chronic work stress that is not effectively managed, which in turn leads to emotional exhaustion, depersonalization, and low personal achievement, which is a common phenomenon in the healthcare profession (17). High burnout levels correlate with deterioration in safety and quality of care, patient satisfaction, and productivity (18, 19). Recognizing and controlling the factors associated with burnout is considered one of the strategies to reduce nurses' turnover intention (20, 21).

Nurse wellbeing is a vital factor in stabilizing the nursing workforce (22), and general wellbeing is a general psychological indicator of quality of life that reflects satisfaction with personal conditions (23). A favorable sense of wellbeing can improve nurses' psychological resilience and mental health and improve job satisfaction and performance (24, 25). According to findings, greater wellbeing is associated with lower absence and turnover intention and higher quality of care delivery (26). However, the impact on turnover intention from the perspective of general wellbeing has rarely been explored.

Moving away from work-related actions and thoughts is termed as psychological detachment from work, and it is regarded as an essential step in the healing process (27). Poor psychological detachment is strongly correlated with weariness, poorer sleep, and decreased wellbeing according to a prior study (28–30). Improving the level of psychological detachment from work can have a positive impact on patient safety, improve nurses' physical and emotional health, and enhance staff wellbeing (31, 32). Research indicates that psychological detachment can decrease nurses' turnover intention (33, 34), while research examining the impact of psychological detachment on turnover intention remains limited. This relationship requires further verification and in-depth exploration.

The characteristics of each job can be divided into work demands and resources based on the theory underlying the job demands–resources model (JD-R model) (35). In the workplace, job demands are the "negative variables" that drain an employee's energy, whereas job resources are the "positive factors" that make it easier to accomplish work objectives, lessen fatigue, and improve performance. Work resources become a motivational and supplementary way to mitigate the exhausting results of job demands and therefore significantly enhance employee wellbeing, which results in positive performance (36, 37). Based on the active process of the JD-R model, psychological detachment as a positive resource for individuals in the workplace helps restore individuals to their previous state during the process of burnout (38, 39), thus reducing nurses' turnover intentions. Other studies have demonstrated that psychological detachment from work might lessen stress related to work, which helps to prevent burnout (40, 41) and enhance nurses' wellbeing (30). Therefore, detachment from work and prevention of resource loss may increase nurses' willingness to stay in their jobs. However, few studies have examined the effects on nurses' turnover intentions from the perspective of psychological detachment and general wellbeing. Hence, this study aimed to explore the effects of burnout, general wellbeing, and psychological detachment on Chinese nurses' turnover intention.

2. Materials and methods

2.1. Design, setting, and participants

A cross-sectional survey using convenience sampling was conducted from January 2023 to March 2023 in a hospital in China. After being informed of the study's objectives, participants signed an informed consent form. The research was carried out using a paper questionnaire that included sociodemographic information, the General Wellbeing Schedule (GWB), the Maslach Burnout Inventory (MBI) scale, the Psychological Detachment scale, and the Turnover Intention scale. Finally, 536 eligible samples were analyzed for data. The inclusion criteria were being over age 18, having a nursing certificate from the People's Republic of China, working for more than a year, voluntarily engaging in the study, and providing complete informed consent. Nursing managers with the title of the head nurse or more, nurses working in administration, nurses on leave (sick leave, maternity leave, or marriage leave), and nurses suffering from serious illness were excluded.

2.2. Measurements

2.2.1. Sociodemographic information of nurses

Based on the preliminary study and review (10, 42–44), a sociodemographic questionnaire was designed to collect participant characteristics, including sex, whether being the only child or not, age, marital status, children, educational background, professional title, level of nursing, position, the form of employment, years of service, night shift work, weekly working hours, monthly net income (CNY), and satisfaction with the institution.

2.2.2. Turnover intention scale

We used the Chinese version of the 6-item Turnover Intention Scale, which was designed by Michael and Spector (45, 46), to evaluate participants' turnover intention as the outcome variable. The Turnover Intention Scale, which includes six items, covers three dimensions: one's probability of leaving a current job (2 items), the desire to look for another job (2 items), and the likelihood of finding a job beyond one's current sector (2 items). From "never" to "often," all of the items were scored on a 4-point scale with values ranging from 1 to 4. The total points ranged between 6 and 24, and the turnover intention was stronger with a higher score. An entire average score of ≤ 1 indicated a very low desire for departure, >1 and ≤ 2 suggested a low desire to leave, >2 and ≤ 3 indicated a high desire to depart, and >3 indicated a very high desire to leave. The Chinese version of the Turnover Intention Scale showed good content validity (0.677) and reliability (Cronbach's alpha = 0.773) in its assessment (45). It is commonly used to measure nurses' intention to leave (42, 47). The Cronbach's alpha of the TIS-6 for the present study was 0.830.

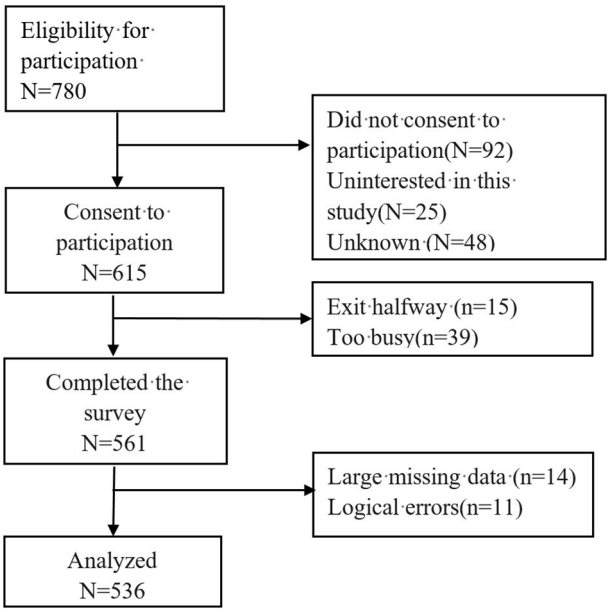

FIGURE 1
A flow chart of the participants.

2.2.3. Maslach burnout inventory scale (MBI)

The 22-item Maslach Burnout Inventory Human Services Survey (MBI-HSS) was employed to assess job burnout levels in the participants (48). This scale contains three dimensions, including emotional fatigue (EE), depersonalization (DP), and decreased personal achievement, which are rated on a seven-point Likert scale, from 0 = never to 6 = every day. The cutoff points for high risk were >26 for emotional exhaustion, >9 for depersonalization, and <33 for reduced personal achievement. As an international standard scale, when a respondent's score on any dimension exceeds the critical value, burnout can be diagnosed (49). The Chinese version of the MBI-HSS Scale has been shown to have excellent credibility and validity (50, 51). Cronbach's alpha (0.916 in this study) was tested to assess the reliability of this scale.

2.2.4. Psychological detachment from work

Sonnentag and Fritz constructed a four-item scale for assessing psychological detachment from work (38). The answers ranged from 1 (strongly disagree) to 5 (strongly agree) on a five-point Likert scale, with a sum score of 4 to 20 on the scale. Higher mean scores on the items suggest a greater level of psychological detachment. The Chinese version of the Psychological Detachment Scale, translated by Lu (34), demonstrated high reliability (α = 0.833) and satisfactory validity (r = 0.74) and has been employed in diverse studies (40, 52). The Cronbach's alpha score for this study was 0.909.

2.2.5. General wellbeing schedule (GWB)

Developed by Fazio (53), translated and revised by a Chinese scholar (54), the General Wellbeing Schedule (GWB), which has 18 items and 6 dimensions, was used to evaluate nurses' subjective wellbeing and how satisfied they were with their overall lives. Six dimensions focus on measuring health concerns (10, 15), energy level (1, 14, 17), emotional–behavioral control (3, 7, 13), satisfying interesting life (6, 11), depressed/cheerful mood (2, 4, 12, 18), and anxiety level (5, 8, 9, 16). Items 1, 3, 6, 7, 9, 11, 13, 15, and 16 were reverse-scored. With a full score of 120, the higher the score was the greater the happiness. The scores corresponding to low, moderate, high, and excellent general wellbeing were 0–24, 25–48, 49–72, 73–96, and 97–120, respectively. Previous studies (25, 55) have confirmed the GWB's reliability and validity. Cronbach's alpha coefficient in this study was 0.877.

2.3. Data collection

This survey was conducted from January 2023 to March 2023 after being reviewed by the hospital ethics committee, and consent was obtained from the hospital nursing department and chief nursing officer. A paper questionnaire was distributed to the clinical nursing units of the hospital by trained research staff, who conducted face-to-face, one-on-one surveys with participants. Participants in the study signed a written consent form willingly and also acknowledged their participation. All questionnaires were completed independently and took approximately 12 min. Participants

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TABLE 1 Demographic characteristics of the participants ($n = 536$).

Variable	Categories	Frequency (*n*)	Percent (%)
Sex	Male	26	4.85%
	Female	510	95.15%
only child or not	Yes	77	14.37%
	No	459	85.63%
Age (years)	<25	21	3.92%
	25–34	346	64.55%
	35–39	129	24.07%
	≥40	40	7.46%
Marital status	Unmarried	146	27.24%
	Married	377	70.34%
	Divorce or other	13	2.43%
Children	No	204	38.06%
	One	174	32.46%
	Two or more	158	29.48%
Educational background	Associate degree or below	34	6.34%
	Undergraduate	483	90.11%
	Graduate	19	3.54%
Professional title	Junior	237	44.22%
	Intermediate	296	55.22%
	Senior	3	0.56%
Nurse levels	N0	51	9.51%
	N1	88	16.42%
	N2	139	25.93%
	N3	187	34.89%
	N4	71	13.25%
Position title	General nurse	449	83.77%
	Responsible group leader	51	9.51%
	Chief Instructor	36	6.72%
Form of employment	Tenured nurse	221	41.23%
	Contract	125	23.32%
	Other	190	35.45%
Years of service (years)	<5	96	17.91%
	5–9	175	32.65%
	10–20	233	43.47%
	>20	32	5.97%
Shifts per month in the past 6 months (days)	No	142	26.49%
	≤4	64	11.94%
	5–9	273	50.93%
	≥10	57	10.63%
Work hours per week in the past 1 month	≤35 h	15	2.80%
	36–40 h	261	48.69%

(Continued)

TABLE 1 (Continued)

Variable	Categories	Frequency (*n*)	Percent (%)
	>40 h	260	48.51%
Monthly net income (in CNY)	<5,000	25	4.66%
	5,000–8,000	114	21.27%
	8,001–10,000	188	35.07%
	>10,000	209	38.99%
Ward of work	Gynecology	69	12.87%
	Obstetrics	71	13.25%
	Pediatrics	195	36.38%
	Special department (intensive care unit, surgery, emergency)	78	14.55%
	Others	123	22.95%
Satisfied with the current institution	Satisfied	291	54.29%
	Neutral	211	39.37%
	Dissatisfied	34	6.34%

were guaranteed anonymity and confidentiality. Figure 1 depicts the participants' flowchart.

2.4. Data analysis

Frequency data were described using counts and percentages. The normality of continuous data was assessed using the Kolmogorov–Smirnov (K-S) test. Due to the non-normal distribution of variables, such as occupational burnout, general wellbeing, turnover intentions, psychological detachment total score, and scores for each dimension, descriptive statistics including the median and quartiles (M [Q25, Q75]) were utilized. Group comparisons were conducted using the chi-square test. Turnover intentions were treated as the dependent variable, with participants categorized into either the "low turnover intentions group" (Dimensional mean score $\leq$ 2) or the "high turnover intentions group" (Dimensional mean score >2). Pearson's chi-square test was employed to compare the two groups. Binary logistic regression analysis was performed to identify factors influencing turnover intention, with results presented as odds ratios (ORs) and 95% confidence intervals (CIs). Statistical significance was set at a $p < 0.05$ (two-tailed).

3. Results

3.1. Participant characteristics

A total of 536 valid questionnaires were analyzed. The participants were mainly women (95.1%) and married (70.3%). Most of them had obtained a bachelor's degree (90.1%), were at the intermediate or Junior (99.4%), and were general nurses (83.8%). Detailed information is shown in Table 1. In addition, the chi-square test results revealed statistically significant differences ($P < 0.05$) between the low turnover intention group and the high turnover intention group regarding variables such as age, marital status, children, professional title, nursing level, the form of employment, years of service, monthly night shifts, monthly net income (in RMB), ward of work, and satisfaction with the institution. Table 2 shows detailed information.

3.2. Burnout, subjective wellbeing, psychological detachment, and intention to leave scores of the study participants and their correlation analysis

The overall mean scores of burnout, psychological detachment, subjective wellbeing, and intention to leave were 43(28,58), 12(8,14), 73(65,81.75), and 13(10,15.75), respectively. Spearman's correlation analysis showed that the turnover intention was positively correlated with burnout ($r = 0.479$, $p < 0.01$) and significantly negatively correlated with general wellbeing ($r = -0.399$, $p < 0.01$) and psychological detachment ($r = -0.091$, $p < 0.05$). Burnout was significantly negatively correlated with psychological detachment ($r = -0.152$, $p < 0.01$) and general wellbeing ($r = -0.657$, $p < 0.01$), and psychological detachment was significantly positively correlated with general wellbeing ($r = -0.284$, $p < 0.01$), as detailed in Table 3.

3.3. Factors associated with turnover intention

In the binary logistic regression analysis, variables identified as statistically significant ($p < 0.05$) through univariate analysis and Spearman's rank correlation analysis were included as independent variables. The binary logistic regression analysis indicated significant associations between contract employment (OR = 4.385, 95% CI = 2.196–8.754), pediatrics (OR = 2.392, 95% CI = 1.267–4.514) or obstetrics (OR = 2.423, 95% CI = 1.145–5.126), work satisfaction with the organization (OR = 0.162, 95% CI = 0.033–0.787), burnout (OR = 1.024, 95% CI = 1.008–1.041),

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TABLE 2 Univariate analysis of the participants ($n = 536$).

Variable	Categories	Low ($N = 236$) N (%)	High ($N = 300$) N (%)	χ^2	P value
Sex	Male	12 (46.2%)	14(53.8%)	0.050	0.823
	Female	224 (43.9%)	286 (56.1%)		
only child or not	Yes	37 (48.1%)	40 (51.9%)	0.590	0.442
	No	199 (43.4%)	260 (56.6%)		
Age (years)	<25	1 (4.8%)	20 (95.2%)	16.163	0.001
	25–34	154 (44.5%)	192 (55.5%)		
	35–39	58 (45%)	71 (55%)		
	≥40	23 (57.5%)	17 (42.5%)		
Marital status	Unmarried	44 (30.1%)	102 (69.9%)	15.767	<0.001
	Married	186 (49.3%)	191 (50.7%)		
	Divorce or other	6 (44%)	7 (56%)		
Children	No	71 (34.8%)	133 (65.2%)	13.431	0.001
	One	80 (46%)	94 (54%)		
	Two or more	85 (53.8%)	73 (46.2%)		
Educational background	Associate degree or below	11 (32.4%)	23 (67.6%)	3.378	0.185
	Undergraduate	214 (44.3%)	269 (55.7%)		
	Graduate	11 (57.9%)	8 (42.1%)		
Professional title	Junior	87 (36.7%)	150 (63.3%)	12.335	0.002
	Intermediate	146 (49.3%)	150 (50.7%)		
	Senior	3 (100%)	0 (0%)		
Nurse levels	N0	14 (27.5%)	37 (72.5%)	20.132	<0.001
	N1	28 (31.8%)	60 (68.2%)		
	N2	58 (41.7%)	81 (58.3%)		
	N3	102 (54.5%)	85 (45.5%)		
	N4	34 (47.9%)	37 (52.1%)		
Position title	General nurse	199 (44.3%)	250 (55.7%)	1.486	0.476
	Responsible group leader	19 (37.3%)	32 (62.7%)		
	Chief Instructor	18 (50%)	18 (50%)		
Form of employment	Tenured nurse	118 (53.4%)	103 (46.6%)	43.931	<0.001
	Contract	23 (18.4%)	102 (81.6%)		
	other	95 (50%)	95 (50%)		
Years of service (years)	<5	27 (28.1%)	69 (71.9%)	21.067	<0.001
	5–9	69 (39.4%)	106 (60.6%)		
	10–20	120 (51.5%)	113 (48.5%)		
	>20	20 (62.5%)	12 (37.5%)		
Shifts per month in the past 6 months (days)	No	80 (56.3%)	62 (43.7%)	13.273	0.004
	≤4	27 (42.2%)	37 (57.8%)		
	5–9	103 (37.7%)	170 (62.3%)		
	≥10	26 (45.6%)	31 (54.4%)		
Work hours per week in the past 1 month	≤35 h	3 (20%)	12 (80%)	4.048	0.132
	36–40 h	113 (43.3%)	148 (56.7%)		
	>40 h	120 (46.2%)	140 (53.8%)		

(Continued)

TABLE 2 (Continued)

Variable	Categories	Low ($N = 236$) N (%)	High ($N = 300$) N (%)	χ^2	P value
Monthly net income (in CNY)	<5,000	3 (12%)	22 (88%)	10.920	0.012
	5,000–8,000	52 (45.6%)	62 (54.4%)		
	8,001–10,000	86 (45.7%)	102 (54.3%)		
	>10,000	95 (45.5%)	114 (54.5%)		
Ward of work	Gynecology	37 (53.6%)	32 (46.4%)	17.844	0.001
	Obstetrics	30 (42.3%)	41 (57.7%)		
	Pediatrics	69 (35.4%)	126 (64.6%)		
	Special department (intensive care unit, surgery, emergency)	30 (38.5%)	48 (61.5%)		
	others	70 (56.9%)	53 (43.1%)		
Satisfied with the current institution	Satisfied	177 (60.8%)	114 (39.2%)	78.175	<0.001
	Neutral	57 (27%)	154 (73%)		
	Dissatisfied	2 (5.9%)	32 (94.1%)		

and general wellbeing (OR = 0.967, 95% CI = 0.946–0.989), and the level of nurse turnover intentions (Table 4). Specifically, nurses with contract employment, working in pediatrics or obstetrics, dissatisfaction with the organization, high levels of occupational burnout, and low levels of general wellbeing exhibited higher levels of turnover intentions.

4. Discussion

In this study, the mean total score for nurses' turnover intentions was 13 (10, 15.75), 56% of nurses have a high level of turnover intention, and these results are consistent with international studies on the same issue (36.5% to 64.9%) (56–59) but are lower than similar findings in China (11, 42). The difference may be due to the timing of the survey in this study; nurses who had the intention to leave may have already left, thus yielding a sample with a lower intention to leave (60). In addition, our study also found that contract nurses had higher turnover intentions than tenured nurses, which is consistent with previous studies (61). Contract nurses are paid less and receive fewer benefits than tenured nurses even though they perform the same job duties. This suggests that nurses working under contract arrangements may experience unique challenges or job-related factors that increase their likelihood of considering alternative employment options. Further investigation into the specific aspects of contract employment, such as limited job security or reduced benefits, could provide a deeper understanding of its impact on turnover intentions (62). In line with previous studies' findings (45, 63), nurses in pediatrics and obstetrics are more inclined to leave their jobs than those in other departments. This may be because pediatric or obstetrics work demands more time and effort due to the specificity of the population they serve and the high demand for nursing skills (64). Exploring the specific stressors and work-related challenges faced by nurses in these areas could shed light on interventions and support systems needed to improve retention rates. The study also found that nurses' turnover intentions were significantly influenced by their satisfaction with the institution, and those who were satisfied with their institution had less intention to leave, which aligns with the results of the previous investigation (65). Dissatisfaction with various aspects of the work environment, such as leadership, organizational culture, workload, or professional development opportunities, may contribute to nurses' decision to seek employment elsewhere (13, 66). It is essential for healthcare organizations to proactively identify and address these areas of dissatisfaction to enhance nurse retention and overall job satisfaction.

The mean score for nurse burnout was 43 (28, 56) with average scores of 20 (14, 27) for emotional exhaustion, 5 (2, 10) for depersonalization, and 16 (9, 23) for low personal accomplishment. These findings are in line with previous studies by Chen R (67) and Karimi L (68), indicating that nurses are currently experiencing moderate levels of burnout. Importantly, these results also suggest that the impact of COVID-19 on nurses' mental health may have been underestimated (69). Additionally, this study's findings revealed that nurses' turnover intentions were positively correlated with burnout; the higher the degree of burnout was, the more likely they were to leave, similar to the results of existing studies (70, 71). Therefore, managers should monitor nurses' physical and emotional symptoms and establish emotional and social support networks (72), such as the Three Good Things based on WeChat (73), to improve nurses' psychological wellbeing and thus stabilize the nursing workforce.

The total general wellbeing score in this study was 73 (65, 81.75), suggesting that the nurses in this study had high general wellbeing, a result that was higher than other reports (74, 75) and lower than Iranian findings (76). In addition, this research found a significant negative effect of general wellbeing on turnover intentions, and these results are similar to those of previous studies (77–79), indicating that enhancing nurses' wellbeing can reduce their turnover intentions and turnover rates. Wellbeing is a positive psychological feeling and cognition; the stronger the happiness of nurses is, the better their psychological adaptability, which helps them maintain career stability (25). However, a meta-analysis

TABLE 3 Spearman correlation analysis and descriptive statistics of main variables.

	Score, *M* (*P*25, *P*75)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Burnout (total score)	43 (28,58)																
2. Emotional fatigue	20 (14,27)	0.848**															
3. Depersonalization	5 (2,10)	0.813**	0.647**														
4. Decreased personal accomplishment	16 (9,23)	0.780**	0.422**	0.508**													
5. Psychological detachment (total score)	12 (8,14)	−0.152**	−0.234**	−0.047	−0.056												
6. General Wellbeing Schedule (total score)	73 (65, 81.75)	−0.657**	−0.692**	−0.447**	−0.445**	0.284**											
7. Energy level	14 (12,16)	−0.556**	−0.619**	−0.358**	−0.373**	0.271**	0.854**										
8. Health worry	7 (5,8)	−0.109*	−0.143**	−0.054	−0.04	0.055	0.216**	0.002									
9. Satisfying interesting life	6 (5,8)	−0.483**	−0.470**	−0.331**	−0.379**	0.110*	0.687**	0.590**	−0.022								
10. Depressed-cheerful mood	19 (16,22)	−0.586**	−0.596**	−0.412**	−0.420**	0.296**	0.887**	0.784**	0.031	0.570**							
11. Emotional-behavioral control	12.5 (11,14)	−0.502**	−0.457**	−0.370**	−0.378**	0.107*	0.671**	0.464**	0.039	0.484**	0.550**						
12. Relaxed vs tense-anxious	15 (13,17)	−0.522**	−0.585**	−0.346**	−0.323**	0.280**	0.819**	0.624**	0.216**	0.478**	0.648**	0.445**					
13.Turnover intention(total score)	13 (10, 15.75)	0.479**	0.476**	0.447**	0.296**	−0.091*	−0.386**	−0.332**	−0.075	−0.340**	−0.328**	−0.276**	−0.270**				
14. Possibility to resign from present job	4 (3,5)	0.512**	0.502**	0.442**	0.341**	−0.123**	−0.426**	−0.383**	-.088*	−0.368**	−0.382**	−0.285**	−0.305**	0.907**			
15. Motivation to seek another job	4 (2,6)	0.449**	0.431**	0.427**	0.297**	−0.076	−0.360**	−0.307**	−0.066	−0.328**	−0.303**	−0.259**	−0.261**	0.893**	0.766**		
16. Possibility to gained an external job	4 (4,5)	0.227**	0.247**	0.241**	0.098*	0.007	−0.156**	−0.112**	−0.001	−0.142**	−0.107*	−0.139**	−0.095*	0.687**	0.470**	0.410**	1

*$p < 0.05$, 2-tailed.
**$p < 0.01$, 2-tailed.

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TABLE 4 A binary logistic regression analysis of factors associated with nurses' turnover intention ($n = 536$).

Variables	*B*	*OR*	*OR* (95% *CI*)	χ^2 value	*p*-value
Form of employment					
Tenured nurse	Ref				
Contract	1.478	4.385	2.196–8.754	17.558	<0.001
Ward of work					
Obstetrics	0.885	2.423	1.145–5.126	5.359	0.021
Pediatrics	0.872	2.392	1.267–4.514	7.242	0.007
others	Ref				
Satisfied with the current institution					
Satisfied	−1.822	0.162	0.033–0.787	5.095	0.024
Dissatisfied	Ref				
Burnout	0.024	1.024	1.008–1.041	8.742	0.003
General well-being	−0.033	0.967	0.946–0.989	8.555	0.003
Psychological detachment	−0.031	0.969	0.916–1.026	1.170	0.279
Hosmer-Lemeshow test	$P = 0.395$				

(80) showed that the wellbeing of Chinese healthcare staff was on the decline. Therefore, measures such as positive psychology interventions can be taken to improve the wellbeing of nurses and thus reduce the turnover rate (81).

The total score of psychological detachment in this study was 12 (8, 14), which is a moderate level of psychological detachment, a result similar to the findings of Majeed's (82) study and Allen's research (52) and lower than other results (83). In addition, binary logistic regression analysis in this research found no statistically significant effect of psychological detachment on nurses' turnover intention, which is inconsistent with previous studies (33, 34). The disparities observed between our study and earlier research may be attributed to variances in cultural contexts and the diversity of sample sources. Further research is needed in the future to explore the relationship between psychological detachment and turnover intention.

5. Conclusion

The findings of this study indicated that among the 536 Chinese nurses surveyed, the prevalence of turnover intention was 56%. Satisfaction with the organization, employment on a contract basis, working in pediatrics or obstetrics departments, general wellbeing, and burnout are identified as significant predictors of nurses' turnover intention. Understanding these factors is crucial for developing targeted interventions to promote the stability of the nursing workforce.

5.1. Limitations of this study

There are several limitations to this study. First, this study uses a convenient sampling procedure that is considered direct, practical, and appropriate to the study's objectives but may have introduced bias. Second, using self-report questionnaires may have biased the results. Then, because only nurses from a tertiary hospital in Henan Province, China, were included in this study, the results may not be generalizable. Therefore, the number and scope of the study population need to be expanded for a comparative study. Third, since this survey was cross-sectional research, the results were unable to clarify the association of dependency among the factors involved and turnover intention. Finally, we recommend further research on the mediating models of psychological detachment, general wellbeing, burnout, and turnover intentions in the future, which will likely facilitate the development of related theories.

5.2. Implications for nursing management

The results of this study indicate the need to improve the working conditions and benefits of contract nurses to reduce the gap between contract and regular nurses. Creating a positive, supportive, and collaborative work environment is essential to increase nurses' organizational satisfaction. Providing professional training and support is essential to help pediatric or obstetric nurses meet the specific challenges and needs of their respective fields while considering improving the benefits package in the relevant departments. In addition, attention to the physical and mental health of nurses and the provision of stress management training and psychological counseling are important considerations.

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 Ethics Committee of the Third Affiliated Hospital of Zhengzhou University and the Chinese Health Department. The patients/participants provided their written informed consent to participate in this study.

Author contributions

FZ contributed to editing the manuscript. CL participated in the drafting of the manuscript and survey design. XL participated in data collection. ML and RJ helped with data analysis and draft revision. The manuscript was examined by FZ, XG, and HB for quality and modifications were made in English. All authors contributed to the manuscript and approved the final 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.

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Association between work stress and mental health in Chinese public health workers during the COVID-19 epidemic: mediating role of social support and self-efficacy

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Background: Little is known about the mediating mechanisms underlying the association between work stress and mental health, especially among primary public health workers (PHWs). We aimed to evaluated the association between work stress and mental health among PHWs, and explore the mediating roles of social support and self-efficacy.

Methods: A large-scale cross-sectional survey was conducted among 3,809 PHWs from all 249 community health centers in 16 administrative districts throughout Shanghai, China. Pearson correlation and hierarchical linear regression were used to explore the associations among work stress, social support, self-efficacy and mental health. Structural equation modeling (SEM) was conducted to examine the mediation effects.

Results: The prevalence of depression and anxiety symptoms among primary PHWs was 67.3 and 55.5%, respectively. There is a significant positive direct effect of work stress on mental health ($\beta = 0.325$, $p < 0.001$). Social support and self-efficacy partially mediated the relationship between work stress and mental health, respectively. Meanwhile, the chained mediating effects of social support and self-efficacy also buffered the predictive effects of work stress on anxiety and depression symptoms ($\beta = 0.372$, $p < 0.001$).

Conclusion: Work stress has significant direct and indirect effects on mental health among primary PHWs. Enhancing social support and self-efficacy may be effective psychological interventions to mitigate the effects of work-related stress on mental health. These findings highlight the severity of mental health problems among primary public health workers and provide new evidence for early prevention and effective intervention strategies.

KEYWORDS

depression, anxiety, social support, self-efficacy, healthcare worker, mediating effect

Introduction

From early 2020 to the current time, the COVID-19 pandemic has affected many countries and regions and declared by the World Health Organization to be a public health emergency of international concern. Shanghai, one of the largest cities in Asia, experienced another unprecedented pandemic and associated lockdown in March 2022, which contributed to serious mental health problems (1). During the continuing COVID-19 pandemic, medical staff in hospitals and primary public health workers (PHWs) in community healthcare center (CHCs) faced increased workload and stress, resulting in adverse mental health conditions (2–4). Therefore, it is one of the main challenges of the pandemic to reduce the damage caused by COVID-19 to the mental health of healthcare workers. However, studies to date have focused on evaluating the mental health impact of COVID-19 related work stress on the various type of medical staff (5–7), with limited attention to primary public health workers. Furthermore, the neglect of primary public health workers may result in the accumulation of psychosocial problems caused by long-term, heavy work stress, potentially leading to a range of adverse psychosocial outcomes and harm to the primary healthcare system. Therefore, it is necessary to understand its harmful pathways and potential mechanisms on psychological health in order to take effective measures to prevent and reduce the risk of mental health problems, such as depression and anxiety symptoms, caused by work-related stress.

Work stress during COVID-19 and mental health

Work stress on primary public health workers has increased mainly from the need that in addition to providing basic health services, public health physicians and medical technicians are required to perform routine nucleic acid testing, mass vaccinations, epidemiological investigations and surveillance, general practitioners and nurses are responsible for community fever clinic services, and administrators and other staff perform health promotion and education and other preventive and control measures to prevent the spread of COVID-19 in the community. Work stress can be quantified based on the classic theory of Effort-Reward Imbalance (ERI) which assesses the intense stress response induced by the imbalance between the effort and the reward of work (8). In the context of COVID-19, there is evidence that work stress is strongly associated with negative mental health outcomes among healthcare workers. Prolonged, intense work stress can directly contribute to the development of anxiety and depression disorders (9). Moreover, previous studies have confirmed that the beneficial predictive effect of ERI on increasing the risk of mental health problems and other adverse health outcomes (10, 11).

Mental health problems of PHWs in community, in addition to health care workers in hospital, is also a crucial part of public health event (12). An epidemiological survey of community epidemic prevention workers revealed that a considerable proportion of participants reported depression (39.7%) and anxiety (29.5%) symptoms (13). Anxiety and depression are common mental health problems (with high prevalence) among health care workers caused by the high-intensity work environment during the COVID-19 epidemic (2, 3, 14, 15). Although previous studies have provided preliminary evidence that work stress may be a significant predictor of mental health among medical staff or healthcare workers, there is limited research on the association between work stress and mental health problems among primary PHWs. Thus, there is a stronger need to further focus on mediating factors and explore potential pathways between work stress and depression and anxiety in order to provide effective interventions for reducing the mental health issues risks of primary PHWs.

Social support and self-efficacy as mediators

Social support is a crucial interpersonal resource that encompasses mainly the close relationship between individuals and various aspects of society, such as friends, family and significant others. Based on stress buffering theory (16, 17), social support has a buffering effect on the relationship between work stress and mental health problems, which is also confirmed in healthcare workers (18, 19). Besides the external source and environment from social support, self-efficacy is an important internal aspect. Self-efficacy, which reflects individuals' subjective evaluation of their own abilities, is considered an important personal trait with significant impact on coping with work stress and alleviating mental health problems (20, 21).

In addition, some studies have found that social support is an important source of self-efficacy, and the more social support someone receives, the more encouragement and affirmation they receive, which further enhances their self-efficacy (22–24). In contrast, when an individual perceives a lack of social support, this negative perspective on social relationships can lead to decrease in self-efficacy. This pathway proposed above bridges the gap between the external environment and personal factors. Notably, the mediating roles of social support and self-efficacy between job stress and mental health problems were also not confirmed in primary PHWs.

Present study

Due to the limited epidemiological evidence for primary public health workers and the severity of public health challenges, we conducted a large-scale cross-sectional study of PHWs to explore the relationship between work stress, social support, self-efficacy, and mental health. Based on the theoretical model and previous related studies, we constructed a chain mediation model to confirm the following hypotheses: Hypothesis 1. Work stress can directly predict mental health. Hypothesis 2. Social support can mediate the association between work stress and mental health. Hypothesis 3. Self-efficacy can mediate the association between work stress and mental health. Hypothesis 4. Social support and self-efficacy are sequential mediators in the association between work stress and mental health (Supplementary Figure S1).

Methods

Participants

We performed a large-scale questionnaire survey among primary public health workers, covering all 249 community health service centers across all 16 districts throughout Shanghai. This study was

conducted with the support of the Shanghai Municipal Health Commission and the cooperation of the leadership and administrative team of each CHC. The primary goal was to improve the capacity of primary care public health services and construction. From October to November 2022, this cross-sectional study was conducted *via* an online survey platform ("SurveyStar," Changsha Ranxing Science and Technology, Shanghai, China). In order to ensure the accuracy and validity of the data, all questionnaires were set up in the computer system with intelligent logical checks to identify and reject invalid responses. The collected data were subsequently desensitized by specialists for statistical analysis. All respondents were invited to complete a self-assessment questionnaire through mobile phones, which included demographic information, lifestyle, work factors and psychological factors. A total of 3,937 respondents completed the questionnaire, and of whom 128 were excluded due to unwilling to engage in this survey. Finally, 3,809 valid questionnaires were collected, with the efficiency response rate of 96.75%. All participants were the target population and were informed of the significance and value of this anonymous survey before accessing the link to complete the questionnaire, and were then asked to read and sign an electronic informed consent form. This study was approved by the Ethical Review Committee of School of Public Health, Shanghai Jiao Tong University School of Medicine (approval number: SJUPN-202108) and adhered to the principles of the Declaration of Helsinki.

Measures

General information

This survey contents included demographic variables (gender, age, educational level, marital status, hometown type), lifestyle characteristic (cigarette smoking, alcohol drinking, physical activity, sleep duration), occupation-related variables (type of occupation, professional title grade, years of working, length of public health service, daily working time, work overtime status, cumulative time involved in front-line prevention during the COVID-19 pandemic).

Work stress

Work stress was assessed by the Chinese version of the effort-reward imbalance (ERI) scale (25), which had good validity and reliability in Chinese medical staff (26, 27). The ERI scale contains 16-item of job effort (5 items, Cronbach's α=0.90) and job reward (11 items, Cronbach's α=0.82). All items were scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). ERI was measured by the effort-reward ratio calculated according to the formula: (effort total score) / [(reward total score) * (correction factor)], where the correction factor (5/11) considering the different number of items investigating job effort and reward (28). In this study, Cronbach's alpha value of the ERI scale was 0.87.

Social support

The Multidimensional Scale of Perceived social support (MSPSS) was used to measure the levels of social support. It consists of three dimensions of support from family, friends, and others, with a total of 12 items. Each item of MSPSS is rated on a 7-point Likert scale ranging from one point (strongly disagree) to seven point (strongly agree). The total MSPSS score is based on the sum of three subscale ranging from 12 to 84, with higher scores representing higher levels of perceived social support (29). The reliability and validity of the Chinese version of the MSPSS have been demonstrated in different surveys (5, 30). In the present study, the Cronbach's alpha was 0.98.

Self-efficacy

Generalized Self-Efficacy Scale (GSES) was developed to assess the level of self-efficacy through psychological states and behaviors that individuals might display when dealing with difficulties or setbacks. The Chinese version of this scale has been widely used among the Chinese population (31). This revised scale consists of 10 items, using 4-point Likert-type scale ranging from 1 (not at all true) and 4 (exactly true). The total scores range from 10 to 40, with higher scores reflecting a stronger sense of self-efficacy. Previous studies showed that the revised GSES scale has good reliability, validity (32). The Cronbach's α in the current study was 0.94.

Anxiety

The General Anxiety Disorder-7 (GAD-7) is widely used to measure the severity of anxiety symptoms in the Chinese population (33). The GAD-7 consists of seven items, and each item is rated on 4-point Likert-type scales (0 = "not at all," 1 = "a few days," 2 = "more than half the days," 3 = "almost every day"), summing to obtain a total score to measure the severity of anxiety symptoms. The higher the score, the more severe the anxiety. Participants with a total score of 0 to 4 were assessed as "normal mood," 5 to 9 were assessed as "mild anxiety symptoms," while scores above 10 or 15 represent moderate or severe anxiety, respectively (34). In this study, the Cronbach's α of the scale was 0.97.

Depression

Depressive symptoms were assessed using the Patient Health Questionnaire-9 Items (PHQ-9). The PHQ-9 is an internationally used depressive symptom assessment scale that contains 9 items to assess the severity of depressive symptoms (35). The degree of depressive symptoms is based on the four answers ranging from 0 (not at all) to 3 (nearly every day), with the total score range from 0 to 27. Higher scores indicate higher levels of depression (0–4 = no depression, 5–9 = mild depression, 10–14 = moderate depression, 15–19 = severe depression, ≥20 = extremely severe depression) (36). Excellent validity and reliability for the PHQ-9 scale have been showed in Chinese hospital workers (37), and the current study showing a Cronbach α of 0.94 for depression.

Statistical analysis

This study conducted descriptive analyses using frequencies and percentages for categorical variables and means ± standard deviations (SD) for continuous variables. Independent samples t-test and one-way ANOVA were used to compare differences in anxiety and depression scores across variable subgroups. The correlations between the main continuous variables (depression, anxiety, social support, self-efficacy, and ERI) were analyzed initially using the Pearson correlation method. Hierarchical multiple linear regression analysis was used to further explore the differential predictive effects of work stress on anxiety and depressive symptoms beyond social support and self-efficacy. The continuous anxiety and depression variables were considered as dependent variables, and demographic variables, lifestyle and COIVD-19-related and other work variables, work stress, social support and

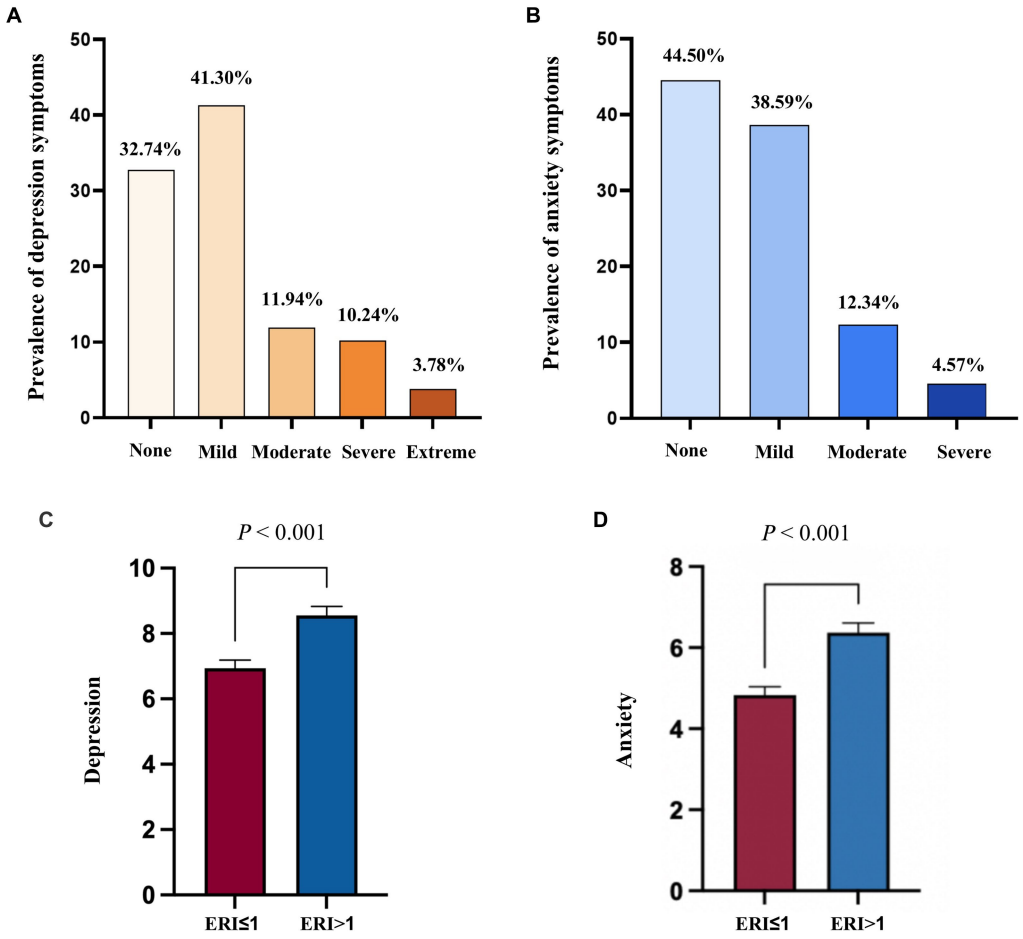

FIGURE 1
Distribution and differences in work stress and mental health problems among primary public health workers **(A)** Prevalence of depression symptom among primary public health workers; **(B)** Prevalence of anxiety symptom among primary public health workers; **(C)** Difference in depression symptom among primary public health workers with and without work stress; **(D)** Difference in anxiety symptom among primary public health workers with and without work stress; *p* calculated by t-test analysis.

self-efficacy were controlled for in stepwise regression models 1–3, respectively. Before the mediation model analysis, the Harman's single-factor test was conducted to examine the presence of common method bias in work stress, social support, self-efficacy, anxiety, and depression. It is generally considered that a variance of more than 40% for the first common factor indicated the presence of a common method bias (38, 39). Multiple mediation model analyses were conducted to examine the relationship between work stress, social support, self-efficacy, and mental health (depression and anxiety symptoms) using the maximum likelihood method. A bias-corrected bootstrap method (5,000 replicates) was applied to compute direct and indirect effects and 95% corrected confidence intervals (40). All statistical analyses were conducted using Mplus (version 8.4) and SPSS software (version 25.0). A two-tailed value of $p < 0.05$ was considered statistically significant.

Results

Characteristic of participants

Among the 3,809 PHWs, the number and percentage of public health physicians, general practitioners, nurses, administrative staff, medical technicians and other staff were 1,664 (43.69%), 298 (7.82%), 1,565 (41.09%), 32 (0.84%), 92 (2.41%) and 158 (4.15%), respectively. The prevalence of "no depression," "mild depression," "moderate depression," "severe depression" and "extremely severe depression" among all participants were 32.74%, 41.30%, 11.94%, 10.24% and 3.78%, respectively. Furthermore, 44.50% of public health workers had no anxiety symptoms, while 55.50% had different degrees of anxiety symptoms, including 38.59% with "mild anxiety," 12.34% with "moderate anxiety," and 4.57% with "severe anxiety" (Figure 1). The differences of anxiety and depression symptom scores among participants across general characteristics were shown in Table 1. In addition, PHW with work stress had significantly higher anxiety ($t = 9.46$; $p < 0.001$) and depression scores ($t = 8.53$; $p < 0.001$) than those without work stress (Figure 1).

Correlation between Key variables

Figure 2 presented the correlation matrix for key study variables. The Pearson correlation analysis showed that ERI was positively correlated with depression ($r = 0.35$, $p < 0.001$) and anxiety ($r = 0.36$, $p < 0.001$), but negatively related with social

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TABLE 1 Comparison of characteristics of anxiety and depression scores among public health workers (*N* = 3,809).

Characteristics	*N* (%)	Depression			Anxiety		
		Mean (SD)	t/F	*p*	Mean (SD)	t/F	*p*
Age (years)							
18–35	1729 (45.39)	8.04 (6.02)	21.69	<0.001	5.87 (5.20)	23.52	<0.001
36–45	1,333 (35.00)	7.96 (5.90)			5.77 (5.07)		
>45	747 (19.61)	6.43 (5.53)			4.42 (4.62)		
Gender							
Men	632 (16.59)	7.69 (6.42)	0.05	0.96	5.53 (5.33)	0.14	0.89
Women	3,177 (83.41)	7.70 (5.81)			5.56 (5.02)		
Educational level							
Junior college or below	986 (25.88)	7.60 (5.98)	0.27	0.77	5.45 (5.10)	1.172	0.31
Bachelor	2,743 (72.01)	7.73 (5.90)			5.57 (5.04)		
Master or above	80 (2.10)	7.98 (5.81)			6.34 (5.74)		
Marital status							
Single	575 (15.10)	8.29 (6.32)	3.48	0.03	6.07 (5.51)	3.52	0.03
Married or in a relationship	3,098 (81.33)	7.59 (5.83)			5.46 (4.97)		
Divorced or windowed	136 (3.57)	7.71 (6.09)			5.43 (5.28)		
Hometown type							
Large city	2010 (52.77)	8.05 (6.10)	8.30	<0.001	5.83 (5.23)	6.47	0.002
Medium-sized and small city	658 (17.27)	7.06 (5.53)			5.15 (4.88)		
Rural	1,141 (29.96)	7.45 (5.77)			5.30 (4.86)		
Type of occupation							
Public health physician	1,664 (43.69)	7.56 (5.88)	6.26	<0.001	5.53 (5.10)	5.86	<0.001
General practitioner	298 (7.82)	6.92 (5.55)			4.90 (4.77)		
Nurses	1,565 (41.09)	8.14 (6.04)			5.87 (5.15)		
Administrative staff	32 (0.84)	8.35 (6.27)			5.76 (4.86)		
Medical technicians	92 (2.41)	7.72 (5.43)			4.63 (4.05)		
Others	158 (4.15)	5.85 (5.15)			3.90 (4.44)		
Professional title grade							
None	387 (10.16)	7.29 (5.99)	2.25	0.08	5.03 (5.02)	3.16	0.02
Junior title	1,561 (40.98)	7.98 (6.03)			5.81 (5.21)		
Middle title	1770 (46.47)	7.56 (5.80)			5.46 (4.98)		
Vice-senior title or above	91 (2.39)	7.29 (5.90)			5.08 (4.44)		
Daily working time (hours)							
≤8	2,399 (62.98)	6.84 (5.41)	85.29	<0.001	4.81 (4.57)	88.53	<0.001
9–10	967 (25.39)	8.61 (6.16)			6.32 (5.45)		
>10	443 (11.63)	10.36 (6.87)			7.91 (5.80)		
Working years in the current institute (years)							
≤5	1,169 (30.69)	7.56 (5.78)	6.27	0.002	5.43 (5.04)	8.58	<0.001
6–15	1,536 (40.33)	8.09 (6.09)			5.94 (5.17)		
>15	1,104 (28.98)	7.30 (5.80)			5.14 (4.93)		
Length of public health service (years)							
≤5	1,354 (35.55)	7.94 (6.00)	5.45	0.004	5.73 (5.21)	5.06	0.006
6–15	1,677 (44.03)	7.78 (5.93)			5.65 (5.06)		
>15	778 (20.42)	7.09 (5.72)			5.04 (4.83)		

(Continued)

TABLE 1 (Continued)

Characteristics	N (%)	Depression			Anxiety		
		Mean (SD)	t/F	p	Mean (SD)	t/F	p
Work overtime							
Almost no overtime	395 (10.37)	5.21 (5.17)	129.38	<0.001	3.62 (4.43)	131.21	<0.001
Occasional overtime	2016 (52.93)	6.90 (5.24)			4.80 (4.48)		
Often overtime	1,398 (36.70)	9.55 (6.51)			7.18 (5.58)		
Cumulative time involved in front-line prevention during the COVID-19 pandemic (days)							
<40	373 (9.79)	6.53 (5.34)	432.62	<0.001	4.37 (4.36)	441.31	<0.001
40–79	428 (11.24)	7.13 (6.08)			4.99 (4.88)		
≧80	3,008 (78.97)	7.93 (5.95)			5.79 (5.16)		
Smoking							
No	3,621 (95.06)	7.68 (5.86)	0.74	0.46	5.54 (5.05)	0.42	0.68
Yes	188 (4.94)	8.06 (6.90)			5.71 (5.45)		
Drinking							
No	3,540 (92.94)	7.63 (5.87)	2.45	0.01	5.51 (5.03)	2.04	0.04
Yes	269 (7.06)	8.55 (6.50)			6.16 (5.55)		
Doing vigorous or moderate exercise							
No	1933 (50.75)	8.47 (6.12)	8.30	<0.001	6.20 (5.25)	8.09	<0.001
Yes	1876 (49.25)	6.90 (5.60)			4.88 (4.80)		
Daily sleep time (hours)							
<7	2041 (53.58)	9.41 (6.06)	20.40	<0.001	7.00 (5.30)	20.27	<0.001
≧7	1768 (46.42)	5.72 (5.08)			3.88 (4.22)		

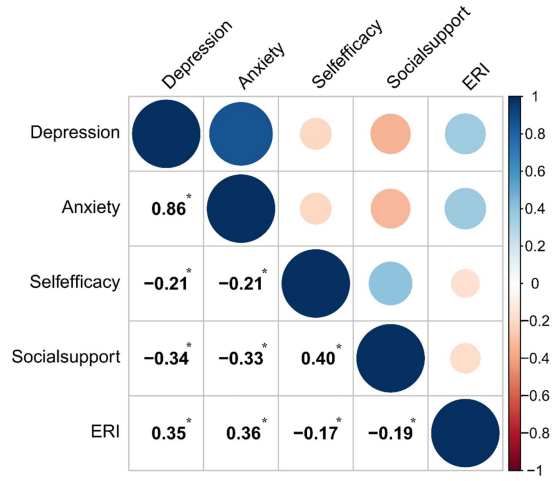

FIGURE 2
Correlations matrix plot of the main study variables. *$p < 0.001$.

support ($r = -0.19$, $p < 0.001$) and self-efficacy ($r = -0.17$, $p < 0.001$). Depression was negatively and significant correlated with social support ($r = -0.34$, $p < 0.001$) and self-efficacy ($r = -0.21$, $p < 0.001$). This significantly negative correlations were also observed between anxiety and social support and self-efficacy ($p < 0.001$). The validity of Hypothesis 1 was confirmed by the results of the correlation analysis.

Hierarchical multiple regression analysis

In the first step, demographic variables, lifestyle and COIVD-19-related and other work variables accounted for 17.0% and 17.1% of the variance in anxiety and depression symptoms, respectively (Table 2). In a second step, work stress was introduced into the model and was positively associated with anxiety and depressive symptoms, explaining 5.8% and 5.1% of the variance, respectively (standardized β=0.266, $p < 0.001$ and standardized β = 0.250, $p < 0.001$). The relationship between work stress and anxiety and depressive symptoms remained significant when social support and self-efficacy were finally added to the model, explaining 5.9% and 6.4% of the variance in anxiety and depression, respectively. The results of the above hierarchical multiple regressions also provided the basis and theoretical support for the complex relationships constructed by the structural equation model.

Mediating effect analysis

The results showed that five factors with eigenvalues greater than 1, and the first factor explained 32.40% of the variance (less than 40%). Therefore, it may be deduced that the variables involved in this study do not have significant common method bias. The results of mediation pathway model in the association between work stress and mental health were shown in Table 3 and Figure 3. All path coefficients, including direct and indirect effects, between work stress and mental health were statistically significant ($p < 0.001$,

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TABLE 2 The hierarchical linear regression analysis for mental health problems (N = 3,809).

Variables	Depression			Anxiety		
	Step 1 (β)	Step 2 (β)	Step 3 (β)	Step 1 (β)	Step 2 (β)	Step 3 (β)
Gender (Ref: female)	−0.016	−0.007	−0.027	−0.017	−0.008	−0.028
Age (Ref: 18-35)						
36–45	−0.015	−0.012	−0.012	−0.018	−0.014	−0.014
>45	−0.096***	−0.081***	−0.076***	−0.098***	−0.082***	−0.077***
Educational levels (Ref: junior college or below)						
Bachelor	−0.033*	−0.040*	−0.037*	−0.042*	−0.049**	0.046**
Master or above	−0.002	−0.001	−0.001	0.011	−0.010	−0.009
Marital status (Ref: single)						
Married or in a relationship	−0.051**	−0.047**	−0.039	−0.051**	−0.047**	−0.039*
Divorced or windowed	−0.018	−0.011	−0.010	−0.022	−0.015	−0.014
Hometown type (Ref: large city)						
Medium-sized and small city	−0.057***	−0.050***	−0.053***	−0.049**	−0.042**	−0.045**
Rural	−0.042**	−0.036**	−0.043***	−0.048**	−0.042**	−0.048**
Smoking (Ref: no)	0.003	0.005	0.003	0.002	0.001	−0.001
Drinking (Ref: no)	0.033*	0.027	0.026	0.028	0.022	0.020
Physical activity (Ref: no)	−0.101***	−0.089***	−0.065***	−0.097***	−0.085***	−0.061***
Sleep time (Ref: <7 h)	−0.251***	−0.215***	−0.188***	−0.249***	−0.211***	−0.185***
Type of occupation (Ref: others)						
Public health physician	0.032	0.021	0.026	0.065*	0.053	0.057*
General practitioner	0.021	0.020	0.022	0.032	0.031	0.033
Nurses	0.088***	0.081**	0.076**	0.101***	0.094***	0.090***
Professional title (Ref: None)						
Junior title	0.050	0.038	0.031	0.074***	0.061**	0.054*
Middle title	0.051	0.029	0.024	0.079**	0.057*	0.051*
Vice-senior title or above	0.012	0.005	0.007	0.015	0.008	0.009
Daily working time (Ref: ≤8)						
9–10	0.040*	0.019	0.010	0.036*	0.014	0.005
>10	0.073***	0.047***	0.051***	0.074***	0.047**	0.051**
Yeas of working in the current institute	0.041	0.032	0.024	0.023	0.013	0.006
Length of public health service	−0.041	−0.049*	−0.051*	−0.037	−0.045*	−0.047
Work overtime (Ref: almost no overtime)						
Often overtime	0.245***	0.156***	0.145***	0.220***	0.126***	0.115***
Occasional overtime	0.112***	0.063*	0.046*	0.080**	0.028	0.012
Cumulative time involved in front-line prevention during the COVID-19 pandemic in Shanghai (Ref: <40)						
40–79	0.046*	0.049*	0.044*	0.050*	0.053**	0.049**
≧80	0.051*	0.070***	0.045*	0.035*	0.062**	0.043*
Work stress (ERI)		0.250***	0.201***		0.266***	0.219***
Social support			−0.241***			−0.233***
Self-efficacy			−0.045***			−0.041**
R^2	0.171	0.222	0.286	0.170	0.228	0.287
ΔR^2	0.171	0.051	0.064	0.170	0.058	0.059

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$. β coefficient is the standardized coefficient.

TABLE 3 Direct, indirect, and total effects of the chain mediation model between work stress and mental health problems.

Model pathways	Effect (standardized)	SE	95% CI	*p*
Total effect of X on Y	0.384	0.016	0.352–0.415	<0.001
Direct effect of X on Y	0.325	0.016	0.294–0.356	<0.001
Total Indirect effect of X on Y	0.059	0.007	0.046–0.074	<0.001
Indirect effect 1: X → M1 → Y	0.046	0.006	0.036–0.058	<0.001
Indirect effect 2: X → M2 → Y	0.008	0.003	0.003–0.014	0.004
Indirect effect 3: X → M1 → M2 → Y	0.005	0.002	0.002–0.009	0.001

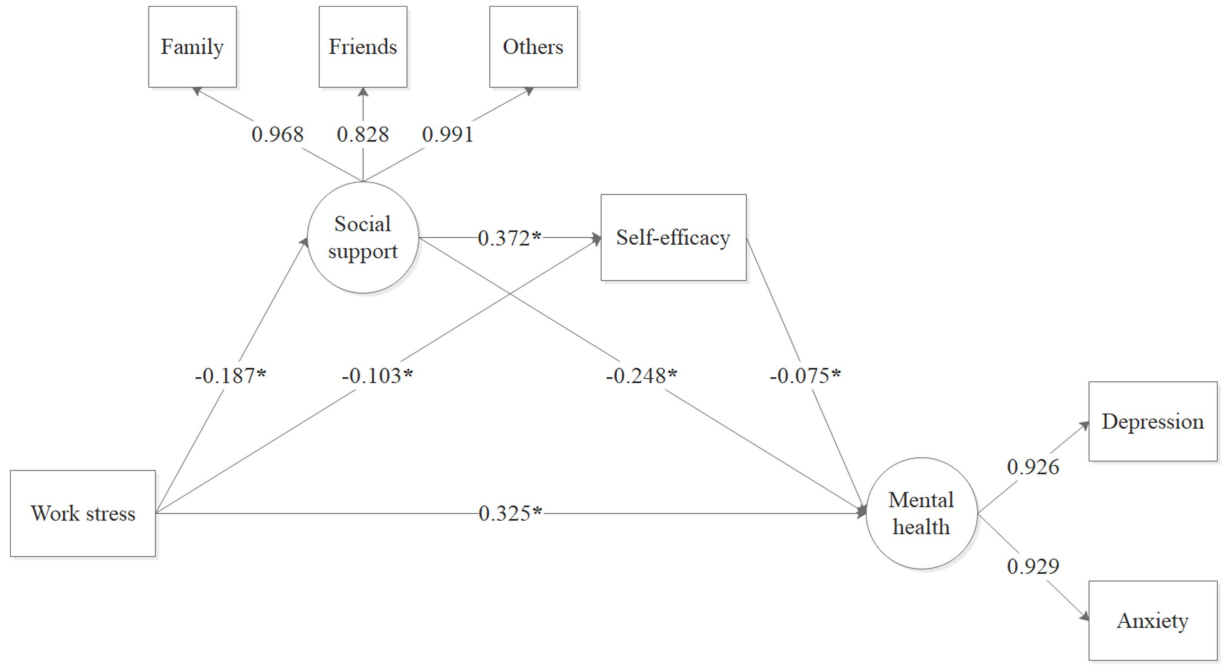

FIGURE 3
The mediating role of social support and self-efficacy in the relationship between work stress and mental health problems. *$p < 0.001$.

bias-corrected 95% confidence interval not including 0). The standardized direct effect of work stress on depression and anxiety was 0.325 ($p < 0.001$). The results indicated that work stress had a significant negative effect on social support ($\beta = -0.187$, $p < 0.001$) and self-efficacy ($\beta = -0.103$, $p < 0.001$). In addition, social support ($\beta = -0.248$, $p < 0.001$) and self-efficacy ($\beta = -0.075$, $p < 0.001$) had a significant negative influence on depression and anxiety. Notably, social support was positively associated with self-efficacy ($\beta = 0.372$, $p < 0.001$). The chain mediating effect model were acceptable according to the model fit index (model fit: $\chi 2/df = 2.98 < 3$ ($p < 0.001$), Tucker-Lewis index (TLI) = 0.982, comparative fit index (CFI) = 0.991, standardized root mean square residual (SRMR) = 0.026 and root mean square error of approximation (RMSEA) = 0.068 ($p < 0.001$)).

Discussion

Currently, there are limited epidemiological evidence on the association between work stress and mental health among primary public health workers. Overall, the prevalence of work stress and mental health problems (i.e., depression and anxiety) among community PHWs was 67.3 and 55.5%, respectively. The prevalence of mental health problems in our study was significantly higher than the combined prevalence of general healthcare workers reported in several meta-analyses during the COVID-19 pandemic (14, 41–43), which also emphasized the importance of focusing on the mental health for primary PHWs. Consistent with previous hypotheses, the current study showed that work stress had direct and indirect effects on depression and anxiety in primary PHWs. Furthermore, the mediating effect of social support and self-efficacy buffered the positive predictive effects of work stress on depression and anxiety. Exploring the underlying mechanisms and pathways between work stress and mental health, and identifying risk factors after a major public health event, is beneficial in preventing the occurrence and progression of mental health problems in primary PHWs.

As assumed, work stress was found to be directly associated with depression and anxiety among community PHWs, which supported and expanded the previous findings on occupational mental health among primary healthcare workers or medical staff.

For example, a cross-sectional study conducted in Brazil found a significant positive relationship between ERI and common mental disorders among healthcare workers (44). Similar results were found for the significant positive effects of work stress on anxiety and depression among Chinese healthcare workers and medical staff (45, 46). Therefore, future research should pay more attention to the work and psychosocial situation of primary PHWs. Meanwhile, the related institutions are recommended to adopt positive coping strategies, such as improving job benefits, providing solid job security and continuous mental health services, to prevent and alleviate mental health problems caused by work stress (47).

As predicted, social support played a significant mediating role in the association between work stress and mental health among community PHWs, which explained 12.0% of the effect of work stress on anxiety and depression. This significant direct effect is consistent with the previous studies conducted with medical staff and primary healthcare workers (19, 45, 48). Individuals with higher levels of social support tended to experience professional achievement and increased confidence in coping with stressful situations, which contributed to reducing anxiety (49). Hence, nurses with higher levels of social support had positive emotional states (22, 50). On the contrary, medical staff who have lower levels of social support are at higher risks of developing depressive symptoms (51). Therefore, higher levels of social support may mitigate the negative effects of work stress on depression and anxiety.

In line with hypothesis, self-efficacy mediated the relationship between work stress and mental health among PHWs. This means that work stress can reduce PHWs' self-efficacy, which in turn can lead to depression and anxiety. Individuals with higher self-efficacy have greater confidence in their ability to handle and overcome work-related challenges and more likely to adopt positive coping strategies to achieve successful and satisfying performance, which may explain why self-efficacy can buffer the effects of work-related stress on mental health (32, 52). Thus, high occupational stress among hospital sanitation workers leads to reduce self-efficacy, which in turn puts them at higher risk of suffering from poor mental health during the COVID-19 epidemic (21). The current study conducted in primary PHWs fulfilled and expanded inadequate research findings on self-efficacy, while highlighting the need for interventions that focus on enhancing self-efficacy to alleviate the adverse effects of job stress on mental health.

Notably, the chain mediation role of social support and self-efficacy in the association between work stress and mental health (depression and anxiety) was first demonstrated in primary PHWs. The long-term accumulation of work-related stress can lead to lack of social support from family, friends and others due to busy work, and consequently losing self-confidence to cope with setbacks and difficulties, eventually leading to a significant increase in anxiety and depression (22). Moreover, social support, as a protective factor for self-efficacy, can provide additional external resources to help improve self-efficacy when individuals perceive work stress (23). And individuals with higher self-efficacy in the process of connecting with people who provide social support may positively cope with work stress and effectively reduce the adverse effects of work stress on mental health (53). Therefore, the current study showed the sequential mediating effect of social support and self-efficacy in the relationship between work stress and mental health, which also provides a potential mechanism for the interaction between individual internal characteristics (e.g., self-efficacy) and external environment (e.g., social support). The indirect effect sizes of social support and self-efficacy on work stress and mental health were not high, respectively, although such indirect effects were shown to be significant. This might be related to factors associated with blocking social support such as lockdowns and social isolation during COVID-19. The relationship and pathways between work stress and mental health are complex, which in turn indicates the need to explore other pathways and potential mechanisms between work stress and mental health. Finally, based on these, related institutions can implement more targeted psychological interventions to improve the psychological health and service quality of community PHWs.

Previous literature suggested that some psychological interventions might reduce anxiety and depressive symptoms by increasing self-efficacy and accessing more social support. For example, effective coping strategies, such as setting up special rest areas and counseling rooms, providing individual case work and group work, using online social platforms and developing healthy and optimistic behaviors, could obtain adequate social support from within or outside the family for coping with work stress and challenges, and reducing anxiety and depression (48). Group-based activities and psychiatric training that improved self-efficacy could reduce depression and anxiety symptoms (32, 53). In addition, interventions that simultaneously consider the interactive effects of social support and self-efficacy may be equally important in reducing the risk of anxiety and depression.

Several limitations of the current study should be considered. First, we failed to examine the causal relationships between work stress, social support, self-efficacy, and mental health due to the limitation of cross-sectional design. Therefore, the intrinsic mechanisms between variables should be further explored in more detail, combined with experimental and long-term longitudinal studies. Second, the main variables in this study were assessed by self-rating scales, which may not avoid resulting recall and social desirability bias. Third, primary PHWs information in this study was collected from all community health centers, but only from one city in China. Therefore, future studies need to conduct surveys in more cities to improve the generalizability of our findings.

Despite the above limitations of this study, this large-scale cross-sectional study with large sample sizes extended the literature on the direct and indirect relationship between work stress and mental health among primary PHWs. The findings of this study shed light on the critical role of social support and self-efficacy in alleviating work stress-induced anxiety and depressive symptoms among community PHWs. The present study contributed to explore the chain mediating pathways of social support and self-efficacy between work stress and mental health, which finding provides a new perspective on interventions to address work stress and mental health among primary PHWs. Therefore, this study has significant public health implications and provides a theoretical and practical basis for government and managers of primary health service center institutions to adopt targeted interventions.

Conclusion

This study showed a high prevalence of depression and anxiety symptoms among primary public health workers after the COVID-19 pandemic outbreak. Moreover, this study revealed that work stress has a significant positive direct effect on depression and anxiety symptoms among PHWs, with social support and self-efficacy playing an independent mediating role. These findings may provide a theoretical basis for developing psychosocial interventions for mental health of primary PHWs in China. Therefore, related healthcare institutions should pay more attention to the mental health of primary public workers, and enhancing social support for public health workers and improving their self-efficacy may be an effective approach to alleviate mental health in follow-up interventions.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the corresponding authors upon reasonable request.

Ethics statement

The studies involving human participants were reviewed and approved by the Ethical Review Committee of School of Public Health, Shanghai Jiao Tong University School of Medicine (approval number: SJUPN-202108) and adhered to the principles of the Declaration of Helsinki. 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

YD: conceptualization, investigation, data curation, formal analysis, and writing – original draft. QZ: investigation, methodology, formal analysis, validation, and writing – original draft. RC: investigation, validation, and data curation. RW: investigation, methodology, and data curation. HH: conceptualization, supervision, and writing – review & editing. YC: conceptualization, funding acquisition, supervision, and writing review & editing. 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.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1236645/full#supplementary-material

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Cytokine associated with severity of depressive symptoms in female nurses in Korea

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Background: Depression has been associated with the risk of developing physical illnesses and diseases. Inflammatory hypotheses of immunoactive and dysregulated cytokine production have been proposed to describe this association; however, data pertaining to the high prevalence of depression among nurses are limited.

Objective: This study aimed to use a comprehensive immune-profiling approach to determine whether an abnormal profile of circulating cytokines could be identified in nurses with self-reported depression and whether this profile is associated with the severity of depression.

Methods: We investigated a cohort of 157 female nurses in Korea. The self-report Patient Health Questionnaire was used to measure the depression levels of nurses. In addition, peripheral blood samples were collected and used to measure the cytokine profile using the Luminex multiplexing system. Generalized gamma regression analyses were conducted to evaluate the association between cytokine and depressive symptoms.

Results: Regarding severity of depressive symptoms, 28.0% of nurses had moderately severe depression while 9.6% had severe depression. Moderately-severe depressive symptoms in nurses were associated with elevated levels of interleukin-6 ($B = 0.460$, $p = 0.003$), interleukin-8 ($B = 0.273$, $p = 0.001$), and interleukin-18 ($B = 0.236$, $p = 0.023$), whereas interferon-gamma levels ($B = -0.585$, $p = 0.003$) showed the opposite profile. Participants with severe depressive symptoms presented decreased interferon-gamma levels ($B = -1.254$, $p < 0.001$).

Conclusion: This study demonstrated that proinflammatory cytokines were associated with depression among nurses. This calls for early detection and intervention, considering the mechanisms linking depression to physical illness and disease.

KEYWORDS

cytokine, depression, Korea, generalized gamma regression, nurse

1. Introduction

Depression is one of the most common and harmful mental disorders, affecting about 15–20% of the general population (1, 2). The number of depression cases reported worldwide increased by 49.9% from 1990 to 2017 (3). Generally, depression causes unhealthy behaviors, such as smoking, reduced physical activity, and excessive calorie intake (4, 5) and has been shown to be associated with increased inflammation, metabolic dysregulation, increased obesity, and worsening chronic diseases (6–8). Though several potential psychophysiological mechanisms explain this association, the inflammatory hypothesis of immune hyper-activation and dysregulated cytokine production has been widely supported (6, 9–11).

In a meta-analysis of inflammatory markers of depression, inflammatory cytokines have been shown to be representative biomarkers (12, 13). Cytokines are typically pro- and anti-inflammatory, and their balance determines the outcome of the inflammatory response (14). In a systematic review and meta-analysis of 82 studies measuring cytokine levels in healthy controls and participants with major depressive disorder (MDD), the latter had elevated peripheral levels of chemokine ligand 2, interleukin (IL)-1 receptor antagonist, 2, 6, 10, 12, 18, and tumor necrosis factor-alpha (TNF-α) and lower interferon-gamma (IFN-γ) levels (12). However, the direction of association between cytokine levels and severity of depression is ambiguous (9, 12, 15, 16). In patients with MDD, a linear correlation was observed between IL-1β, IL-8, and TNF-α and the severity of depression, whereas the transforming growth factor-beta (TGF-β) was significantly decreased in patients with chronic hepatitis B infection who had mild depression compared to those without depression and with moderate to severe depression (15, 16). Further evidence of the role of inflammation in psychiatric disorders has shown that anti-inflammatory agents influence changes in cytokine levels in MDD in a meta-analysis of clinical trials, indicating antidepressant effects (13, 17).

Neurobiological pathways involved in depression include inflammatory cytokine signals that initiate an inflammatory response in the brain and interfere with the activity of important behavioral regulatory neurotransmitters, including norepinephrine, dopamine, and serotonin (6, 18). Inflammatory cytokines can affect hypothalamic–pituitary–adrenal (HPA) regulation (18), causing the early onset of physical symptoms, such as pain, fatigue, loss of appetite, reduced exercise, sleep disorders, and reduced work performance and productivity (19). Prolonged activation of inflammation is detrimental to physical and mental well-being (19, 20). In recent years, nurses' awareness of the importance of depression has increased because it can increase the risk of missed nursing care as well as threaten their own health (21–23).

The prevalence of depression is about twice as high among nurses as the general population (22, 24, 25). Nurses experience greater work stress than other healthcare professionals (21) and are at an increased risk of depression owing to shift work (26) and exhaustion owing to consistently caring for patients (27). Recently, researchers have identified a close association between depressive symptoms in nurses and abnormal eating habits (5, 28), increased risk of autoimmune diseases (29), and ovarian cancer (30). However, evidence for the role of inflammation in depression in the nurse population is limited. Therefore, understanding how depression is associated with inflammatory biomarkers among nurses and signaling the need for prevention and intervention are important.

The present study aimed to use a comprehensive immune-profiling approach to determine whether an abnormal profile of circulating cytokines could be identified in nurses with self-reported depression and whether this profile is associated with the severity of depression.

2. Methods

2.1. Study design and sample

The Korean Nurses' Health Study is a prospective cohort study that began as a web-based survey of registered female nurses between the ages of 25 and 45 residing in Korea (31). It aimed to investigate the health status, lifestyle, health behavior, and illness of female nurses of childbearing age and identify industrial health, including work schedules, work conditions, work-related stress, and work risk exposure. A total of 20,613 registered female nurses responded to the basic questionnaire (Module 1) between July 2013 and November 2014. Participants in Module 1 were asked via text message to complete a follow-up online survey. Eight survey modules (Modules 2–9) were then opened to participants from 2014 to 2021.

In Module 5, 11,527 people participated in the survey from November 2016 to March 2017, and blood samples were collected from 1,703 nurses working in general hospitals who voluntarily agreed to provide blood. In this study, data from 1,703 individuals who provided blood samples in Module 5 and data from 157 individuals without missing data on key study variables, including cytokine levels, were used for analysis. Those who underwent medical diagnoses or suffered from mental disorders, pregnant or postpartum women, and those who had taken antidepressants or drugs with immune-regulatory effects such as glucocorticoids were excluded.

This study was approved by the Institutional Review Board of the affiliated university (IRB No. 117-4). Anonymity and confidentiality were assured, and informed consent was obtained from all participants.

2.2. Measurement of variables

In this study, the cytokine profile was used as the dependent variable, and depression was used as the independent variable. The covariates included personal characteristics, health behavioral factors, and work status.

2.2.1. Depression

Depression was measured using the Patient Health Questionnaire (PHQ-9), a nine-item self-report measure that assesses the severity of depressive symptoms. It evaluates both physical and emotional depressive symptoms and corresponds to the DSM diagnostic criteria for MDD (21). It consists of a 4-point Likert scale ranging from 0 (not

Abbreviations: CCL, Chemokine ligands; HPA, Hypothalamic-pituitary-adrenal; IFN-γ, Interferon-gamma; IL, Interleukins; MDD, Major depressive disorder; PHQ-9, Patient Health Questionnaire; TGF-α, Transforming growth factor-alpha; TGF-β, Transforming growth factor-beta; Th1, T-helper type-1; Th2, T-helper type-2; TNF-α, Tumor necrosis factor-alpha.

at all) to 3 (nearly every day) and has a score ranging from 0 to 27. Higher scores indicated greater symptoms of depression. The PHQ-9 comprises five categories of depression severity: none-minimal [0–4], mild [5–9], moderate [10–14], moderately severe [15–19], and severe [20–27] (32). In our study, Cronbach's alpha for the PHQ-9 was 0.95.

2.2.2. Cytokine profile analysis

Fasting peripheral blood samples were collected via intravenous puncture. After separating the serum through centrifugation, it was stored at −80°C until analysis. All samples were analyzed under the same conditions on the same day. Sixteen cytokine immunoassays were performed using the Luminex multiplexing system with the magnetic bead method and read on Luminex xMAP (Komabiotech, Seoul, Korea). Custom kits, including chemokine (C-C motif) ligand 2 (CCL2), chemokine (C-E-C motif) ligand 1 (CXCL1), interferon gamma (IFN-γ), IL-1RA, IL-1β, IL-2, IL-4, IL-5, IL-6, IL-7, IL-8, IL-10, IL-12, IL-18, transforming growth factor-alpha (TGF-α), and TNF-α, were used. The results are presented as the concentration of cytokines in the serum (pg/mL).

2.2.3. Covariate information

To investigate the association between depression and cytokine profiles, covariates, including sociodemographic characteristics, health behavior, and work-related factors, were adjusted based on prior literature. Demographic factors included age (12, 26, 33), level of education (34), and marital status (34). Health behavioral factors included alcohol consumption (35) and body mass index (13, 26), and rotational shift work (26) was included as a work-related factor. None of the participants smoked; therefore, smoking was not included as a covariate.

2.3. Data analysis

Statistical analysis was performed using SPSS version 26.0 (IBM Corp., Armonk, NY, United States) based on a significance level of $\alpha = 0.05$. Descriptive statistics were used for absolute and relative proportions for categorical data and means and standard deviations for continuous variables. One-way analyses of variance and Chi square test were used to investigate quantitative differences in the severity of depression. The two-sample Student's *t*-test was performed to compare the serum levels of cytokines according to the severity of depressive symptoms ("no" vs. moderately severe, "no" vs. severe); variables were natural log or square root transformed in the final model if required to meet the normality assumption for the analyses.

To measure the effect of depression levels on cytokine profiles, we performed generalized gamma regression with the severity of depression = no as a reference variable. We controlled for factors related to demographic characteristics, health behavior, and rotational shift work. Gamma regression is a generalized linear model that is evaluated as an appropriate model when data are skewed to the right of non-negative and heteroscedasticity. Compared to regression analysis, which transforms the dependent variable using an exponential function, it does not require transformation and is easier to interpret (36, 37). Gamma regression was chosen because our cytokine data showed non-normal unequal variances (38, 39).

3. Results

3.1. Comparison of the demographic characteristics of participants

The mean age of the participants was 32 years (standard deviation, 5.9). The majority of 157 nurses were unmarried (59.9%) and had bachelor's degrees (63.7%). Most participants had shift work (75.8%). The demographic characteristics of the depression-severity groups are shown in Table 1. There was no significant difference between the groups in age, marital status, level of education, alcohol consumption, body mass index, and rotational shift work ($p > 0.05$). Depression levels in the PHQ-9 are classified into five categories according to the score; however, our study includes only three categories, as none of our participants had either mild or moderate depression. The severity of depressive symptoms was as follows: 98 (62.4%) participants had none-minimal depression (2.03 ± 1.45), 44 (28.0%) had moderately severe depression (16.45 ± 1.34), and 15 (9.6%) had severe depression (22.13 ± 2.13).

3.2. Comparison of cytokine profile by the severity of depressive symptoms

The serum levels of 16 cytokines according to the severity of depression are shown in Figure 1; Table 2. IL-8 levels were significantly different when stratified by severity, as shown in Figure 1 in red ($p = 0.046$).

3.3. Association between cytokine and depressive symptoms

Table 3 shows the results of analyzing the association between cytokine profiles and severity of depression using generalized gamma regression analyses. After controlling for all covariates, we found that the moderately severe depression group had increased IL-6 ($p = 0.003$), IL-8 ($p = 0.001$), and IL-18 ($p = 0.023$) levels but decreased IFN-γ ($p = 0.003$) levels. The severe depression group had lower levels of IFN-γ ($p < 0.001$) than the no-depressive symptom group.

4. Discussion

This study investigated the association between depression severity and inflammatory cytokine profiles among female nurses of childbearing age. We found that self-reported depressive symptoms were associated with pro-inflammatory cytokines. Serum IL-6, IL-8, IL-18, and IFN-γ levels are estimated biomarkers for depression severity in nurses, showing that they may increase the risk of inflammatory dysregulation when nurses have high depressive symptoms. Recent changes in peripheral cytokines and chemokines in depression have shown that patients with MDD have increased average levels of pro-inflammatory immune markers and decreased levels of anti-inflammatory immune markers (12, 13). In our study, moderately severe depressive symptoms in nurses were associated with elevated levels of IL-6, IL-8, and IL-18, whereas IFN-γ showed the opposite profile. Participants with severe depressive symptoms

TABLE 1 Demographic characteristics of participants.

Demographics	All ($n = 157$)	Severity of depression; n (%) of nurse			F	p
		None-minimal ($n = 98$)	Moderately-severe ($n = 44$)	Severe ($n = 15$)		
Age, years, mean ± SD	32.3 ± 5.9	32.7 ± 6.0	31.9 ± 6.3	31.3 ± 4.2	0.461	0.632
Marital status					1.489	0.229
Single	94 (59.9)	54 (55.1)	31 (70.5)	9 (60.0)		
Married	63 (40.1)	44 (44.9)	13 (29.5)	6 (40.0)		
Level of education					0.199	0.819
3-year college	34 (21.7)	22 (22.4)	8 (18.2)	4 (26.7)		
4-year college	100 (63.7)	63 (64.3)	29 (65.9)	8 (53.3)		
Master's or higher	23 (14.6)	13 (13.3)	7 (15.9)	3 (20.0)		
Alcohol consumption					0.319	0.728
Never	33 (21.0)	21 (21.4)	8 (18.2)	4 (26.7)		
Occasionally	105 (66.9)	64 (65.3)	31 (70.5)	10 (66.7)		
Frequently	19 (12.1)	13 (13.3)	5 (11.4)	1 (6.7)		
Body mass index					0.936	0.394
Underweight	15 (9.6)	11 (11.2)	2 (4.5)	2 (13.3)		
Normal	90 (57.3)	52 (53.1)	30 (68.2)	9 (60.0)		
Overweight	51 (32.5)	35 (35.7)	12 (27.3)	4 (26.7)		
Shift work					0.647	0.525
No	38 (24.2)	26 (26.5)	10 (22.7)	2 (13.3)		
Yes	119 (75.8)	72 (73.5)	34 (77.3)	13 (86.7)		
PHQ-9 score, mean ± SD		2.03 ± 1.45	16.45 ± 1.34	22.13 ± 2.13	−38.705	<0.001**

**$p < 0.01$; PHQ-9, Patient Health Questionnaire; SD, standard deviation.

showed decreased levels of IL-6, IL-8, IL-18, and IFN-γ. These results suggest a state of immune system dysregulation.

Increased levels of pro-inflammatory cytokines IL-6, IL-8, and IL-18 in nurses with moderately-severe depressive symptoms support a meta-analysis of inflammatory markers in depression studies that identify depression as a pro-inflammatory state (12). During acute infection, dendritic cells and macrophages produce IL-6, which is secreted in response to acute inflammatory stimulation (12). IL-8, which plays a pro-inflammatory role, mediates the movement of neutrophils to the inflammatory site as chemokines and influences the immune response in the acute inflammatory stage (40). IL-18 may have a significant effect on the pathophysiology of the CNS and contribute to neuro-inflammation (41). Higher levels of depression symptoms were associated with increased levels of pro-inflammatory biomarker IL-6 in caregivers caring for an older person in the community (42). Pregnant women with severe anxiety and accompanying depressive symptoms showed a significant increase in serum levels of IL-6 and TNF-α (43). Similar to our results, this suggests that nurses with high depressive symptoms are at risk of increased inflammation, and that changes in cytokine concentrations may be affected by the intensity of depressive symptoms.

Contrastingly, the blood samples of nurses with severe depression in our study showed a decrease in pro-inflammatory cytokine levels. Regarding the severity of depression, some studies did not find a relationship between cytokines and disease severity (44, 45) or showed a negative correlation between serum cytokine levels and depression severity in patients with major depression (46), pregnant women with depressive symptoms (47), and patients with breast cancer (48). In the present study, IL-6, IL-8, and IL-18 levels increased with moderately severe depressive symptoms but decreased with severe depressive symptoms. This finding suggests the dysregulation of the HPA axis. The hypothalamus is the central site for regulating autonomous body functions and adapting behavior to environmental stimuli and is involved in depression pathology (49). The interaction between cytokines and HPA activity has been observed to be dependent on depression (50). Adaptation of the HPA response was maximized when faced with a severe stressor, and the HPA response to a stressor repeated daily was shown to decrease gradually (51). In other words, a state of reduced immune response is considered to result from a blunt HPA axis response. However, the validation of these results requires further research with broader sample profiles.

In our study, the level of IFN-γ decreased in both depressive and non-depressive symptom groups. This was consistent with the meta-analysis results of 17 studies showing that patients with MDD had decreased IFN-γ levels compared with healthy controls (13). However, another meta-analysis that considered smoking status reported increased IFN-γ levels (12). The nurses in the study were in a controlled, tobacco-free state, and the results of IFN-γ were more controversial. Given that it has not previously been consistent in a

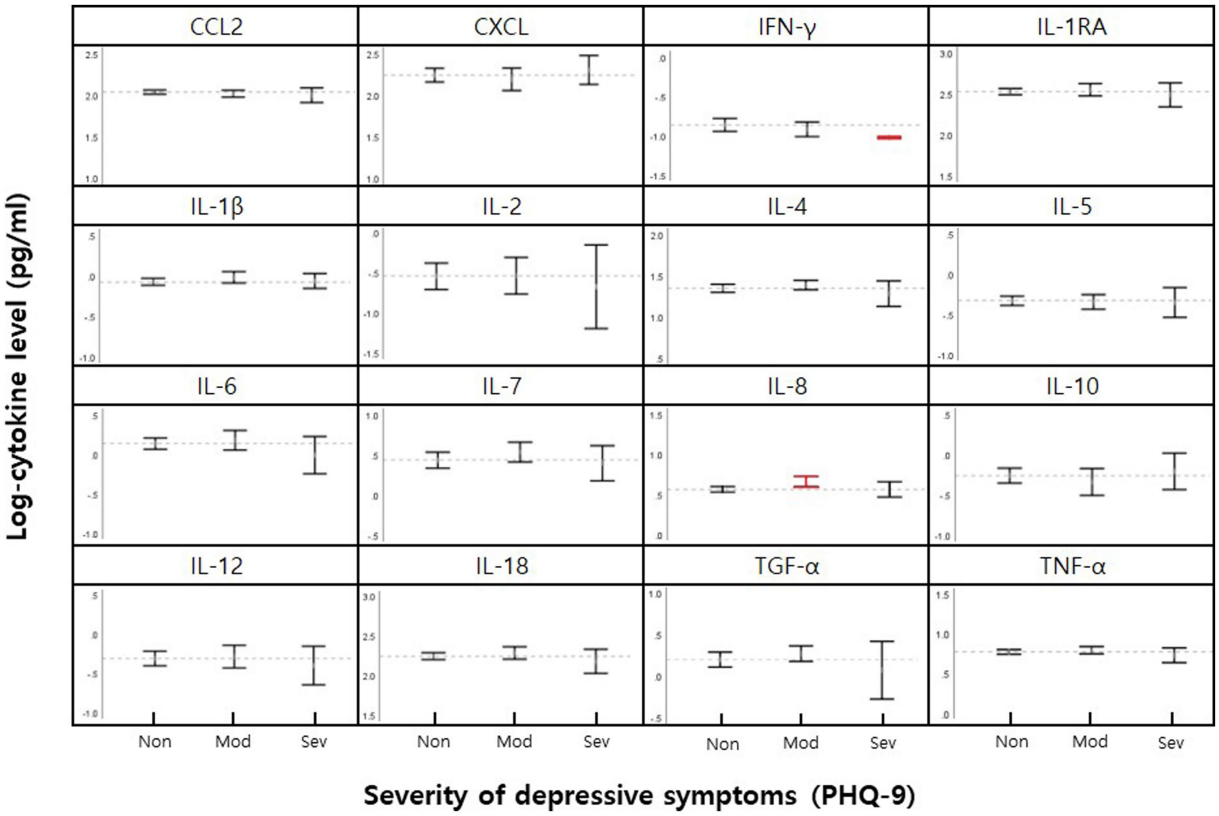

FIGURE 1
Mean cytokine levels in female nurse grouped by none-minimal (Non), moderately-severe (Mod), and severe (Sev) depressive symptoms. 95% CI for means for each cytokine are shown within vertical brackets. The dotted horizontal line within each cytokine panel represents the average value for no depressive symptoms. Statistically significant comparisons of depression severity level ($p < 0.05$, Table 2) are in red.

smaller meta-analysis (52) related to IFN-γ, we believe that more studies on IFN-γ in relation to depression are needed.

Both TNF-α and IL-2 are well known pro-inflammatory cytokines that play a central role in the early stages of the immune response, highlighting the systemic nature of inflammatory conditions (53). Higher levels of depression symptoms were associated with increased levels of pro-inflammatory biomarkers CRP and TNF-α in older nurses working in the United States (54). In this study, no significant results were observed for TNF-α and IL-2 levels; however, there exists an inverted U-shape relationship between the severity of depressive symptoms and TNF-α and IL-2 levels. These results may support the notion that chronic stress does not control immune function but may lead to the suppression of the immune response (53). However, further studies using longitudinal samples that can reflect acute and chronic stress are needed to confirm these findings.

Notably, the participants in this study were nurses with self-reported depressive symptoms, not diagnosed with depression. Because of their healthcare knowledge, nurses are more likely to engage in healthy lifestyle habits such as no smoking and regular exercise; however, because of work shifts, most of the time, they are involved in physically demanding tasks, such as standing for long. The nature of labor-intensive work can affect systemic inflammation and depression. Screening nurses for depression and providing early intervention may be ways to improve health before symptoms worsen, leading to physiological dysregulation.

This result should be considered in light of several limitations. First, although the Korean Nurses' Health Study is a large cohort study, participants who provided blood were conveniently extracted and the sample size was relatively small. Additionally, the samples were all female, with a limited ability to investigate potential gender differences. Previous studies have shown sex differences in both depression and inflammation, and women are more likely to experience a more detrimental effect of depression on inflammation. Second, causality could not be inferred by considering the cross-sectional characteristics of the current study. Future longitudinal studies are needed to address whether nurses who self-reported depressive symptoms are within, or fluctuate between, cytokine signatures and disease severity categories over time. Finally, various cytokines have been studied; however, the results do not reflect changes in the overall immune network response, such as immune cell abnormalities. Further studies of other immune cells, such as the ratio of T-helper type-1 (Th1) cells to type-2 (Th2) cells are needed, which can provide a comprehensive understanding of changes in overall immune network responses.

5. Conclusion

Our study showed inflammatory cytokine profiles in female nurses with depressive symptoms. Serum IL-6, IL-8, IL-18, and

TABLE 2 Comparison of mean cytokine levels in female nurses.

	Severity of depressive symptoms			Non vs. Mod	Non vs. Sev
	None-minimal	Moderately-severe	Severe		
Cytokine	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	*p*	*p*
CCL2	2.039 (2.013; 2.064)	2.020 (1.978; 2.061)	2.001 (1.912; 2.090)	0.418	0.300
CXCL1	2.243 (2.161; 2.326)	2.193 (2.058; 2.326)	2.305 (2.132; 2.478)	0.512	0.579
IFN-γ	−0.858 (−0.941; −0.776)	−0.914 (−1.007; −0.821)	−1.018 (−1.031; −1.006)	0.423	<0.001**
IL-1RA	2.529 (2.491; 2.567)	2.552 (2.478; 2.626)	2.489 (2.342; 2.636)	0.545	0.475
IL-1β	−0.072 (−0.115; −0.029).	−0.017 (−0.087; 0.054)	−0.062 (−0.154; −0.029)	0.168	0.865
IL-2	−0.544 (−0.708; −0.022)	−0.537 (−0.765; 0.308)	−0.673 (−1.194; 0.152)	0.963	0.577
IL-4	1.350 (1.302; 1.399)	1.389 (1.332; 1.446)	1.289 (1.130; 1.440)	0.346	0.344
IL-5	−0.327 (−0.385; −0.270)	−0.341 (−0.432; −0.251)	−0.348 (−0.533; −0.163)	0.793	0.798
IL-6	0.137 (0.066; 0.208)	0.180 (0.055; 0.305)	−0.008 (−0.243; 0.227)	0.526	0.154
IL-7	0.436 (0.336; 0.536)	0.537 (0.414; 0.660)	0.399 (0.181; 0.618)	0.238	0.787
IL-8	0.569 (0.534; 0.604)	0.665 (0.603; 0.727)	0.567 (0.473; 0.662)	0.004*	0.974
IL-10	−0.258 (−0.351; −0.165)	−0.337 (−0.503; −0.170)	−0.206 (−0.432; 0.021)	0.376	0.683
IL-12	−0.311 (−0.403; −0.218)	−0.287 (−0.430; −0.218)	−0.206 (−0.432; 0.021)	0.775	0.480
IL-18	2.243 (2.200; 2.286)	2.284 (2.205; 2.362)	2.179 (2.027; 2.331)	0.325	0.301
TGF-α	0.199 (0.109; 0.290)	0.271 (0.177; 0.364)	0.072 (−0.275; 0.419)	0.342	0.337
TNF-α	0.770 (0.740; 0.799)	0.791 (0.746; 0.836)	0.728 (0.635; 0.820)	0.422	0.312

*$p < 0.05$; **$p < 0.01$; CCL, chemokine ligands; IFN-γ, interferon-gamma; IL, interleukins; TGF-α, transforming growth factor-alpha; TNF-α, tumor necrosis factor-alpha; SD, standard deviation; 95% CI, confidence interval; Non, none-minimal; Mod, moderately-severe; Sev, severe.
Grouped into none-minimal, moderately-severe, and severe depressive symptoms; *p*-value in the unadjusted analysis using two-sample students' *t*-test of equal change.

TABLE 3 Association with cytokine level and the severity of depressive symptoms.

	Moderately-severe			Severe		
Cytokine	*B*	95% CI	*p*	*B*	95% CI	*p*
CCL2	−0.023	−0.129; 0.083	0.672	−0.063	−0.224; 0.099	0.446
CXCL1	−0.066	−0.369; 0.238	0.671	−0.063	−0.523; 0.397	0.788
IFN-γ	−0.585	−0.969; −0.201	0.003**	−1.254	−1.837; −0.672	<0.001**
IL-1RA	0.136	−0.050; 0.322	0.151	−0.011	−0.292; 0.271	0.942
IL-1β	0.135	−0.058; 0.329	0.171	−0.065	−0.358; 0.228	0.663
IL-2	−0.132	−0.570; 0.306	0.555	−0.092	−0.756; 0.572	0.786
IL-4	0.046	−0.119; 0.211	0.588	−0.137	−0.385; 0.112	0.280
IL-5	−0.070	−0.282; 0.141	0.514	−0.072	−0.393; 0.249	0.660
IL-6	0.460	0.159; 0.762	0.003**	−0.267	−0.724; 0.191	0.253
IL-7	0.114	−0.175; 0.402	0.441	−0.218	−0.656; 0.220	0.329
IL-8	0.273	0.118; 0.428	0.001**	−0.002	−0.237; 0.233	0.986
IL-10	−0.081	−0.426; 0.265	0.647	0.004	−0.519; 0.528	0.987
IL-12	−0.045	−0.460; 0.370	0.833	−0.211	−0.841; 0.418	0.510
IL-18	0.236	0.032; 0.440	0.023*	−0.137	−0.447; 0.172	0.385
TGF-α	0.142	−0.114; 0.397	0.277	−0.102	−0.489; 0.286	0.607
TNF-α	0.046	−0.071; 0.163	0.442	−0.085	−0.263; 0.092	0.347

*$p < 0.05$; **$p < 0.01$; CCL, chemokine ligands; IFN-γ, interferon-gamma; IL, interleukins; TGF-α, transforming growth factor-alpha; TNF-α, tumor necrosis factor-alpha; 95% CI, confidence interval.

IFN-γ are estimated biomarkers for depression and can identify the physiopathology of inflammatory regulation abnormalities in depression. Current research also suggests that more attention should be paid to depression among nurses, given that most nurses do not seek mental health services for depression. We propose early detection and intervention,

considering the mechanisms linking depression to physical illness and disease.

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.

Ethics statement

The studies involving human participants were reviewed and approved by the institutional review board of the Ewha Womans University (No. 117-4). The patients/participants provided their written informed consent to participate in this study.

Author contributions

YK, YP, OK, and HL designed the study, collected the data, and interpreted the results. YK and HL interpreted data, wrote the manuscript, interpreted the results, and discussed and revised the manuscript. HP collected and organized the biological samples and performed and interpreted the cytokine assay. YP and OK organized the survey, collected data, and discussed and revised the manuscript. 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.

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Stress experiences of healthcare assistants in family practice at the onset of the COVID-19 pandemic: a mixed methods study

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Background: At the beginning of the pandemic in 2020, healthcare assistants in general practices were confronted with numerous new challenges. The aim of the study was to investigate the stress factors of healthcare assistants in March/April 2020 as well as in the further course of the pandemic in 2020.

Methods: From August to December 2020, 6,300 randomly selected healthcare assistants in four German states were invited to participate in the study. We performed a mixed methods design using semi-structured telephone interviews and a cross-sectional survey with quantitative and open questions. The feeling of psychological burden was assessed on a 6-point likert-scale. We defined stress factors and categorized them in patient, non-patient and organizational stress factors. The results of the three data sets were compared within a triangulation protocol.

Results: One thousand two hundred seventy-four surveys were analyzed and 28 interviews with 34 healthcare assistants were conducted. Of the participants, 29.5% reported experiences of a very high or high feeling of psychological burden in March/April 2020. Worries about the patients' health and an uncertainty around the new disease were among the patient-related stress factors. Non-patient-related stress factors were problems with the compatibility of work and family, and the fear of infecting relatives with COVID-19. Organizational efforts and dissatisfaction with governmental pandemic management were reported as organizational stress factors. Support from the employer and team cohesion were considered as important resources.

Discussion: It is necessary to reduce stress among healthcare assistants by improving their working conditions and to strengthen their resilience to ensure primary healthcare delivery in future health crises.

KEYWORDS

healthcare assistants, COVID-19 pandemic, psychological burden, stress factors, primary care

1. Introduction

The World Health Organization declared the COVID-19 outbreak a pandemic on 11 March 2020, we will refer to this as the "Corona pandemic" hereafter (1). Numerous studies have examined the stress experience of hospital staff during the first wave of the pandemic in March–April 2020 (2–4). In Germany, the majority of COVID-19 patients was treated by primary care physicians (5). Further, healthcare assistants (HCAs) in primary care practices have played a key role in the pandemic management and have contributed significantly to relieving the outpatient sector during the pandemic. HCAs support physicians in the examination and treatment of patients. They are also responsible for patients' appointment management, organization of practice procedures, performing billing for health insurance services and laboratory activities. For patients, they are often the first point of contact when problems arise. In contrast to healthcare workers in other countries, HCAs have more an assisting and managing function (6, 7). It is well known that health professions are considered to be highly stressful (8) and the pandemic has promoted the emergence of new stressors and the reinforcement of existing stressors. Previous studies reported a great impact of the pandemic on stress experiences, mental health and well-being of healthcare workers by high levels of anxiety, burnout, depression and posttraumatic stress disorder (9). Winefield et al. defined three sources of stress among healthcare professionals: patient-related (e.g., patient care), non-patient-related (e.g., relationships at work, work-life-balance) and organizational sources of stress (e.g., paperwork, support) (10). The sources are related to negative stress experiences, intentions to quit work and negative health effects (8, 10). During the pandemic an acute increase of the already significant shortage of HCAs was reported. According to a survey conducted by the German association of HCAs at the beginning of 2022 among 3,900 HCAs, almost half of them repeatedly considered to give up their profession (11–13). Although the shortage of HCAs is a known health politics problem affecting primary care, their situation has received little scientific attention. While the nursing staff in hospitals often received increased appreciation from the public and policy makers during the pandemic, HCAs in outpatient care were hardly considered (14). Similarly, in ambulatory primary care, the focus of research has generally been the physician sector, while the HCA sector has often been left out completely. International studies looking at the stress experience of primary care health workers showed that they did not feel optimally prepared for the pandemic (15). In this context, it was also reported that primary care nurses felt stressed and overwhelmed. In particular, the lack of protective equipment and the associated anxiety in the workplace were among the stress factors (15, 16). While other healthcare workers were able to work remotely, German HCAs could rarely work from home. Both settings, remote and practice work, showed many stressors and contributed to distress (17). Hence, working in general practices comes along with a risk of infection and the fear of passing the virus to relatives (15, 16). A systematic review identified several occupational risk factors for psychological distress. For example, a high-risk work environment, a lack of specific training and work experiences as well as a lack of social support and stigmatization fostered the development of stress (18). Furthermore, the authors mentioned that resilience, social support and adaptive coping strategies had a protective influence on healthcare workers' mental health during the COVID-19 pandemic (9) as well as during past infectious disease outbreaks like SARS or MERS (19).

In Germany, other healthcare professions have been focused in research, while HCAs' stress experiences in pandemic have received little scientific attention. The aim of this study was to explore the occupational stress factors of German HCAs in general practices (GPs) during the initial phase of the pandemic in March/April 2020, when Germany was in lockdown for the first time (20) and during the months afterwards (August–December 2020). Specifically, we aimed to explore the psychological burden of HCAs and to identify patient related, non-patient related and organizational sources of stress. We also wanted to explore HCAs' individual coping strategies and resources that helped them to deal with the pandemic situation. Our results can support therein to identify approaches to build up resilience of HCAs and find recommendations for policy in the context of future health crises.

2. Methods

2.1. Study design

This mixed methods study consisted of a survey, with both structured and open-ended questions, as well as qualitative telephone interviews. We simultaneously collected quantitative and qualitative data from August 2020 until December 2020. While the results of the quantitative and qualitative survey data have not been reported before, the results of the telephone interviews have been published (21). We thus analyzed the qualitative telephone interviews in the sense of the new research question in addition to the survey data aiming to provide a holistic understanding of the burdening experience of HCAs during the pandemic in 2020. We compared the results of all three data sets within a triangulation protocol, using the same methodology as used in a similar study (22). We used methodological data and investigator triangulation to improve the validity of our results (23). An overview of the triangulation process is given in Figure 1.

2.2. Study population and recruitment

The study population consisted of 6,300 GPs in four federal states in Germany (for details see Supplementary material S1). When planning the study, incidence rates varied largely, with Southern Germany experiencing far more COVID-19 cases. In order to gain a more holistic understanding of the experiences in general practices we therefore included two federal states in the north (Schleswig-Holstein and Mecklenburg-Western Pomerania) and the south of Germany (Bavaria and Baden-Württemberg). The practices were randomly selected by Arztdata, a commercial provider of address lists (24). We invited 1,980 practices in Schleswig-Holstein and Mecklenburg-Western Pomerania and 4,320 practices in Bavaria and Baden-Württemberg (proportionally to the overall number of GPs within the federal states, for details of the sample size calculation see Supplementary material S2). The survey was conducted from August to December 2020. The first mailing of questionnaires took place on 04/Aug/2020. The practices received two reminders (a first reminder including the survey 6 weeks later, a 2nd reminder of a post card after another 4 weeks). Survey responses have to be assessed in the context of the COVID-19 pandemic course. Supplementary material S3

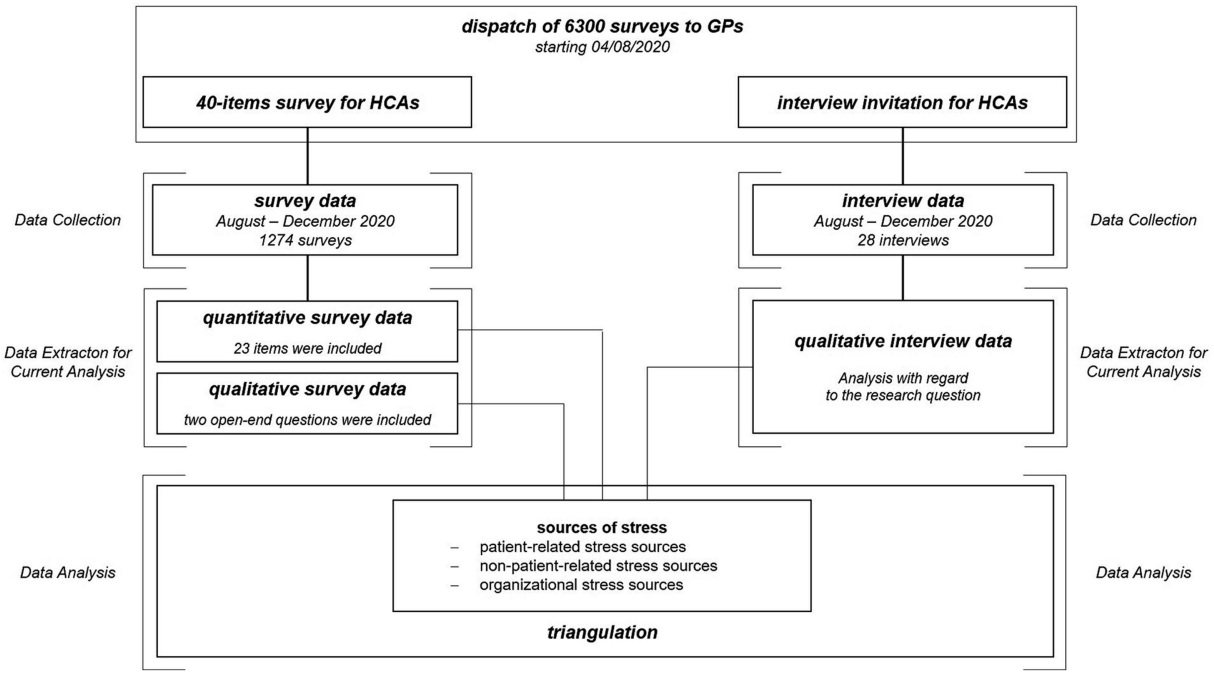

FIGURE 1
Process of data collection, extraction, analysis and triangulation.

illustrates the relation between the distribution of responses and infection rates.

From each selected GP one physician and one HCA were eligible to participate in the cross-sectional survey and in the interviews. Results of the study with general practitioners are published elsewhere (25, 26). As already described only five HCAs registered for the telephone interviews in response to the first invitation (21). Therefore, 100 of the 6,300 invited HCAs were randomly selected and invited again by telephone to participate in the interviews. Of these, 23 HCAs participated, 50 declined participation and 27 were not reached. Participation was remunerated with 30€. HCAs who had already participated before were also paid 30€ retroactively (21) (for details about the study recruitment see Supplementary material S1).

2.3. Data collection

The research team was multidisciplinary and consisted of practicing clinicians, academic GPs and psychologists (JR, HS, GB, SP, IG, HK, and SJ), quantitative (GB and KL) and qualitative (IG, SP, and HK) research experts and a doctoral student (JE-M). Interviews were conducted by one researcher (JE-M) who was trained and supervised by an experienced qualitative researcher (HK).

2.3.1. Quantitative data: the survey

The 40-items survey (see Supplementary material S4) was developed in a participatory process involving family physicians, junior doctors, psychologists, and other scientific staff from eight Departments of General Practices to ensure the relevance of the questions for the target group. Then, the survey was tested in one of the teaching practices of the Department of General Practice of Würzburg, belonging to the focus group. Data was collected at one measurement time point between August and December 2020. The questionnaire contained retrospective questions about HCAs' experiences during the initial period of the pandemic in March/April 2020, as well as the current situation at the time of the survey (August to December 2020) and their future expectations. The survey consisted of single-choice and multiple-choice questions with the option "others" offering the possibility of specification or adding additional information, likert-scaled questions and open-end questions. The feeling of psychological burden was assessed on a 6-point likert-scale. A paper-pencil format was used.

2.3.2. Qualitative data: open end survey-questions

We included responses to two open-ended questions of the survey (see Supplementary material S4). One question asked about wishes for other future pandemic waves (question 7: "What measures/offers would you wish for in a case of another pandemic wave?") and the other question asked about wishes of support (question 16: "Are there other forms of support you would like in a future pandemic wave?").

2.3.3. Qualitative data: telephone interviews

The main results of the qualitative interview data on experiences with the COVID-19-pandemic as seen from the perspective of German HCAs are already published (21). The semi-structured telephone interviews were conducted between August and December 2020. The interview guide appears in Supplementary material S5. For this study we performed a further analysis of the data with a focus on burdening experiences, stress factors and coping strategies.

2.4. Data analysis

Quantitative data were analyzed by GB, while qualitative data were analyzed by HS, JR, and JE-M. We identified burdensome experiences and stress factors in all three datasets and then grouped them using a model of stress sources in healthcare defined by Winefield et al. (10).

2.4.1. Analysis of quantitative survey data

Data entry was performed in Redcap (27). The data was exported and analyzed using SPSS (Version 26, data export function) (28) and Python (version 3.5). Cases with missing values (m) were excluded from the respective analyzes only. For this study we selected 23 survey items based on Winefield's sources of stress for analyzes and assigned them to the stress-related categories (10) (Supplementary material S6). For the descriptive analyzes, absolute frequencies, minimum and maximum values, means, medians and standard deviations were calculated depending on the nature of the data. Data measured on ordinal scales were compared using the Vargha-Delaney A statistics, implemented (GB) in Python (29). The "A" formula was also used for comparisons of ordinal variables to a reference level (e.g., changes in feeling overburdened over the time) using "no changes" as reference category. We hypothesized that temporal changes may have been present. When the survey included corresponding questions, these hypotheses were tested. *P* values and confidence intervals (95% CI, shown between brackets) for A values were calculated using bootstrap, implemented (GB) in Python (30). In the relative frequency calculations "I do not know" (d), missing (m) and "no need" answers were not included in the denominator.

2.4.2. Analysis of qualitative survey data

Open questions were explored through qualitative methods as described in the section below on telephone interviews. As described previously categories were identified deductively-inductively (31–34). Therefor the main categories were derived by the research objectives and topics to be triangulated, whereas the themes emerging within these categories were derived inductively from the text. Categories were then grouped to the stress factors aligned to Winefield et al. (10).

2.4.3. Analysis of qualitative telephone interview data

All interviews were analyzed again. Aspects related to the burdening experience were extracted from the existing coding framework and analyzed in more depth using MAXQDA software (Vers. 2020). New codes were assigned deductively with regard to the research question and were discussed several times by the research team (HS, JR, and JE-M) until agreement was achieved. Themes were then grouped to the stress factors aligned to Winefield and colleagues (10). Supplementary material S7 shows the published coding framework and the restructured framework focusing on stress experiences.

2.5. Triangulation of results

We identified the key findings of each data set and listed them within a triangulation protocol (GB, HS, and JR for quantitative results, JE-M, JR, HS for qualitative results; Supplementary material S8). Key findings were compared and categorized as agreement, partial agreement, silence (e.g., not mentioned due to study design) or disagreement by HS, JR, and JE-M. SP supervised the triangulation process. Differences were resolved by discussion.

2.6. Ethics statement

Participation was anonymous as the questionnaires were returned by mail via return envelope without indicating a sender. Informed consent for the telephone interviews to be audio recorded was given by mail and e-mail and was signed by all participants. Details of the interviews which might allow to identify a person were anonymized during the transcription (21).

3. Results

3.1. Sociodemographic characteristics of the respondents

There were 1,274 surveys available for analysis (response rate 21.1%, details in Supplementary material S1). Most of the HCAs were female [98.9%; missing (m) = 17]. The median age was 43 years and their median number of working years in the profession was 20. The type of practice they were working in was a Individual practice for 58.2% of the HCAs and Joint practice for 35.4% (Table 1). For a detailed description of qualitative interview participants see Supplementary material S9.

3.2. Burdening experience of HCAs

3.2.1. Quantitative survey results

A high and very high feeling of psychological burden in March/April 2020 was reported by 29.5% of the participants. Only a few participants reported that professional psychological support was available for them, whereby 52.6% stated that they felt no need for this. The proportion of those who felt overburdened in daily practice decreased at the time of the survey compared to March/April 2020 (Table 2).

3.2.2. Qualitative telephone interviews

Most HCAs reported suffering from experiences of burden at the beginning of the pandemic. They noted an increased petulance, and felt overwhelmed, burned out, and tainted with the situation. Worries about their own health and, even more, the health of their families through infection risk strained the HCAs (VS1). Also, physical illnesses were reported as a result of the high stress level (VS2). A wish for offers of professional psychological counseling was expressed (VS3).

3.3. Stress sources of HCAs in the context of the COVID-19 pandemic

In the following section the results are presented thematically triangulated according to the stress sources defined by Winefield and colleagues (10). Exemplary additional verbatim quotes (*VS*) and comments (*VC*) are listed in Supplementary materials S10, S11.

TABLE 1 Sociodemographic data of survey participants and practice characteristics.

	Mean	Median	Range
Age in years ($N = 1,175$; $m = 99$)	42.5	43	18–76
Years of profession ($N = 1,161$; $m = 113$)	21.4	20	1–57
Number of HCAs ($N = 1,231$; $m = 43$)	4.7	4	1–35
Number of physicians ($N = 1,232$; $m = 42$)	2.1	2	1–16
COVID-19 risk group* ($N = 1,187$; $m = 87$)	**Valid *n* (%)**		
Yes	210 (17.7%)		
No	977 (82.3%)		
COVID-19 risk group household ($N = 1,227$; $m = 47$)	**Valid *n* (%)**		
Yes	581 (47.4%)		
No	646 (52.6%)		
Position in practice ($N = 1,229$; $m = 45$)**	**Valid *n* (%)**		
HCA trainee	9 (0.7%)		
Employee HCA	840 (68.3%)		
Senior HCA	347 (28.2%)		
Other**	33 (2.7%)		
Practice structure* ($N = 1,213$; $m = 61$)**	**Valid *n* (%)**		
Individual practice	741 (58.2%)		
Joint practice	451 (35.4%)		
Medical care center	21 (1.6%)		
Practice with several locations	55 (4.3%)		
Practice with single location	84 (6.6%)		
Location of the practice ($N = 1,242$; $m = 32$)	**Valid *n* (%)**		
Rural (<5,000 inhabitants)	477 (38.4%)		
Small town (5,000-20,000)	407 (32.8%)		
City (>20,000-100,000)	235 (18.9%)		
Large city (>100,000)	112 (9.0%)		
Other	11 (0.9%)		
Federal state of practice ($N = 1,256$; $m = 18$)	**Valid *n* (%)**		
Bavaria	550 (43.8%)		
Baden Wuerttemberg	307 (24.4%)		
Mecklenburg-Western Pomerania	192 (15.3%)		
Schleswig-Holstein	207 (16.5%)		

The missing values (m) were not included in the percentage calculation. *Self-assessment. **Other positions: physicians' assistant, physicians' secretary, temporary assistant, diabetes adviser and deputy QM manager, nurs, wife of physician, practice manager, supply assistant and/or non-medical assistant (additional qualification of HCAs). ***Multiple choice possible.

3.3.1. Patients as a source of stress

3.3.1.1. Quantitative survey results

In March/April 2020, 31.7% of the HCAs felt bad and 12.7% very bad about caring for COVID-19 patients. The feeling of being able to take care of COVID-19 patients was substantially improved at the time of the survey. Further worries expressed by the HCAs were getting insufficient or contradicting information about COVID-19 (50.1%) and to overlook COVID-19 among their patients (36.1%). In the opinion of HCAs, in March/April non-COVID-19 patients canceled appointments out of fear (91.2%). 8.7% of HCAs thought that non-COVID-19 patients have been harmed through the pandemic situation in March/April (Table 3).

3.3.1.2. Qualitative survey results

HCAs reported difficulties with stressful, unfriendly and impatient patients (VC1, VC2, and VC3). There was a wish for more educational work for the population and that media coverage should be more objective to avoid causing panic among patients (VC3, VC4, and VC5).

3.3.1.3. Qualitative telephone interviews

Some participants reported uncertainty in the team due to the new disease pattern (VS4). There was uncertainty about how to deal with infectious patients and SARS-CoV-2 tests (VS5). As also described previously, poor information about the new virus and how to get protected from it contributed to the stressful experience (VS6) (21). Some HCAs reported disagreements with patients regarding the

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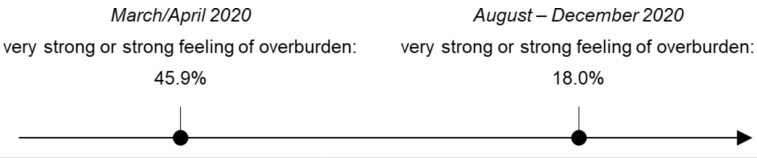
TABLE 2 Psychological burden of HCAs and availability of support.

Psychological burden in March/April 2020 ($N = 1,247$; $m = 27$)		Availability of psychological support ($N = 1,231$; $m = 43$)	
	Valid *n* (%)		Valid *n* (%)
Not at all	194 (15.5%)	Never	**489 (83.7%)****
Very little	127 (10.2%)	Rarely	32 (5.5%)
Little	215 (17.2%)	Sometimes	28 (4.8%)
Medium	**343 (27.5%)****	Often	13 (2.2%)
High	234 (18.8%)	Always	22 (3.8%)
Very high	134 (10.7%)	No need	647
Feeling of overburden in daily practice (for more details see Supplementary material S9)			
			
Vargha-Delaney A [$A = 34.5\%$ (32–36) $p < 0.001$] [$A = 26.2\%$ (24–28) $p < 0.001$]			

The missing values (m) and the answer "no need" were not included in the percentage calculation. **The median response is highlighted in bold for scale questions.

hygiene measures (VS7) and an increase in telephone calls with unsettled and lonely patients (VS8). There were experiences with aggressive as well as thankful patients (VS9). Some HCAs worried that patients would be harmed because they did not go to the doctor because of fear of COVID-19 (VS10) and even dreaded deaths in a small number of patients (VS11).

3.3.2. Non-patient sources of stress

3.3.2.1. Quantitative survey results

The fear that family members could become severely ill with COVID-19 was greater than the fear of own illness. For 27.3% of the HCAs the pandemic caused difficulties in reconciling work and family life (e.g., unavailable childcare), 15.5% only sometimes had such difficulties (Table 4). Other non-patient sources of stress were worries that colleagues would get infected or that the team would infect patients and concerns of suffering financial damages. Some HCAs (6.2%) were worried about losing their jobs (Supplementary material S12).

3.3.2.2. Qualitative survey results

There was the wish for regular testing of medical personnel to protect the relatives (VC8). Working on the frontline, HCAs wanted financial resources for further staff, salary increases and bonus payments (VC6). Furthermore, they wished for better support with childcare.

3.3.2.3. Qualitative telephone interviews

Some practices reduced their treatment services (21) due to fear of infections or had to close completely (VS12, VS13). Many HCAs were worried about infecting family relatives (VS14). In some cases, HCAs took sick leave to avoid infecting themselves or their family (VS15). Contact restrictions led to social isolation (VS16) as well as restrictions on leisure activities (VS17), so that the restrictions had an impact on the mood (VS18). HCAs also reported stigmatization and discussions in their private environment about pandemic measures (VS19, VS20). HCAs occasionally mentioned financial problems due to reduced weekly working hours (V21). Some HCAs experienced the limited childcare at the beginning of the COVID-19 pandemic as very challenging (VS22, VS23). Other HCAs found it very stressful that colleagues were absent due to the lack of childcare (VS24). Individual HCAs also stated that they saw quitting their jobs as a last resort to solve the childcare problem (VS25). Good-willing employers dedicated colleagues and also well-organized schools and teachers were described as helpful (VS26). The good teamwork helped to overcome the challenges (VS27).

3.3.3. Organizational sources of stress

3.3.3.1. Quantitative survey results

In March/April 2020 HCAs spent more time on organizational tasks than before [$A = 76\%$ (75–78) $p < 0.001$; Table 5]. At the time of the survey (between August and December 2020) HCAs estimated that they spent less time with organizational duties than in March/April, but still more than before the pandemic. For details about working hours and time spent with patients see Supplementary material S13. Most of the HCAs felt well supported by their employers. They were also satisfied with the actions of their employers (Supplementary material S14) but less [$A = 20.1\%$ (18–20) $p < 0.001$] satisfied with the actions of the provincial government (Table 5). FFP2 masks were scarcely available in March/April 2020 (Supplementary material S15).

3.3.3.2. Qualitative survey results

According to the HCAs, sufficient personal protective equipment should be available and affordable in future waves (VC9, VC10). HCAs also wished a better governmental pandemic management (VC10, VC11), less bureaucracy, more digitalization and clear responsibilities, as well as reliable contact persons (VC12). Wishes for future waves of the pandemic were more support for GPs, e.g., by specialized COVID-19 services (corona medical centers, infection practices) (VC14), as well as more support from the Department of Health. According to HCAs the outpatient care was disregarded in medial pandemic reports. HCAs

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TABLE 3 Summary of patient-related stress factors.

Survey QUAN	
Ability to care for COVID-19 patients in March/April 2020 (*N* = 1,242; *m* = 32)	**Valid *n* (%)**
Very poor	158 (12.7%)
Poor	394 (31.7%)
Medium	**387 (31.2%)**
Good	244 (19.6%)
Very good	59 (4.8%)
Ability to care for COVID-19 patients in Aug-Dec 2020 (*N* = 1,239; *m* = 35)	**Valid *n* (%)**
Very poor	25 (2.0%)
Poor	102 (8.2%)
Medium	362 (29.2%)
Good	**598 (48.3%)**
Very good	152 (12.3%)
Current concerns regarding practice (*N* = 1,274)**	**Valid *n* (%)**
Overlooking COVID-19 disease in patients	460 (36.1%)
I am not concerned about COVID-19	132 (10.4%)
Contradictory or too little Information on COVID-19	638 (50.1%)
Patients being infected by the practice team	441 (34.6%)
Changes in care of non-COVID-19 patients in March/April 2020 (*N* = 1,274)**	**Valid *n* (%)**
Patients have canceled appointments out of fear	1,162 (91.2%)
Reduction in unnecessary consultations	868 (68.1%)
Patients have been harmed	111 (8.7%)
No changes	44 (3.5%)
Survey QUAL	**Interviews QUAL**
Disagreements with impatient and unfriendly patients Desire for educational work and information - Desire for more educational work and information for the population - Objective coverage through media for avoiding panic among patients	Dealing with patients' emotions - Disagreements with patients on hygiene measures - Increase in telephone calls with unsettled, lonely patients - Patients with a cold were afraid and came to exclude Corona Worries about patient's health - Patients avoided the GP because of fear of infection - Patients being harmed - Death of individuals (a small number of patients) - Uncertainty with new disease Poor information about the disease - Uncertainty how to deal with infected patients - Uncertainty how to deal with SARS-CoV2 tests
Example verbatims: What measures/offers or other forms of support you would like in a future Pandemic wave? VC1: Patients being *"reasonable," "less stressful," "patently," "not so bad"* VC2: *"Sympathy of patients and relatives"* VC3: *"Support from the health departments so that patients can be well informed and do not have to turn to us helplessly because the departments are overloaded."* VC4: *"Structured information material for patients"* VC5: *"Communication of the real risk of disease. Avoidance of panic and horror messages. Information on health protection measures."*	Example verbatims VS9: *"[…] Also because many patients are more dissatisfied, more aggressive, which I already said, you have to be scolded why things are not moving forward. People have to stand outside in the rain in the cold. But as I said, they are all just people and we cannot do more than work. Of course, we also have patients who really praise us and say: "Wow, that's great how you do everything here and how you handle it. You have both encouragement, but also patients who are sometimes, I would say, indignant." (No. 7, pos. 12)* VS8: *"That's more now, as the numbers are getting higher now, of course we are getting more panicky patients, need to make more phone calls because patients just panic and of course they call us, and we have to reassure them, explain a little bit and they were, are now also sometimes afraid to come to the surgery. "(No. 20, pos. 16)* VS4: *"Now what to speak, what is a worried patient and what is a sick patient, who really needs help?" (No. 2, pos 8)*

The missing values (m) were not included in the percentage calculation. *The median response is highlighted in bold for scale questions. **Multiple choice possible.

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TABLE 4 Summary of non-patient-related stress factors.

Survey QUAN	
Afraid of getting sick with COVID-19 (*N* = 1,254; *m* = 20)**	**Valid *n* (%)***
Agree completely	196 (15.6%)
Rather agree	289 (23.0%)
Indifferent	**224 (17.9%)**
Rather disagree	375 (29.9%)
Disagree completely	170 (13.6%)
Afraid that relatives could get severely sick with COVID-19 (*N* = 1,254; *m* = 20)**	**Valid *n* (%)***
Agree completely	477 (38.0%)
Rather agree	**414 (33.0%)**
Indifferent	143 (11.4%)
Rather disagree	155 (12.4%)
Disagree completely	65 (5.2%)
Difficulties in balancing family and career (*N* = 1,249; *m* = 25)	**Valid *n* (%)***
Yes	342 (27.4%)
Sometimes	194 (15.5%)
No	713 (57.1%)
Survey QUAL	**Interviews QUAL**
Desire to protect from COVID-19 - Removing infectious patients to protect other patients - Fear of infect their relatives with COVID-19 - Complaining about no regular testing of medical personnel to protect relatives Wish for support in child care	Decrease in quality of healthcare - Reduced services (e.g., ecg) because of hygiene measures - Closed GP completely - Sick leaves of HCAs to protect themselves and their relatives Feeling less resilient because of pandemic measures - Contact restrictions - Restrictions on leisure - Discussions about measures in private environment - Stigmatization in private environment Pro and cons of reduced working hours - Financial problems - More leisure time Struggle because of lack or limited child care - Problems in handling job and family - Quitting job as last resort - More work for colleagues because of staff shortage Feeling strengthened through improved team work due to new challenges
Example Verbatims: What measures/offers or other forms of support you would like in a future Pandemic wave? VC6: *"Reopening of the test station by the coordinating doctor to avoid contact between infected or suspicious patients and non-infected patients."* VC7: *"keep COVID-19 out of practices as much as possible"* VC8: *"That medical staff are also tested. Medical practices are left alone with this."*	Example verbatims VS12: *"And yet when I think that some now here in the area, yes some have closed, actually closed their surgeries, out of concerns about the Corona. "(No. 2, pos. 44)* VS17: "*You cannot go to the beach anymore, you cannot do sports, you cannot go for walks by the sea, now you have to go into the forest […]. So you have to change. But that does not mean / you have to change, but you are already more organized with the meetings of friends, they are phoned. So it works differently." (No. 19, pos. 97)* VS24: *"Well, yes, I also have a small child who is in the kindergarten. Then the time when the kindergartens were closed was also a huge drama at the beginning. Of course, I was always afraid at the beginning that I would spread something to my daughter or to my grandmother, who is actually very ill. But at the beginning, in March and April, contacts were limited and it was difficult to manage child and work, because at the beginning it wasn't under emergency care." (No. 25, pos. 38)* VS27: *"For a short time it was quite difficult. I have to be honest that every one of us reached the limit. Thank God, we have a great team, where almost no one was sick because they were overworked, or thank God, they did not get sick, good luck. But of course we were often nagging and grumbling at each other, and we were right, because we had to remember that there was a lot of pressure, a lot of responsibility on us." (No. 25, pos. 16)*

The missing values (m) were not included in the percentage calculation. *The median response is highlighted in bold for scale questions. **For more data see Supplementary material S16.

wished more recognition, appreciation and respect for their work and equal treatment to other health professions (VC13).

3.3.3.3. Qualitative telephone interviews

The HCAs reported an increased workload due to administrative duties (VS28) and catch-up dates for canceled appointments during the 1st lockdown in March/April 2020. Another stress factor described by almost all HCAs was the insufficient supply of protective equipment at the beginning of the pandemic, which hindered the daily work (VS29, VS30, VS31). On the other hand, some participants reported feeling restricted in their work by wearing mouth-nose protection masks (e.g., lack of facial expression, headaches, fatigue, breathing problems) (VS32), even if there was a protective function (VS33). HCAs reported that, due to organizational restructuring, measures had to be revised constantly (VS34). During the early pandemic, HCAs felt insufficiently supported and appreciated by policy makers and public health services (VS35, VS36) and saw themselves left on their own due to a lack of contact persons (VS37, *VS* 38). There was a wish for increased controls on compliance with the hygiene measures and quarantine rules, as well as harsher punishment for rule violations (VS39).

3.3.4. Coping strategies

In the interviews, HCAs mentioned numerous strategies to cope with increased burden (e.g., planning day trips instead of vacations) (VS40). Furthermore, the HCAs said they had actively strengthened their ties to family and friends (VS41). Some participants reported that having a positive attitude, accepting and allowing negative feelings had helped them to cope with the pandemic (VS42). Some HCAs reported that they also had done extensive private research on COVID-19, which had contributed to a sense of security among them (VS43) (Supplementary material S17).

3.4. Triangulation of the results

The key findings ($N = 33$) across all data sources are described in the triangulation protocol (Supplementary material S8). Allover, there were eight agreements between the three data sources. There was a high number of agreements between qualitative survey data and qualitative interviews (25 agreements, 8 silences), whereas there was a high number of silence between quantitative and qualitative survey data, indicating a different focus of questions and that participants used the qualitative questions to complement the information provided within quantitative variables. There was no disagreement.

4. Discussion

4.1. Summary of the main findings

Our results show a high psychological distress of the HCAs at the beginning of the pandemic, which caused negative feelings such as anger and frustration. Patient-related sources of stress during the pandemic were for example non-COVID-19 patients being harmed and an uncertainty in patient care due to a lack of experience with COVID-19. Non-patient-related stress factors were compatibility problems of work and family, as well as the fear of HCAs infecting their relatives with COVID-19. Organizational sources of stress were a lack of availability of protective equipment and an increase in organizational and administrative workload. Furthermore, the HCAs complained about a lack of appreciation and support from policy makers. HCAs used problem-focused strategies (e.g., implementation of hygiene measurements in a creative way), emotional-focused strategies (e.g., leisure time, social resources) and attributional-focused strategies (e.g., optimism, reframing) for coping stress. Professional psychological support, on the other hand, was considered hardly available. Triangulation of results showed agreement and silence between key findings, indicating that participants often used qualitative questions to complement the information provided within the quantitative survey related to their experience of stress.

4.2. Comparison with existing literature

In numerous countries, high stress levels in healthcare workers were reported, especially at the beginning of the pandemic (3, 4, 35, 36). Quantitative studies identified an increased incidence of mental and psychosomatic illness among healthcare workers (37, 38). Consistent with these findings, our data reveal high level of stress and described psychological burden as well as psychosomatic illnesses in the context of the pandemic, which were considered as stress-related. Further, changes in the relationship to patients through conflicts with regard to hygiene measures were identified as a source of stress, which corresponds to literature (39–41). Reviews from Zhang et al. and Rossi et al. revealed an increase of pandemic related workplace violence (42, 43). While our study did not report instances of physical aggression, HCAs considered the increase of verbal violence of patients against them as stressful. Non-patient sources of stress were a lack of childcare and fear of passing the virus to family members as also seen by Ashley et al., Robinson et al., and Frenkel et al. (16, 44, 45). The fear of infecting family members and friends was greater than the fear of HCAs' own infection, indicating a high feeling of responsibility as also described among general practitioners (46). Furthermore, few cases in the study also reported the stigmatization of HCAs during the pandemic as reported in other study results (47). In other countries and also in our results, an unstructured flow of information was mentioned as an organizational source of stress in everyday practice (18, 48). In general, stress arises if external or internal demands perceive as threatening and unable to cope (49). This could be also observed in our data. In March/April 2020, the HCAs were concerned to get too little and unstructured information about the unknown disease and felt not good prepared to care for COVID-19 patients. They reported uncertainty and constantly changing conditions that made it hard to feel able to cope with the pandemic situation and may frustrated the need for control and orientation (50). The months afterwards, the caring abilities increased and the feeling of overwhelm decreased showing a successful adaption of HCAs to the pandemic situation. A change in weekly working hours was particularly evident at the onset of the pandemic, with a greater amount of organizational activities and less time spent with patients (51). HCAs expressed frustration about policymakers' lack of appreciation for their work (52). As also reported by the media, for the future the participants wished to be considered for bonus payments like other health care staff, as well as for adjustment of their salaries in view of the increased workload (53). A relief of the

GPs by public health services and also more structured information flow was considered essential, which is in line with the results of other studies (48, 54, 55). The literature emphasized the relevance of coping abilities and resilience of healthcare workers during crises (18, 56). The HCAs reported different strategies to cope with new pandemic challenges and the increased stress. As a problem-focused coping strategy, practice teams often resorted to creative solutions in the face of problems such as a lack of protective equipment or difficulties in implementing hygiene concepts. Working as a team strengthened cohesion (54, 57–59). Social resources like family and friends found to be supportive which is in line with literature mentioned social support as a protective factor of stress (18, 60). Optimism and reappraisal of the pandemic situation helped some HCAs as a cognitive coping strategy (18).

4.3. Strengths and limitations

This is, to our knowledge, one of the first mixed methods studies using survey data and qualitative interviews to explore the burdening experience of German HCAs within primary healthcare in relation to the COVID-19 pandemic. The study included a relatively large randomly selected sample. Nevertheless, with a response rate of 21%, it is unclear whether the results are representative of HCAs in Germany.

TABLE 5 Summary of organizational stress factors.

Survey QUAN	
Impact of the pandemic on organizational activities in March/April 2020	**Valid *n* (%)***
More time than usual	**727 (57.1%)**
Less time than usual	59 (4.6%)
No impact	38.3%
Feeling supported by your employer (*N* = 1,242; *m* = 32)**	**Valid *n* (%)***
Very good	599 (48.2%)
Good	**438 (35.3%)**
Medium	150 (12.1%)
Poor	42 (3.4%)
Very poor	13 (1.0%)
Satisfaction with your state governments handling (*N* = 1,249; *m* = 25)	**Valid *n* (%)***
Very satisfied	76 (6.1%)
Satisfied	367 (29.4%)
Medium	**512 (41.0%)**
Dissatisfied	220 (17.6%)
Very dissatisfied	74 (5.9%)
Survey QUAL	**Interviews QUAL**
Wish for personal protection equipment (PPE) - Not enough and insufficient PPE - Enormous price increases due to higher demand desire for control and order - Information management: information should be more objective, uniform, non-contradictory - Pandemic measures: more transparent, implementable and should not change permanently - Information and latest changes of measures should reach medical professionals before public Frustration through bureaucracy - Wish for less bureaucracy and administrative work (especially billing procedure) - Wish for more digitalization Wish for support for GPs - External structures (e.g., corona medical centers, infection practices) for relief of GP and reducing infection risk in GP - Clear responsibility and reliable contact persons (e.g., Department of Health) Seeking for recognition and appreciation - Missing recognition and appreciation from the government, media, public More respect for the job of a HCA Equal treatment to other (health) professions	Personal protection equipment (PPE) caused Restrictions in daily work - Not enough and insufficient PPE - Feeling restricted in work by wearing mouth-nose protection masks (e.g., breathing) Desire for control and order - Permanent changing measures - Wishes for increased controls on hygiene measures and quarantine rules - Wish for harsher punishment for rule violations Feeling overwhelmed through bureaucracy - Increased workload due to administration (especially billing procedure) - Organization of catch-up appointments for canceled appointments in the 1st lockdown Feeling left on their own and seeking for relief - Insufficient support by politicians and public health services - Saw themselves left on their own - Lack of contact persons - Well-organized external structures (e.g., corona centers or separate test practices) for relief of GP and reducing infection risk in GP - Offers to talk about worries Lack of appreciation from politicians and the population

(Continued)

TABLE 5 (Continued)

Survey QUAL	Interviews QUAL
Example Verbatims: What measures/offers or other forms of support you would like in a future Pandemic wave? VC9: *"We currently buy gloves, masks* etc. *at far overpriced prices (3–4 times the normal price) in order to protect ourselves."* VC10: *"More information, we felt very uninformed and helpless at the beginning. We only had information from the news and were supposed to calm patients down. We were told it was our own fault if we did not have protective equipment in stock."* VC11: *"Clear information and uniform, well thought-out regulations that are easy to implement for a practice."* VC12: *"Better information on the "bureaucratic aspects," information sheets on billing procedure and coding were often incomplete, ambiguous, not pertinent for GPs; frequent changes [of information] and we had to tediously collect information on our own."* VC13: *"That we are given the same attention and support as was given to the hospital staff. After all, GPs are the first point of contact for infectious patients or the fears and worries associated with the pandemic."* VC14: *"Financial compensation for HCAs! We are also system relevant and not mentioned anywhere!"*	Example Verbatims VS11: *"[…] we had no protective clothing available, we had no FFP2 masks. We actually had nothing at all. "(No. 21, pos. 4)* VS34: *"Well, I have to say that the time was really stressful for me and also, as I said, something changed every day, every day there was another letter from the KV [german: Kassenärztliche Vereinigung; Association of Statutory Health Insurance Physicians] where you had to reorganize yourself again. So we did so much organizational work. […]" (No. 1, pos. 16)* VS22: *"Health departments were not available. We were always told, "Busy," or, "Contact your family doctor." We felt downright left all alone. "(No. 16, pos. 4)* *VS35: "It's kind of annoying because you do not get much support from the departments and government agencies." (No. 7, pos. 2)*

The missing values (m) were not included in the percentage calculation. *The median levels of ordinal and continuous scale variables are highlighted in outlined numbers. **For more data see Supplementary materials S14.

A similar response rate was found in the survey of physicians (26). This could indicate an influence of physicians' participation to the participation of HCAs as a selection bias. The study design (cross-sectional) does not allow a detailed assessment of the impact of the pandemic on HCAs. Although survey questions assessed different time points [March/April 2020 and "current" (corresponding between August and December 2020)], the single-stage survey allows little inference about the dynamics of the pandemic and the experiences of HCAs in the course of it. In addition, individual participant responses may have been affected by memory lapses (recall bias). An additional limitation is the lack of standardized measurements of psychological burden (e.g., for anxiety and depression) as well as stress experiences. Further bias may have occurred in the recruitment of HCAs for the qualitative interviews, with a subsequent introduction of an incentive due to recruitment difficulties. In addition, some HCAs conducted the interviews on the premises of the practice while others off-site, which may have led to a bias in the response pattern, particularly regarding team dynamics and employers. Due to the long study period of 5 months, systematic biases in the response tendencies could have arisen as a result of the pandemic dynamics both in qualitative and quantitative data. The study was conducted during a period when the number of infections in Germany was comparatively low, which might have influenced the differences we detected with regards to the burdening experience between the two time points we assessed in our survey (March/April 2020 and "current"). Even if the pandemic in March/April 2020 represented a previously unknown exceptional situation, GP teams were repeatedly confronted with new stress situations during the course of the pandemic, which represent an extreme intervention in the everyday practice (e.g., vaccination campaigns) (13, 61). Thus, it seems likely that the results of this study will be transferable to future pandemic events. Furthermore, our study has investigated an underrecognized study population that needs more attention in further research.

4.4. Implications

The COVID-19 pandemic was a dynamic infection event, whereby it can be assumed that in the long term further pandemics will lead to changes in the daily routine of GPs (62–64). This study can therefore help to better understand the stressful and supportive factors of HCAs as an occupational group that has received little attention in research to date. Our results show the important role of the public health sector today and in the future in terms of ensuring the productivity and well-being of HCAs in the pandemic. Future research topics should therefore include how to improve the collaboration of GP teams with employees of the public health department. Regarding to HCAs' increased burden due to the pandemic expounded by our study, services should also be created for the outpatient sector that can help deal with workplace-related stress. To deal with future challenges, the resilience of HCAs should be promoted and strengthened (65). This can help prevent overwork and ensure an effective, adaptable and sustainable work team. The aforementioned sources of stress, such as challenging patients, organizational factors and regulations, can provide starting points for this. Especially in view of the shortage of HCAs not only in Germany, it seems fundamental to improve their working conditions in order to be able to ensure primary health care delivery (66–68). This could prevent HCAs exodus toward other professions not only with regard to future pandemics.

Data availability statement

The datasets presented in this article are not readily available because due to restrictions within the ethical approval, the datasets cannot be made publicly available. Specific data can be shared upon

reasonable request. Requests should be directed to the corresponding authors. Requests to access the datasets should be directed to schrader_h@ukw.de.

Ethics statement

The studies involving humans were approved by Ethics committee of the University Hospital Würzburg (No. 135/20-am) and the Medical Faculty of the University of Kiel (D 295/20). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

IG, SJ, HK, HS, SP, and KL conceptualized the initial study. HS and JE-M were involved in study recruitment. JE-M and HK conducted qualitative interviews and transcribed the narratives. GB performed the statistical analysis. HS, JR, JE-M, GB, and SP conducted qualitative analysis and triangulation. IG supervised all processes. HS and JR drafted the initial manuscript. All authors contributed during the process of reviewing and adapting the manuscript and approved the current version for submission.

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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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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1238144/full#supplementary-material

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Nurse burnout before and during the COVID-19 pandemic: a systematic comparative review

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Introduction: This review aimed to compare available evidence examining burnout using the Maslach Burnout Inventory (MBI) in nurses before and during the COVID-19 pandemic. The specific objective was to compare nurse burnout scores in terms of emotional exhaustion, depersonalization, and personal accomplishment.

Methods: A comprehensive search was conducted for studies on nurses' burnout using the MBI published between 1994 and 2022. In total, 19 studies conducted prior to the pandemic and 16 studies conducted during the pandemic were included and compared using the criteria from the Joanna Briggs Institute Critical Appraisal Tool.

Results: Surprisingly, the results indicated that nurses' burnout scores did not differ significantly before ($N = 59{,}111$) and during ($N = 18{,}629$) the pandemic. The difference observed was qualitative rather than quantitative.

Discussion: The outbreak of the COVID-19 pandemic exacerbated an already critical situation, and while COVID-19 may serve as an additional triggering factor for staff mental illness, it cannot solely explain the observed burnout levels. These findings underscore the need for long-term clinical and preventive psychological interventions, suggesting that psychological resources should not be limited to emergencies but extended to address the ongoing challenges faced by nurses.

Systematic review registration: https://www.crd.york.ac.uk/PROSPERO/display_record.php?RecordID=399628, identifier: CRD42023399628.

KEYWORDS

COVID-19 pandemic, nurse burnout, systematic review, comparative analysis, healthcare professionals

1. Introduction

A major problem worldwide is the shortage of medical personnel. As early as 2006, the World Health Organization reported that the shortage of nurses and health workers has a significant negative impact on improving the health and wellbeing of the world's population (1). The nursing profession in many countries faces increased rates of burnout caused by unrealistic expectations of work, poor working conditions, work demands that exceed

personal resources, poor relationships between professionals, and ultimately an increase in occupational health risks (2).

Burnout is characterized by a relatively rapid decline in emotional, physical, and psychological energy as a result of increased work stress. It often leads to a sense of low self-efficacy and results from work overload, a lack of control, resources, and equity. It can also be caused by a lack of community and value conflicts (3). The psychological phenomenon of burnout usually consists of three main factors as follows: emotional exhaustion (EE), i.e., emotional and physiological exhaustion due to work stress, leading to a decrease in energy, fatigue, despair, depression, and helplessness; depersonalization (DP), which refers to negative and insensitive behavior toward others and detachment from the needs of others and guidelines; and finally, a sense of low personal accomplishment (PA), i.e., an evaluation of oneself as inadequate and failing (4). These features of burnout lead to increased turnover rates and have a negative impact on the quality of healthcare.

This has been explained by the concepts of "compassion fatigue" and "caring burden" (5, 6) as the health profession requires a high level of relational and empathic engagement (7). It has been found that burnout in nurses is often associated with a deterioration in physical wellbeing, psychosomatic symptoms, such as insomnia, and psychological symptoms, such as depression. The discomfort is first felt in the professional sphere but then easily transfers to the personal level, and alcohol and psychoactive substance abuse and the risk of suicide are high among burnout sufferers (8).

The COVID-19 outbreak has created unique stressors and challenges, especially for frontline nurses. These stressors and challenges include moral and ethical issues (9). In Italy, Damico et al. (10) found a prevalence of burnout-related symptoms observed in at least 68% of nurses: 77.4% were at risk for EE, 68.7% for DP, and 77.9% for decreased PA. In addition, a statistically higher risk was observed among nurses in COVID-19 wards for EE (54.4 vs. 30.6%, $p < 0.01$), DP (39.7 vs. 23.6%, $p = 0.019$), and decreased PA (44.8 vs. 29.2%, $p = 0.027$), suggesting that the risk of burnout was lower in nurses who did not care for patients with COVID-19 during the emergency.

Despite this evidence, critical levels of burnout in pre-pandemic nurses were found in the literature among different types of units (11, 12). Previous studies and reviews found no differences in burnout, EE, DP, or PA between chronic and acute units. Some authors argue that the level of nurses' dissatisfaction may be related to increased workload combined with a reduction in relationship time (13). Considering EE as an isolated factor, it is significantly higher among nurses in the emergency department; DP, on the other hand, was not found in this area but showed very high scores in chronic units (14).

The international literature has focused heavily on burnout in healthcare workers in the last 2 years, leading to possible biases, such as the association of burnout with the COVID-19 pandemic. To our knowledge, an estimate of the difference between burnout levels in nurses before and during the COVID-19 pandemic is lacking. The aim of this review is, therefore, to compare studies that looked at burnout levels in its subcomponents EE, DP, and PA among nurses before and during the COVID-19 outbreak.

2. Materials and methods

2.1. Instruments

The Maslach Burnout Inventory (MBI) is the most well-known and extensively used instrument for evaluating burnout. The theoretical foundations of the MBI are based on the tri-dimensional model of burnout by Maslach (15), comprising "exhaustion," "cynicism," and "ineffectiveness." Maslach's model includes precise definitions for each dimension that align well with the corresponding measurement tool. There are currently five versions of the MBI as follows: (1) Human Services Survey (MBI-HSS), (2) Human Services Survey for Medical Personnel [MBI-HSS (MP)], (3) Educators Survey (MBI-ES), (4) General Survey (MBI-GS), and (5) General Survey for Students [MBI-GS (S)].

In a study conducted according to MOOSE (meta-analysis of observational studies in epidemiology) and the PRISMA guidelines recommended by the Cochrane Collaboration (16), the degree of burnout is taken into account (Table 1).

2.2. Procedure

2.2.1. Protocol registration

The systematic review and meta-analysis were conducted according to the protocol of the International Platform for Registered Systematic Reviews and Meta-Analyses. This study is based on the development of published data; therefore, ethical approval is not required. The study protocol was registered on PROSPERO, the International Prospective Register of Systematic Reviews, National Institute of Health Research, University of York, with the registration number "CRD42023399628."

2.2.2. Literature search strategy

The analysis was conducted according to the steps of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) procedure (see flowchart). To identify relevant studies, we searched the Web of Science, PubMed, Medline, and the CINAHL Plus (Cumulative Index of Nursing and Allied Health Literature) databases. Detailed search terms were a combination of "nurse," "burnout," "burnout syndrome," "MBI," "Maslach Burnout Inventory," and "COVID-19." Studies that examined burnout in nurses using the MBI were collected from 1994 to 2022. All those studies that had used one of the other versions of the scale were excluded; studies that did not report mean and standard deviations, but other indices related to burnout, such as correlations, positive case rate, and prevalence were also excluded. To ensure that no relevant articles were missed, the researchers of this study independently searched the reference lists of the included studies.

2.2.3. Study selection process and eligibility criteria

PRISMA was used to select the relevant studies. The words "Maslach Burnout Inventory" and nurse were searched. A total of 843 results were produced, of which 105 were produced in 2020, 140 in 2021, and 127 in 2022, while in previous years,

there were <100 studies per year. A total of 530 studies were excluded before screening because of duplication (n = 243) and were marked as ineligible by automation tools (n = 101) and other reasons (n = 186). The remaining 313 records were screened, and 231 records were excluded because they were opinion articles, chapters, case reports, letters to the editor, and studies on burnout in physicians and paramedics, or they used a different version of the scale. Finally, the exact keyword search that considered the human service survey version of the scale was 66. Of these, 31 were consulted and excluded because they did not report means and standard deviations, but other indices were related to burnout, such as correlations, percentage of positive cases, and prevalence. Thus, the present comparative review included 35 studies, of which 19 were conducted on nurses before COVID-19 and 16 during COVID-19, for a total of 77.740 valid cases (see Figure 1-PRISMA flowchart). Throughout the process, the researchers of the current study reviewed the studies based on the inclusion and exclusion criteria, and conflicts were resolved through group discussions.

PICOS-guided eligibility criteria included the following: (P) patient/population: participants were nurses working in critical care units; (I) intervention: studies that applied the MBI to assess burnout reporting means and standard deviations; (C) comparison/study design: burnout in nurses exposed to COVID-19 vs. burnout in nurses before the pandemic; (O) outcome: burnout

TABLE 1 MBI scoring guide.

Burnout construct	Cutoff score		
EE	0–18	19–26	>27
	Low	Moderate	High
DP	0–5	6–9	>10
	Low	Moderate	High
PA	0–33	34–39	>40
	High	Moderate	Low

EE, emotional exhaustion; DP, depersonalization; PA, personal accomplishment (17).

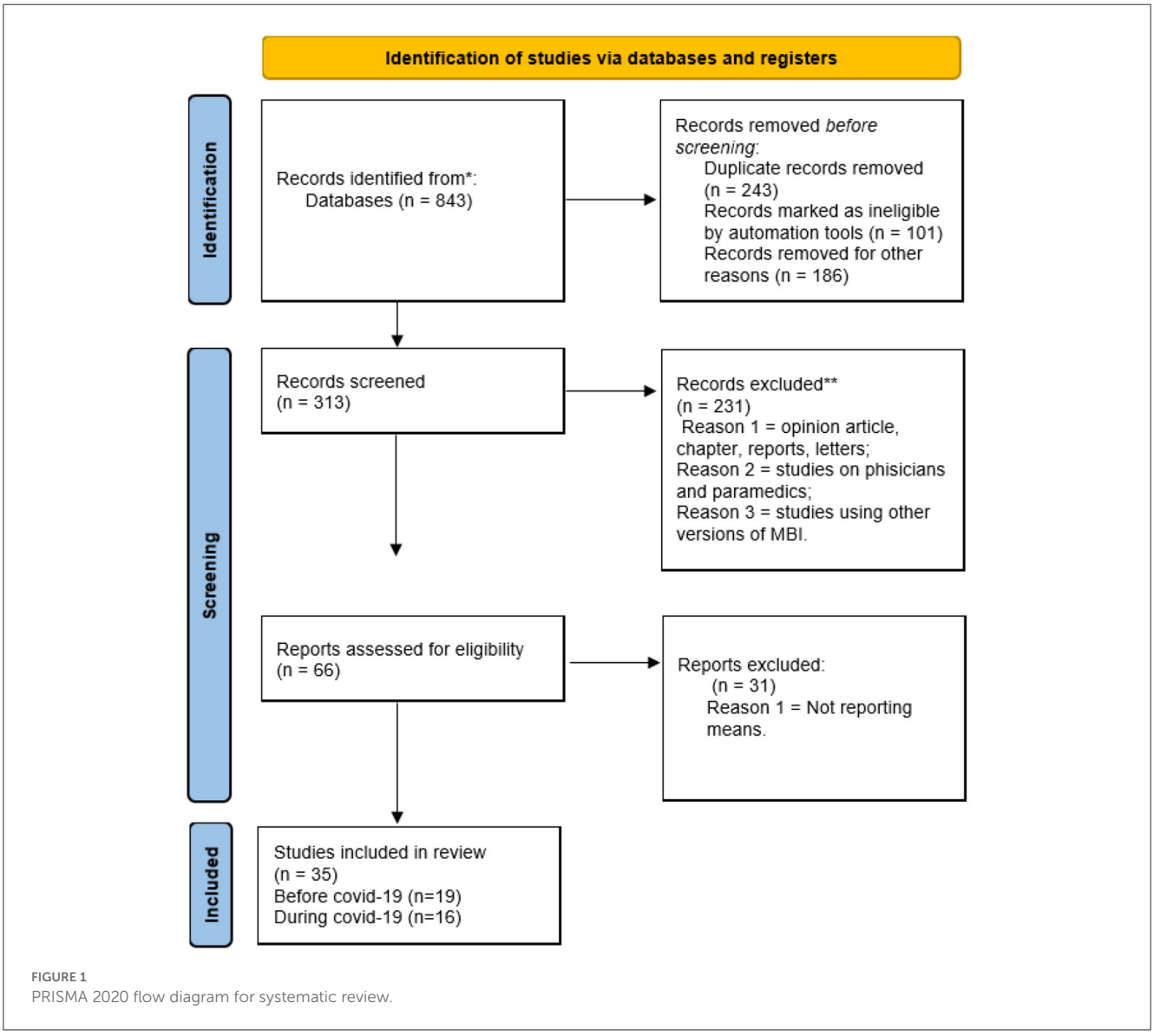

FIGURE 1
PRISMA 2020 flow diagram for systematic review.

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TABLE 2 Review results of Maslach Burnout Inventory among nurse EE, DP, and PA means and rating.

Authors	Nation	Nurse *N.*	Unit	EE	DP	PA	EE rating	DP rating	PA rating
Cao et al. (34)	China	485	Community health nurses	27.40	8.40	25.60	High	Moderate	Low
Cao et al. (35)	China	456	Community health nurses	26.50	8.50	24.60	Moderate	Moderate	Low
Edwards et al. (28)	UK	189	Community mental health	22.32	6.02	31.45	Moderate	Moderate	Low
Faura et al. (18)	Spain	116	Primary care	12.80	6.30	37.90	Low	Moderate	Moderate
Hannigan et al. (24)	UK	283	Community mental health	21.20	5.20	34.80	Moderate	Low	Moderate
Harkin et al. (32)	Ireland	48	Emergency nurses, medical nurse	24.60	11.90	29.10	Moderate	High	Low
Hayter et al. (23)	UK	30	HIV clinical nurses	13.00	15.50	21.30	Low	High	Low
Helps (21)	UK	35	Emergency nurses	36.09	21.34	8.09	High	High	High
Hu et al. (36)	China	420	Community nurses	13.00	15.50	21.30	Low	High	Low
Lorenz et al. (33)	Brasile	168	Primary healthcare	24.60	9.40	30.40	Moderate	Moderate	Low
Poghosyan et al. (30)	USA	13.204	Adult general hospital	22.00	9.40	37.00	Moderate	Moderate	Moderate
Poghosyan et al. (30)	Canada	17.403	Adult general hospital	20.40	8.30	37.20	Moderate	Moderate	Moderate
Poghosyan et al. (30)	UK	9.855	Adult general hospital	19.70	8.90	35.80	Moderate	Moderate	Moderate
Poghosyan et al. (30)	Germany	2.681	Adult general hospital	14.40	7.40	37.10	Low	Moderate	Moderate
Poghosyan et al. (30)	New Zealand	4.799	Adult general hospital	19.80	8.30	37.90	Moderate	Moderate	Moderate
Poghosyan et al. (30)	Japan	5.956	Adult general hospital	25.00	12.40	24.30	Moderate	High	Low
Poghosyan et al. (30)	Russia	442	Adult general hospital	15.10	3.60	20.40	Low	Low	Low
Poghosyan et al. (30)	Armenia	398	Adult general hospital	8.40	3.70	21.90	Low	Low	Low
Quattrin et al. (29)	Italy	100	Oncology	19.50	4.20	38.60	Moderate	Low	Moderate
Schaufeli et al. (20)	Holland	183	General hospital, mental hospital	16.20	5.40	32.70	Low	Low	Low
Schaufeli et al. (20)	Poland	200	General hospital, mental hospital	20.00	8.70	27.30	Moderate	Moderate	Low
Schaufeli et al. (19)	Holland	64	Community nurses	17.50	4.80	30.30	Low	Low	Low
Shmitz et al. (25)	Germany	361	9 Hospital units	10.60	31.00	19.60	Moderate	High	Low
Cámara and Cuesta (27)	Spain	208	Primary care	19.90	7.60	27.40	Moderate	Moderate	Low
Tomàs-Sàbado et al. (31)	Spain	146	Primary care	17.50	4.80	41.20	Low	Low	High

(Continued)

TABLE 2 (Continued)

Authors	Nation	Nurse *N.*	Unit	EE	DP	PA	EE rating	DP rating	PA rating
Vahey et al. (26)	Pennsylvania	820	40 Hospital units	24.30	7.40	36.60	Moderate	Moderate	Moderate
Wykes et al. (22)	UK	61	Community nurses	22.50	7.80	35.20	Moderate	Moderate	Moderate
Bellanti et al. (43)	Italy	293	University hospital	26.95	9.09	35.20	Moderate	High	Moderate
Bisesti et al. (46)	Italy	105	SICU	29.10	9.00	32.00	High	Moderate	Low
Chen et al. (44)	China e Taiwan	12.596	Healthcare	19.10	5.50	19.00	Moderate	Moderate	Low
Cortina-Rodriguez and Afanador (38)	Puerto Rico	23	Clinical personnel (Nurses)	32.00	9.80	32.70	High	High	Low
Guixia et al. (37)	China	92	Practical nurses	19.20	5.78	34.45	Moderate	Moderate	Moderate
Hu et al. (45)	China	2.101	ICU	23.40	6.80	34.80	Moderate	Moderate	Moderate
Jakovljevic et al. (50)	Serbia	27	Hospital nurse	30.24	6.85	28.82	High	Moderate	Low
Jalili et al. (41)	Iran	300	Healthcare	26.60	10.20	27.30	Moderate	High	Low
Kakemam et al. (49)	Iran	1.004	Emergency, critical care, general wards	25.94	8.30	29.39	Moderate	Moderate	Low
Kamali et al. (51)	Iran	261	Healthcare	29.22	7.41	18.53	High	Moderate	Low
Murat et al. (42)	Turkey	705	Front-line nurses	11.40	7.30	18.90	Low	Moderate	Low
Pekince et al. (52)	Turkey	270	University hospital	19.30	6.80	19.70	Moderate	Moderate	Low
Rivas et al. (48)	Spain	101	COVID Nurse	32.24	9.51	36.73	High	High	Moderate
Sayilan et al. (40)	Turkey	267	General hospital	23.68	17.14	17.56	Moderate	High	Low
Yörük et al. (47)	Turkey	377	General hospital	20.06	6.42	22.70	Moderate	Moderate	Low
Zhang et al. (39)	China	107	Front-line nurses	12.30	2.10	16.50	Low	Low	Low

scores and its three dimensions, such as EE, DP, and PA, categorized as low, moderate, and high (see review Table 2).

The following literature was excluded: conference abstracts, reviews, letters, case reports, posters, unpublished data, and insufficient data, and studies in which averages (e.g., correlation scores or percentages of at-risk cases) were not reported. Health services survey (MBI) data were collected; when data were also collected on other samples, such as physicians and nurses, only data on nurses were reported.

2.3. Quality of the studies

The Critical Appraisal tools for use in Joanna Briggs Institute (JBI) Systematic Reviews and the Checklist for Systematic Reviews and Research Syntheses of the JBI Faculty of Health and Medical Sciences at the University of Adelaide, South Australia were used to assess the quality of the studies. The quality of the texts was evaluated by the researchers, and scoring was performed independently. The tool evaluates studies based on 11 standard questions. If the answer was affirmative, the question was assigned a score of 1. If the answer was negative, unclear, or not applicable, a score of 0 was assigned. Studies that scored >8 as an index of study quality and appropriateness were included in this review.

3. Results

Table 2 shows the results of the comparative review. The following information was extracted: study characteristics (first author, year of publication, country, number of participants, and type of department) and outcome data [mean emotional exhaustion

(EE > 26), mean depersonalization (DP > 9), and mean personal accomplishment (PA < 34)], collected with the MBI. Burnout dimension scores were classified into low, moderate, and high burnout risk according to the MBI scoring guide (see Table 2).

3.1. Study characteristics

3.1.1. Before COVID-19

The review included 19 studies that examined 27 samples, comprising 59,111 nurses belonging to departments of Primary Care, Community, General Hospital, Mental Hospital, Emergency, HIV Clinical Care, Community Mental Health, Hospital Units, Oncology, Adult General Hospital, and Medical and Primary Healthcare. Pre–COVID-19 burnout studies were mainly conducted in Europe (eight nations), Asia (three nations), North America (two nations), South America (one nation), and Oceania (one nation). Among the 27 samples, the scores for the EE dimension were classified as low in nine studies, moderate in 16 studies, and high in two studies. While the scores of the DP dimension were classified as low in seven studies, moderate in 14 studies, and high in six studies, the scores of the PA dimension were classified as low in 15 studies, moderate in 10 studies, and high in two studies.

3.1.2. During COVID-19

The studies that detected burnout risk during COVID-19 that met the inclusion criteria were 16, representing 16 samples with 18.629 nurses from COVID-19 departments, emergency, critical care, general wards, front-line, general hospital, university hospital, healthcare, ICU, and SICU. Studies on burnout during COVID-19 were mainly conducted in Asia (four nations), Europe (three nations), and North America (one nation). Among the 27 samples, the scores for the EE dimension were classified as low in two studies, moderate in nine studies, and high in five studies. While the scores of the DP dimension were classified as low in a study, moderate in 10 studies, and high in five studies, the scores of the PA dimension were classified as low in 12 studies and moderate in four studies.

3.2. Comparison

3.2.1. Quantitative analysis

A comparison of means for independent samples was performed with Student's *t*-test comparison of means with 95% confidence intervals. After Bonferroni correction, *p*-values of <0.01 can be considered statistically significant (Table 3). Mean levels of EE were 20.12 ± 5.63 before COVID-19 and 23.79 ± 6.44 during COVID-19. The DP mean was 8.56 ± 4.03 before COVID-19 and 8.00 ± 3.15 during COVID-19. The PA mean was 30.23 ± 7.58 before COVID-19 and 26.51 ± 7.36 during COVID-19. Comparison of the averages measured did not report statistically significant results (see also the simple boxplot comparing means in Supplementary material). From a qualitative point of view, however, an increase in EE and a decrease in PA are appreciated. Figures 2–4 report the mean of EE, DP, and PA across years. COVID-19 studies started in 2019.

TABLE 3 Statistics about the comparison of the studies before vs. during COVID-19.

MBI subscales	Statistics	Scores
EE	Odds ratio (exp/control)	11.25
	Confidence interval	[1.193, 106.123]
	Left-sided interval	[1.711, +∞]
	Right-sided interval	[−∞, 73.979]
	P-value	**0.01**
	Z-score	2.11
DP	Odds ratio (exp/control)	5.83
	Confidence interval	[0.525, 64.823]
	Left-sided interval	[0.193, +∞]
	Right-sided interval	[−∞, 44.014]
	P-value	0.07
	Z-score	1.43
PA	Odds ratio (exp/control)	1.60
	Confidence interval	[0.129, 19.838]
	Left-sided interval	[0.193, +∞]
	Right-sided interval	[−∞, 13.235]
	P-value	0.357
	Z-score	0.365

The symbol "+∞" represents positive infinity; The symbol "−∞" represents negative infinity.

3.2.2. Qualitative analysis

The graphs represent the comparison of the number of studies that found low, moderate, and high levels of burnout, respectively, before and during COVID-19. MedCalc® odds ratio calculator was used to calculate the ratio between odds, confidence intervals, and *p*-values for the odds ratio (OR) between exposed and control groups. Studies during the COVID-19 pandemic reporting high risk for burnout were considered events in the exposed group. Studies during COVID-19 reporting a low rate of burnout were considered non-events in the exposed group. Studies before the pandemic reporting a high risk of burnout were inserted as events in the control group. Studies before the pandemic reporting low risk were inserted as non-events in the control group. The significance was set at a confidence interval of 95%. Figures 5–7 show the comparison between the number of studies before ($N = 19$) and during ($N = 16$) the COVID-19 pandemic, which found low, moderate, and high EE.

The calculation of the odds ratio shows a significant increase in studies that found high levels of EE during the COVID-19 pandemic, with respect to the studies that were carried out before COVID-19 (Figure 5). On the contrary, the calculation of the odd ratio shows no significant increase in the studies which found high levels of DP during the pandemic, with respect to the studies that were carried out before COVID-19 (Figure 6). Concerning the PA dimension, the calculation of the odd ratio shows no significant increase in the studies which found—in this case—low levels of satisfaction during the pandemic

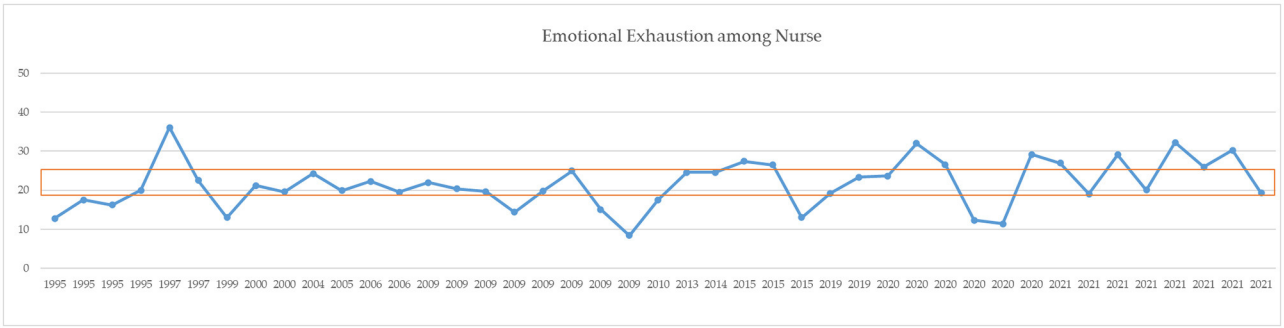

FIGURE 2
MBI EE means across years. Orange line = moderate range (19–26).

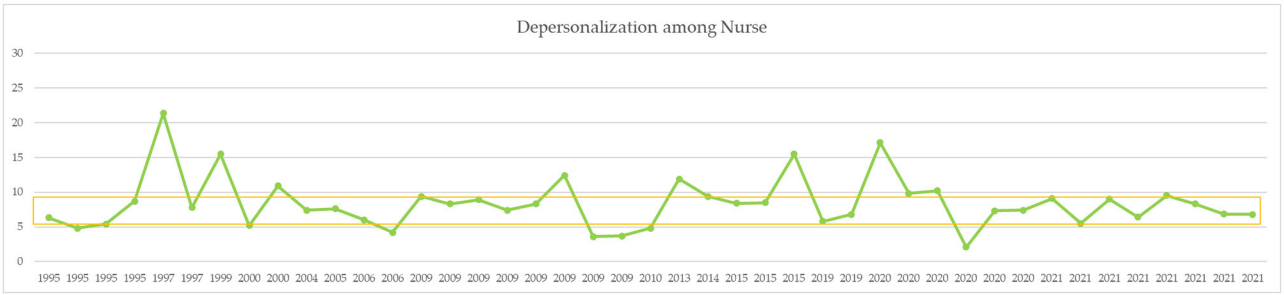

FIGURE 3
MBI DP means across years. Yellow line = moderate range (6–9).

FIGURE 4
MBI PA means across years. Gray line = moderate range (34–39).

compared with the studies that were carried out before COVID-19 (Figure 7).

4. Discussion

4.1. Aim of the present study

This comparative review aimed to examine burnout levels among nurses by comparing the average scores of nurses before and during the COVID-19 pandemic. To make the results comparable, the main psychometric assessment tool for burnout was selected for its main factorial components, such as EE, DP, and PA. This comparison was made using a quantitative and qualitative analysis of scores collected from a large number of large samples of health professionals over a period of more than 20 years. To make these data comparable, they were further processed and classified according to risk level: low, moderate, and high (3). Surprisingly, the comparison of the measured average values did not yield statistically significant results. Quantitative findings show that the burnout levels of the nurses were similar before and during the COVID-19 pandemic, whereas qualitative findings show that nurses reported higher levels of EE and lower levels of PA during the COVID-19 pandemic. The distribution of burnout levels across the emotional exhaustion (EE), depersonalization

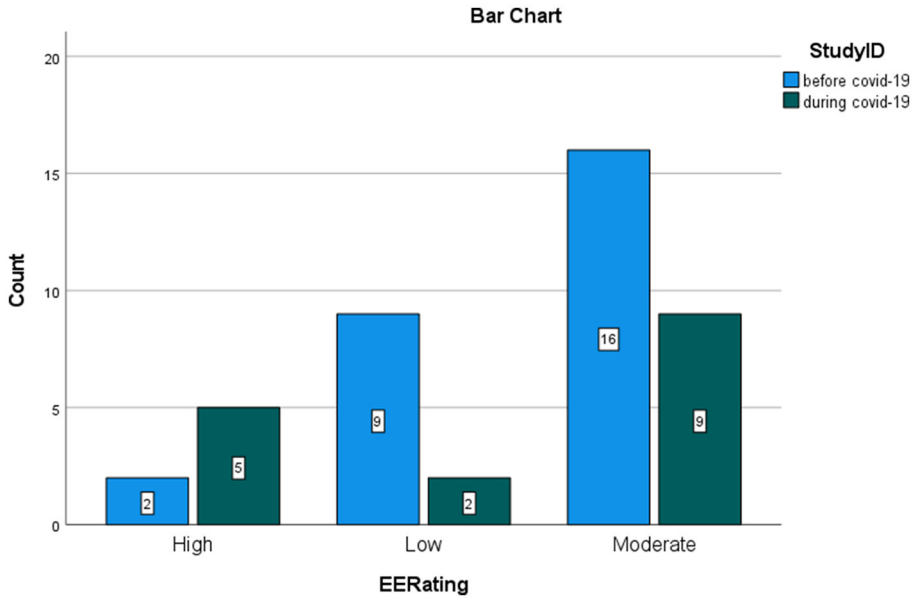

FIGURE 5
Rating of EE in nurses. Comparison between studies before and during the pandemic.

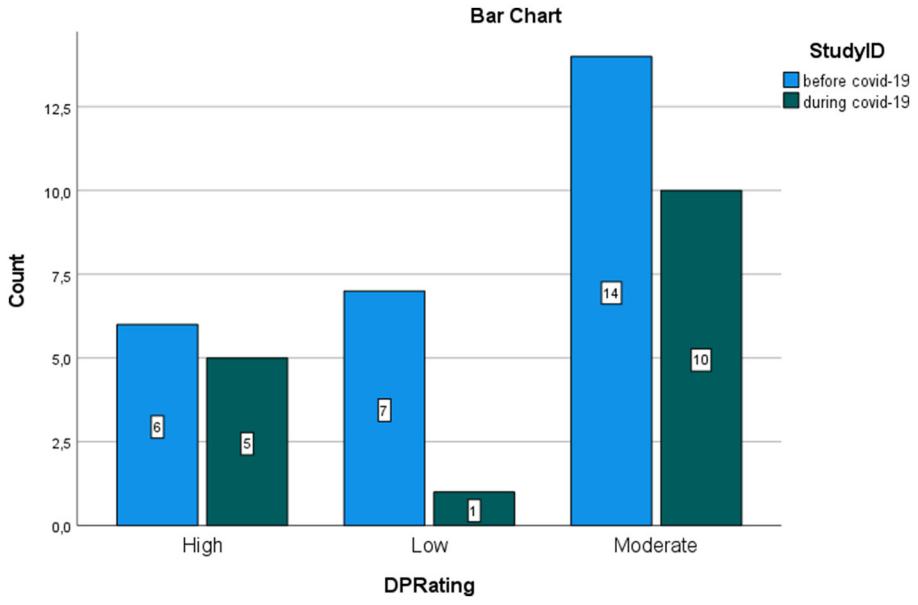

FIGURE 6
Rating of DP in nurses. Comparison between studies before and during the pandemic.

(DP), and personal accomplishment (PA) dimensions differed between the two periods. Before COVID-19, the majority of studies reported moderate scores for EE and DP, with fewer studies reporting high scores. However, during COVID-19, there was an increase in the number of studies reporting high scores for EE and DP. Additionally, during COVID-19, more studies reported low scores for PA compared with the period before COVID-19.

4.2. Burnout levels among nurses before the pandemic

High and moderate levels of EE and DP and low levels of PA were already prevalent in the population of nurses in several countries around the world before the pandemic (53, 54). From a theoretical perspective, this finding is consistent with Gee et al. (55) who found that the nursing workforce was already at risk

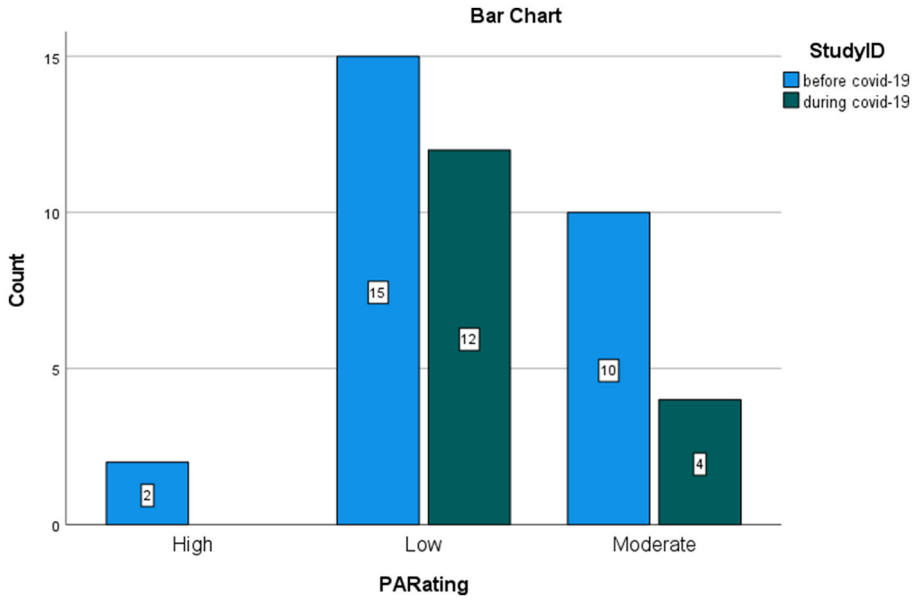

FIGURE 7
Rating of PA in nurses. Comparison between studies before and during the pandemic.

of burnout in previous years. A recent meta-analysis by Ge et al. (56)—including 94 studies covering over 30 countries—revealed that the global prevalence of nursing burnout syndrome over the past 10 years (from 2012 to 2022) was 30.0%, with significant heterogeneity influenced by specialty, region, and year. The prevalence tended to gradually increase during the COVID-19 pandemic, with more significant increases observed in Europe and Africa. Differences in sample size and research scope may account for the discrepancy. Factors contributing to burnout include adverse working conditions such as workload, rotating shifts, low salaries, workplace violence, and a lack of support.

4.3. Burnout levels among nurses during the pandemic

During the pandemic, a large percentage of frontline workers had low levels of burnout and a sense of personal satisfaction, also due to role changes from primary and community nurses to frontline workers dealing with patients suffering from COVID-19 (57–59). A study by Dewi et al. (60) found that nurse burnout in Asia during the COVID-19 pandemic was influenced by various factors. Psychological factors such as worry and psychological distress were already significant predictors of burnout (61), while the COVID-19 outbreak has worsened the mental health of healthcare workers, impacting their performance. Religious beliefs and supportive spiritual aspects are important for the mental wellbeing of healthcare workers. Work-related factors such as workload, overtime jobs, and job stress contribute significantly to burnout. Stress in surgical wards and ICUs is particularly associated with burnout among nurses. Insufficient resources and a lack of personal protective equipment (PPE) are additional predictors of stress and burnout. Nurse-patient relationships also play a role in burnout in the form of abuse from patients and emotional situations with the public.

4.4. Differences among countries

According to Toscano et al. (62), several studies have highlighted the prevalence of burnout syndrome (BOS) among nurses during the COVID-19 pandemic, taking into account differences among countries. In Belgium, 68% of participating ICU nurses showed BOS symptoms, with emotional exhaustion, depersonalization, and reduced personal accomplishment reported. A Canadian study found moderate-to-high burnout in all nurses, with signs of secondary traumatic stress and intentions to quit. Israeli nurses reported high levels of burnout, which significantly affected professional functioning. Turkish ICU nurses demonstrated a positive correlation between burnout and fear of COVID-19. South African nurses experienced moderate-to-high burnout levels, while Iranian ICU nurses showed emotional exhaustion and depersonalization. Italian nurses exhibited BOS symptoms, with emotional exhaustion being the most prevalent. These findings indicate a relevant risk of BOS among ICU nurses during the pandemic.

In the present study, before COVID-19, studies were more evenly distributed across different continents, with studies conducted in Europe (eight nations), Asia (three nations), North America (two nations), South America (one nation), and Oceania (one nation). During COVID-19, the majority of studies were conducted in Asia (four nations), followed by Europe (three nations) and North America (one nation). The comparison indicates that during the pandemic, there was a notable increase in burnout levels among nurses in Asian countries, with more

studies reporting high scores in emotional exhaustion and depersonalization. Additionally, there was a general increase in studies reporting low scores in personal accomplishment during COVID-19, indicating potential challenges in maintaining a sense of achievement and fulfillment among nurses during the pandemic.

Europe continued its research efforts during the pandemic, but burnout levels remained relatively consistent before COVID-19. North America had a reduced focus on burnout research during the pandemic. However the available data from this region showed similar patterns of increased high scores in EE and DP and more studies reporting low scores in PA during COVID-19.

4.5. Limitations

The study also has some limitations. In interpreting the results, it is necessary to take into account the differences (e.g., healthcare systems, working hours, and work–life balance) in terms of the countries in which the studies were conducted and the year of their publication. Regarding possible publication bias, it is necessary to consider the possible bias of the studies included in the study, a factor that was attempted to be controlled by critical reading of the studies before their inclusion. A standard meta-analytic methodology was not used due to a lack of statistical parameters, yet it could be well performed if the amount of research data allowed it. Because the articles reviewed were descriptive studies, the level of evidence from the studies is low, but it is sufficient to analyze means, standard deviations, and percentages and to relate the variables and their integration in a comparative review such as the one conducted here. Furthermore, the comparison of burnout between the two groups might be affected by differences in sample size. The group with a larger sample size (before COVID-19) will likely have higher statistical power to detect smaller effects, while the group with a smaller sample size (during COVID-19) may have reduced statistical power to detect significant differences. Finally, it would have been ideal to compare the same subjects under different conditions, but unfortunately, there are no longitudinal studies on burnout levels.

5. Conclusion

The present study has shown that burnout is already a silent epidemic that is certainly exacerbated by COVID-19. However, considering the literature data, COVID-19 can only explain a portion of the burnout levels among nurses. The literature accurately shows how these healthcare professionals had already been in a precarious situation for years (61). Addressing burnout among nurses should remain a top priority. Implementing comprehensive support systems, enhancing work–life balance, and fostering a positive work environment can help mitigate burnout risk (62). Longitudinal studies should investigate the lasting effects of the pandemic on nurse burnout. Tailored interventions, training programs, and mental health resources can aid nurses in coping with the challenges they face (63–65). Continuous monitoring and preventive strategies are essential to safeguarding the wellbeing of healthcare professionals (66–71).

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.

Author contributions

AR and FC: conceptualization, software, and investigation. AR: methodology and data curation. AC and MY: validation. FC: formal analysis. AC: resources, visualization, supervision, and project administration. AR, MY, and GGÖ: writing—original draft preparation. MY, FC, GGÖ, ŁS, SZ, and GN: writing—reviewing and editing. 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.

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Presenteeism and mental health of workers during the COVID-19 pandemic: a systematic review

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Background: A large number of workers attend work despite being ill. Attending work during sickness can have a number of consequences for the worker (e.g., worsening of physical and mental condition), for co-workers, and for the company, and for service users.

Objectives: The aim of this study was to assess the factors influencing presenteeism and mental health of workers during the COVID-19 pandemic.

Methods: A systematic review following the PRISMA format was conducted in the PubMed, Scopus, Web of Science (WoS), Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycInfo, and ScienceDirect electronic databases in January 2023, using the following key words: Presenteeism, Mental Health, and COVID-19. The eligibility criteria applied were original articles published in English, Spanish, French, German, and Portuguese, workers during the COVID-19 pandemic (data collection date: January 01, 2020 – January 01, 2023), and articles assessing at least one measure of presenteeism and mental health status. Methodological quality was assessed using the critical appraisal tools of the Joanna Briggs Institute. The followed protocol is listed in the International Prospective Register of Systematic Reviews (PROSPERO) with code CRD42023391409.

Results: A total of 25 studies were included in this review recruiting a total of 164,274 participants. A number of factors influencing mental health and sickness presenteeism were identified: (1) mental health-related factors (burnout [in 4 studies], stress [in 9 studies], depression [in 1 study], fear of COVID-19 [in 1 study], no well-being [in 2 studies], etc.); (2) individual factors (health status [in 1 study], being young [in 1 study], workers who experienced interrupted medical care [in 2 studies], having a chronic disease [in 1 study], etc.); (3) factors related to the situation caused by COVID-19 (confinement, symptoms, loss of contract, risk of bankruptcy, etc. [in 1 study each one]); and (4) factors derived from working conditions (organisational support [in 1 study], patient care [in 1 study], work functioning or task performance impairment [in 4 studies], work fatigue [in 2 studies], safety climate [in 1 study], workload [in 1 study], etc.).

Conclusion: Identifying the key determinants of presenteeism and understanding the phenomena and origins of sickness presenteeism will help to create a safe

working environment and optimal organisational systems to protect vulnerable workers in a pandemic context.

Systematic review registration: The unique identifier is CRD42023391409.

KEYWORDS

COVID-19, mental health, occupational health, presenteeism, workers

1. Introduction

Work attendance during illness can be an occupational health and public health problem, as it is directly related to productivity and the worker's perception of ineffectiveness (1). Sickness presenteeism is a type of behaviour displayed by some workers who, despite being ill and having physical and/or psychological conditions, decide to go to work or continue with their workday (2). On the other hand, presenteeism means that workers attend work physically and comply with their working hours, but do not really work or contribute anything beyond their presence (3). It is estimated that around 1 in 3 European workers engage in sickness presenteeism (3) and the cost that presenteeism incurs in the workplace is higher than the cost of treatment for these physical and mental illnesses, or even absenteeism (failing to work due to sickness) and sick leaves (4).

This decision is usually made autonomously by the worker and may depend on personal characteristics, the economic situation and type of work, the individual's values and concerns about leaving their job unattended, among other things (5). In fact, both job demands and resources may be elements that influence a worker's decision to work despite being sick, according to the Job Demands-Resources Model (6, 7). In this line, authors such as Pohling et al. (8) focused on occupational environmental factors and work climate as the theoretical basis for explaining presenteeism according to the Person-Environment (mis)fit theory. When a misfit between work and the person occurs as a result of these factors, workers experience stress and subsequent psychological burnout as a result. This misfit, together with the need to save resources, leads to workers continuing to work despite this situation (9).

Attending work during sickness can have a number of consequences for the worker (e.g., worsening physical and mental condition), for co-workers, and for the company and service users (10), hence the importance of its study and evaluation. Nevertheless, before the pandemic, some authors had already found possible links between certain mental health-related problems (such as depression) and a change in productivity caused by sickness presenteeism (11–13).

According to the Cambridge dictionary (14), a worker is someone who works in a particular job or in a particular way or someone who works for a company or organisation but does not have a powerful position. Self-employed workers or workers in small businesses may have replacement difficulties in the event of absence from work and are often compelled to work despite being ill (15). A study in Portugal determined that self-employed workers were 85% less likely to take sick leave than employees (14). This can be justified by the need to continue working despite being sick because of the economic difficulties in general, and the pandemic in particular, in order to find solutions to keep their businesses going (16). Another occupational group with high levels of sickness presenteeism is healthcare workers (5). In this case, work attendance during illness can undermine the quality of care provided, increase the likelihood of incidents that may compromise patient safety and clinical practise (17), and even lead to infecting patients and/or co-workers (18). Specific factors justifying these high levels of presenteeism or sickness presenteeism among health workers may include feelings of professionalism and loyalty (19), personal circumstances, and working conditions (stressful work, high complexity, long working hours, low staffing levels, etc.) (18, 20), situations that worsened considerably during the COVID-19 pandemic.

The COVID-19 pandemic has led many organisations to change the way they work and, consequently, the working conditions of their workers. In addition to the pandemic's impact on people's mental health (21), the economic situation and job insecurity also worsened (some people worked despite being ill in order not to lose their jobs), some workers switched to teleworking (teleworking from home despite being ill and performing work duties outside of their working hours), chronic programmes were temporarily suspended, and people's health and consumption habits began to change, with the subsequent consequences at the physical, mental, and social levels (22). Despite recommendations for social distancing and isolation in the case of COVID-19-like symptomatology, many workers were forced to work in order not to lose their jobs or see their income reduced, especially workers with a lower level of education and lower socio-economic status (23), with the consequent impact this may have on their mental health. This study is necessary so as to know the factors that influence presenteeism and to assess which professions suffer the most from sickness-related presenteeism so that organisations and/or companies can take measures based on scientific evidence.

Therefore, the aim of this study was to assess the factors associated with mental health and working conditions that affect presenteeism of workers during the COVID-19 pandemic.

2. Methods

2.1. Study design

A systematic review of association (aetiology and risk) (24) was conducted following the PRISMA statement guidelines (Preferred Reporting Items for Systematic reviews and Meta-Analyses) (25, 26). The followed protocol is listed in the International Prospective Register of Systematic Reviews (PROSPERO) with code CRD42023391409. This topic was not covered recently by a Review in IJPH or in another journal.

2.2. Databases and search strategy

The search was carried out in the Pubmed, Scopus, Web of Science (WoS), Cumulative Index to Nursing and Allied Health Literature

(CINAHL), PsycInfo, and ScienceDirect electronic databases based on the keywords that the research question yielded following the PEO strategy (27). The research question was *What are the factors related to mental health and working conditions that affect presenteeism of workers during the COVID-19 pandemic?* (Table 1).

Following these keywords, the Medical Subject Headings (MeSH) thesaurus was consulted, yielding the descriptors Presenteeism, Mental Health, and COVID-19. In order to improve the collection of published studies in line with the subject of the study, synonymous terms were used to complete the search strategy based on the MeSH descriptors (Table 2), which were joined using the Boolean operators *and* and *or*.

In this case, the terms *Presenteeism, sickness presence, Mental Health, Burnout, Stress, Anxiety, Depression, COVID-19,* and *SARS-CoV-2* were used. Table 3 shows the search strategy used, carried out on January 17, 2023, for each of the aforementioned databases during the search process.

2.3. Selection criteria

The following criteria were used for the selection of articles:

2.3.1. Inclusion criteria

- Original articles published in English, Spanish, French, German, and Portuguese.
- Type: original articles, short communications, and case reports.
- Population: workers during the COVID-19 pandemic (someone who works in a particular job or in a particular way or someone who works for a company or organisation).
- Data collection date: January 01, 2020 – January 01, 2023.
- Articles assessing any of the following values and/or effects and those that include at least one measure of presenteeism and mental health status (presenteeism, mental health, and factors associated): prevalence of presenteeism or sickness presenteeism, consequences and main manifestations, short/medium/long-term effects; influence of mental health on sickness presenteeism, and possible causes of sickness presenteeism; and other factors that reduce or increase presenteeism or sickness presenteeism; differences between countries and professions; differences between telework and face-to-face work.

2.3.2. Exclusion criteria

- Studies of low scientific-technical quality after applying the quality assessment tool.
- Population: students.
- Date of data collection: if out of the inclusion period or if the date of data collection was missing.
- Articles that did not answer the research question and were not related to the objective of the review. Studies that did not assess presenteeism or sickness presenteeism as well as mental health were excluded.
- Type: opinion articles, editorials, and letters to the editor.

2.4. Data collection and extraction

Based on the aforementioned consensual search strategy, two investigators independently performed the searches, eliminated duplicate studies, and selected articles for inclusion after reading the abstract and title according to the previously established criteria. Subsequently, the same two authors reviewed the full text of potentially eligible studies and the decision to include or exclude them in the review was made by consensus. Discrepancies were resolved by a third author. For the data collection after reading the full text of the articles, specific information on the studies was extracted, such as authors'

TABLE 1 PEO format: keywords.

Population	Workers during the COVID-19 pandemic
Exposure	Factors related with mental health and working conditions
Outcomes	Presenteeism: prevalence of presenteeism; consequences and main manifestations; short/medium/long-term effects; influence of mental health on presenteeism; differences between countries and professions; other factors associated with presenteeism; differences between telework and face-to-face work; and possible causes of presenteeism.
Research question	
What are the factors related to mental health and working conditions that affect presenteeism of workers during the COVID-19 pandemic?	

TABLE 2 Terms and definitions used in the search.

MeSH terms	Meaning	Terms
Presenteeism	Reporting for work despite feeling ill	Presenteeism OR sickness presence
Mental Health	Emotional, psychological, and social well-being of an individual or group	Mental Health OR Burnout OR Stress OR Anxiety OR Depression
COVID-19	A viral disorder generally characterised by high fever; cough; dyspnoea; chills; persistent tremor; muscle pain; headache; sore throat; a new loss of taste and/or smell (see ageusia and anosmia); and other symptoms of a viral pneumonia	COVID-19 *OR* SARS-CoV-2

MeSH, Medical Subject Headings.

TABLE 3 Search strategy used in each database.

Databases	Search strategy
PubMed	("presenteeism"[Title/Abstract] OR "sickness presence"[Title/Abstract]) AND ("COVID-19"[Title/Abstract] OR "SARS-CoV-2"[Title/Abstract]) AND ("mental health"[Title/Abstract] OR "burnout"[Title/Abstract] OR "stress"[Title/Abstract] OR "anxiety"[Title/Abstract] OR "depression"[Title/Abstract])
Scopus	(TITLE-ABS-KEY (mental AND health OR burnout OR stress OR anxiety OR depression) AND TITLE-ABS-KEY (presenteeism OR sickness AND presence) AND TITLE-ABS-KEY (covid-19 OR sars-cov-2))
Web of Science	"mental health" OR burnout OR stress OR anxiety OR depression (Topic) AND presenteeism OR sickness presence (Topic) AND COVID-19 OR SARS-CoV-2 (Topic)
CINAHL	AB ("mental health" OR burnout OR stress OR anxiety OR depression) AND AB (presenteeism OR sickness presence) AND AB (COVID-19 OR SARS-CoV-2)
PsycInfo	tiab(mental health OR burnout OR stress OR anxiety OR depression) AND tiab(presenteeism OR sickness presence) AND tiab(COVID-19 OR SARS-CoV-2)
ScienceDirect	Title, abstract, keywords: (mental health OR burnout OR stress OR anxiety OR depression) AND (presenteeism OR sickness presence) AND (COVID-19 OR SARS-CoV-2)
Other sources	Items identified through other resources
Search date: January 17, 2023	

names and year of publication; context in which the study was conducted; objective of the study; type of study; sample, methodology, and instruments used for data collection; main findings; and quality of the study after applying the critical appraisal tools.

2.5. Methodological quality assessment

Two reviewers independently determined the methodological quality of the selected studies using the critical appraisal tools of the Joanna Briggs Institute (JBI) at the University of Adelaide. These tools allowed assessing the methodological quality of a study and determining the extent to which a study has excluded or minimised the risk of bias in its design, conduct, and/or analysis. The versions for analytical cross-sectional studies (8-items) (28), for qualitative research (10 items) (29), for cohort studies (11 items), and for Randomised Controlled Trials (13 items) (30) were used, setting the cut-off point at 6 to be accepted for inclusion in this review for the first two, 8 for the third, and 10 for the fourth (Supplementary material). The basic parameters of the included articles conform to the applied inclusion criteria (especially study design, year of publication, and country origin).

3. Results

The initial search strategies identified a total of 88 references, which were then screened according to the topic of this review. A total of 25 studies were finally selected (Figure 1), recruiting a total of 164,274 participants. 22 of which were analytical cross-sectional studies, 1 qualitative research, 1 cohort study, and 1 randomised controlled trial.

Four studies had been conducted in Japan (31–34) and 4 in United Kingdom (35–38), 3 in United States (39–41), 2 in China (42, 43), Germany (44, 45), and the Republic of Korea (46, 47), and 1 in Sweden (16), Wales (48), Canada (22), Turkey (49), Lithuania (50), Portugal (51), Australia and New Zealand (52), and Belgium and the Netherlands (53). In 14 of the 25 selected articles, collection took place in 2020; 6 of the 25 were collected in 2021; and the remaining 5 were collected over months in both 2020 and 2021. No studies were found with data collected in 2022 or later. Regarding participants, in 10 studies the sample consisted of health professionals, in 2 studies the sample was collected in the educational environment, and another 2 samples included self-employed workers. The remaining studies (11 out of 25) included workers from other occupational fields or general workers. Working from home or remote working was assessed in 3 of the 25 studies.

It was found that between 70.6% (43) and 26% (38) of the subjects in the included studies showed sickness presenteeism. In addition, a number of factors may have also favoured presenteeism or sickness presenteeism, such as mental health-related factors [burnout (34, 45, 49, 51), stress (33–35, 38, 42, 44, 45, 47, 49), depression (46), fear of COVID-19 (49), no well-being (16, 40), cyberbullying (51), sleep disturbance (34), concern about having enough food (41), social isolation (38), and no resilience (38)]; individual factors [poor marital relationship (31), health status (42), being young (38), attention-deficit/hyperactivity disorder symptoms (32), workers who experienced interrupted medical care (33, 40), low physical activity (38, 50), sedentary behaviours (52), having children (41), having health insurance (41), and having a chronic illness (38)]; factors related to the situation caused by COVID-19 [confinement (45), having symptoms of respiratory infectious disease (48), not volunteering to work on the frontline (47), impact on business operations, loss of contract, and risk of bankruptcy (16)]; and factors arising from working conditions [perceived organisational support (49), direct patient care (39), work functioning or task performance impairment (31, 42, 43, 53), work fatigue (34, 43), safety climate (22), workload (22), having no one to replace them (48), geographical distribution (48), transition from in-person to online modes of working (34, 35), salary of less than $35,000 (41), increase in working hours, work–family conflict (16)].

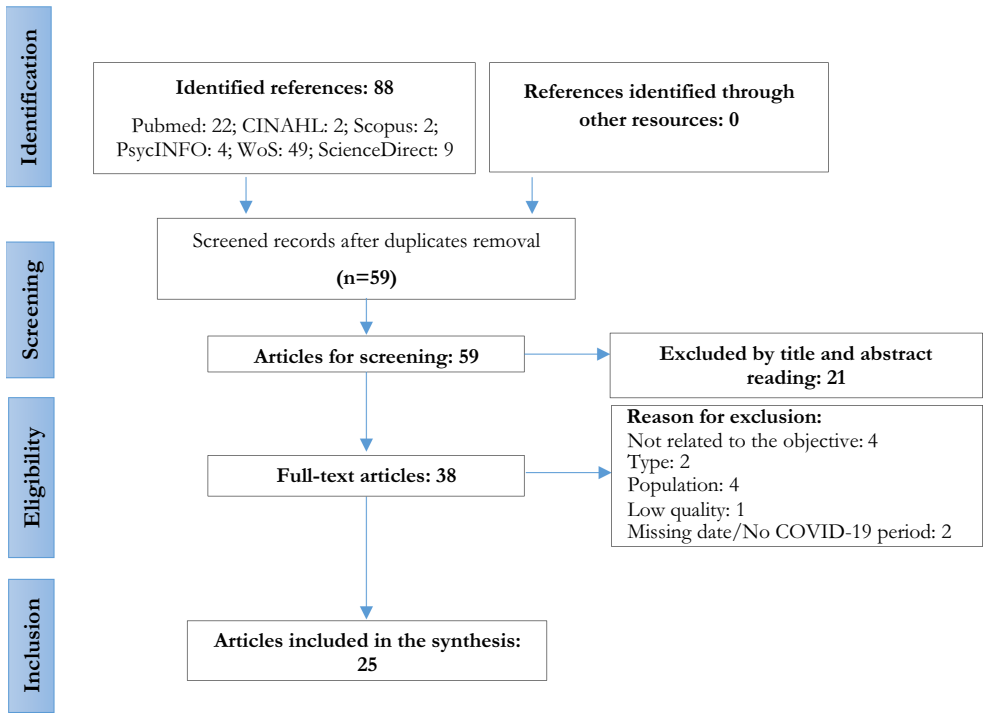

FIGURE 1
Search results (PRISMA – Flowchart).

The included studies were assessed with the JBI critical appraisal tool, where analytical cross-sectional studies, qualitative research, and randomised controlled trials obtained medium-high scores.

Table 4 shows the characteristics of each of the 25 studies included in this review.

4. Discussion

The aim of this study was to assess the factors influencing presenteeism or sickness presenteeism and mental health of workers during the COVID-19 pandemic. In this sense, a series of factors related to mental health that may affect presenteeism have been found, as well as a number of factors specific to the individual, factors inherent to the situation caused by the COVID-19 pandemic, and factors derived from working conditions, among others.

4.1. Presenteeism and mental health

Stress is one of the main contributing factors to working despite being ill which, in turn, may be one of the reasons why workers continue to work despite being ill (33–35, 38, 42, 44, 45, 47, 49), and in many cases workload, pressure from colleagues, and organisational culture play a part in this relationship (54). Stress was already related to sickness presenteeism prior to the COVID-19 pandemic, so it appears that COVID-19 is not the only factor that may influence sickness presenteeism as expected (55).

There are some high-pressure work environments, such as that of the study by Jia et al. (42), carried out on a sample of 4,261 medical staff, in which it was observed that in high-pressure environments, health problems are more likely to appear and medical staff are more likely to ignore their own health problems, thus increasing sickness presenteeism. In addition to the field of healthcare, it has been observed that the shift from face-to-face work to teleworking has led to workers being forced to be constantly online and on email, thereby generating constant stress, as they worry about losing their jobs (35). For many workers, they had to stay online at all times to prove their worth at work or to convince their employers that they were not avoiding their duties while working from home (56).

Continuous stressful situations can lead to sickness presenteeism due to burnout, as observed in the studies by Basar et al. (49), Ferreira et al. (51), Haehnle et al. (45), and Shimura et al. (34), and to symptoms of depression as seen in the study by Lee et al. (46), in which an association between SP and depression was found to be higher among blue-collar and less educated workers. In the case of the latter, the depressive symptoms of workers who were not able to obtain paid sick leave were 2.18 times higher than those who had the option to do so, hence symptoms of stress, depression, or anxiety were likely to appear. These excessive work demands may lead to presenteeism, while burnout may be a consequence resulting from this situation (9). In this regard, there are a number of factors that could buffer these demands, such as well-being (16, 40) or work engagement (55).

On the other hand, there was only one study that determined a relationship between nurses' fear of contracting COVID-19 and stress-related presenteeism (49), which can lead to reduced performance, productivity, and efficiency in organisations (57). Other factors such

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TABLE 4 Characteristics of the studies included in the systematic review.

Studies	Context	Study objective	Type of study	Participants	Methods	Main findings	JBI
Basar et al. (51)	Turkey May–June 2021	To uncover whether nurses' fear of contracting COVID-19 has resulted in stress-related presenteeism and burnout, and whether perceived organisational support is effective in dealing with both nurses' fear of contracting COVID-19 and its undesired consequences.	Cross-sectional study	513 Nurses	- Stress-related Presenteeism Scale - Perceived Organisational Support Scale - Fear of COVID-19 Scale - Burnout Scale	They reported notable levels of burnout (M = 4.51, SD = 1.47) and stress-related presenteeism (M = 3.29, SD = 1.01), as well as slightly inadequate levels of perceived organisational support (M = 2.30, SD = 1.07). Fear of COVID-19 infection resulted in burnout ($\beta = 0.35$, $p < 0.001$) and stress-related presenteeism ($\beta = 0.39$, $p < 0.001$). Stress-related presenteeism also resulted in burnout ($\beta = 0.50$, $p < 0.001$), mediating the relationship between fear of contracting COVID-19 and burnout.	8/8
Cheslack-Postava et al. (41)	United States April–June 2020	To assess occupational circumstances associated with adverse mental health among health care workers during the COVID-19 pandemic.	Cross-sectional study	2,076 HCWs	- PHQ-9 - GAD-7 2nd outcomes: COVID-related occupational experiences, stress, and anger	50% of the population experienced symptoms, but did not work while sick, 15% worked while sick but not in direct patient care, and 35% worked in direct patient care while sick. Presenteeism experiences were associated with OR of negative mental health of the following: 1.28 (0.98–1.67), $p = 0.07$ for those with symptoms who did not work; 1.48 (0.99–2.22), $p = 0.05$ for those who worked while sick but not in direct patient care; and 2.29 (1.71–3.08), $p < 0.001$ for those who worked in direct patient care while sick, respectively.	6/8
Fujino et al. (33)	Japan December 2020 and December 2021	To examine the association between presenteeism and the risk of divorce among Japanese workers during the COVID-19 pandemic	Cohort study	27,036 Participants, with 18,560 in the follow-up	- WFun	Poor marital relationship may have affected presenteeism at baseline. Compared with the group with the lowest WFun score, the OR for the group with moderate WFun was 1.16 (95% CI, 0.74–1.82; $p = 0.525$), and the OR for the group with the highest WFun was 1.76 (95% CI, 1.18 to 2.62; $p = 0.006$).	9/11
Gnanapragasam et al. (39)	United Kingdom March–June 2021	To determine the effectiveness of the 'Foundations' application (app) on general (non-psychotic) psychiatric morbidity.	Randomised controlled trial	1,002 HCWs at 16 NHS trusts (multicentre)	Measures were assessed at baseline, after 4 and 8 weeks - GHQ-12 2nd outcomes: BRS-6, SWEMWBS-7; SPS-6; GAD-7; PHQ-9, WSAS-5, MISS-3, and stressors	There was no association between the app group and BRS (aMD = 0.03, 95% CI −0.03–0.09); presenteeism (SPS-6, aMD = 0.38, 95% CI −0.12–0.87); moderate anxiety (GAD-7, aOR = 0.69, 95% CI 0.39 to 01.23); moderate depression (PHQ-9, aOR = 0.61, 95% CI–1.04); moderately severe or severe functioning impairment (WSAS, aOR = 0.61, 95% CI–1.11).	12/13

(Continued)

TABLE 4 (Continued)

Studies	Context	Study objective	Type of study	Participants	Methods	Main findings	JBI
Hähnle et al. (47)	Germany November 2020 to May 2021 (Psychiatric hospitals)	To examine the consequences of burnout symptoms at the institutional level, such as staff turnover	Cross-sectional study	172 Professionals in Psychiatric hospitals of Children and Adolescents	- BOSS 2nd outcomes: Intention to make shifts, sickness absence in the last 12 months and quality of job performance.	The results show that signs of burnout symptoms impact the turnover tendency, presenteeism, and job performance of professionals. In addition, evidence emerged that professionals were more stressed during the winter lockdown (2020/2021) of the COVID-19 pandemic, and that this influenced turnover tendency, presenteeism, and absenteeism as well as the quality of job performance.	6/8
Jia et al. (44)	China Jane 2020 (Hospital)	To evaluate the direct effects of work stress, health status and presenteeism on task performance, and further explore the mediating effects of health status and presenteeism, hoping to provide theoretical basis for improving the performance of medical staff.	Cross-sectional study	4,261 Medical staff	- CHSS - SF-36 - SPS-6 - Task Performance Scale	The mean scores for work stress, health status, presenteeism and task performance were 2.05 ± 0.84, 4.18 ± 0.68, 2.15 ± 0.79 and 4.49 ± 0.64, respectively. There were significant differences in the task performance scores between different genders, ages, marital statuses, professional titles, departments and work years ($p < 0.05$). Work stress ($\beta = -0.136$, $p < 0.001$) and presenteeism ($\beta = -0.171$, $p < 0.001$) were negative predictors of task performance. Health status ($\beta = -0.070$; $p < -0.001$) and presenteeism ($\beta = -0.064$; $p < 0.001$) mediated the relationship between work stress and task performance ($p < 0.001$). Presenteeism mediated the relationship between health status and task performance ($\beta = 0.07$; $p < 0.001$).	8/8
Lee et al. (48)	Republic of Korea 2020	To examine the association between sickness presenteeism and depression among Korean workers during the COVID-19 pandemic in relation with the socioeconomic and lifestyle factors.	Cross-sectional study	Employee group (n = 64,666) and employers or self-employed workers group (n = 19,848).	Korean Community Health Survey - PHQ-9 2nd outcome: sickness presenteeism	Employees in sickness presenteeism showed a higher association with depressive symptoms than employers or self-employed individuals (OR = 2.18, 95% CI: 1.85, 2.56 among employees vs. OR = 1.76, 95% CI: 1.29, 2.40 among employers or self-employed individuals).	8/8
Li et al. (45)	China December 2020 to May 2021 (Hospital)	To investigate the serial-multiple mediating effect of job burnout and fatigue in the relationship between sickness presenteeism and productivity loss among nurses.	Cross-sectional study	2,968 Nurses (multicentre, 14 hospitals)	- Sickness Presenteeism Questionnaire - SPS-6 - Chalder Fatigue Scale - MBI	Sickness presenteeism exhibited a prevalence of 70.6% during the COVID-19 pandemic. The mean score of health-related productivity loss was 15.05 ± 4.52, fatigue was 8.48 ± 3.40, and job burnout was 39.14 ± 19.64. Sickness presenteeism was positively associated with fatigue and job burnout while job burnout was positively associated with nurse fatigue. Sickness presenteeism, fatigue, and job burnout were also positively correlated with health-related productivity loss.	8/8

(Continued)

TABLE 4 (Continued)

Studies	Context	Study objective	Type of study	Participants	Methods	Main findings	JBI
Mansour et al. (24)	Canada Time 1 October–November 2020, and Time 2 June–July 2021	To examine the role psychosocial safety climate plays as driver or moderator to reduce presenteeism by lessening work intensification over time and the impact of work intensification over time on presenteeism during the COVID-19 pandemic	Cross-sectional study	800 Nurses at Time 1 and 344 at Time 2	- JDS - SPS-6 2nd outcomes: Psychosocial safety climate	Psychosocial safety climate reduces presenteeism over time by reducing work intensification at time 1. Psychosocial safety climate moderates the relationship between work intensification at time 1 and work intensification at time 2. Psychosocial safety climate as moderator also lessens the detrimental effect of work intensification at time 2 on presenteeism at time 2. Presenteeism among nurses affects their health and psychological well-being.	8/8
Nakai et al. (34)	Japan March 2021	To evaluate the impact of the COVID-19 pandemic on employment status, work productivity, QOL, and depressive symptoms in undiagnosed adults with and without attention-deficit/hyperactivity disorder symptoms in Japan	Cross-sectional study	Participants with ($N = 949$) and without ($N = 942$) attention-deficit/hyperactivity disorder symptoms	Japanese Medilead Healthcare Panel - EuroQol 5D-5L - WPAI - PHQ-9 2nd outcomes: Unemployment rate and depressive symptoms	The percentage of impairment with respect to presenteeism was higher in those subjects with ADHD symptoms before the pandemic and without ADHD symptoms before the pandemic than in those with ADHD symptoms during the pandemic and without ADHD symptoms during the pandemic.	6/8
Okawara et al. (35)	Japan December 2020	To examine the relationship between interruption to routine medical care during the COVID-19 pandemic and sickness presenteeism among workers in Japan.	Cross-sectional study	27,036 Workers	CORoNaWork Treatment status, sickness presenteeism and other covariates	The aOR of sickness presenteeism was significantly higher among workers who experienced interrupted medical care (3.44; 95% CI: 3.04–3.89) than among those who did not require routine medical care. The highest OR of sickness presenteeism days was observed for mental health symptoms (aOR: 5.35, 95% CI: 4.85–5.91, $p < 0.001$). When the analysis was performed based on the 36 treatment-symptom groups (3 treatment statuses and 12 symptoms), the largest predictive margin of sickness presenteeism days was observed for mental health symptoms and interrupted medical care (predictive margin: 9.9 days, SE = 0.38)	6/8
Pasfield et al. (50)	New South Wales March–June 2021	To evaluate factors associated with sickness presenteeism in New South Wales registered veterinarians suffering from influenza-like illness, both before and since the beginning of the COVID-19 pandemic	Cross-sectional study	122 Veterinarians	A mixed-methods questionnaire with eight subsections	'Having no one to cover' and geographical distribution were significantly associated with sickness presenteeism. Although sickness presenteeism remained common, participants reported that they were less likely to attend work with symptoms of influenza-like illness since the beginning of the COVID-19 pandemic.	8/8

(Continued)

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TABLE 4 (Continued)

Studies	Context	Study objective	Type of study	Participants	Methods	Main findings	JBI
Sagui-Henson et al. (42)	United States March 2020 and March 2021	To examine the effectiveness of evidence-based telecoaching delivered *via* videoconferencing to people requesting mental health services during the COVID-19 pandemic.	Cross-sectional study	1,228 Workers who utilised telecoaching	- WHO-5 well-being questionnaire 2nd outcomes: Burnout, Absenteeism and presenteeism Visit utilisation, and Satisfaction with care	Well-being ($p = 0.02$) significantly increased, while both presenteeism ($p < 0.001$) and absenteeism ($p < 0.001$) significantly decreased at follow-up in the full sample, but represented negligible effect sizes. For every 1 unit increase in the moderator, there was a 0.08-point decrease in presenteeism. When participants completed 1 visit, their presenteeism did not change; when participants completed 2–3 visits, their presenteeism significantly decreased by 0.11 points; and when participants completed 4+ visits, their presenteeism significantly decreased by 0.20 points.	8/8
Schulze et al. (46)	Germany August–October 2020 (nursing homes)	To investigate which psychosocial burdens and potential positive aspects nurses working in long-term care facilities experience during the COVID-19 pandemic	Cross-sectional study	177 Nurses and nursing assistants (nursing homes)	A mixed-methods study - COPSOQ III	The sample scored significantly worse regarding the scales 'quantitative demands', 'hiding emotions', 'work-privacy conflicts', 'role conflicts', 'quality of leadership', 'support at work', 'recognition', 'physical demands', 'intention to leave profession', 'burnout', 'presenteeism' and 'inability to relax'. The interviews (n = 15) revealed six main themes related to nurses' psychosocial stress: 'overall working conditions', 'concern for residents', 'management of relatives', 'inability to provide terminal care', 'tensions between being infected and infecting others' and 'technicisation of care'.	6/8
Žilinskas et al. (52)	Lithuania February–April 2021	To conduct an anonymous online survey among white-collar workers from various finance, IT and technology companies in Lithuania to define factors associated with worse sleep quality and diminished productivity during a COVID-19 lockdown.	Cross-sectional study	114 Administrative staff	- PSQI - SLOC - GAD-7 - WHO-HPQ 2nd outcomes: sleep hygiene, physical activity and alcohol use	There was no association between measures of either presenteeism, absenteeism, or sleep locus of control, and general sleep quality ($p > 0.05$). However, there was no strong relationship between sleep-related variables (i.e., sleep hygiene, sleep locus of control, quality of sleep) or levels of anxiety and measures of work productivity.	6/8
Adisa et al. (37)	United Kingdom July–September 2020 (Remote)	To explore how remote working inhibits employee engagement	Qualitative research	32 Workers working from home	Conservation of resources theory Semi-structured interviews	The transition from in-person to online modes of working during the pandemic brought about work intensification, online presenteeism, employment insecurity and poor adaptation to new ways of working from home. These stress factors are capable of depleting vital social and personal resources, thereby impacting negatively on workers engagement levels.	10/11

(Continued)

TABLE 4 (Continued)

Studies	Context	Study objective	Type of study	Participants	Methods	Main findings	JBI
Ferreira et al. (53)	Portugal April–June 2020 (school and high school)	(1) To understand whether observing cyberbullying among students can be associated with teachers' productivity loss due to presenteeism and burnout; (2) to examine the role of productivity loss due to presenteeism in the relationship between observing cyberbullying situations among students and teacher burnout.	Cross-sectional study	1,044 Middle school and high school teachers	- Cyberbullying Inventory - SPS - Copenhagen Burnout Inventory Questionnaire	Teacher's productivity loss due to presenteeism mediated the relationship between observing cyberbullying incidents among their students and their burnout levels. Specifically, the total effect of productivity loss due to presenteeism on teachers' burnout was 0.57 [CI90, LO = 0.53 HI = 0.62].	8/8
Han et al. (49)	Republic of Korea August 2020	To find predictors of mental health for public health doctors from working experiences at frontline of COVID-19 pandemic.	Cross-sectional study	350 Public health doctors	- PHQ-9 - GAD-7 - PSS - SPS-6	Public health doctors with lowered self-efficacy at work or those exhibiting presenteeism (SPS-6 total score ≥ 19) felt more stress during COVID-19 duty compared to other assignments (AOR = 4.58, 95% CI = 2.32–9.93, $p < 0.001$); a willingness to further volunteer for COVID-19 dispatch was associated with lower odds of presenteeism (AOR = 0.47, 95% CI = 0.26–0.82, $p = 0.009$).	8/8
Hunter et al. (54)	Australia and New Zealand June–August 2020	To determine the associations between health behaviours and work ability and performance during COVID-19 restrictions and if health behaviours were related to demographic or population factors.	Cross-sectional study	433 Adult workers.	- IPAQ - Work Ability Index - WHO-HPQ	A 10% increase in daily sedentary behaviour was associated with 3.68% higher median presenteeism (95% CI: 1.24–6.12%; $p = 0.003$). Being sufficiently physically active was associated with higher reported physical (aOR = 2.1; p = 0.001) and mental work abilities (aOR = 1.8; $p = 0.007$) and self-reported job performance (i.e., lower presenteeism) (median + 7.42%; $p = 0.03$). Part-time workers were 56% less likely ($p = 0.002$) to report a good or very good mental work ability.	8/8
Shimura et al. (36)	Japan 2019 and 2020	To provide empirical evidence of the implications for people and organisations of this new scenario of working from home.	Cross-sectional study	3,123 Office workers from 23 tertiary industries	- BJSQ-57 - PSQI-18 - WLQ-4	5 days a week of remote work (full-remote) was a significant factor for worsening presenteeism (aOR = 1.421, $p = 0.017$) with the adjustment of increasing job stressors (aOR = 1.036/pt., $p < 0.001$), reduced social support (aOR = 1.033/pt., $p < 0.001$), worsening of psychological and physical stress responses (aOR = 1.049/pt., $p < 0.001$), and worsening of sleep disturbance (PSQI) (aOR = 1.080/pt., $p < 0.001$).	8/8

(Continued)

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TABLE 4 (Continued)

Studies	Context	Study objective	Type of study	Participants	Methods	Main findings	JBI
Tilchin et al. (43)	United States March 2020	To understand barriers to staying home from work when sick from COVID-19 (COVID-19 presenteeism) to understand COVID-19 health disparities and transmission and guide workplace and social policy.	Cross-sectional study	220 Workers who worked away from home	COVID-19 presenteeism	Overall, 34.5% of participants reported intended COVID-19 presenteeism. As compared with a salary of less than $35,000, individuals who made $35,000 to $90,000 and individuals who made more than $90,000 had 51% ($p = 0.033$) and 80% ($p = 0.002$) lower odds of COVID-19 presenteeism, respectively. Individuals with insurance versus no insurance had 56% lower odds of COVID-19 presenteeism ($p = 0.034$), individuals who were worried about having enough food versus not worried had 314% higher odds of COVID-19 presenteeism ($p < 0.001$).	6/8
Van Ballegooijen et al. (55)	Belgium and the Netherlands May 2020	To describe: (1) stress, concerns and quality of life; (2) access to healthcare and cancelled/delayed healthcare; and (3) productivity during the first 8 weeks of the coronavirus lockdown in the general population.	Cross-sectional study	2099 Belgian and 2058 Dutch	- VAS (health status) - EuroQol 5D-5L - iMCQ - iPCQ	Productivity losses due to the COVID-19 restrictions were calculated in absenteeism (36%) and presenteeism (30%) for Belgium, and (19%) and (35%) for the Netherlands. Most concerns and productivity losses were reported by respondents with children <12 years, respondents aged 18–35 and respondents with an (expected) COVID-19 infection. The mean value of lost production among respondents in paid profession per person per week including absenteeism and presenteeism was €161.39 for Belgium and €82.69 for the Netherlands.	8/8
Vinberg et al. (18)	Sweden March–April 2021	To analyse the impact of business operations, work and family circumstances, and well-being on the risk of sickness presenteeism for Swedish self-employed workers during the COVID-19 pandemic.	Cross-sectional study	845 Self-employed workers	EQLS and EWCS Outcomes: Sickness presenteeism, Impact on business operations, Risk of bankruptcy, Loss of contracts, Job satisfaction, The index for Work–family conflict, and WHO-HPQ	The impact on business operations (OR = 1.74), loss of contract (OR = 1.41), risk of bankruptcy (OR = 1.15), increase in work hours (OR = 1.41), work–family conflict (OR = 1.45), and mental well-being (OR = 0.86) were significantly related to a higher risk of sickness presenteeism. There was no significant relationship between sickness presenteeism and age, gender, education of the self-employed worker, and company size.	8/8

(Continued)

TABLE 4 (Continued)

Studies	Context	Study objective	Type of study	Participants	Methods	Main findings	JBI
Blake et al. (38)	United Kingdom April–August 2020 (hospital)	To determine facility usage and gather insight into worker wellbeing and the views of workers towards this provision.	Cross-sectional study	819 Hospital workers.	17-week service use monitoring - SWEMWBS 2nd outcomes: Job stressfulness, job satisfaction turnover intentions, presenteeism, and UWES-9	There was moderate-to-high job stress (62.9%), low wellbeing (26.1%), presenteeism (68%), and intentions to leave (31.6%). There were no significant differences in perceived job stressfulness, job satisfaction, and presenteeism or turnover intentions between those who did, or did not, access a centre.	8/8
Van Der Feltz-Cornelis et al. (40)	United Kingdom May-June 2020 (university, remote)	To explore how the COVID-19 outbreak and arrangements such as remote working and furlough affect work or study stress levels and functioning in staff and students at the University of York, United Kingdom	Cross-sectional study	1,055 University staff and 925 University students	- VAS-scale - PSQ - GAD-7 - PHQ-9 - PHQ-15 - iPCQ	26% of staff and 40% of the students experienced presenteeism. For staff, a model of six variables predicted presenteeism [$\chi 2(6) = 68.40$; $p < 0.001$]. Predictors of presenteeism are younger age [OR = 0.97; CI (95) = 0.96–0.98], living with a somatic chronic medical condition [OR = 1.34; CI (95) = 1.03–1.74] or a functional somatic syndrome [OR = 2.14; CI (95) = 1.21–3.80], social isolation [OR = 1.53; CI (95) = 1.05–2.23], no access to outdoor space at home [OR = 1.26; CI (95) = 1.04–1.55], and low current exercise level [OR = 0.78; CI (95) = 0.69–0.89]. Presenteeism was significantly lower in resilient staff ($p < 0.001$)	8/8

aOR, adjusted odds ratio; BDI-2, Beck Depression Inventory-II; BJSQ, Brief Job Stress Questionnaire; BOSS, Burnout Screening Scale; BRS, Brief Resilience Scale; CFT, Cognitive Flexibility Test; CHSS, Challenge-and Hindrance-Related Self-Reported Stress Measures; CI, confidence interval; COPSOQ III, Copenhagen Psychosocial Questionnaire; CORoNaWork, Collaborative Online Research on the Novel-Coronavirus and Work project; EQLS, Eurofound's European Quality of Life Survey; EWCS, European Working Conditions Survey; GAD, Generalised Anxiety Disorder; GHQ, General Health Questionnaire; HCWs, Healthcare Workers; iMCQ, Medical Consumption Questionnaire; IPAQ, International Physical Activity Questionnaire; iPCQ, iMTA Productivity Cost Questionnaire; JDS, Job Demands Scale; MISS, Minimal Insomnia Symptom Scale; OR, odds ratio; PHQ, Patient Health Questionnaire; PSQI, Pittsburgh Sleep Quality Index and Sleep Schedules; QOL, Quality of Life; MBI, Maslach Burnout Inventory; SF-36, Short Form-36 Health Survey; SLOC, Sleep Locus of Control; SPS, Stanford Presenteeism Scale; SWEMWBS, Short Warwick-Edinburgh Mental Well-being Scale; UWES, Utrecht Work Engagement Scale; VAS, Visual Analogue Scale; WFun, Work Functioning Impairment Scale; WHO-HPQ, World Health Organisation's Health and Work Performance Questionnaire; WLQ, Work Limitations Questionnaire; WPAI, Work Productivity and Activity Impairment scale; WSAS, Work and Social Adjustment Scale.

as cyberbullying (51), sleep disturbance (34), concern about having enough food (41), social isolation (38), and no resilience (38) were also related to sickness presenteeism.

4.2. Presenteeism and individual factors

It was observed that having a chronic illness could be correlated with sickness presenteeism despite having a decompensated disease. In fact, at the onset of the disease, workers continue to work despite manifesting symptoms until they are forced to take sick leave due to exacerbation of the symptoms or prolonged duration of the disease (38). To avoid this problem, continued regular treatment is recommended in order to manage the disease and maintain health (56), as was the case among workers who experienced interrupted medical care (33, 40).

On the other hand, self-perception of one's own health status determines whether workers assess their illness as sufficiently serious, moderate or mild for them to continue working or not (42). It is known that when working in high-pressure environments, health problems are more likely to occur and therefore, health is compromised (58). In this case, during the COVID-19 pandemic, fever was identified as one of the main symptoms used by workers to be absent from work as it may be related to COVID-19 (48). However, previously, this type of symptom was not a usual reason for taking sick leave and some workers, despite having fever, continued to work. In fact, feeling unable to take sick leave can negatively affect health and vice versa (59).

Other factors such as poor marital relationship (31), being young (38), attention-deficit/hyperactivity disorder symptoms (32), low physical activity (38, 50) and sedentary behaviours (52), having children (41), and having health insurance (41) may be related to sickness presenteeism.

4.3. Presenteeism and factors related to the situation caused by the COVID-19 pandemic

In a study conducted in New South Wales between March and June 2021 on a sample of 122 veterinarians, it was determined that one of the factors associated with sickness presenteeism among those suffering from influenza-like illness during the COVID-19 pandemic was that they attended work despite having symptoms of respiratory infectious disease (48). The same could happen with COVID-19 signs and symptoms; people with mild symptoms may continue attending work despite the possible risk of virus transmission (57). This could again be explained by the sample's high level of work engagement, the shortage of staff, and the company's specific sick leave policies (36). According to Okawara et al. (33), workers do not attach the same importance to some signs and symptoms as to others. Those symptoms related to mental health, pain, burnout, or sleep were more susceptible to higher sickness presenteeism, whereas others such as signs and symptoms related to skin or hair problems, etc. showed moderate levels of sickness presenteeism and workers did see the need to take sick leave due to this type of symptomatology. This dichotomy will depend on the individual and whether they consider the symptoms to be sufficiently adverse or severe (60). In this regard, consideration should be given to what is meant by 'unable to work due to illness', i.e., is it a total inability to work, or is it an inability to perform functions at an expected level? (48).

Other factors contributing to presenteeism or sickness presenteeism during the COVID-19 pandemic (16) may be its impact on business operations, loss of contract and risk of bankruptcy, not volunteering to work on the front line (47), or confinement itself (45), which may in turn be indicators of poor socio-economic and working conditions (54).

4.4. Presenteeism and factors related to working conditions

Direct patient care (39) and workload (22) may be factors associated with presenteeism, which is particularly observed in services with a shortage of staff and with workers under high time pressure (5). Related to the above, perceived organisational support (49) and safety climate (22) may be contributing factors to sickness presenteeism. In some organisations, it is not easy for workers to choose to stay at home when they are sick, which may lead to frustration, resentment towards the company, depressive symptoms, and lower work engagement (61).

Only one of the studies (45) analysed the relationship between shift work and sickness presenteeism. As in other studies conducted prior to the COVID-19 pandemic (62), health workers who were on shifts attended work while sick more often than health workers who were not on shifts, and perhaps this may be influenced by their own biorhythms. Work-related fatigue may also be related to sickness presenteeism (34, 43), so long working hours need to be managed (62), communication and monitoring systems within the company should be improved, and a replacement plan should be in place to prevent workers from not taking sick leave on the grounds that there is no one to cover them (48).

Regarding the transition from in-person to online modes of working (34, 35), improving the work environment for workers while working from home is important to reduce the negative health outcomes associated with this type of activity, reduce absenteeism, and increase productivity.

Other variables related to working conditions may be work functioning or task performance impairment (31, 42, 43, 53), salary of less than $35,000 (41), increased working hours, work–family conflict (16), and geographical distribution (48).

It is estimated that the mean value of lost production per person per week, including absenteeism and presenteeism, can be in a range between €161 and €82 (53).

Contrary to many studies, there was one study in which the authors found no significant relationship between sickness presenteeism and age, sex, education of the self-employed, and size of the company (16). This could be explained by the characteristics of the sample, being young and highly engaged workers.

Finally, in a meta-analysis that assessed the status and factors influencing presenteeism among clinical nurses before the pandemic (63), it was observed that presenteeism scores were higher in publications prior to 2020, but in this case, they did find statistically significant differences in terms of age, sex, marital status, experience, region, and service groups that could be explained by the change in working conditions that a pandemic such as the COVID-19 one has brought about. In this line, and as has been detected, sickness presenteeism has been found to be a risk factor for future sickness absenteeism and may lead to decreased self-perceived health as observed in a systematic review conducted prior to the COVID-19 pandemic (64).

4.5. Limitations

There are a number of limitations to this study. Although certain factors favouring or reducing the likelihood of sickness presenteeism have been detailed, it is possible that many of these factors are a consequence of sickness presenteeism or may even interact with it, and it might not be possible to discern cause from consequence. On the other hand, the samples were highly heterogeneous, and the time of collection and the instruments used also differed, making it difficult to compare the samples, which is why no meta-analysis was proposed. Most of the finally selected studies were cross-sectional and used hetero-administered instruments *via* online surveys, with the limitations that this method entails. Finally, each country has its own rules on sick leave entitlement, which may result in a person needing to continue to work despite being ill.

5. Conclusion

A number of factors have been identified that influence mental health and sickness presenteeism, such as factors directly related to mental health (burnout, stress, depression, fear of COVID-19, no well-being, cyberbullying, sleep disturbance, concern about having enough food, social isolation, and no resilience); individual factors (poor marital relationship, health status, being young, attention-deficit/hyperactivity disorder symptoms, workers who experienced interrupted medical care, low physical activity and sedentary behaviours, having children, having health insurance, and having a chronic illness); factors related to the situation caused by the COVID-19 pandemic (confinement, having symptoms of respiratory infectious disease, not volunteering to work on the front

line, impact on business operations, loss of contract, and risk of bankruptcy); and factors arising from working conditions (perceived organisational support, direct patient care, work functioning impairment or task performance, work fatigue, safety climate, workload, having no one to cover them, geographical distribution, transition from in-person to online modes of working, salary of less than $35,000, increased working hours, and work–family conflict).

Identifying the key drivers of presenteeism or sickness presenteeism and understanding the underlying phenomena and origins will help to create a safe working environment and optimal organisational systems to protect vulnerable workers from medical and occupational adversity, especially in a pandemic context where changes, challenges, and consequences have had a considerable impact.

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.

Author contributions

JJG-I, JG-S, JA, RR, EC, CR-F, SM-I, DF-G, and ÁV-A: conceptualization, data curation, formal analysis, investigation, methodology, resources, software, supervision, validation, visualization, writing – original draft, and writing – review and editing. JJG-I, JG-S, JA, RR, EC, and ÁV-A: project administration. All authors contributed to the article and approved the submitted version.

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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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1224332/full#supplementary-material

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Depression, anxiety and stress among healthcare workers in the context of the COVID-19 pandemic: a cross-sectional study in a tertiary hospital in Northern Vietnam

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Introduction: The outbreak of coronavirus severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) had significant effects on the mental well-being in general, particularly for healthcare professionals. This study examined the prevalence of depression, anxiety, and stress, and identified the associated risk factors amongst healthcare workers during the COVID-19 outbreak in a tertiary hospital located in Vietnam.

Methods: We conducted a cross-sectional study at a tertiary-level hospital, where the Depression Anxiety and Stress Scale 21 (DASS-21) web-based questionnaire was employed. We analyzed the determinant factors by employing multivariate logistic models.

Results: The prevalence of depression, anxiety, and stress symptoms were 19.2%, 24.7%, and 13.9%, respectively. Factors such as engaging in shift work during the pandemic, taking care of patients with COVID-19, and staff's health status were associated with mental health issues among health professionals. In addition, having alternate rest periods was likely to reduce the risk of stress.

Conclusion: The prevalence of mental health problems in healthcare workers during the COVID-19 pandemic was relatively high. Having resting periods could potentially mitigate the development of stress among health professionals. Our findings could be taken into account for improving mental health of the health professional population.

KEYWORDS

depression, anxiety, stress, DASS 21, healthcare workers, COVID-19, Vietnam

1. Introduction

The surge in the number of Coronavirus (COVID-19) cases strongly impacted public health around the world. Since the initial case in Wuhan, China, in December 2019, COVID-19 spread rapidly worldwide, quickly becoming a global health threat. As of 30 July 2023, there were over 768 million confirmed cases and over 6.9 million deaths reported globally (1). Over the same period of time, the total number of COVID-19 cases in Vietnam reached over 11.6 million confirmed cases and over 43,000 deaths (2). As a result, governments adopted a variety of measures to mitigate the spread of the virus. In Vietnam, the government enforced compulsory quarantine for people returning from abroad and patients with COVID-19; people worked from home, non-essential services were shut down, schools were suspended, there were travel restrictions, and lockdown in some locations. Such measures changed daily life and impacted incomes. Consequently, these factors affected the mental health of the population.

It is reasonable to assume that the COVID-19 pandemic was and is stressful for health workers. They had a higher risk of being infected with COVID-19 or were always fearful of being infected (3, 4). They also worked long hours, increased workloads, a shortage of personal protective equipment, faced social stigma, and lacked incentives to continue working (5–7). As a result, studies showed that this led to a significantly higher incidence of insomnia among healthcare workers as compared to non-healthcare workers during the pandemic (8, 9). However, unlike other professional groups, healthcare workers were not diagnosed and their health issues were not cared for during the pandemic. Indeed, they may not have realized that they had health problems, especially those related to mental health. This influenced the health of health care professionals and their levels of motivation. Subsequently, patient care was negatively affected.

Studies from many countries reported a prevalence of depression and anxiety in healthcare workers during the pandemic. For instance, Chen et al. (10) reported that the overall prevalence of anxiety and depression among frontline healthcare workers was 43% and 45%, respectively. Pappa et al. (11) reported that the prevalence of insomnia was 34.32% in 2020. A study in five major hospitals in Singapore and India reported that the prevalence of depression, anxiety, and stress symptoms was 10.6%, 15.7%, and 5.2%, respectively (12). A study among 1,090 medical staff in China revealed that the self-reported prevalence of anxiety symptoms, depression symptoms were 13.3%, 18.4%, and 23.9%, respectively (13). However, the percentages vary depending on the country and culture. In Vietnam, some previous studies reported the prevalence rates (14–17). For instance, Nguyen et al. reported 22.6% of participants had psychosocial problems (14). Nguyen et al. observed that 90.3% of participants felt that their job put them at risk of COVID-19 infection and 85.7% of participants expressed fear of potential infections (14). However, no study examined the associated risk factors carefully.

Vietnam experienced a challenging period of epidemic outbreaks and deployed several special strategies. For instance, mobilizing doctors from low risk countries to support high risk countries. Moreover, the healthcare staff from the studied hospital, a pediatric hospital, have worked and supported treatment on adults' patients. These factors can contribute to an increase in the workload as well as the anxiety of healthcare workers.

The objectives of this study were to investigate the prevalence of depression, anxiety, and stress, as well as the associated risk factors, among healthcare workers at a tertiary hospital for children in Northern Vietnam during the COVID-19 outbreak. These findings will help identify strategies to support counseling services, implement stress management programs, and promote work-life balance for a particular population.

2. Methods

2.1. Study design and sample

We conducted this cross-sectional study at a tertiary-level children's hospital in Hanoi. This is a multi-disciplinary hospital and the largest pediatric hospital in Northern Vietnam.

We recruited all permanent hospital staff in July 2022, just after the COVID-19 pandemic's peak, to participate in the investigation. There were 1,001 staff who responded to the questionnaire (about 65% of the total hospital staff). We collected data through an online self-administered survey using an anonymous questionnaire distributed to all healthcare workers via email address. Only one response per person was permitted. The study was approved by the institutional ethics board of the Vietnam National Children's Hospital (Number 1925/BVNTW_HĐĐĐ).

2.2. Measures

Depression, anxiety, and stress were assessed by the Depression Anxiety and Stress Scale 21 (DASS-21). The scale consists of three subscales that are depression, anxiety, and stress. Each subscale includes seven questions which are graded on a 4-point Likert scale from 0 to 3 (0 "Did not apply to me at all," 1 "Applied to me to some degree, or some of the time," 2 "Applied to me to a considerable degree, or a good part of time," 3 "Applied to me very much, or most of the time"). The Vietnamese version of the DASS-21 scale has been translated and validated by the National Institute of Mental Health (18) with a reported Cronbach Alpha of 0.88, sufficiently reliable for the Vietnam population.

The questions also included demographic characteristics (age, gender, education, marital status, years of working, health status before COVID-19 pandemic); and working conditions during COVID-19, shift work during the pandemic, including number of working hours, having alternate rest periods, having direct contact with COVID-19 patients, incomes, number of days away from home per month, and number of sick days.

2.3. Data management and analysis

We extracted data and performed quality control by checking the missing values and cross-checked the information. Fortunately, we did not find duplicated records and missing records. Levels of depression, anxiety and stress were coded based on the total score as the guideline (19). For depression, total score from 0 to 9 was considered as normal, from 10 to 13 was mild, from 14 to 20 was moderate, from 21 to 27 were considered as severe, above 28 was considered extremely severe.

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TABLE 1 Participants' characteristics of an children's hospital, location in Northern Vietnam all and by type of professional, 2022.

Characteristics	Total *n* = 1,001	Doctors *n* = 239	Nurses/medical technologists *n* = 563	Other staff *n* = 199
	n (%)	n (%)	n (%)	n (%)
Age (Mean: 35.7; SD: 13.5)				
≤35	502 (50.1)	102 (42.7)	315 (56.0)	85 (42.7)
>35	499 (49.9)	137 (57.3)	248 (44.0)	114 (57.3)
Gender				
Male	245 (24.5)	108 (45.2)	86 (15.3)	51 (25.6)
Female	756 (75.5)	131 (54.8)	477 (84.7)	148 (74.4)
Education				
Junior college or below	238 (23.8)	0 (0.0)	171 (30.4)	67 (33.7)
Bachelor's degree	410 (41.0)	27 (11.3)	291 (51.7)	92 (46.2)
Master degree or above	353 (35.3)	212 (88.7)	101 (17.9)	40 (20.1)
Marital status				
Married	841 (84.0)	204 (85.4)	477 (84.7)	160 (80.4)
Single	160 (16.0)	35 (14.6)	86 (15.3)	39 (19.6)
Working years				
<5 years	210 (21.0)	64 (26.8)	97 (17.2)	49 (24.6)
5–10 years	220 (22.0)	46 (19.2)	134 (23.8)	40 (20.1)
>10 years	571 (57.0)	129 (54.0)	332 (59.0)	110 (55.3)
Health status before COVID-19				
Very good/good	805 (80.4)	194 (81.2)	453 (80.5)	158 (79.4)
Weak	196 (19.6)	45 (18.8)	110 (19.5)	41 (20.6)
Working hours				
Regular work hours (8 h/day)	679 (70.2)	198 (86.5)	324 (58.9)	157 (83.5)
Shiftwork	288 (29.8)	31 (13.5)	226 (41.1)	31 (16.5)
Direct contact with COVID-19 patients				
No	237 (24.5)	43 (18.8)	110 (20.0)	84 (44.7)
Yes	730 (75.5)	186 (81.2)	440 (80.0)	104 (55.3)
Having alternate rest period				
No	130 (13.4)	42 (18.3)	63 (11.5)	25 (13.3)
Yes	837 (86.6)	187 (81.7)	487 (88.5)	163 (86.7)
Income				
<10 million VND	646 (64.5)	120 (50.2)	369 (65.5)	157 (78.9)
10–20 million VND	305 (30.5)	87 (36.4)	182 (32.3)	36 (18.1)
>20 million VND	50 (5.0)	32 (13.4)	12 (2.1)	6 (3.0)
Number of days away from home/month				
None	117 (12.1)	16 (7.0)	46 (8.4)	55 (29.3)
<10 days	608 (62.9)	168 (73.4)	343 (62.4)	97 (51.6)
10–30 days	174 (18.0)	30 (13.1)	112 (20.4)	32 (17.0)
>30 days	68 (7.0)	15 (6.6)	49 (8.9)	4 (2.1)
Number of sick days				
None	335 (34.6)	83 (36.2)	193 (35.1)	59 (31.4)
<10 days	532 (55.0)	124 (54.1)	298 (54.2)	110 (58.5)
10–30 days	93 (9.6)	20 (8.7)	54 (9.8)	19 (10.1)
>30 days	7 (0.7)	2 (0.9)	5 (0.9)	0 (0.0)

The anxiety subscales were considered as normal (0–7), mild (8, 9), moderate (10–14), severe (15–19), and extremely severe (20–42). The total stress subscale was considered as normal (0–14), mild (15–18), moderate (19–25), severe (26–33), and extremely severe (34–42).

We employed the logistic model to investigate the associated risk factors of total depression scores equal and higher than 10, total anxiety scores equal and higher than 8, and total stress scores equal and higher than 15. Variables with *p* value above 0.2 would be included for final logistic regression models. We also conducted *t*-test and ANOVA to compare scores by participants' characteristics, which is in the appendix. The significant level was set at 0.05.

3. Results

The mean age (standard deviation—SD) was 35.7 (± 13.5) years. More than 75% of participants were female and most participants were married (84%). Approximately 23.9% were doctors and 56.2% were nurses or medical technologists. More than half of the study participants had more than 10 years of experience in their respective fields (Table 1).

In relation to working conditions of healthcare workers during the COVID-19 pandemic, about 70.2% of respondents had normal work hours (8 h per day) and 29.8% were shift workers. Most participants (86.6%) had alternate rests. About 75.5% of the staff had direct contact with COVID-19 patients. On average, 64.5% had income less than 10 million VND, and 30.5% had income from 10 to 20 million VND.

Table 2 shows the percentage of depression, anxiety, and stress among healthcare workers. 24.7% of respondents reported having symptoms of anxiety, of which 11.7% had moderate symptoms and 5.4% had extremely severe symptoms. 19.2% of respondents reported having symptoms of depression, of which 8.3% had mild symptoms and 6.5% had mild symptoms. 13.9% of respondents reported having symptoms of stress, of which 5.4% had mild symptoms and 3.8% had moderate symptoms.

The associated factors of depression, anxiety, and stress are presented in Tables 3–5, respectively. Sociodemographic characteristics (i.e., age, gender, education, marital status, year of experience) were not associated with symptoms of depression, anxiety, and stress. The odds of having depression were significantly higher among those having weak health status before the outbreak of COVID-19 (OR = 1.87, 95% CI 1.28–2.73). Similarly, high proportions of those suffering from anxiety among health professionals were those with shift work during the pandemic (OR = 1.48, 95% CI 1.06–2.07) and having weak health status before the outbreak of COVID-19 (OR = 1.67, 95% CI 1.16–2.40). High risk stress was observed in those in direct contact with COVID-19 patients (OR = 1.94, 95%CI 1.13–3.32) and shift work during the pandemic (OR = 2.22, 95%CI 1.47–3.37). Healthcare workers having alternate rest periods significantly decreased the odds of having stress (OR = 0.42, 95%CI 0.26–0.67).

4. Discussion

Mental health problems among healthcare worker can lead to high levels of job dissatisfaction and increased turnover (20). So, the evidence of the mental health problems concern can help address the issue by creating a supportive work environment and promoting staff

TABLE 2 Levels of depression, anxiety and stress symptoms among the staff in a children hospital located in the Northen Vietnam, in total and by professionals.

Characteristics	Total *n* = 1,001	Doctors *n* = 239	Nurses/medical technologists *n* = 563	Other staff *n* = 199
	n (%)	n (%)	n (%)	n (%)
Depression				
Normal	809 (80.8)	198 (82.8)	446 (79.2)	165 (82.9)
Mild	65 (6.5)	12 (5.0)	42 (7.5)	11 (5.5)
Moderate	83 (8.3)	18 (7.5)	48 (8.5)	17 (8.5)
Severe	11 (1.1)	2 (0.8)	8 (1.4)	1 (0.5)
Extremely severe	33 (3.3)	9 (3.8)	19 (3.4)	5 (2.5)
Anxiety				
Normal	754 (75.3)	198 (82.8)	400 (71.0)	156 (78.4)
Mild	45 (4.5)	7 (2.9)	29 (5.2)	9 (4.5)
Moderate	117 (11.7)	17 (7.1)	82 (14.6)	18 (9.0)
Severe	31 (3.1)	5 (2.1)	19 (3.4)	7 (3.5)
Extremely severe	54 (5.4)	12 (5.0)	33 (5.9)	9 (4.5)
Stress				
Normal	862 (86.1)	204 (85.4)	479 (85.1)	179 (89.9)
Mild	54 (5.4)	14 (5.9)	35 (6.2)	5 (2.5)
Moderate	38 (3.8)	9 (3.8)	23 (4.1)	6 (3.0)
Severe	31 (3.1)	7 (2.9)	19 (3.4)	5 (2.5)
Extremely severe	16 (1.6)	5 (2.1)	7 (1.2)	4 (2.0)

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TABLE 3 Associations between participants' characteristics and depression's prevalence in a children hospital located in Northern Vietnam, 2022.

	Depression score ≥ 10	Depression score ≤ 9	OR	95% CI of OR	*P*
	n (%)	n (%)			
Education					
Junior college or below	44 (18.4)	194 (81.5)	1	–	–
Bachelor's degree	90 (21.9)	320 (78.0)	1.05	0.65–1.68	0.850
Master degree or above	58 (16.4)	295 (83.5)	0.89	0.59–1.32	0.552
Health status before COVID-19					
Very good/good	138 (17.1)	667 (82.9)	1	–	–
Weak	**54 (27.6)**	**142 (72.4)**	**1.87**	**1.28–2.73**	**0.001**
Working hours					
Normal work hours (8 h/day)	118 (17.4)	561 (82.6)	1	–	–
Shiftwork	72 (25.0)	216 (75.0)	1.43	1–2.06	0.049
Direct contact with COVID-19 patients					
No	37 (15.6)	200 (84.4)	1	–	–
Yes	153 (21.0)	577 (79.0)	1.40	0.93–2.13	0.109
Having alternate rest					
No	33 (25.4)	97 (74.6)	1	–	–
Yes	157 (18.8)	680 (81.2)	0.71	0.45–1.11	0.133
Income					
<10 million VND	144 (22.3)	502 (77.7)	1	–	–
10–20 million VND	42 (13.8)	263 (86.2)	0.49	0.2–1.23	0.127
>20 million VND	6 (12.0)	44 (88.0)	0.93	0.36–2.39	0.883
Number of days away from home/month					
None	25 (21.4)	92 (78.6)	1	–	–
<10 days	106 (17.4)	502 (82.6)	0.93	0.43–2	0.856
10–30 days	43 (24.7)	131 (75.3)	1.29	0.69–2.41	0.428
>30 days	16 (23.5)	52 (76.5)	0.97	0.49–1.91	0.920

Bold values highlight statistically significant association with $p < 0.05$.

retention. Consequently this contributes to better continuity of care for patients and hospital performance (21). In this study, the prevalence of depression, anxiety and stress among healthcare workers were 19.2%, 24.7%, and 13.9%, respectively. Those were slightly higher than figures reported by some other studies in Vietnam (16, 17). However, figures in our study were lower than those in a study conducted during the fourth wave of COVID-19 (22). The prevalence of depression, anxiety, and stress among healthcare workers in this study was lower than figures in many countries, including China (23.6%, 27.4%, and 16.3% respectively) (23), South Korea (30.6%, 41%, and 19.4% respectively) (24), Italy (35.9%, 25.5%, 33.3%, respectively) (25), Brazil (38.4%, 53.8%, and 40.3%, respectively) (26), and Northwest Ethiopia (55.3%, 69.6%, and 20.5%, respectively) (27). The prevalence of depression, anxiety, and stress among healthcare workers in this study was higher than figures in Singapore and India (12). Nonetheless, in line with the other countries, these prevalence rates in health providers in Vietnam during COVID-19 were higher than in the larger community.

During the pandemic, health professionals experienced many psychosocial stressors such as the disruption of routine life, travel restrictions, shortage of necessities, separation from family members and friends, and salary reduction. Indeed, during the COVID-19 pandemic, several frontline healthcare workers such as doctors working with COVID-19 patients or laboratories, were isolated with other staff in the hospital and isolated with families and communities due to incomplete information and fear associated with COVID-19 (16). In the beginning of pandemic, Holmes et al. (28) had called for actions to address the mental health in vulnerable groups including healthcare providers and emphasized the long term psychological impact. In this study, even at the end of the peak wave of pandemic when life was gradually returning to normal, the prevalence remained high. Therefore, further studies on mental health issues in health workers need to be conducted in order to promote the healthcare sector.

The lower prevalence of depression, anxiety, and stress observed among healthcare workers in our study may be attributed to several

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TABLE 4 Associations between participants' characteristics and anxiety's prevalence in a children hospital located in Northern Vietnam, 2022.

	Anxiety score ≥ 8	Anxiety score ≤ 7	OR	95% CI of OR	*p*
	n (%)	n (%)			
Education					
Junior college or below	63 (26.5)	175 (73.5)	1	–	–
Bachelor's degree	120 (29.3)	290 (70.7)	0.86	0.52–1.43	0.558
Master degree or above	64 (18.1)	289 (81.9)	0.76	0.49–1.18	0.219
Marital status					
Married	212 (25.2)	629 (74.8)	1	–	–
Unmarried/Divorced/widowed	35 (21.9)	125 (78.1)	0.77	0.5–1.2	0.257
Professional position					
Doctors	41 (17.2)	198 (82.8)	1	–	–
Nurses/medical technologists	163 (29.0)	400 (71.0)	0.90	0.5–1.62	0.726
Other staff	43 (21.6)	156 (78.4)	0.68	0.44–1.04	0.074
Health status before COVID-19					
Very good/good	181 (22.5)	624 (77.5)	1	–	–
Weak	**66 (33.7)**	**130 (66.3)**	**1.67**	**1.16–2.4**	**0.006**
Working hours					
Normal work hours (8 h/day)	144 (21.2)	535 (78.8)	1	–	–
Shiftwork	**97 (33.7)**	**191 (66.3)**	**1.48**	**1.06–2.07**	**0.023**
Having alternate rest					
No	36 (27.7)	94 (72.3)	1	–	–
Yes	205 (24.5)	632 (75.5)	0.86	0.55–1.33	0.502
Income					
<10 million VND	181 (28.1)	465 (71.9)	1	–	–
10–20 million VND	**62 (20.3)**	**243 (79.7)**	**0.27**	**0.09–0.8**	**0.018**
>20 million VND	4 (8.0)	46 (92.0)	0.46	0.16–1.37	0.163
Number of days away from home/month					
None	29 (24.8)	88 (75.2)	1	–	–
<10 days	133 (21.9)	475 (78.1)	1.30	0.64–2.64	0.473
10–30 days	57 (32.8)	117 (67.2)	1.60	0.9–2.85	0.110
>30 days	22 (32.4)	46 (67.6)	1.08	0.57–2.02	0.818

Bold values highlight statistically significant association with $p < 0.05$.

factors. Firstly, our study was conducted once the pandemic had ended and life had returned to a more normal state. During this time, there was a clearer understanding of virus transmission and spread, which likely reduced the fear and uncertainty experienced by healthcare workers. As mentioned by Singh and Subedi (29) health workers initially faced fear, threats, and eviction from their homes due to concerns about bringing the virus home in the beginning stage of pandemic. Such experiences often led to stigma, discrimination, and social isolation. Secondly, Vietnam adopted several effective strategies to control COVID-19 in the last stage (30). These strategies likely contributed to a lower number of cases and reduced the burden on healthcare workers, resulting in less psychological distress. Thirdly, the staff studied were in a children's hospital where the number of COVID-19 hospitalized cases was small. Some staff had to mobilize to support other hospitals, but this was a small number. During the outbreak in Ho Chi Minh City and the southern provinces, 195 healthcare workers of a studied hospital traveled south to help deal with the pandemic. Healthcare workers at the hospital took alternate breaks from 7 to 14 days per month. Incomes were cut based on the number of actual working days. Healthcare workers with COVID-19 infections are entitled to 7–10 days of paid quarantine leave according to the social insurance regime.

In conclusion, our study supported the fact that mental health depends on the healthcare workers' emotional response under pressurized situations (31) or adaptation to contextual demands (32). We suggest using the context sensitivity index (CSI) to measuring the ability to identify the presence and absence of stressor context cues in Vietnam.

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TABLE 5 Associations between participants' characteristics and Stress's prevalence in a children hospital located in Northern Vietnam, 2022.

	Stress score ≥ 15	Stress score ≤ 14	OR	95% CI of OR	*P*
	n (%)	n (%)			
Education					
Junior college or below (reference)	24 (10.1)	214 (89.9)	1	–	–
Bachelor's degree	71 (17.3)	339 (82.7)	1.37	0.7–2.7	0.362
Master degree or above	44 (12.5)	309 (87.5)	0.69	0.4–1.18	0.176
Professional position					
Doctors (reference)	35 (14.6)	204 (85.4)	1	–	–
Nurses/medical technologists	**84 (14.9)**	**479 (85.1)**	**0.48**	**0.23–0.99**	**0.046**
Other staff	20 (10.1)	179 (89.9)	0.64	0.36–1.14	0.131
Health status before COVID-19					
Very good/good (reference)	104 (12.9)	701 (87.1)	1	–	–
Weak	35 (17.9)	161 (82.1)	1.31	0.83–2.05	0.242
Working hours					
Normal work hours (8 h/day) (reference)	73 (10.8)	606 (89.2)			
Shiftwork	**62 (21.5)**	**226 (78.5)**	**2.22**	**1.47–3.37**	**0.000**
Direct contact with COVID-19 patients					
No (reference)	21 (8.9)	216 (91.1)	1	–	–
Yes	**114 (15.6)**	**616 (84.4)**	**1.94**	**1.13–3.32**	**0.015**
Having alternate rest					
No (reference)	34 (26.2)	96 (73.8)	1	–	–
Yes	**101 (12.1)**	**736 (87.9)**	**0.42**	**0.26–0.67**	**0.000**
Income					
<10 million VND (reference)	103 (15.9)	543 (84.1)	1	–	–
10–20 million VND	32 (10.5)	273 (89.5)	0.46	0.16–1.39	0.170
>20 million VND	4 (8.0)	46 (92.0)	0.85	0.27–2.61	0.771
Number of days away from home/month					
None (reference)	18 (15.4)	99 (84.6)	1	–	–
<10 days	76 (12.5)	532 (87.5)	0.50	0.2–1.27	0.147
10–30 days	32 (18.4)	142 (81.6)	0.75	0.35–1.63	0.471
>30 days	9 (13.2)	59 (86.8)	0.59	0.26–1.37	0.220

Bold values highlight statistically significant association with $p < 0.05$.

Our study revealed that those with shiftwork were more likely to suffer from anxiety and stress than those with regular work hours (8 h/day). A study from Korea showed that female nurses or nursing assistants who did shift work had a higher risk of anxiety (33). Another study revealed that nurses working night shifts were at twice the risk of developing stress than those working the day shifts (27). In hospitals, clinical staff members often do shiftwork, whereas the administrative staff work regular hours. Hence we observed a higher prevalence of stress amongst the healthcare workers working directly with patients.

Healthcare workers in direct contact with patients with COVID-19 were more likely to have stress. Previous findings from other countries also showed that healthcare workers in direct exposure to patients with COVID-19 were at a higher risk of mental health problems (34–37). A study conducted in the fourth wave of COVID-19 in Vietnam reported that healthcare workers treating moderate and severe COVID-19 patients were at increased risk for anxiety (22).

Our study also found that those having alternate rest periods significantly decreased the risk of having stress. A study conducted by Robles et al. with 5,938 healthcare workers found that over 30% of frontline healthcare workers reported a lack of rest time, and those with a lack of rest time were at a 3.1 times higher risk of having insomnia (38). Several qualitative studies revealed that healthcare workers desired adequate rest during COVID-19. They would like more support and attention toward their psychological well-being

from leaders (39, 40). We also suggest special implement intervention for clinical staff in Vietnam.

Some intervention programs to cope with new psychosocial issues resulting from COVID-19 for healthcare workers have been introduced. For example, the Institute of Mental Health and the Medical Psychology Research Center of the Second Xiangya Hospital provided psychological support by examining of immediate needs from the staff and adjusting the measures afterward (20). In this study, the hospital provided a place for rest, protective supplies, and training on psychological skills to deal with patients' emotional problems such as anxiety or depression during the pandemic. The trial entitled "RECHARGE" mainly focuses on psychoeducation by teaching people techniques on problem-solving skills and managing worries in Australia, Switzerland (41). A program in Canada had been using a Virtual Peer Support Platform to guide healthcare workers to build resilience against burnout by group therapy (42). Regardless of the methodology, all studies emphasized the significance of multidisciplinary collaboration. However, most past programs were implemented in university associated hospitals, which prevents us from applying the findings to other types of hospital or "lack a rigorous protocol" impedes finding out the best way to go (21). Therefore, the World Health Organization is still calling to develop a tailored psychological intervention for healthcare workers worldwide (43).

Though DASS-21 has been widely used to assess levels of depression, anxiety, and stress in various research, it has certain limitations that can lead to subscale overlap and interaction. In the current study, we found strong positive correlations between depression and anxiety ($r = 0.85$, $p < 0.05$), depression and stress ($r = 0.88$, $p < 0.05$), and anxiety and stress ($r = 0.84$, $p < 0.05$). Indeed, we observed the consistent determinant factors for each subscale (Tables 3–5). The reasons might be attributed to the scale reliance on self-reporting, in other words, it is influenced by individual socially desirable response. Furthermore, there is the potential of bias due to cultural factors in the questionnaire (44, 45). Therefore, findings from this study could be considered as preliminary results. Future comprehensive studies should combine its findings with other assessment methods, taking account of the cultural context. This can help mitigate some limitations of the scale.

5. Limitations

This study is subject to several limitations. Firstly, the research design was a cross-sectional study, so causal relationships are inconclusive. Secondly, given that the study took place after the pandemic, there could have been recall bias involved when obtaining information.

Finally, it is important to note that the study was conducted at a single center, which may limit the scope of the findings. Nonetheless, our sample size is high (above 1,000), hence, the interpreting findings are reliable.

6. Conclusion

The prevalence of depression, anxiety, and stress among healthcare workers were notably high. Additionally, staff with adverse working conditions, such as shift work, direct contact with COVID-19 patients, and income level, and psychological status before the pandemic, were more likely to have a high risk of mental health problems. Having alternate rest periods and limiting time away from home to no more than 10 days per month during COVID-19 pandemic might reduce risk of stress development. The findings of the study can help promote adequate measures to protect the mental health of pediatric health staff during pandemics.

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.

Ethics statement

The studies involving humans were approved by the Institutional Review Board at the Vietnam National Children's Hospital (IRB number:1925/BVNTW-HDDD dated August 22, 2022). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

HTP: conceptualization, methodology, and writing—review and editing. TV: conceptualization, methodology, and review and editing. NT-T and NB: writing—original draft and writing—review and editing. LV, BT, LT, TV, TT, PT, TTH, HTTB, and TN: data curation, formal analysis and writing - original draft. All authors contributed to the article and approved the submitted version.

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.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1231326/full#supplementary-material

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Development and validity of a mentally-passive and mentally-active sedentary time questionnaire in nursing college students

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Objective: This study aimed to develop and validate a questionnaire to evaluate nursing college students' mentally-passive and mentally-active sedentary time (M-PAST) in China.

Methods: An initial M-PAST questionnaire with mentally-passive and mentally-active sedentary behaviors was developed with content validity undertaken through a consensus panel and pilot test where a convenience sample of six nursing students was recruited to assess the relevance, comprehensiveness, and comprehensibility of the refined questionnaire after expert panelists' responses. A cross-sectional online survey using a self-reported questionnaire was distributed to nursing students by email and then conducted using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to assess the construct validity of the M-PAST questionnaire and factor structures. Finally, the criterion validity was examined by exploring the associations between the M-PAST and the IPAQ sitting time, psychological distress, and insomnia.

Results: Eight items regarding learning and leisure were included in the final version of the M-PAST questionnaire. A group of 650 nursing college students in China completed the study. Principal component analysis revealed two factors (i.e., mentally-passive and mentally-active sedentary behaviors), which explained 41.98% of the variance contributing to the questionnaire. The CFA reached the adaptive standard. Cronbach's α ranged from 0.730 to 0.742. The correlations between M-PAST and IPAQ total sitting time were significant ($p < 0.01$, $r = 0.125–0.396$). Mentally-passive sedentary time was associated with psychological distress and insomnia ($p < 0.01$, $r = 0.078–0.163$), while no significant associations were found in mentally-active sedentary behaviors.

Conclusion and implications for practice: The M-PAST questionnaire appears to be a reliable and valid tool that reported both mentally-passive and mentally-active sedentary behaviors in nursing college students in China. However, future studies may need to further examine its validity among international nursing college students. This study further confirmed that mentally-passive sedentary behavior was positively associated with psychological distress and insomnia. Effective strategies are needed to reduce nursing college students' mentally-passive sedentary time to improve their health and wellbeing in China.

KEYWORDS
sedentary behavior, nursing, mentally-passive, mentally-active, health promotion

1. Introduction

Nursing college students were reported to experience prolonged sitting time during the COVID-19 pandemic by more than 50% compared to pre-COVID-19 (1). Uninterrupted classroom sitting was associated with increased discomfort and sleepiness in nursing college students (2). Prolonged sitting is also strongly associated with low levels of physical activity, psychological distress, and insomnia, resulting in academic, interpersonal, and functional challenges (3–5). Many studies reported that nursing students experienced a high prevalence of unhealthy lifestyles, including sleep deprivation and psychological disorder, in Brazil (6), India (7), and China (8), where sedentary behavior/physical inactivity are considered to be potential factors that lead to an unhealthy lifestyle. Belingheri et al. (9) also found that nursing students reported a higher prevalence of sleep disorders partially because of physical inactivity/sedentary behavior than students in other subjects. Given that nursing college students spend most of their weekdays in classroom environments that leads to prolonged sitting, reducing sedentary time in nursing college students could be a health promotion strategy to reduce their symptoms of psychological distress and insomnia. Although prolonged sedentary time was reported to be a potential risk factor for multiple adverse health outcomes (e.g., psychological distress and insomnia), diverse sedentary behaviors may have inequivalent detrimental effects on these health outcomes (10). This study develops and validates a questionnaire to evaluate nursing college students' mentally-passive and mentally-active sedentary time in China, and explores their associations with psychological distress and insomnia.

Sedentary contexts are often divided into three broad categories: occupation/learning, leisure, and transport referring to where the sedentary behaviors usually occur (11, 12). Furthermore, Werneck et al. (13) described diverse sedentary types, including mentally-passive and mentally-active sedentary behaviors according to the nature of the activity itself. For example, TV viewing is a type of mentally-passive sedentary behavior as it requires low cognitive demand and is usually undertaken in leisure. In contrast, work-related tasks and reading books involves concentration and cognitive effort. Thus, occupational/learning sedentary behaviors would logically be considered mentally-active (11). As for the effects of mentally-passive and active sedentary behaviors, studies found that mentally-passive sedentary behaviors appear to increase the risk of depression and cognitive impairment in older adults and adolescents, whereas mentally-active sedentary behaviors may protect against these outcomes (11, 13, 14). However, limited studies have examined the effects of different types of sedentary behaviors on the health status of nursing college students due to the lack of a valid questionnaire to examine mentally-passive and active sedentary sitting time in this population.

The preliminary framework to guide the development of sedentary behavior questionnaires also suggested assessing sedentary behaviors across three contexts (i.e., occupation/learning, leisure, and transport) and two types (i.e., mentally-passive and mentally-activity) (11). While existing studies commonly used the international physical activity questionnaire (IPAQ), this is limited to only one item that assesses the total sitting time of the past 7 days (15, 16). Mentally-passive and mentally-active sedentary questionnaires found that most studies used one or two questions to assess the nature of the sedentary behaviors (12, 13). They reported no established validity and reliability, especially for use by college students. Moreover, Other existing questionnaires, for example, the sedentary behavior questionnaire (SBQ) (17) and the adolescent sedentary activity questionnaire (ASAQ) (18), assessed the time spent in sedentary activities in more than five domains (e.g., playing computer games, reading, relaxing with friends, and going to church). In addition, the sedentary sitting time recorded devices (e.g., activPAL3 activity monitor) have been used to objectively record individuals' sitting time in a college context (19). However, these questionnaires and objective sedentary behavior measures do not differentiate sedentary behaviors into specific contexts and categories of either mentally-passive or mentally-active. In addition, not all the included items were appropriate for nursing college students and no specific college student questionnaire has been developed.

There has been a suggestion that besides the assessment of total sedentary time, a different approach to the assessment of sedentary sitting is needed where both the contexts and types of sedentary behaviors should be considered (11). Therefore, developing an appropriate and valid assessment tool, which delineates between mentally-passive and mentally-active sedentary behaviors with three contexts and the time spent on these behaviors, is necessary to understand how different types of sedentary behaviors associate with or explain the health status (i.e., psychological distress and insomnia) of nursing college students. In addition, it is of great importance to design such a questionnaire for recording both mentally-active and mentally-passive sitting time separately which cannot be achieved by objective sedentary behavior measures. Thus, the current study aimed to explore nursing college students in China to (a) develop a self-reported mentally-passive and mentally-active sedentary time (M-PAST) questionnaire, (b) test the content and construct validity of the M-PAST questionnaire as well as its criterion validity using the associations between the M-PAST and the IPAQ sitting time, psychological distress, and insomnia, and (c) test the reliability of the M-PAST questionnaire.

2. Methods

2.1. Phase 1: development of the M-PAST questionnaire

The development and content validity of the M-PAST questionnaire was undertaken using a consensus panel and pilot test. Expert panelists' feedback was summarized to inform changes until group consensus among experts was achieved. A pilot test was then

TABLE 1 Items in the developed M-PAST questionnaire.

Sedentary contexts	Questionnaire items	Sedentary types	Questions for each item
Learning	1. Learning	Mentally-active	➢ How often do you perform the activity while sitting or lying down on weekdays and weekends separately during the past week? ➢ Please record the approximate duration per day you perform the activity on weekdays and weekends separately
Leisure	2. Reading books/newspapers		
	3. Socializing		
	4. Playing electronic games		
	5. Watching TV/films/videos	Mentally-passive	
	6. Browsing websites/moments/online shop		
	7. Having meals		
	8. Napping		

conducted among a convenience sample of six nursing students to assess the relevance, comprehensiveness, and comprehensibility of the refined M-PAST questionnaire (i.e., 8 items) based on experts' responses. Ethics approval was received from the Research Ethics Committee of the affiliated institute (2021-R-164).

2.1.1. Preliminary item selection

An initial self-reported M-PAST questionnaire comprising 10 items in three contexts (i.e., learning, leisure, and transport) was developed for nursing college students in China, including (1) learning, (2) reading books/newspapers, (3) socializing, (4) playing electronic games, (5) watching TV/films/videos, (6) browsing websites/moments/online shop, (7) having meals, (8) napping, (9) sitting as a passenger in a car, and (10) driving a car. Sedentary behaviors were defined by the energy expenditure of <1.5 metabolic equivalents (METs) (e.g., equivalent to sitting or lying down) (20). In addition, based on differential concentration and cognitive effort/demand of different sedentary behaviors, the items (1), (2), (3), (4), and (10) are characterized by cognitive effort. These are referred to as mentally-active sedentary behaviors, with the remaining five items being mentally-passive sedentary behaviors as they involve passive mental activity.

Participants were asked, "how often do you perform the above certain activity while sitting or lying down on weekdays and weekends separately during the past week? For each activity, please respond with the approximate duration per day you perform the activity on weekdays and weekends separately." The total duration of mentally-passive and mentally-active sedentary sitting time on weekdays and weekends in the past week was calculated.

2.1.2. Refinements based on responses from experts

Content validity of the M-PAST content was undertaken using a consensus panel between 15 May and 30 July 2021. This panel comprised six nursing, public health, and physical health professors recruited from the university by word of mouth and email. Expert panelists were health professors experienced with exercise or nursing researchers interested in health promotion. After recruitment, potential expert panelists were provided a study information sheet by email that explained the purpose of the study, study risks and benefits, the refinement process, and contact information. Consenting expert panelists were asked to sign and email their written informed consent forms back to the researchers. Expert panelists then received the M-PAST questionnaire via email and adjusted whether the item was relevant on two occasions. For each item, a score of 1 to 5 points was assigned, 5 very relevant, and 1 irrelevant. Items were discarded if an average total of <2 points was obtained (21).

The original two questionnaire items (i.e., items 9 and 10) about transport context (with an average of 1.33 points) were found to be not suitable for Chinese college students due to on-campus residency in China (22). Finally, eight items were included within two contexts (i.e., learning and leisure) with the items (1), (2), (3), and (4) referring to mentally-active sedentary behaviors and the remaining four items (i.e., 5, 6, 7, 8) being mentally-passive sedentary behaviors.

2.1.3. Pilot test

Following refinements of the M-PAST questionnaire (i.e., 8 items) based on experts' responses, a pilot test was conducted between 15 August and 30 August 2021 by asking a convenience sample of six nursing students (i.e., ages ranging from 20 to 22 years) using an online survey administered via a free online Chinese survey platform[1] where two of them were males and four were females. The ten criteria for good content validity of a patient-reported outcome measure (PROM) were used to assess the relevance (five criteria), comprehensiveness (one criterion), and comprehensibility (four criteria) of the refined M-PAST questionnaire (23). No items were excluded from the final version of the revised M-PAST questionnaire after the pilot test (see Table 1).

2.2. Phase 2: validity of the M-PAST questionnaire

2.2.1. Design

A cross-sectional study using an online survey design was performed to assess the construct and criterion validity of the developed M-PAST questionnaire. Construct validity indicates the degree to which the instrument is consistent with hypotheses (i.e., mentally-active and mentally-passive sitting time) (24). Criterion validity is defined as the degree to which the scores of an instrument are an adequate reflection of the "gold standard" and are positively or negatively associated with the scores of other instruments (25, 26). The current study examined the agreement between the sitting time of the IPAQ and the developed M-PAST. Although the IPAQ is not a "golden

1 https://www.wjx.cn

standard," the IPAQ has already been validated in Chinese language and college students (27) and so the sitting time of IPAQ was used to support the criterion validity of the M-PAST questionnaire in the current study. In addition, the M-PAST sitting time should correlate with psychological distress and insomnia. Their associations were also used to assess the criterion validity of the M-PAST questionnaire.

This study was conducted following the Declaration of Helsinki established by the World Medical Association and is reported according to the STROBE reporting guidelines for cross-sectional studies. Ethics approval for this validation study was received from the Research Ethics Committee of the affiliated institute (2021-R-165). Completion and submission of the online survey implied consent to participate. This was declared to respondents at the commencement of the survey.

2.2.2. Participants and recruitment

Using convenience sampling, nursing students from a large medical college in China were invited to participate. An email invitation with the help of the College Deputy Vice Administration Office was sent to all nursing students. The email invitation included the purpose of the study, inclusion and exclusion criteria, and the online survey link (see footnote 1) to the M-PAST questionnaire.

2.2.3. Data collection

Data collection took place between 10 October and 30 December 2021. The study survey included participants' demographic details (i.e., age, gender, and year of study), the M-PAST questionnaire, IPAQ-short form (IPAQ-SF), and an assessment of psychological distress and insomnia.

The IPAQ-SF Chinese version was used to assess participants' physical activity participation and average sitting time on weekdays and weekends during the past 7 days. There are two types of IPAQ scores for data processing and analysis: a categorical and a continuous score. The categorical score classified participants into three physical activity intensity levels (i.e., low, moderate, and high). The continuous score is expressed as the metabolic equivalent task (MET-minutes per week) of energy expenditure. In addition, participants sitting time (i.e., hours per day) was also recorded on the IPAQ-SF. High validity and reliability for the IPAQ-SF have been established among Chinese adults with intraclass correlation coefficients above 0.84 (28).

The 10-item Kessler psychological distress scale (K10) Chinese version was used to assess psychological distress. The K10 is a self-reported questionnaire containing 10 questions with a score ranging from 1 to 5 to assess participants' frequency of nonspecific psychological distress across the past month based on questions related to symptoms of anxiety and depression. Participants choose how often they felt or thought in a certain way: 1 = almost never, 2 = sometimes, 3 = fairly often, 4 = very often, 5 = all the time. The total score was obtained by summing all 10 items, with a total score of 10–50. A score of 22 or greater indicates a high level of psychological distress. Higher scores indicate higher levels of psychological distress. The K10 scale is a valid instrument with acceptable internal consistency, with Cronbach's α over 0.84 in adults over 18 years old (29).

The insomnia severity index (ISI) was used to assess participants' insomnia symptoms. The ISI is a self-reported questionnaire containing seven questions with a score from 0 to 4 to assess participants' degree of insomnia during the past week. The total score was obtained by summing all seven items, with a total score of 0–28. High scores indicate a higher degree of insomnia. A score of seven or less reflects no insomnia, with mild insomnia scores ranging from 8 to 14, moderate insomnia scores ranging from 15 to 21, and high insomnia scores ranging from 22 to 28. High validity and reliability for ISI have been established (Cronbach's $\alpha = 0.91$) for people over 18 years old (30).

2.2.4. Statistical analysis

Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS) version 25.0 and the AMOS 24.0 (IBM Corporation). Based on the data cleaning rules for the IPAQ-SF, respondents who reported over 960 min of total sedentary time per day were identified as over-reporting. The assumption is that individuals spend an average of 8 h of sleep per day (31). Descriptive statistics were calculated using frequencies (i.e., percentages) for categorical variables and mean and standard deviations for continuous variables.

The sample of 650 participants was randomly divided into two groups to investigate construct validity using exploratory factor analysis (EFA) ($n = 325$) and confirmatory factor analysis (CFA) ($n = 325$). The EFA was conducted using the principal component analysis (PCA) and varimax rotation to provide evidence of a stable factor structure. The PCA was conducted when the KMO was over 0.06, and the Bartlett test of sphericity was significant ($p < 0.05$). Items with factor loading >0.4 significantly contributed to a factor (21). Analysis of eigenvalues in the screen plot and the commonly applied eigenvalue criterion (>1.0) were used to determine the number of factors remaining for the final questionnaire. AMOS (IBM Corporation) was used to perform the CFAs of the M-PAST questionnaire, analyzing the fit of models of its respective parameter estimates. Additionally, the criterion validity of the M-PAST questionnaire was investigated using the Spearman correlation coefficients (r) to determine the correlation between the M-PAST and the IPAQ sitting time, psychological distress, and insomnia.

Cronbach's α was used to evaluate the internal consistency, with Cronbach's α being acceptable for values >0.7 (21). An independent t-test and Spearman correlation coefficients (r) were used to separately evaluate differences in the mentally-passive and mentally-active sedentary factors among different sexes and ages. The significant level was set at 0.05.

3. Results

3.1. Participants' characteristics

Six hundred fifty nursing college students were included for analysis in this study after removing those who reported more than 960 min of total sedentary time per day ($n = 85$; 11.6%). The majority of participants were female ($n = 506$; 77.8%) (see Table 2), 27.7% were first-year college students, with 36.9% and 35.4% participants being second-year and third-year participants, respectively. Almost half of the participants engaged in moderate physical activity levels, and only 21.5% reported high-intensity activity.

3.2. Construct validity analysis

The KMO criterion was acceptable at 0.665, and the Bartlett test of sphericity was significant ($\chi^2_{190} = 254.656$; $p < 0.001$). Using

TABLE 2 Demographic characteristics of the participants ($n = 650$).

Variables	$\bar{x} \pm s/n$	Range/%
Age	19.52 ± 1.08	17~23
Gender		
Male	144	22.2%
Female	506	77.8%
Year of study		
First-year	180	27.7%
Second-year	240	36.9%
Third-year	230	35.4%
IPAQ levels		
Low intensity	191	29.4%
Moderate intensity	319	49.1%
High intensity	140	21.5%

IPAQ, international physical activity questionnaire.

TABLE 3 Factor-loading matrix and Cronbach's α.

Factor and question number	Factor loadings
FACTOR 1[a]	
1. Learning	0.816
2. Reading books/newspapers	0.618
3. Socializing	0.497
4. Playing electronic games	0.477
FACTOR 2[b]	
5. Watching TV/films/videos	0.586
6. Browsing websites/moments/online shop	0.732
7. Having meals	0.633
8. Napping	0.528

[a]Cronbach's $\alpha = 0.742$.
[b]Cronbach's $\alpha = 0.730$.

PCA and varimax-rotation as the extraction methods, the scree-plots revealed two factors that accounted for 41.98% of the variance. Table 3 presents the factor-loading matrix of the eight items, consistent with the original two-factor assumption. The first factor of the two-factor-solution consisted of four items (i.e., 1, 2, 3, and 4) with high loadings and accounted for 21.68% of the variance in the explained model (eigenvalue = 2.18). These items refer to mentally-active behaviors with cognitive effort (e.g., learning). Thus, this factor was named "mentally-active sedentary behaviors." Additionally, the second factor consisted of the four remaining items (i.e., 5, 6, 7, and 8) and accounted for 20.30% of the variance in the explained model (eigenvalue = 1.18). This factor reflects passive mental activity (i.e., watching TV) and is named "mentally-passive sedentary behaviors."

The CFA indicated a good fit for a two-factor model. In the model fitness index, the chi-square degree of freedom was 1.199, the goodness-of-fit index was 0.984, the adjusted goodness-of-fit index was 0.968, the incremental fit index was 0.981, Tucker Lewis index was 0.969, the comparative fit index was 0.980, and the root mean square error of approximation was 0.025.

3.3. Criterion validity analysis

The correlations between the M-PAST and IPAQ total sitting time were significant on weekdays and weekends ($p < 0.01$, $r = 0.125$–0.396). The K10 scores were significantly related to mentally-passive sedentary time on weekdays ($p < 0.01$, $r = 0.125$) and weekends ($p < 0.01$, $r = 0.163$), indicating that longer mentally-passive sedentary time was correlated with negative mental health. Similarly, longer mentally-passive sedentary was also correlated with insomnia on weekdays ($p < 0.05$, $r = 0.078$) and weekends ($p < 0.05$, $r = 0.097$). No statistically significant associations were found between mentally-active sedentary behaviors and psychological distress or insomnia (Table 4).

3.4. Reliability analysis

Internal consistency for the questionnaire was assessed by Cronbach's α (Table 2). The total M-PAST questionnaire's Cronbach's α was 0.808, with 0.742 and 0.730 for mentally-active and passive sedentary behaviors, respectively.

Data on different ages and genders were pooled to confirm the two patterns of sedentary behaviors further. There are significant differences on the mentally-active sedentary time and mentally-passive sedentary time on weekdays ($p < 0.05$, $r = -0.12$ to -0.27) among various ages. No significant differences were found in the weekdays' mentally-passive and mentally-active, sedentary time among females and males. However, the mentally-active sedentary time on weekends was significantly shorter in females than in males ($p < 0.001$), whereas the mentally-passive sedentary time of females was significantly longer ($p = 0.004$) (Table 5).

4. Discussion

To our knowledge, this is the first study that has developed a questionnaire for assessing various sedentary times within different contexts and examined its validity among nursing college students in China. This study presents an M-PAST questionnaire (i.e., 8 items) that assesses two types of sedentary behaviors: mentally-passive and mentally-active, sedentary behavior within learning and leisure contexts. However, two items of the transport context were excluded from the preliminary M-PAST questionnaire (i.e., 10 items) following experts' review, as nursing college students are not used to driving a motor vehicle or sitting as a passenger in China. One reason was that nursing college students aged from 18 to 22 years old are usually characterized as holding limited disposable income and unlikely to have car ownership (32). In addition, unlike college students in other countries, who may be residing off-campus and travelling to university, college students in China are more likely to live in an on-site dormitory (22). Hence, they have fewer opportunities to drive or take a car. However, the revised M-PAST questionnaire may limit its use internationally, which suggests that future studies may need to add the two transport items and further examine its validity among international nursing college students.

This study outcome is comparable to other construct validation studies (21, 33). Factor analysis confirmed the two-component factor structures. Four questions (e.g.,1–4) identified mentally-active sedentary behaviors, including questions about sitting/lying down and

TABLE 4 Criteria validity of M-PAST questionnaire (n = 650).

Variables	TST (weekdays)	TST (weekends)	M-AST (weekdays)	M-AST (weekends)	M-PST (weekdays)	M-PST (weekends)
IPAQ-ST (weekends)	0.084*	0.125**	0.078*	0.169**	0.072	0.033
IPAQ-ST (weekdays)	0.396**	0.121**	0.394**	0.154**	0.192**	0.055
K10	0.015	0.129**	−0.049	0.017	0.125**	0.163**
ISI	−0.005	0.027	−0.055	−0.049	0.078*	0.097*

*$p < 0.05$, **$p < 0.01$, M-AST, mentally-active sedentary time; M-PST, mentally-passive sedentary time; TST, total sedentary time calculated by summing the M-AST and M-PST; IPAQ-ST, international physical activity questionnaire sitting time.

TABLE 5 Mean scores in males and females (n = 650).

	Females (n = 506)		Males (n = 144)		p
	Mean	SD	Mean	SD	
M-AST (weekdays)	24.97	16.52	25.81	16.59	0.593
M-AST (weekends)	9.02	4.79	10.87	5.11	<0.001
M-PST (weekdays)	14.87	7.86	13.47	7.26	0.055
M-PST (weekends)	8.88	4.63	7.85	3.48	0.004

M-AST, mentally-active sedentary time; M-PST, mentally-passive sedentary time.

"learning" or "playing electronic games" or "reading books/newspapers" or "socializing," which need cognitive activities. No significant associations existed between mentally-active sedentary behavior, psychological distress, and insomnia. This result was inconsistent with previous studies where mentally-active sedentary behavior is suggested to have the potential of protection against mental disorders, as mentally-active sedentary time may be linked to nursing college students' mental stimulation that improves mental health (12, 13).

Additionally, the positive effects of mentally-active sedentary behavior may be attributed to the increased cognitive demand and brain connectivity during mentally-active sedentary activities, which are also associated with mental health (13). Specific reasons for these differences may be attributed to methodological discrepancies between studies. For example, the different ages of participants may contribute to the different results, with most previous studies including adolescents from 11 to 16 years (13). There are also differences in sample sizes where there were more than 7,124 participants in previous studies (12, 13) compared to our study of only 650 participants. These findings suggest that a large sample size should be considered in future studies to find the significant effects of mentally-active sedentary behavior on the mental health of nursing college students.

The remaining four questions inquiring about mentally-passive sedentary behaviors included items about sitting/lying down and "watching TV/films/videos," "browsing websites/moments/online shop," "having meals," or "napping." This study observed statistically significant associations between mentally-passive sedentary time and psychological distress as well as insomnia, where longer mentally-passive sedentary time may be a risk factor for psychological distress and insomnia, which are in line with previous studies (11, 34–36). One apparent reason to explain this result may be the reduction of time engaged in physical activity, well-established effective prevention and treatment for mental health (37). A potential mechanism suggested that mentally-passive sedentary behavior like watching TV can hinder direct communications between individuals, reducing social interaction and increasing the potential for psychological distress (35). In addition, mentally-passive sedentary behavior like using a computer increased screen exposure which was linked to delayed bedtime, reduced sleep duration, and poor sleep quality (38). The mentally-passive sedentary behavior and its consequence on sleep quality may become prevalent in mental disorders, increasing anxiety, depression, and stress symptoms. Therefore, practical interventions aimed at raising awareness about negative health implications and training in behavioral self-regulation may be needed to reduce nursing college students' mentally-passive sedentary time and improve health wellbeing (39, 40).

The Cronbach's α and the two-factor internal-reliability had an acceptable value compared with similar studies (21, 41). This study showed that males tend to have longer mentally-active sedentary time than females on weekends. In comparison, females showed longer mentally-passive sedentary time than males on weekends. Deep-rooted gender differences may contribute to significant differences in sedentary time of females and males on weekends, including different psychosocial factors (e.g., self-perception of health, satisfaction with body image) (42) and motiving factors to engage in physical activity (42). Moreover, various purposes of the internet/devices may contribute to longer mentally-active and passive sedentary among males and females, as males are more likely to play online games (i.e., mentally-active sedentary activity) (43). In contrast, females use the internet/device for website browsing (i.e., mentally-passive sedentary activity) (44). In addition, there are significant differences in the level of physical activity between males and females (45), indicating that male students reported better physical activity self-efficacy than females, which contributes to high levels of physical activity engagement in male students. The differences in physical activity participation may also be one potential reason for the detected differences in the mentally-passive and mentally-active sitting time of different genders on weekends. Hence, it is important for future studies to look at interventions targeting reductions in nursing college students' mentally-passive sedentary sitting times, for example, changing behaviors of physical activity participation and internet usage, particularly in female students.

4.1. Study limitations

Some limitations of this study should be considered. First, the lack of data collection at two-time points does not allow interpretation of test-retest reliability analysis. Assessing test-retest reliability is an area for improvement in future studies. Second, the criterion validity assessment was not measured by comparing it with a "gold standard" (e.g., activPAL3 activity monitor) which could provide perfectly true sedentary time, but using the agreement with the sitting time of the IPAQ and the associations with psychological distress and insomnia. The missing collection of sitting time using a "gold standard" is another limitation of this study. Third, the reported estimate of sedentary

behavior and time may not accurately reflect the time spent on the various sedentary behaviors because of possibly multi-tasking and overlapping time. For example, nursing college students may sit in front of a computer for learning and leisure, so the time reported for "learning," "reading," and "watching TV" may overlap. Forth, using self-reported measures of the M-PAST may also be a study limitation, as self-reported outcomes can lower the accuracy of the data and further reduce the internal validity of the M-PAST questionnaire. Future studies with nursing college students could combine alternatively objective outcome measures (e.g., activPAL3 activity monitor) when using the M-PAST questionnaire to eliminate possible self-reported bias. Fifth, the current study is a convenience sample of nursing college students, and is not representative of college students. Finally, the gender distribution, with most respondents being females, also limits the generalizability of the study results.

5. Conclusion and relevance for clinical practice

Preliminary evidence demonstrates that the M-PAST questionnaire is a reliable and valid self-reported questionnaire to identify mentally-passive and mentally-active sedentary behaviors among nursing college students in China. Not only have content, construct, and criterion validities been established, but an acceptable internal consistency of the two factors structure in the M-PAST questionnaire has also been found. Mentally-passive sedentary behaviors are significantly and positively associated with both psychological distress and insomnia among nursing college students but not mentally-active sedentary behavior. Future studies should focus on the test-retest reliability assessment in a larger sample size. These findings suggest that practical strategies to reduce nursing college students' mentally-passive sedentary sitting time are needed to promote their health and well-being.

The M-PAST questionnaire is a valid and reliable tool to assess nursing college students' mentally-passive and mentally-active sedentary time in China. Importantly, the current study further confirmed that mentally-passive sedentary behavior was positively associated with psychological distress and insomnia. These findings can be useful for assessing the mentally-active and mentally-passive sedentary time of nursing college students, which can be used for the implementation of practical strategies for future nurses to reduce their mentally-passive sedentary sitting time and further promote their health and well-being.

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 humans were approved by the Research Ethics Committee of the author's institution. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in phase 1 of this study. Written informed consent was not obtained from the individuals in phase 2 of this study as completion and submission of the online survey implied consent to participate. This was declared to respondents at the commencement of the survey.

Author contributions

MQ: conceptulization, data curation, formal analysis, writing—original draft, and writing—review and editing. YG: conceptulization, data curation, formal analysis, and writing—original draft. XZ: conceptulization, data curation, formal analysis, and writing—review and editing. CJ: data curation, data interpretation, and writing—review and editing. WM: data interpretation and writing—review and editing. SS: conceptulization, writing—review and editing, visualization, supervision, and project administration. PL: writing—review and editing, visualization, supervision, and project administration. 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.

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Health professionals who have worked in COVID-19 immunization centers suffer the effects of violence

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Background: The phenomenon violence against health professionals has received increasing attention in recent years because of its frequency and significant impact on victims' mental health and disruption of health services. Despite this attention, little is known about the incidence of workplace violence in the highly politicized immunization services. Therefore, we decided to examine the prevalence of workplace violence in the COVID-19 immunization campaign, the risk and protective factors, and the impact on victims' mental health.

Methods: Between March and April 2022, we conducted an anonymous online survey among health professionals working in COVID-19 vaccination centers in the Friuli-Venezia Giulia Region (Italy). We used the Questionnaire for Workplace Violence in Healthcare Settings and the Impact of Event Scale–Revised.

Results: Of the 200 participants, 93 (46.5%) reported being victims of an act of violence during the vaccination campaign, 60 of them verbally and 7 physically. In 35.5% of cases, the IES score indicated a possible post-traumatic stress reaction in the victim. Opinions on measures to prevent violence and support workers in the workplace differed according to the sex of the health professional, with women emphasizing the need for self-defense training and improvement of security arrangements ($p < 0.001$).

Conclusion: One-third of health professionals involved in the COVID-19 immunization campaign reported that their mental health was affected by workplace violence. Public health professionals dealing with politicized and debated issues such as immunization should receive more attention, as should the implementation of a more structured and multidisciplinary approach to the problem within healthcare organizations.

KEYWORDS

violence, health professionals, impact, COVID-19 vaccination, workplace violence (WPV)

Background

The World Health Organization defines workplace violence (WPV) as "incidents where staff is abused, threatened, or assaulted in circumstances related to their work, including commuting to and from work, involving an explicit or implicit challenge to their safety, wellbeing or health" (1). Workplace violence includes both physical and verbal violence and can be categorized into four types depending on the perpetrator's relationship to the workplace. Type II violence is the case perpetrated by a patient (2).

In recent years, the WPV phenomenon has been referred to as a silent epidemic (3) that accompanies the COVID-19 pandemic that the world has known since 2020 regardless of a country's security situation (4) or work environment, organizational culture, and access to resources (5). The burden of this problem has been studied and discussed by many authors (6–8), but it still seems to be underestimated because of a lack of systematic recording (3) and a high underreporting rate, which is partly related to resignation and the misperception of this behavior as an inherent state of frailty and powerlessness of the patient. The overall prevalence of WPV is 58.7%, with verbal violence (66.8%) predominating over physical violence, which in any case reaches a worrying level (20.8%) (9) and shows differences between professional profiles (10). In most cases, this violence is perpetrated by patients (11), which has a dramatic impact on the physical and mental health of health professionals (6). Nonetheless, the impact of the COVID-19 pandemic on the general public and health professionals has raised a number of COVID-related health issues, such as the uncertain health, economic, and, because of recent developments, political situation, which has disturbed the balance at all levels, generating stress and, at best, even leading to poor mental health status (12–15).

Despite the very early warning of the enormous pressure the pandemic would place on healthcare workers (16), and given the high level of attention given to health professionals working in emergency care and highly politicized healthcare services, which according to Kuhlmann et al. (17) include vaccination centers as well as services that provide abortion and reproductive healthcare, and services for minorities and vulnerable groups (e.g., asylum seekers, migrants, LGBTQ persons), there have been no studies, to our knowledge, that have examined the incidence of violent episodes specifically related to the COVID-19 vaccination campaign or its impact on the mental health of health professionals. The difficulties associated with the COVID-19 vaccination campaign, due in part to the limited supply of vaccines, in part to the conflicting and changing indications for their use, and in part to the mandatory vaccination against COVID-19 in Italy, were met with a hesitant attitude toward the vaccine that made this campaign even more difficult for public health professionals. This climate of concern, coupled with mistrust, fitted into a context in which there had already been an increase in violence against health professionals for several years.

For these reasons, we decided to investigate the prevalence of workplace violence against health professionals related to the COVID-19 vaccination campaign in our region, to examine the risk and protective factors for these incidents, and to assess the impact on the victims' mental health.

Methods

Study participants and study design

From March 18 to April 27, 2022, we conducted a cross-sectional study targeting all health professionals involved in the COVID-19 vaccination campaign in the Friuli-Venezia Giulia Region (Italy). The questionnaire included a total of 75 questions for two validated tests to investigate and analyze violent episodes against healthcare workers and their impact on the mental health of the workers themselves: the "Questionnaire for Workplace Violence in Healthcare Settings" (WPV) by Kumari et al. (18) and the Italian version of the "Impact of Event Scale – Revised" also known as IES-R (19, 20). The WPV questionnaire contains questions on five areas: forms of violence, impact of violent incidents, incident reporting, mitigation strategies, and risk factors. The questionnaire was translated into Italian by the research group according to the guidelines of WHO (21). The steps were: (1) independent translation of the questionnaire from English into Italian by two bilingual physicians and experts in care safety terminology and incident reporting; (2) revision of the Italian version by three experts in care safety and clinical risk management (physician, nurse, psychologist; two women and one man) who pointed out inappropriate words, phrases, or expressions and inconsistencies in the translation from English into Italian. These suggestions and proposed changes were incorporated into a revised version; (3) the revised version was back-translated into English by a bilingual person who was not involved in the previous steps; (4) this back-translated version was then compared with the original English version by two expert physicians. Particular attention was paid not to literal translation but to conceptual and cultural equivalence, as suggested by the WHO guidelines. (5) Finally, the resulting questionnaire was presented to some health professionals who might represent the population under study, in order to check in detail the understanding of each question. At this stage, the testers could point out unclear terms and suggest possible modifications to improve the understanding of the questionnaire, taking into account the objectives of the questions and the instrument. The IES-R is a well-known instrument designed for measuring symptoms of post-traumatic stress disorder (PTSD) that has been devised according to DSM-IV criteria. It is a brief, east-to-use self-report questionnaire used for repeated measures over time to monitor progress and is best used for recent and specific traumatic events. In the present work, the validated Italian version was used (22).

Sociodemographic variables such as age, sex, marital status (single, cohabiting or married with children, cohabiting or married without children, separated/divorced/widowed), profession (physician, medical resident, specialist, nurse, health assistant, auxiliary staff, other), level of education (lower secondary, upper secondary, bachelor's degree-3 or 5/6 years, doctorate, master's, other), area of usual work (intensive and emergency care, surgery, medicine, maternal and child, diagnostic imaging, laboratory, mental health, public health, primary care, general practitioner, recent graduate, other), years of work experience, role in COVID-19 immunization campaign (physician, administrator, front office, back office, session leader, other), previous experience with immunization services was also recorded. The full text of the questionnaire is included in Additional file 1.

The invitation to complete the questionnaire was sent by e-mail to all health professionals involved in the vaccination campaign in Friuli Venezia Giulia in the designated public vaccination centers. Health professionals who vaccinated only inpatients during hospitalization were not included; the survey was not addressed to pharmacists, since they did not administer vaccines in the Friuli Venezia Giulia region at the time of the survey. The email contained a redirection link to complete the online questionnaire on the EUSurvey platform. This platform is supported by the European Commission and can be used by researchers free of charge; the survey was conducted in full compliance with the data protection regulations currently in force at European Union level (EU-GDPR). The invitation to participate was accompanied by a description of the reasons for the study and its objectives; it was clearly stated that participation was voluntary and free of charge. The questionnaire was completely anonymous; it was not possible in any way to identify the individual participant. This survey was not part of any national or international research on the subject. Subjects who participated in the study gave their consent to the use of the data collected by completing the questionnaire. Participants were specifically asked to complete the questionnaire about their experience within the COVID-19 immunization campaign. At the end of the questionnaire, participants who wished to discuss or elaborate on their experiences of violence episodes they had experienced were given a contact person/service for psychological support.

Reading of responses, collection in a special database, and subsequent data analysis were limited to the research group. The data were managed in aggregate form, and it was not possible in any way to track the responses of individual participants. Considering that the percentage of health professionals involved in an episode of violence (threats, harassment, verbal and physical assault) is 40% according to a recent Italian survey conducted by INAIL (Italian National Institute for Insurance against Occupational Accidents) (23), it was necessary to analyze 193 questionnaires to obtain an interval estimate (95% IC) with an accuracy of 7%. The study was approved by the Unique Regional Ethical Committee of Friuli Venezia Giulia (Italy).

Analysis of the data

Descriptive analyses were conducted to characterize the population participating in the study. Frequencies and percentages for categorical variables and means and standard deviations for continuous variables were calculated. For responses to the items of the "Questionnaire for Workplace Violence in Healthcare Settings" all responses on the 3- and 5-point Likert scales that indicated some level of agreement (moderate to strong) were scored as "agreeing responses" and those that indicated a level of disagreement "neutral" or "disagreeing" were scored as "disagreeing responses," and then the difference was tested with a Chi-square test. The 5-point Likert scale was used to score the "Impact of Event Scale – Revised." Results were analyzed according to Cramer et al. (20), including the three main subpatterns of avoidance, intrusiveness, and hyperarousal. We tested the normality of the distribution with the Sahpiro-Wilk test and then used parametric (t-Student) and nonparametric tests (Friedman) to compare the variables. A value of $p <$ of 0.05 was considered statistically significant. Data were analyzed using IBM SPSS Statistics for Windows, version 20.0 software (Armonk, NY: IBM Corp.).

Results

We collected 200 questionnaires, 144 (72.0%) from women, 53 (26.5%) from men, and 3 (1.5%) from individuals who preferred not to provide this information. The mean age of respondents was 46.7 ± 11.5 years, 45.8 ± 11.4 years for women and 49.6 ± 18.1 years for men. The majority of respondents were nurses (107, 53.5%), followed by physicians (71, 35.5%) and other health professionals (22, 11.0%). Key characteristics of participants, stratified by professional profile, are shown in Table 1.

Overall, 93 (46.5%) of the 200 respondents reported being the victim of a violent act during their duty within COVID-19 immunization campaign; of these, seven described a physically violent

TABLE 1 Participants' characteristics.

Variable		Professional profile		
		Physician *n*. 71	Nurse *n*. 107	Other *n*. 22
Age (Mean ± DS)		45.6 ± 18.5	47.9 ± 9.8	44.7 ± 10.5
		n (%)	*n* (%)	*n* (%)
Sex	Women	32 (45.1)	92 (86.0)	20 (90.9)
	Men	38 (53.5)	13 (12.1)	2 (9.1)
	Missing	1 (1.4)	2 (1.9)	–
Years of service	Less than 20	44 (62.0)	35 (32.7)	13 (59.1)
	20 or more	27 (38.0)	72 (67.3)	9 (40.9)
Role in the campaign	Administrator or session leader	65 (91.5)	77 (72.0)	3 (13.6)
	Support staff	6 (8.5)	30 (28.0)	19 (86.4)
Area of usual work	Clinical and surgical care	32 (45.1)	34 (31.8)	9 (40.9)
	Directional, public health and diagnostic	20 (28.2)	17 (15.9)	9 (40.9)
	Primary care	6 (8.4)	32 (29.9)	2 (9.1)
	Emergency and intensive care	6 (8.4)	21 (19.6)	2 (9.1)
	Other	7 (9.9)	3 (2.8)	0 (0.0)

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TABLE 2 Characteristics of health professionals involved in violent episodes and who developed post-traumatic stress symptoms.

	Participants $N = 200$	Episode of violence $N = 93$	*p*-value	Post- traumatic stress symptoms $N = 33$	*p*-value
	N (%)	*N* (%)		*N* (%)	
Professional profile					
Other	22 (11.0)	8 (8.6)	–	4 (12.1)	–
Nurse	107 (53.5)	47 (50.5)		19 (57.6)	
Physician	71 (35.5)	38 (40.9)		10 (30.3)	
Sex					
Women	144 (72.0)	64 (68.8)	–	23 (69.7)	–
Men	53 (26.5)	27 (29.0)		8 (24.2)	
Missing	3 (1.5)	2 (2.2)		2 (2.1)	
Age group (years)					
20–40	70 (35.0)	33 (35.5)	–	13 (39.4)	–
41–60	103 (51.5)	47 (50.5)		18 (54.5)	
61 or more	27 (13.5)	13 (14.0)		2 (2.1)	
Years of service					
Less than 20	92 (46.0)	44 (47.3)	–	17 (51.5)	–
20 or more	108 (54.0)	49 (52.7)		16 (48.5)	
Education					
Bachelor degree or lower	77 (38.5)	28 (30.1)	<0.05	10 (30.3)	–
Master's degree or higher	123 (61.5)	65 (69.9)		23 (69.7)	
Role in the campaign					
Administrator or session leader	145 (72.5)	67 (72.0)	-	18 (54.5)	<0.05
Support staff	55 (27.5)	26 (28.0)		15 (45.4)	
Area of service					
Directional, public health and diagnostic	46 (23.0)	22 (26.7)	-	10 (30.3)	<0.05
Emergency care and ICU	29 (14.5)	11 (11.8)		3 (9.1)	
Clinical and surgical care	75 (37.5)	38 (40.9)		8 (24.2)	
Primary care	40 (20.0)	16 (17.2)		10 (30.3)	
Other	10 (5.0)	6 (6.4)		2 (2.1)	

act and 60 described a verbally violent act, and 26 did not provide information that would have been useful in determining the type of violent act. In 33 subjects (35.5%), the IES score indicated the presence of a possible post-traumatic stress reaction. Table 2 summarizes the main characteristics of health professionals stratified by the presence of a violent episode and the presence of an IES score ≥ 33; the only characteristic that had a statistically significant effect on the presence of violent episode was a higher study title. For the presence of possible post-traumatic stress (PTS) symptoms, campaign role and service area were the characteristics that had an influence; the risk of PTS was higher in vaccine administrators and session leaders, and lower in professionals who normally work in emergency care or intensive care units.

The difference in IES score was not statistically significant between those who had suffered physical violence (30.14 ± 15.39) and those who had suffered verbal violence (27.30 ± 16.18).

When the scores for each of the three parts of the IES were analyzed, the mean score for avoidance was 1.15 ± 0.66, for intrusiveness was 1.31 ± 0.89, and for hyperarousal was 1.45 ± 0.90, with a statistically significant difference ($p < 0.01$). Analysis of these data for each professional role yielded IES scores of avoidance 1.03 ± 0.55, intrusiveness 1.20 ± 0.77, and hyperarousal 1.37 ± 0.81 for physicians; avoidance 1.26 ± 0.71, intrusiveness 1.37 ± 0.97, and hyperarousal 1.52 ± 0.99 for nurses; and avoidance 1.00 ± 0.79, intrusiveness 1.39 ± 0.94, and hyperarousal 1.40 ± 0.88 for the other health professions.

Table 3 summarizes the prevalence of agreeing responses of the total surveyed population to the questions about workplace violence prevention and support activities for workers. For all questions, there were no statistical differences in the prevalence of agreement among the three professional profiles. Significant differences by sex are highlighted in the table.

Discussion

The aim of our study was to investigate the prevalence of workplace violence against health professionals involved in the

TABLE 3 Participants' opinions on the impact of WPV, violence reporting behavior, strategies to mitigate violence, and risk factors according to professional profile and sex.

Item	Overall *n*. 200		Professional profile						Sex			
			Physicians *n*. 71		Nurses *n*. 107		Other *n*. 22		Female *n*. 144		Male *n*. 53	
	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree
The effect of the episodes of WPV one had on the different aspects of life												
How much have the episodes of violence at your workplace affected your personal wellbeing and self-care?*	135 (67.5)	65 (32.5)	47 (66.2)	24 (33.8)	69 (64.5)	38 (35.5)	19 (86.4)	3 (13.6)	95 (66.0)	49 (34.0)	39 (73.6)	14 (26.4)
How much has your family been affected due to the episodes of violence at your workplace?**	145 (72.5)	55 (27.5)	50 (70.4)	21 (29.6)	78 (72.9)	29 (27.1)	17 (77.3)	5 (22.7)	101 (70.1)	43 (29.9)	43 (81.1)	10 (18.9)
How much has your social life been affected due to the episodes of violence at your workplace?***	148 (47.0)	52 (26.0)	56 (78.9)	15 (21.1)	75 (70.1)	32 (29.9)	17 (77.3)	5 (22.7)	103 (71.5)	41 (28.5)	44 (83.0)	9 (17.0)
How much do the episodes of violence at your workplace has affected your mental and psychological well-being (increased aggressiveness, irritability, low self-esteem, etc.)?	102 (51.0)	98 (49.0)	37 (52.1)	34 (47.9)	51 (47.7)	56 (52.3)	14 (63.6)	8 (36.4)	69 (47.6)	75 (52.1)	32 (60.4)	21 (39.6)
Reporting of incidence												
I would be comfortable in reporting the episode of violence at my workplace to competent authorities.	34 (17.0)	116 (83.0)	14 (19.7)	57 (80.3)	18 (16.8)	89 (83.2)	2 (9.1)	20 (90.9)	25 (17.4)	119 (82.6)	7 (13.2)	46 (86.8)
Extent to which these following reasons lead to under-reporting?												
Felt ashamed of reporting	104 (52.0)	96 (48.0)	39 (54.9)	32 (45.1)	58 (54.2)	49 (45.8)	7 (31.8)	15 (68.2)	70 (48.6)	74 (51.4)	32 (60.4)	21 (39.6)
A belief that no action will be taken against the perpetrator// **per sex ($p = 0.003$)**	21 (10.5)	179 (89.5)	11 (15.5)	60 (84.5)	9 (8.4)	98 (91.6)	1 (4.5)	21 (95.5)	**9 (6.3)**	**135 (93.8)**	**11 (20.8)**	**42 (79.2)**
Lack of organizational support	22 (11.0)	178 (89.0)	8 (11.3)	63 (88.7)	11 (10.3)	96 (89.7)	3 (13.6)	19 (86.4)	16 (11.1)	128 (88.9)	6 (11.3)	47 (88.7)
Lack of provision to report such incidences	45 (22.5)	155 (77.5)	13 (18.3)	58 (81.7)	26 (24.3)	81 (75.7)	6 (27.3)	16 (72.7)	34 (23.4)	110 (76.4)	11 (20.8)	42 (79.2)
The process was time-consuming	52 (26.0)	148 (74.0)	14 (19.7)	57 (80.3)	32 (29.9)	75 (70.1)	6 (27.3)	16 (72.7)	42 (29.2)	102 (70.8)	10 (18.9)	43 (81.1)
Fear that the appraisal or promotion avenues will be affected	108 (54.0)	92 (46.0)	42 (59.2)	29 (40.8)	56 (52.3)	51 (47.7)	10 (45.5)	12 (54.5)	75 (52.1)	69 (47.9)	33 (62.3)	20 (37.7)
Mitigation Strategies												
Controlling the number of attendants visiting the hospital with a patient	29 (14.5)	171 (85.5)	11 (15.5)	60 (84.5)	16 (15.0)	91 (85.0)	2 (9.1)	20 (90.9)	21 (14.6)	123 (85.4)	8 (15.1)	45 (84.9)
Educating patients and attendants about limitations of medical sciences and available infrastructure	16 (8.0)	184 (92.0)	5 (7.0)	66 (93.0)	11 (10.3)	96 (89.7)	-	22 (100)	12 (8.3)	132 (91.7)	4 (7.5)	49 (92.5)
Regular training of healthcare workers regarding soft skills (communication skills, breaking bad news, counseling skills, problem solving skills)	7 (3.5)	193 (96.5)	5 (7.0)	66 (93.0)	2 (1.9)	105 (98.1)	-	22 (100)	4 (2.8)	140 (97.2)	3 (5.7)	50 (94.3)
Self-defence training of Health care workers// **per sex ($p < 0.001$)**	50 (25.0)	150 (75.0)	23 (32.4)	48 (67.6)	24 (22.4)	83 (77.6)	3 (13.6)	19 (86.4)	**25 (17.4)**	**119 (82.6)**	**24 (45.3)**	**29 (54.7)**

(Continued)

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TABLE 3 (Continued)

Item	Overall *n*. 200		Professional profile						Sex			
			Physicians *n*. 71		Nurses *n*. 107		Other *n*. 22		Female *n*. 144		Male *n*. 53	
	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree
Improving healthcare facilities (like doctor-patient ratio, population-bed ratio)	3 (1.5)	197 (98.5)	-	71 (100)	3 (2.8)	104 (97.2)	-	22 (100)	2 (1.4)	142 (98.6)	1 (1.9)	52 (98.1)
Improving facilities within a hospital (like availability of medicines and diagnostic tests)	33 (16.5)	167 (83.5)	10 (14.1)	61 (85.9)	20 (18.7)	87 (81.3)	3 (13.6)	19 (86.4)	21 (14.6)	123 (85.4)	12 (22.6)	41 (77.4)
Improving Infrastructure facilities (like installation of CCTVs, metal detectors, alarm system)	13 (6.5)	187 (93.5)	6 (8.5)	65 (91.5)	6 (5.6)	101 (94.4)	1 (4.5)	21 (95.5)	9 (6.3)	135 (93.8)	4 (7.5)	49 (92.5)
Active complaint redressal system	24 (12.0)	176 (88.0)	10 (14.1)	61 (85.9)	13 (12.1)	94 (87.9)	1 (4.5)	21 (95.5)	14 (9.7)	130 (90.3)	10 (18.9)	43 (81.1)
Strong legislature measures like provision of significant punishment for offenders	6 (3.0)	194 (97.0)	2 (2.8)	69 (97.2)	3 (2.8)	104 (97.2)	1 (4.5)	21 (95.5)	4 (2.8)	140 (97.2)	2 (3.8)	51 (96.2)
Unbiased media reporting	8 (4.0)	192 (96.0)	3 (4.2)	68 (95.8)	5 (4.7)	102 (95.3)	-	22 (100)	5 (3.5)	139 (96.5)	3 (5.7)	50 (94.3)
Sensitizing politicians and public figures not to give immature/ negative statements regarding healthcare workers	5 (2.5)	195 (97.5)	2 (2.8)	69 (97.2)	3 (2.8)	104 (97.2)	-	22 (100)	4 (2.8)	140 (97.2)	1 (1.9)	52 (98.1)
Peaceful working climate (missing = 1)	-	199 (100)	-	70 (100)	-	107 (100)	-	22 (100)	-	143 (100)	-	53 (100)
Availability of support from colleagues (missing = 1)	1 (0.5)	198 (99.5)	1 (1.4)	69 (98.6)	-	107 (100)	-	22 (100)	-	143 (100)	1 (1.9)	52 (98.1)
Risk factors related to incidents of Workplace violence												
Unrealistic expectations of patients/attendants	-	200 (100)	-	71 (100)	-	107 (100)	-	22 (100)	-	144 (100)	-	53 (100)
Inappropriate knowledge about the disease/health condition	6 (3.0)	194 (97.0)	3 (4.2)	68 (95.8)	3 (2.8)	104 (97.2)	-	22 (100)	6 (4.2)	138 (95.8)	-	53 (100)
Poor communication skills	6 (3.0)	194 (97.0)	2 (2.8)	69 (97.2)	4 (3.7)	103 (96.3)	-	22 (100)	3 (2.1)	141 (97.9)	3 (5.7)	50 (94.3)
Lack of resources (equipment and medicines, doctor-patient ratio)// **per sex ($p = 0.026$)**	24 (12.0)	176 (88.0)	13 (18.3)	58 (81.7)	10 (9.3)	97 (90.7)	1 (4.5)	21 (95.5)	**13 (9.0)**	**131 (91.0)**	**11 (20.8)**	**42 (79.2)**
Overcrowding	7 (3.5)	193 (96.5)	3 (4.2)	68 (95.8)	4 (3.7)	103 (96.3)	-	22 (100)	5 (3.5)	139 (96.5)	2 (3.8)	51 (96.2)
Long waiting time	-	200 (100)	-	71 (100)	-	107 (100)		22 (100)	-	144 (100)	-	53 (100)
Inadequate security arrangements// **per sex ($p = 0.020$)**	18 (9.0)	182 (91.0)	8 (11.3)	63 (88.7)	9 (8.4)	98 (91.6)	1 (4.5)	21 (95.5)	**9 (6.3)**	**135 (93.8)**	**9 (17.0)**	**44 (83.0)**
Inadequate action on receiving complaints of WPV	1 (0.5)	199 (99.5)	1 (1.4)	70 (98.6)	-	107 (100)	-	22 (100)	-	144 (100)	1 (1.9)	52 (98.1)
Lack of respect for the authority of doctors/healthcare workers	3 (1.5)	197 (98.5)	2 (2.8)	69 (97.2)	1 (0.9)	106 (99.1)	-	22 (100)	2 (1.4)	142 (98.6)	1 (1.9)	52 (98.1)
Negative and inappropriate media reporting	4 (2.0)	196 (98.0)	2 (2.8)	69 (97.2)	2 (1.9)	105 (98.1)	-	22 (100)	1 (0.7)	143 (99.3)	3 (5.7)	50 (94.3)
Lack of the provision of harsh punishment for aggressors/ offenders	12 (6.0)	188 (94.0)	5 (7.0)	66 (93.0)	6 (5.6)	101 (94.4)	1 (4.5)	21 (95.5)	6 (4.2)	138 (95.8)	6 (11.3)	47 (88.7)
Lack of redressal system// **per sex ($p = 0.024$)**	21 (10.5)	179 (89.5)	11 (15.5)	60 (84.5)	9 (8.4)	98 (91.6)	1 (4.5)	21 (95.5)	**11 (7.6)**	**133 (92.4)**	**10 (18.9)**	**43 (81.1)**

*Personal wellbeing and self-care include activities such as sleep schedule, eating pattern, fitness, grooming, dressing etc.; **Family life is defined as the routine interactions and activities that a family have together especially with the members who live together with parents, spouse, children; ***Social life is defined as the part of a person's time spent doing enjoyable things with others like friends, colleagues or people living in the society other than close family member. In bold are reported statistically significant differences among values.

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COVID -19 vaccination campaign in our region, to identify the risk and protective factors for these incidents, and to assess their impact on the mental health of the victims.

We found that 46.5% of health professionals who participated in our regional COVID -19 vaccination campaign reported being a victim of a physical or verbal act of violence in the workplace. In general, half of health professionals reported that the consequences of workplace violence affected their mental and psychological well-being, and about one-third reported that these consequences also affected their family and social life. The likelihood of reporting workplace violence was evenly distributed among health professionals, with the exception of those with higher levels of education, who were more likely to report such incidents. Although most incidents of workplace violence were verbal in nature, more than one-third of victims developed post-traumatic stress symptoms. The incidence of post-traumatic stress symptoms was higher among frontline professionals, who were likely to be more exposed to the stress, anger, and frustration of citizens who visited the immunization centre, than among those who supported campaign activities from the back office. In contrast, professionals who normally work in emergency situations reported lower levels of stress. This could be related to some skills and competencies they acquired in their professional context and background, or to some coping strategies they developed personally or with the support of psychologists supervising their units. However, they may also be more accustomed to such situations, which may have led to some underreporting.

The impact of COVID-19 on the mental health of the general population is widely recognized (12), and has been called the perfect storm for mental health by some colleagues (13). The importance and burden of pandemics on the mental health of healthcare workers is also not new to the scientific community. For example, the systematic review and meta-analysis by Hills et al. estimated the prevalence of post-traumatic stress disorder at 21.7%, anxiety at 16.1%, major depressive disorder at 13.4%, and acute stress disorder at 7.4% (24). However, starting from a stable trend of WPV reported in Italy in the years preceding the pandemic (25), an increase in workplace violence, mostly by patients (type II), and especially in emergency departments, was observed in the years of COVID-19 (6, 11, 26). Although some authors reported a higher prevalence of workplace violence in men (7, 27), this was not the case in our setting, which seemed to confirm the absence of sex differences reported in an Italian analysis before COVID (25). Other findings related to a higher prevalence in older (7) or younger (27) health professionals were not confirmed by our data.

The role of WPV's added psychological trauma in pandemic fatigue and its contribution to decreased job satisfaction (7), the development of mental illness (6), decreased empathy skills (28), burnout, resulting turnover intent (29), and the unprecedented exodus of public health professionals we are currently experiencing has been explored but requires further research and investment to address this critical issue (11). In any case, given the impact on the mental health and well-being of the victim, it is important to recognize verbal abuse as a form of workplace violence that should be reported and addressed (2). This is even more important when considering the potential impact of these incidents on patient access and patient safety, which are fundamental to health care (30), and considering that the impact on the family and social relationships of health professional involved in a violent incident may exacerbate the situation for the victim (6).

Our data seem to confirm that frontline health professionals and especially those working in highly politicized settings, as described by Kuhlmann et al. (17), as well as preventive health services, such as COVID-19 immunization services, are among the main target groups of WPV.

The actual extent of this phenomenon still seems to be underestimated, and health professionals cited lack of confidence in an effective reporting system (i.e., lack of rules for reporting such incidents, time-consuming process) and lack of confidence in the administration and action taken (i.e., belief that no action will be taken against the perpetrator, lack of organizational support) as possible reasons for this attitude. Indeed, in many cases, participants reported that the risk for violent incidents was higher when effective communication was absent or inadequate. Just as continuous training in so-called hard skills is mandatory for health professionals, it might be useful for healthcare institutions to organize structural courses to improve soft skills, which can be useful not only in private life but also in everyday work. Indeed, these skills may have played an important role in preventing the development of post-traumatic stress reactions among the emergency specialists in our sample. Soft skills that should be learned by health professionals for this purpose certainly include effective communication, but teamwork and conflict management would also likely help mitigate many of the scenarios found in our study. Regarding training, the fact that a fairly large number of health professionals indicated that they would feel safer if they had taken a self-help course can be seen both as a purpose for a specific training course and as evidence of distrust in the healthcare organization and its ability to address the problem in the future. Although many respondents indicated that they would feel comfortable reporting incidents of violence, we cannot ignore the fact that several participants indicated that this was not the case. This may be primarily because they believe it is unnecessary to report because there was no uniform official reporting system at the time of the study, but also because they believe that no action is taken against the perpetrators of violence.

Most of the mitigation strategies proposed in the questionnaire met with the respondents' agreement, with nine of the 13 items receiving a general approval of over 90%. The most important ones can be divided into the following groups: (1) relationships – such as the existence of a peaceful working climate (100%), the availability of supportive colleagues (99.5%); (2) organization – such as the improvement of health facilities in terms of doctor-to-patient and population-to-patient ratios (98.5%), the management or avoidance of overcrowding (96.5%), and the availability of technological equipment (e.g., video surveillance, metal detectors, alarm systems; 93.5%); and (3) communication, both political (97.5%) and media (96.0%), but also taking into account the training of individual health professionals in soft skills (96.5%). Other authors suggested classifying the same and other risk/protective factors according to their affiliation with the workplace and policy, patient, physicians, physician-patient relationship, and sociocultural aspects (6). In any case, effective communication is undoubtedly considered the first step to reduce the incidence of aggression by patients, improve the experience of healthcare staff in dealing with such incidents, and help them maintain their psychological well-being in the long term (31).

Although stigmatization of health professionals during the pandemic was reported as a common phenomenon in low-income countries (32), the expression of public anguish, likely resulting from the negative emotional impact on the general population due to

restrictions on social and economic activities and disruption of services (26), appears to be consistently common in middle- and higher-income countries (32). This phenomenon of anger and violence against health care workers during pandemics has been analysed by colleagues who noted a pattern that seems to be repeated throughout history regardless of the left or right orientation of government (33). Indeed, the occurrence of the II WPV type is a negative trigger for the quality of the trust relationship between health professionals and patients, as well as a sensitive thermometer of psychosocial risk factors. In addition, the problem of patients' unrealistic expectations of science and medicine emerges from the analysis of several questions about potential containment strategies and WPV risk factors. Nonetheless, the issue of public trust in the healthcare system, including all levels from frontline health workers to their leaders/managers, and the government providing resources, emerges in the backyard and may have played a role, especially in the context of a massive vaccination campaign such as that conducted for COVID -19. Conspiracy beliefs have been linked to intentions of violence, showing that such theories are not harmless. Their association with communication limited to one's own echo chamber, which has been observed with other topics of public interest such as climate change, genetically modified organisms, and the origin of pathogens, can lead individuals to make risky health decisions and greatly endanger public health at the population level (34).

Although health professionals are expected to care for patients, we should always remember that they may suffer because of their work. Indeed, the suicide rate among healthcare workers because of WPV suffered or other management problems is not known and should be further investigated. We agree with colleagues who say that health care workers, like all other workers, have a right to safety in the workplace (2, 6). Therefore, we believe that employers and governments have duties to their employees and should adhere to some sort of ethical code by ensuring the care of their employees, investigating and sanctioning health care violence (4), and protecting and promoting the well-being of health care workers (5). With regard to workplace violence, a zero-tolerance policy should be developed, and legal action taken against perpetrators (3, 7). In light of recent statements by the Italian Ministry of Health (35), some changes seem to be emerging, but the actual implementation of this commitment will be evaluated soon. In the meantime, institutions and colleagues are taking steps toward a safer work environment for health professionals, for example, in pediatric clinics (36), even using simulations based on improvisational theater (37). Much work remains to be done in this area to develop structured strategies. Possible interventions suggested in the scientific literature include actions at the organizational and individual levels, with training and education on violence prevention, attention to at-risk patients, increased security measures, development of safety standards in health care facilities, and timely response after acts of violence (6). Strategies that include both prevention of episodes of violence and management of violence that has already occurred must be implemented in parallel (31). In addition, specifically in the case of vaccination, the government and public health organizations should work to ensure that the vaccination process remains apolitical and counter misinformation that could fuel anger or fear (38).

Limitations and strengths

This study has several limitations that must be considered in order to better interpret and utilize our results. First, our data refer only to the Friuli-Venezia Giulia region, so the generalizability of the results at the national or international level cannot be guaranteed, also in view of the different burden of vaccine hesitancy and the resulting COVID-19 vaccination adherence. Furthermore, because of the cross-sectional nature of the study, a causal relationship cannot be inferred. Second, the data were collected using an online questionnaire, so participants were not assisted in answering the questions, which may have introduced bias in the number of reported acts of WPV, particularly underreporting of verbal violence, which is often not considered an act of violence. In addition, some recall bias may have occurred because we asked participants to report episodes of violence that occurred during their service as part of the vaccination campaign that began in Europe in late 2020. Third, we do not have information from those healthcare professionals who were involved in the vaccination campaign but did not participate in our survey despite being invited, so we cannot rule out selection bias. Finally, because of the anonymous nature of the survey, we could not calculate the potential exposure to workplace violence for each participant in the COVID-19 vaccination campaign. However, our strengths include the use of two validated instruments to measure the occurrence or impact of workplace violence. In addition, we chose to include all professional groups involved in the vaccination campaign at the regional level to obtain a multiprofessional perspective on the phenomenon.

Conclusion

One third of the health professionals involved in the COVID-19 immunization campaign reported that their mental health and well-being were affected by violence perpetrated during their service. More attention should be paid to public health professionals who deal with politicized and much debated issues such as immunization. Nevertheless, a more structured and multidisciplinary approach to the problem needs to be adopted, addressing all aspects, including legal and psychological support, information, education and training, reporting system, and quality improvement.

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 humans were approved by the Unique Regional Ethical Committee of Friuli Venezia Giulia (Italy). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

LB: Conceptualization, Data curation, Investigation, Methodology, Project administration, Writing – original draft. ES: Conceptualization, Investigation, Methodology, Writing – review & editing. TL: Conceptualization, Data curation, Writing – review & editing. FrF: Conceptualization, Investigation, Methodology, Writing – review & editing. FC: Investigation, Methodology, Writing – review & editing. PZ: Conceptualization, Writing – review & editing. FeF: Investigation, Methodology, Writing – review & editing. EC: Data curation, Writing – review & editing. BP: Data curation, Writing – review & editing. RC: Investigation, Methodology, Writing – review & editing. LA: Conceptualization, Formal analysis, Investigation, Methodology, Writing – review & editing.

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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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Prevalence of post-traumatic stress disorder among residents of Shanghai standardized training programs during the COVID-19 outbreak: a cross-sectional study

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Background: The COVID-19 pandemic may have increased the prevalence of psychiatric disorders, such as anxiety, depressive disorders, and post-traumatic stress disorder (PTSD), among healthcare workers.

Purpose: This study aims to investigate the prevalence of PTSD and its risk factors among residents in the standardized residency training programs (SRTPs) in Shanghai during the COVID-19 outbreak.

Participants and methods: An online cross-sectional survey was conducted between December 17, 2021, and January 7, 2022, among SRPT residents from 15 hospitals in Shanghai, China. Questionnaires comprising general information, medical-related traumatic event experiences, the PTSD Checklist (PCL-5), and the perceived social support scale (PSSS) were distributed to the participants using the online Questionnaire Star electronic system.

Results: We included 835 valid responses for the analysis. In total, 654 residents (78.3%) had experienced at least one traumatic event, and 278 residents (33.3%) were found to have PTSD symptoms. The age 26–30 years old, female sex, and increased resident working hours were identified as the risk factors for PTSD ($p < 0.05$), and perceived social support had a significant negative association with PTSD ($p < 0.05$).

Conclusion: During the COVID-19 pandemic, there was a high prevalence of PTSD among SRTPs residents in Shanghai. The age 26–30 years old, female sex, and increased resident working hours were identified as risk factors for PTSD, while perceived social support was identified as a protective factor against PTSD. The present findings can be applied in STRPs management and provide useful information for designing special interventions and protocols for SRTPs residents.

KEYWORDS

post-traumatic stress disorder, COVID-19, residents, standardized residency training program, perceived social support

1. Introduction

On 11 March 2020, the World Health Organization (WHO) reported severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) as the causative agent of coronavirus disease-2019 (COVID-19) and declared the pandemic status of COVID-19 (1). The pandemic prompted an assertive public health response worldwide, including social isolation as well as the closure of schools, businesses, and other establishments, all of which contributed to a rise in various mental health problems among citizens (2). Healthcare workers (HCWs) working at the frontline of this pandemic experienced high stress levels and were particularly at risk for persistent mental health problems, such as depression, chronic psychological stress, anxiety, insomnia, and posttraumatic stress disorder (PTSD) (2). Importantly, these mental health problems, in turn, could result in hazards exceeding the consequences of the COVID-19 pandemic itself (3).

PTSD is a significant economic burden while a highly prevalent condition. The prevalence of probable PTSD in HCWs is about three times than observed in the general population. This pattern is due to the long-term work-related stressors HCWs must endure (4). Studies have suggested a high risk for PTSD development among HCWs who have been involved in the three major recent coronavirus disease-related outbreaks: severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), and COVID-19 (5). More specifically, it has consistently been shown that a high proportion of HCWs is at a high risk of developing PTSD due to the COVID-19 pandemic (6, 7), and the individual-level risk factors for this phenomenon include pre-existing mental-health concerns (8), being in the nursing profession (9), being female (10), and young age (11).

In China, standardized residency training programs (SRTPs) were first implemented in Shanghai in 2010 to set quality standards for residency training (12). Since then, all hospitals in Shanghai have hired physicians only with certifications from SRTPs. SRTPs are considered an important resource for continuing education and receiving system-based clinical training (13). In general, the importance of SRTPs has been demonstrated because they provide residents with more standardized training and ensure that the residents are highly qualified. However, the transition to a SRTP leads to challenges, such as the uncertainty of employment and less personal attachment to the workplace for SRTP residents. Moreover, entering an SRTP adds 3 years of highly stressful training and relatively low-paid work for young physicians (14). Given the work-related stressors, pressures elicited by patients, and challenging daily work routines, SRTP residents may be at an increased risk of psychopathological stress-related disorders. Zhang and colleagues reported that the prevalence of depression disorder was 28.3% among SRTP residents (15). Thus, it would not be surprising if the prevalence of PTSD among SRTP residents was much higher than that in the general population.

Studies have found that young age, low work experience, heavy workload, working in unsafe settings, as well as a lack of training and social support are predictors of stress-related symptoms (16). SRTP residents are more likely than other HCWs to experience traumatic events and develop PTSD due to their high-pressure roles, and this is especially pertinent in relation to the COVID-19 pandemic. Therefore, given that SRTP residents are one of the populations most vulnerable to PTSD among HCWs, we investigated the prevalence of PTSD and its risk factors among SRTP residents during the COVID-19 outbreak from 2019 to 2021.

2. Materials and methods

2.1. Study design and participants

The Department of Ethics Commission of Ruijin Hospital/Lu Wan Branch within the School of Medicine of Shanghai Jiaotong University (Shanghai, China) provided ethical approval (LWEC2020031) for our study protocol.

Online informed consent for participation was obtained upon completion of the questionnaire. Fifteen hospitals providing SRTPs in Shanghai were selected as research units using a multistage method based on stratified random-cluster sampling. The online Questionnaire Star electronic system (www.wjx.cn/) was used, and questionnaires were distributed to participants as a link via the WeChat (www.wechat.com/), with the help of the education departments of selected hospitals. The inclusion criterion for participants was residents enrolled in an SRTP from 2019 to 2021.

2.2. Screening questionnaire

The screening questionnaire was written in Chinese and comprised four main components: general information, medical-related traumatic experiences, PTSD Checklist for the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5, PCL-5)*, and the perceived social support scale (PSSS).

2.2.1. General information

The general data of participants collected were hospital level, sex, age, education, medical specialty, training grade, marital status, average number of hours worked per week, and salary.

2.2.2. Medical-related traumatic events

The checklist for medical-related traumatic events in the questionnaire comprised nine common traumatic events: "criticism/bullying by senior doctors," "criticism/bullying by other SRTP residents," "failing an important examination," "iatrogenic exposure/infection," "conflict with patients/family members, being threatened or attacked," "medical negligence and malpractice," "patients died/deteriorated," "medical isolation/separation," and "yourself or hospital colleague fell seriously ill." If participants had experienced traumatic events that were not included in this checklist, they could describe it as "other." Furthermore, those who reported at least one traumatic experience were required to select the most affecting traumatic event and continue to PCL-5 and the PSSS. If they had not suffered a traumatic experience, the survey was terminated, and participants were excluded from the diagnosis of PTSD.

2.2.3. PCL-5

PCL-5 is a self-reported screening measurement with 20 items to assess PTSD symptoms. The responses on PCL-5 are given using a Likert scale, and the severity of each symptom is divided into five levels: 0 = "not at all"; 1 = "a little bit"; 2 = "moderately," 3 = "quite a bit"; 3 = "extremely." The maximum score is 80. We used a cutoff score of

33 points (7) to determine a diagnosis of PTSD, and this scale had satisfactory reliability and validity (Cronbach's α = 0.94).

2.2.4. PSSS

The PSSS consists of 12 items, with four items measuring "family support," four items measuring "friend support," and four items measuring "significant other support." The responses for each item are ranked on a seven-point Likert scale (1 = "strongly disagree"; 7 = "strongly agree"). The total score of perceived social support is the sum of all items, with a high score indicating a high level of perceived support.

In the present study, social support was categorized into three levels according to the total score: "low" (PSSS score < 37), "moderate" (37 ≤ PSSS score ≤ 60), and "high" (PSSS score > 60) (17). The Chinese version of the PSSS was found to have adequate internal consistency (Cronbach's α = 0.94) among undergraduate students during the early phases of the COVID-19 pandemic (18). In the present study, Cronbach's alpha of the total scale was 0.93.

2.3. Data collection

A total of 867 online questionnaires from 15 hospitals were collected, and 32 questionnaires were excluded because of incomplete data (15 questionnaires) or response times of less than 90 s (17 questionnaires). Finally, 835 valid responses were included valid for analysis, the response rate was 96.3%, as shown in Figure 1.

2.4. Data analysis

Statistical analyses were undertaken using SPSS 25.0 (IBM, Armonk, NY, United States). Categorical variables are expressed as absolute values (percentages). The internal consistency of the total scores of PCL-5 and the PSSS was evaluated using Cronbach's alpha. Analyses of descriptive statistics were conducted to examine the demographic and other selected characteristics of participants. Pearson's chi-square test or Fisher's exact test were used to compare differences among subgroups. Multivariate logistic regression was employed to assess the risk factors for PTSD variables that were significant in the univariate analysis at $p \leq 0.10$. $p < 0.05$ was considered significant unless stated otherwise.

3. Results

Table 1 summarizes the sociodemographic characteristics and PTSD prevalence of respondents. Most (92.7%) respondents were from a third-class hospital. Most respondents were male ($n = 493$, 59.0%). The prevalence of PTSD was higher in women (41.5%) than in men (27.6%). Respondents were between 20 and 30 years of age ($n = 776$). Respondents were mainly undergraduates ($n = 445$, 53.3%). Specifically, 194 respondents were in their third year, 266 were in their second year, and the largest number of respondents were in their first year ($n = 373$, 44.7%) of training. Most respondents: were medical practitioners ($n = 608$, 72.8%); were unmarried ($n = 710$, 85.0%); worked 50–60 h per week ($n = 340$, 40.7%); had a monthly salary of 5,001–8,000 yuan ($n = 465$, 55.7%).

Overall, 50 residents (6%) had a low level of social support (PSSS score < 37), 307 residents (36.8%) had a moderate level of social support (PSSS score ≥ 37 and ≤ 60), and 478 residents (57.2%) had a high level of social support (PSSS score > 60). Social support was negatively associated with PTSD. The prevalence of PTSD in respondents with a high level of social support ($n = 278$, 18.6%) was lower than that for respondents with a low level of social support ($n = 31$, 62%) or moderate level of social support ($n = 158$, 51.5%; $p < 0.05$) (Table 1).

Figure 2 shows the prevalence of PTSD among different specialties. The specialties represented in the cohort were internal medicine ($n = 147$, 17.6%), surgery ($n = 166$, 19.9%), gynecology

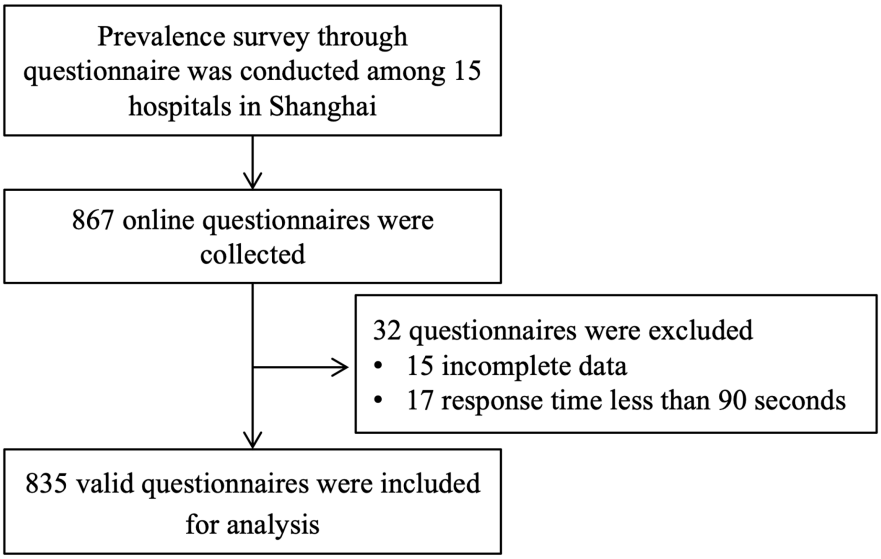

FIGURE 1
Flowchart of the study.

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TABLE 1 Baseline characteristics of study participants ($N = 835$).

Characteristic	*N*	%	PTSD + *N* (%)	*p*
Types of medical institutions				
Third class hospital	774	92.7%	264 (34.1%)	0.121
Second class hospital	57	6.8%	16 (28.0%)	
Other	4	0.5%	1 (25.0%)	
Sex				
Female	342	41.0%	142 (41.5%)	0.000*
Male	493	59.0%	136 (27.6%)	
Age				
20–25	362	43.4%	109 (30.1%)	0.321
26–30	414	49.6%	148 (35.7%)	
>30	59	7.1%	21 (35.6%)	
Education				0.986
Undergraduate	445	53.3%	147 (33.0%)	
Graduate	247	29.6%	83 (33.6%)	
Doctor	143	17.1%	48 (33.6%)	
Grade				0.735
Third year	194	23.2%	63 (32.5%)	
Second year	266	31.9%	92 (34.6%)	
First year	373	44.7%	123 (33.0%)	
Postpone graduation	2	0.2%	0 (0.0%)	
Medical practitioner or not				0.357
Yes	608	72.8%	208 (34.2%)	
No	227	27.2%	70 (30.8%)	
Marital status				0.295
Single	710	85.0%	239 (33.7%)	
Married	124	14.9%	38 (30.6%)	
Other	1	0.1%	1 (100.0%)	
Average hours work per week				0.000*
<50 h	188	22.5%	39(20.7%)	
50–60 h	340	40.7%	108 (31.8%)	
60–70 h	173	20.7%	72 (41.6%)	
70–80 h	61	7.3%	22 (36.1%)	
>80 h	73	8.7%	37 (50.7%)	
Monthly salary (CNY)				0.464
<5,000	280	33.5%	99 (35.4%)	
5,001–8,000	465	55.7%	154 (33.1%)	
8,001–10,000	66	7.9%	21 (31.8%)	
10,001–15,000	18	2.2%	3(16.7%)	
>15,000	6	0.7%	1 (16.7%)	
Social support				0.000*
Low (<37score)	50	6.0%	31 (62.0%)	
Median (37–60 score)	307	36.8%	158 (51.5%)	
High (>60score)	478	57.2%	278 (18.6%)	

*= significant ($p < 0.05$).

($n = 35$, 4.2%), pediatrics ($n = 13$, 1.6%), general practice ($n = 173$, 20.7%), emergency medicine ($n = 55$, 6.6%), anesthesiology ($n = 96$, 11.5%), medical imaging ($n = 56$, 6.7%), rehabilitation ($n = 14$, 1.7%), and other ($n = 80$, 9.6%). The specialties with the lowest prevalence of PTSD were general practice (20.7%), surgery (19.91%), and internal medicine (17.6%). Except for the specialties of pediatrics and

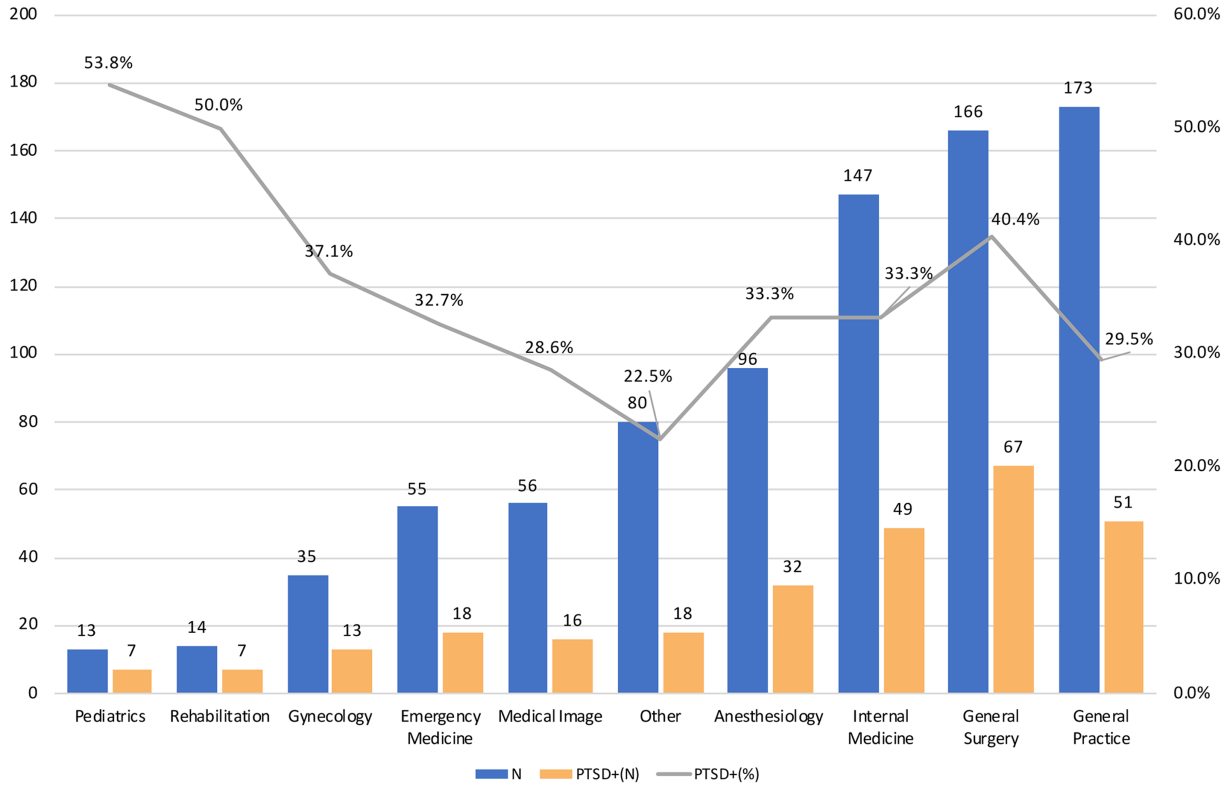

FIGURE 2
Comparison of screening positive for PTSD between medical specialties.

rehabilitation, which had a small number of respondents, the medical specialties with the highest proportion of individuals screening positive for PTSD were surgery (40.4%), gynecology (37.1%), internal medicine (33.3%), and anesthesiology (33.3%). Overall, 33.3% of the sample ($n = 278$) screened positive for PTSD.

Table 2 shows the multivariate analysis of potential modifiable and nonmodifiable risk factors for PTSD among all specialties. Of the surveyed demographic and occupational characteristics, being female (odds ratio (OR) = 0.601, $p = 0.003$), being aged 26–30 years (OR = 1.578, $p = 0.018$), and working an average of 50–60 h per week (OR = 1.789, $p = 0.010$), 60–70 h per week (OR = 2.725, $p < 0.001$), 70–80 h per week (OR = 2.014, $p = 0.039$), and > 80 h per week (OR = 4.365, $p < 0.001$) were significantly associated with a greater probability of having PTSD symptoms. There were no significant differences ($p > 0.05$) in the prevalence of PTSD among residents based on their education, medical specialty, marriage status, or monthly salary.

Overall, 654 (78%) residents reported experiencing at least one traumatic event. The most common traumatic stressors were "failing an examination" (47%), "witnessing death" (40%), and "bullying by superiors" (39%) (Figure 3). Traumatic stressors among specialties were compared and, in general, there were similar trends among them. In addition, traumatic stressors were related to the work content and context of the specialism. For example, the number of events of "witnessing death," "conflicts at work," and "iatrogenic exposure" in the specialty of medical imaging was lower than that for other specialties.

Multivariate analysis with adjustment for potential confounders showed that the medical profession-related traumatic events of "criticism/bullying by senior doctors" (OR = 2.269, $p < 0.001$), "criticism/bullying by other SRTP residents (disharmonious relationship)" (OR = 2.366, $p < 0.001$), "failing an important examination" (OR = 2.666, $p < 0.001$), and "medical isolation/separation" (OR = 2.105, $p = 0.003$) were risk factors for PTSD (Table 3).

4. Discussion

A number of studies have confirmed the negative psychological impact of experiencing a disaster, suggesting that the subsequent risk of suffering from PTSD is substantial (19). The continuous tussle with unfavorable conditions related to the COVID-19 pandemic has increased the risk of HCWs suffering from PTSD and its symptoms. To clarify the characteristics of medical-related PTSD among SRTP residents in Shanghai during the COVID-19 pandemic, we conducted a cross-sectional survey and included 835 valid responses for analyses. We found that 654 residents (78.3%) had experienced at least one traumatic event, and that 278 residents (33.3%) had PTSD symptoms. Being 26–30 years of age, female, and having long working hours were identified as risk factors for PTSD, and perceived social support had a significant negative association with PTSD.

Overall, 33.3% of SRTP residents were found to have PTSD symptoms. This prevalence is significantly higher compared with that in research on PTSD among HCWs in the three previous outbreaks of coronavirus-related diseases (5). For example, Lin et al. (20) reported a PTSD prevalence of 21.7% among emergency-department staff after SARS 2003, whereas Zhang et al. (21) reported a PTSD prevalence of

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TABLE 2 Multivariate analysis of potential risk factors for screening PTSD positive.

Variables	OR	CI 95%		*p*
		Lower	Upper	
Sex				
Female	Ref			
Male	0.601	0.431	0.840	0.003*
Age				0.108
20–25	Ref			
26–30	1.578	1.081	2.305	0.018*
>30	1.949	0.919	4.131	0.082
Education				0.306
Undergraduate	Ref			
Graduate	0.852	0.566	1.283	0.443
Doctor	0.631	0.352	1.134	0.124
Medical specialties				0.332
Internal medicine	Ref			
Surgery	1.009	0.605	1.681	0.973
Gynecology	1.212	0.539	2.730	0.642
Pediatrics	2.824	0.848	9.407	0.091
General practice	0.927	0.541	1.589	0.784
Emergency medicine	0.880	0.438	1.766	0.719
Anesthesiology	1.016	0.559	1.848	0.958
Medical image	0.839	0.413	1.705	0.628
Rehabilitation	2.497	0.785	7.943	0.121
Other	0.597	0.309	1.153	0.125
Medical practitioner or not				
Yes	Ref			
No	0.858	0.573	1.285	0.457
Marital status				0.768
Single	Ref			
Married	0.833	0.508	1.364	0.467
Average hours work per week				0.000*
<50 h	Ref			
50-60 h	1.789	1.151	2.782	0.010*
60-70 h	2.725	1.663	4.464	0.000*
70-80 h	2.014	1.036	3.915	0.039*
>80 h	4.365	2.346	8.122	0.000*
Monthly salary(¥)				0.329
<5,000	Ref			
5,001–8,000	0.971	0.687	1.372	0.866
8,001–10,000	0.810	0.427	1.535	0.518
10,001–15,000	0.286	0.076	1.080	0.065
>15,000	0.302	0.032	2.877	0.298

*= significant ($p < 0.05$).

12.4% among HCWs in high-risk areas during the COVID-19 pandemic. Studies have reported an increased risk of psychiatric disease and stress-related disorders among HCWs during the COVID-19 pandemic, as well as a high prevalence of PTSD symptomatology (22–24). Kheirallah et al. (25) reported a significant proportion of medical students from Jordan self-reporting an

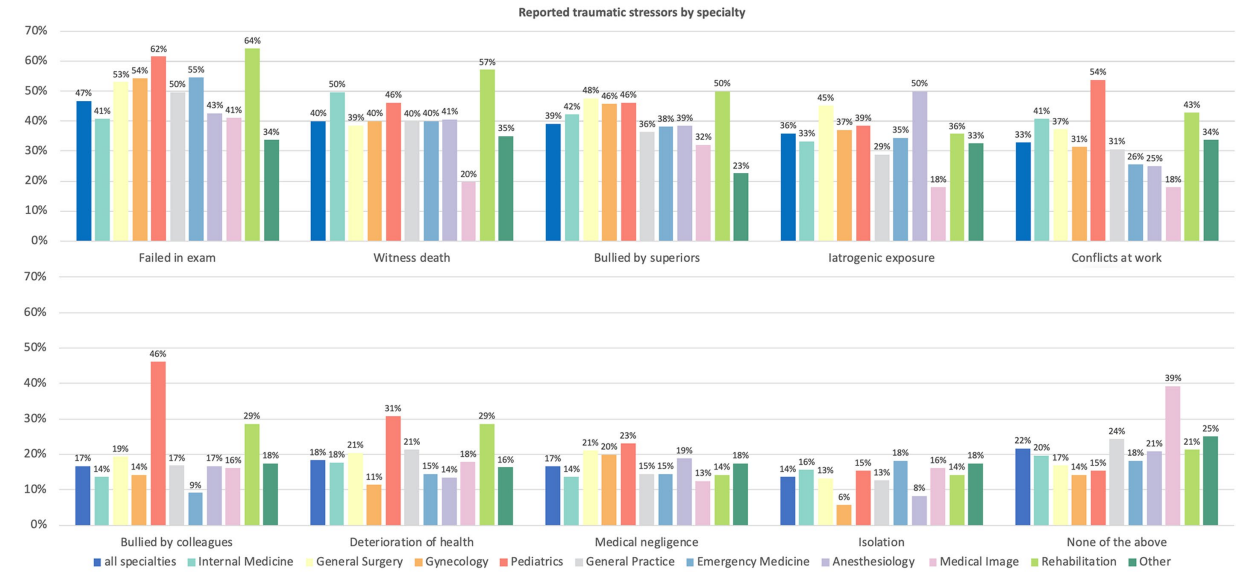

FIGURE 3
Reported traumatic stressors by specialty.

TABLE 3 The multivariate analysis of PTSD screening positive respondents and medical-relevant traumatic events experiences.

Variables	OR	CI 95%		*p*
		Lower	Upper	
Criticism/bullying by superior doctors	2.269	1.581	3.256	0.000*
Criticism/bullying by other SRTP residents (disharmonious relationship)	2.366	1.487	3.765	0.000*
Conflict with patients/family members, be threatened or attacked	1.462	0.998	2.141	0.051
Iatrogenic exposure/infection	1.256	0.877	1.798	0.213
Patients died/deteriorated	1.379	0.968	1.966	0.075
Medical negligence and malpractice	1.077	0.672	1.726	0.759
Failure in important exam	2.666	1.875	3.791	0.000*
Medical-isolated or separated	2.105	1.298	3.415	0.003*
Yourself or hospital colleague fall in serious ill	0.927	0.596	1.442	0.738

*= significant ($p < 0.05$).

increased level of anxiety (49.2%) and depression (23.1%). Exposure to medical-related stressful events outside the range of normal human experience is part of the job for all HCWs, and the increased prevalence of PTSD in this group is not a new concept (especially during severe pandemics). However, what is an acceptable prevalence of PTSD for SRTP residents?

Among the demographic characteristics of SRTP residents, age, sex, and long working hours were associated with PTSD prevalence. Studies have demonstrated a higher level of work-related stress and "burnout" among female physicians compared with that experienced by male physicians (26, 27). In addition, the high prevalence of PTSD among HCWs is due to long working hours and work-related stress. We found the long working hours of residents to be associated with PTSD prevalence. Therefore, interventions to reduce working hours and, thus, improve physician wellbeing, are needed urgently.

Social support has been proposed to be the most efficacious way to alleviate the physical and emotional impacts of stressors (28). Social support has a critical role in the emotional, cognitive, and behavioral aspects of PTSD (29). Zalta and colleagues identified a lack of social support after trauma as a risk factor for PTSD, with a perceived lack of social support leading to a higher level of PTSD symptoms (30). A significant negative correlation between PTSD prevalence and perceived social support was demonstrated in the present study. Advice from friends, family, and significant others may enable subsequent behavioral changes that make everyday tasks more efficient or positive. Therefore, understanding, respecting, supporting, and empathizing with SRTP residents is fundamental in promoting their mental health in their medical careers.

Failing an examination, witnessing death, and bullying by superiors were the most commonly reported traumatic stressors among all SRTP residents. In general, there were similar trends of reported traumatic stressors between SRTP specialties. In addition, traumatic stressors were related to the work content and context of the specialism. For example, the prevalence of "witnessing death," "conflicts at work," and "iatrogenic exposure" in the specialty of medical imaging was lower than that in the other medical specialties.

More than 45% of SRTP residents specializing in pediatrics answered "yes" to experiencing five traumatic stressors, indicating the high pressure and workload of pediatric medicine in China (31).It is not surprising that "failing an examination" was listed as the most common stressor among all SRTP residents. To ensure training quality, residents must complete the entire SRTP course and pass all examinations before they can apply for the exit examination (13). The latter is critically important, and those who do not pass it cannot graduate from the STRP and practice medicine in Shanghai. In addition, they receive only one more opportunity to take the examination after ≥6 months of training.

Isolation is an effective form of public-health management to prevent the spread of infectious diseases. However, isolation is associated with negative psychosocial effects, including depression, anxiety, anger, and PTSD. Samrah et al. (32) reported on isolated patients suffering from COVID-19 in Jordan; 44% reported symptoms of depression, and 21% were at high risk of major depressive disorder. HCWs (especially SRTP residents) may also develop PTSD as a result of isolation.

The present study had two main limitations. First, we focused on the occurrence of and risk factors for PTSD among STRP residents instead of clinical diagnoses and therapy. Therefore, the self-reported screening measures of PTSD and social support were applied in our study, but clinician-administered measures may have led to different results. Second, our cross-sectional research showed a strong bidirectional relationship between PTSD and social support, but we could not determine the direction of causality between social support and PTSD symptoms. Further research may be needed to ascertain if our findings can be replicated using longitudinal data.

5. Conclusion

The present findings demonstrate that there was a high prevalence of PTSD among SRTPs residents in Shanghai during the COVID-19 pandemic. The age 26–30 years old, female sex, and increased resident working hours were identified as risk factors for PTSD, while perceived social support was identified as a protective factor against PTSD. The present findings can be applied in SRTPs management for designing special interventions and protocols to protect the mental health of SRTPs residents.

Data availability statement

Publicly available datasets were analyzed in this study. This data can be found here: the datasets presented in this article are not readily available because the data includes sensitive and private information. According to the ethical approval we cannot share it with the third party.

Ethics statement

The studies involving humans were approved by the Department of Ethics Commission of Ruijin Hospital/Lu Wan Branch, School of Medicine, Shanghai Jiaotong University. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

RH participated in conception, design of the work, data interpretation and analysis, drafting, and revision of the manuscript. CT, TL, LW, and CL participated in the acquisition and interpretation of data. JL and LC participated in the data analysis and revision of the draft. LC and SW made contributions to the concept and design of the study, acquisition of data, manuscript revision, and supervision. All authors approved the publication of this final 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.

Publisher's note

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Phenomenological characteristics of autobiographical future thinking in nurses with burnout: a case-control study

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Objective: Nurses constitute the largest group of healthcare workers worldwide, and job burnout is very common among them. This study aims to explore abnormal future thinking in nurses with burnout. Additionally, the study investigates whether these manifestations worsen as burnout progresses.

Methods: The study was conducted in inpatient ward nurses at a tertiary hospital in Hangzhou, China. In the first phase, two group of nurses were recruited: nurses with burnout ($N = 70$) and nurses without burnout ($N = 70$). In the second phase, three groups were recruited according to the burnout levels: mild burnout ($N = 43$), moderate burnout ($N = 42$) and severe burnout ($N = 43$). Data on job burnout were obtained using the Chinese Maslach Burnout Inventory. The Sentence Completion for Events in the Future Test (SCEFT) was employed to measure the content of future thinking, which was evaluated by two raters in terms of the specificity, emotional valence, and concrete content of the imagined future events. The proportions of specific types of events among all the produced events were calculated.

Results: The results revealed that nurses with burnout, compared to nurses without burnout, imagined fewer specific future events, positive events, and events related to relationships and achievement. They also had more omissions. As the level of burnout increased, their impairment in future thinking worsened. Furthermore, the results also revealed that the scores of emotional exhaustion, depersonalization, and personal accomplishment had significant correlations with the proportions of positive events and events related to relationships and achievement/mastery in nurses' future thinking content.

Conclusion: The future thinking ability of nurses with burnout was impaired, and this impairment worsened as the symptoms of burnout progressed. The findings of the present study have important implications for nurse caring and advocate effective interventions targeting positive future thinking to mitigate nurses' burnout.

KEYWORDS

burnout, nurses, future thinking, Sentence Completion for Events in the Future Test, work-related stress

Introduction

In recent years, nurses have played a crucial role in the ongoing COVID-19 pandemic. Faced with the constant threat of COVID-19 infection, nurses endure significant psychological stress, making them vulnerable to burnout and other adverse outcomes (Galanis et al., 2021; Çağış and Yıldırım, 2023; Rizzo et al., 2023). A meta-analysis has revealed that one in ten nurses worldwide has reported experiencing burnout (Woo et al., 2020). High levels of burnout could lead to decreased job satisfaction, reduced worker productivity, lower levels of care, higher absenteeism and increased turnover (Borritz et al., 2006; Kakemam et al., 2021; Stewart et al., 2023), which could further exacerbate staffing shortages in healthcare organizations (Fasih Far et al., 2022). Therefore, it is necessary to address nurse burnout to maintain a stable healthcare workforce in times of crisis (Karimi et al., 2022). Specifically, it is vital to understand the impact of burnout on nurses' occupational mental health and well-being, as well as its effects on patient care.

Burnout is a psychological response to prolonged workplace stress, characterized by emotional exhaustion, depersonalization, and diminished personal accomplishment (Maslach and Jackson, 1981; Chen et al., 2023; Chirico et al., 2023). Cross-sectional studies have connected burnout to psychological symptoms such as hopelessness (Civilotti et al., 2022) and depression (Chen et al., 2021). This suggested that burnout might be associated with the abnormality of future thinking. Future thinking refers to the capacity to envision or simulate experiences that might occur in one's future (Schacter et al., 2008, 2017). Simulating future scenarios provides crucial functional benefits such as visionary decision-making (Sze et al., 2017), emotional regulation (Hallford et al., 2022), and the formation of intentions and plans (Schacter et al., 2017). Thus, future thinking is critical for the human well-being (Schacter and Addis, 2007; Ward, 2016).

Hopelessness, a key element of burnout, often involves anticipating a bleak future (Marchetti, 2019). As a positive psychological capital, hope is closely related to an individual's expectations and plans for future goals, as well as the actions needed to achieve those goals (Snyder, 2002). Several studies have reported that hope and resilience is the dominant positive force in confronting the future and is linked negatively with job burnout (Pharris et al., 2022; Yıldırım et al., 2023; Yıldırım and Ashraf, 2023). In addition, burnout has a close connection with depression, and is sometimes referred to as job depression (Firth et al., 1987). Previous research has demonstrated that individuals with depression, schizophrenia, bipolar disorder, and Parkinson's disease often exhibit abnormalities in future thinking (de Vito et al., 2012; Hallford et al., 2018). Notably, many studies have found that individuals with depression lack depth and vividness in their future thinking (Stöber, 2000; King et al., 2011). Finally, positive or negative expectations about the future significantly influence one's behaviors. Negative expectations about the future can lead to negative reactions and contribute to the development of burnout (Koc and Bozkurt, 2017; Ahlstedt et al., 2019). All the mentioned evidences seem to indicate that job burnout might have an important influence on future thinking. Exploring the characteristics of future thinking in nurses with burnout might contribute to uncover the mechanism by which burnout occurs and develops.

Despite the importance of future thinking in understanding burnout, most studies on job burnout have focused on past and present situations. To the best of our knowledge, no study has investigated future thinking in nurses with burnout. Therefore, the present study attempts to fill this gap. We adopted the Sentence Completion for Events in the Future Test (SCEFT) to evaluate the content of future thinking, which has been used to assess future thinking in people with schizophrenia (Gan et al., 2015) and autism spectrum disorder (Crane et al., 2013). Specifically, we aim to examine whether the future thinking in nurses with burnout is impaired and to identify any specific characteristics in the content of their future thinking. Additionally, we aim to determine if these manifestations worsen as burnout progresses. We hypothesize that nurses with burnout will exhibit impaired future thinking with negatively biased imaginative content. Furthermore, we anticipate that these manifestations will intensify with the severity of burnout.

Methods

Study design

The study adopted a case–control design. In the first phase, two groups of nurses were recruited: those with job burnout and those without. In the second phase, nurses with burnout were categorized into three levels: mild, moderate, and severe burnout, leading to three groups. The study was conducted from March 2022 to May 2022 at a renowned tertiary hospital in eastern China.

Participants

The sample size was calculated using G*Power version 3.1 (Franz, Universität Kiel, Germany), considering an effect size of 1 (Gan et al., 2015), an alpha error probability of 0.05, a power of 0.8, and an allocation ratio of N2/N1 of 1. As a result, the sample size for each group in the first phase should be more than 17. Initially, 500 female nurses volunteered for the study and underwent an exhaustive screening process using the Maslach Burnout Inventory (MBI) (Maslach and Jackson, 1981). In the first phase, 70 nurses who met the burnout criteria and 70 nurses who did not were recruited.

In the second phase, three groups of nurses were included, i.e., mild burnout, moderate burnout and severe burnout. The G*Power calculator showed that each group should consist of at least 5 participants. From the remaining 360 nurses, those who met the corresponding burnout criteria were selected. This resulted in 43 nurses with mild burnout, 42 with moderate burnout, and 43 with severe burnout.

Inclusion criteria of the participants were: (1) meeting the inclusion criteria for burnout/non-burnout, or mild/moderate/severe burnout; (2) having no history of other neurological disorders; (3) being able to complete the pen-and-paper questionnaire; and (4) provision of written informed consent and cooperation in the study. Exclusion criteria were: (1) nurses who were in training, during probation or internship; and (2) nurses who were not on duty during the survey period.

Measurements

Maslach burnout inventory

The Chinese version of the MBI was utilized in this study, which consists of 22 items across three sub-dimensions: emotional

exhaustion, depersonalization, and personal accomplishment. This scale has been validated and widely applied in China (Song et al., 2021). Each item is assessed using a 7-point Likert scale, where respondents rate from 0 (never) to 6 (every day) regarding their personal experiences (Wang et al., 2021). The Cronbach's alpha coefficient for the Maslach Burnout Inventory in the present study was 0.737.

The criteria for identifying burnout were based on established norms among healthcare professionals (Ball et al., 2020). Specifically, participants were identified as experiencing burnout if they scored 27 or higher on emotional exhaustion, 10 or higher on depersonalization, or 33 or lower on personal accomplishment. Participants who met the criteria in at least one of the three dimensions were recruited in the burnout group in the first phase of the study. Meanwhile, participants who did not meet any of the criteria in any of the three dimensions were selected for the group without burnout. During the second phase, participants who met only one criterion out of the three dimensions were assigned to the mild burnout group. Those who met two criteria from the three dimensions were placed in the moderate burnout group. Finally, participants who met all three criteria from the three dimensions were categorized into the severe burnout group.

Sentence completion for events in the future test

The SCEFT includes 11 incomplete sentences. For example, "Next year, I…" "Next week, I…" "I can see clearly in the future…" Nurses were instructed to complete these sentences with their own thoughts, ensuring that each response conveyed unique content different from the others. The completed sentences were rated in three aspects. First, the items were rated according to their specificity, in which five types of events were included: specific events (with a specific time and place within a day), extended events (specific events lasting more than a day), categorical events (generally belonging to a category of events), semantic associates (semantic information), and omission (participants cannot imagine anything) (Anderson and Dewhurst, 2009). Second, the items were rated on emotional valence (i.e., positive, negative, or neutral events). Third, the items were rated according to their content, in which twelve types of events were categorized: life-threatening events, exploration/recreation, relationships, hospitalization/stigmatization, achievement/mastery, guilt/shame, drug/alcohol events, failure, happy events, career events, neutral events, and events unclassifiable (Raffard et al., 2016).

Data collection

Data collection for this study took place in a quiet room. Initially, participants were given an overview of the study and asked to provide informed consent. They were then requested to complete demographic information, the MBI scale, and the SCEFT task.

Research materials were collected on-site by the researchers and team members, all of whom underwent standardized training. During the evaluation of future thinking, a stringent grading protocol was followed. All raters underwent training and followed the grading procedures consistent with established research practices. Each nurse's responses in SCEFT were independently coded and scored by two raters. In cases of disagreement on the interpretation of a certain sentence between the two raters, a third rater get involved and discussed with the previous two raters to obtain a final score. The inter-rater reliability was assessed using Cohen's kappa, which indicated high reliability in the present study: $K = 0.82$ for the event specificity, $K = 0.88$ for the emotional valence, and $K = 0.80$ for the content.

Data analyses

To analyze the data, we calculated the ratio of the number of responses for each nurse's content in terms of specificity, emotional valence, and content. For instance, if a nurse provided six positive events, one negative event, and four neutral events out of 11 sentences related to emotional valence, the scores for positive, negative, and neutral events would be calculated as $6/11 = 0.55$, $1/11 = 0.09$, and $4/11 = 0.36$, respectively.

The statistical procedures were performed using IBM SPSS 26.0 (IBM Corp. Released, Armonk, NY, USA). Descriptive analysis, chi-square tests, and Fisher's exact test were used to describe and compare the demographic data (education level, working seniority, employment form, professional title, and working time with patients) and indices of future thinking. Independent-samples t-tests and one-way analysis of variance (ANOVA) were used to compare the differences in nurses' future thinking for data that conformed to a normal distribution (see Supplementary Table S1). For data that did not adhere to a normal distribution, we conducted analyses using the Kruskal-Wallis test. Tukey's and Mann–Whitney *post hoc* test were used to assess pairwise differences in sample means. Spearman correlation analyses were conducted to explore the relationships between burnout sub-dimension and the variables concerning future thinking.

Results

Future thinking of nurses with and without burnout

Nurses' characteristics

Both of the burnout group and no-burnout group consisted of 70 nurses. There were no significant differences in the demographic characteristics between the two groups (see Supplementary Table S2 for details).

Comparison of the content of imagined future events between the two groups

The proportion of events generated in each category in the SCEFT was presented in Table 1. The outcome variable was compared between the two groups (nurses with and without burnout), and the results was also showed in Table 1.

Specificity

In terms of specificity, imagined events were categorized into five types: specific events, extended events, categorical events, semantic associates, and omissions. The results indicated that nurses with burnout imagined significantly fewer specific events ($Z = -2.32$, $p < 0.05$) and categorical events ($Z = -2.01$, $p < 0.05$) than nurses without burnout (Figures 1A,B). Meanwhile, nurses with burnout had significantly more omissions about the future than nurses without burnout ($Z = -4.48$, $p < 0.001$). As for extended events ($Z = 0.07$, $p > 0.05$) and semantic associate events ($t = -0.28$, $p > 0.05$), there were no significant differences between the two groups.

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TABLE 1 Intergroup differences in the proportions of imagined future events between nurses with and without burnout.

Item	Burnout ($N = 70$)	Without burnout ($N = 70$)	t/Z	P
Specificity				
Specific events	0.18 (0.00,0.91)	0.18 (0.00,0.91)	−2.32	0.020*
Extended events	0.18 (0.00,0.45)	0.18 (0.00,0.91)	−0.07	0.948
Categorical events	0.00 (0.00,0.36)	0.00 (0.00,0.82)	−2.01	0.044*
Semantic associates	0.45 ± 0.25	0.35 ± 0.28	−0.28	0.778
Omission	0.18 (0.00,0.82)	0.00 (0.00,0.64)	−4.48	<0.001**
Emotional valence				
Positive	0.45 (0.00,1.00)	0.64 (0.09,1.00)	−3.10	0.002*
Negative	0.00 (0.00,0.45)	0.00 (0.00,0.36)	−1.73	0.084
Neutral	0.18 (0.00,0.45)	0.18 (0.00,0.55)	−1.90	0.057
Content				
Life-threatening events	0	0	/	/
Exploration/recreation	0.00 (0.00,0.18)	0.00 (0.00,0.27)	−1.28	0.201
Relationships	0.00 (0.00,0.55)	0.09 (0.00,0.55)	−6.20	<0.001**
Achievement/mastery	0.09 (0.00,0.55)	0.18 (0.00,0.55)	−2.73	0.006*
Guilt/shame	0.00 (0.00,0.09)	0.00 (0.00,0.09)	−0.57	0.572
Drug/alcohol events	0	0	/	/
Hospitalization/stigmatization	0	0	/	/
Failure	0.00 (0.00,0.09)	0.00 (0.00,0.09)	0.00	1.000
Happy events	0.20 ± 0.11	0.27 ± 0.18	3.67	<0.001**
Career events	0.20 ± 0.12	0.22 ± 0.12	−0.34	0.733
Neutral events	0.09 ± 0.11	0.08 ± 0.10	−3.69	<0.001**
Not classifiable	0.27 (0.00,0.82)	0.09 (0.00,0.36)	−4.70	<0.001**

For data that does not conform to a normal distribution, the form of "median (min, max)" was used to describe them. For data that conforms to a normal distribution, the "mean ± SD" was adopted to describe them. *$p < 0.05$. **$p < 0.001$.

Emotional valence

Regarding the emotional valence, imagined events were categorized into positive, neutral, and negative events. The results showed that, compared to nurses without burnout, nurses with burnout imagined significant less positive future events ($Z = -3.10$, $p < 0.05$), as shown in Figure 1C. However, no significant difference was found between the two groups regarding the negative ($Z = -1.73$, $p > 0.05$) and neutral events ($Z = -1.90$, $p > 0.05$).

Content

In terms of the concrete content of imagined future events, they were classified into 12 categories. The results revealed that, nurses with burnout imagined significantly less future events concerning relationships ($Z = -6.20$, $p < 0.001$), achievement/mastery ($Z = -2.73$, $p < 0.05$) than nurses without burnout (see Figures 1D,E). Meanwhile, nurses with burnout (compared to nurses without burnout) imagined significantly more future neutral events ($t = -3.69$, $p < 0.001$) and unclassifiable events ($Z = -4.70$, $p < 0.001$) and fewer happy events ($t = 3.67$, $p < 0.001$). However, there were no significant differences between the two groups in events related to exploration/recreation ($Z = -1.28$, $p > 0.05$), career ($t = -0.34$, $p > 0.05$), failure ($Z = 0.00$, $p > 0.05$), and guilt/shame ($Z = -0.56$, $p > 0.05$). Additionally, no participants in either group imagined future events associated with life-threatening situations, drug/alcohol use, or hospitalization/stigmatization.

Future thinking of nurses with different levels of burnout

Nurses' characteristics

To explore the effect of different burnout levels on the future thinking, we divided the nurses with burnout into three groups: 43 nurses with mild burnout, 42 nurses with moderate burnout, and 43 nurses with severe burnout. There were no significant differences in the demographic characteristics among the three groups, as shown in Supplementary Table S3.

Comparison of the content of imagined future events among the three groups

The proportion of events generated in each category in the SCEFT within the three groups is presented in Table 2, and the comparative results among the three groups (nurses with mild, moderate, and severe burnout) are also shown in Table 2.

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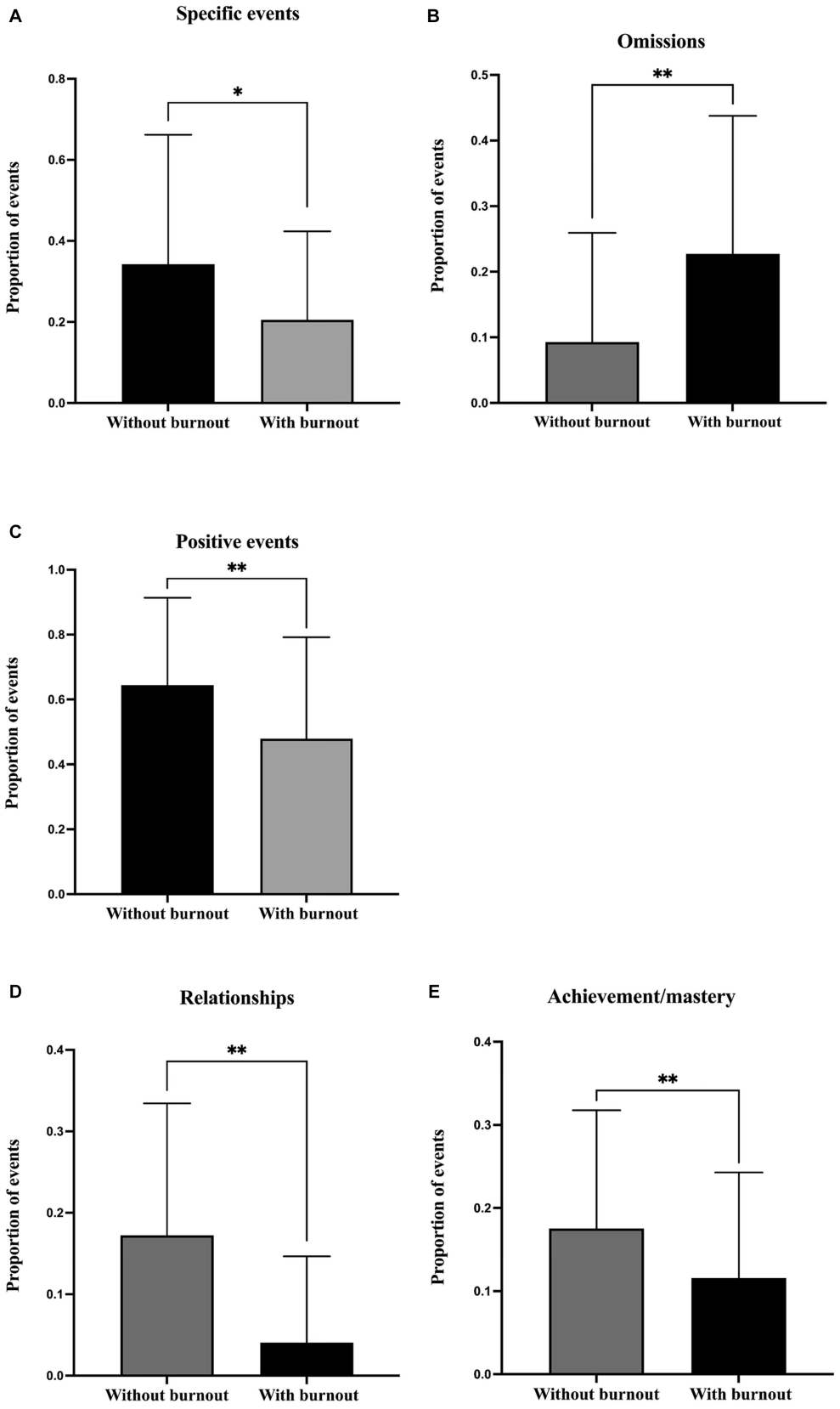

FIGURE 1
Comparison of the proportion of different categories in imagined future events between nurses with and without burnout: **(A)** specific events, **(B)** omission, **(C)** positive events, **(D)** relationships, **(E)** achievement/mastery. *$p < 0.05$. **$p < 0.001$.

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TABLE 2 Differences of proportions of imagined future events among nurses with different burnout levels.

Item	Mild burnout (*N* = 43)	Moderate burnout (*N* = 42)	Severe burnout (*N* = 43)	*H/F*	*p*
Specificity					
Specific events	0.19 ± 0.25	0.15 ± 0.18	0.08 ± 0.09	3.45	0.035*
Extended events	0.18 (0.00,0.55)	0.18 (0.00,0.45)	0.18 (0.00,0.45)	6.87	0.032*
Categorical events	0.00 (0.00,0.82)	0.00 (0.00,0.45)	0.36 (0.00,0.82)	2.14	0.343
Semantic associates	0.36 (0.00,1.00)	0.36 (0.00,0.91)	0.09 (0.00,0.91)	3.27	0.195
Omission	0.04 ± 0.10	0.12 ± 0.19	0.34 ± 0.20	47.68	<0.001**
Emotional valence					
Positive	0.67 ± 0.30	0.62 ± 0.32	0.34 ± 0.24	16.33	<0.001**
Negative	0.03 ± 0.05	0.03 ± 0.07	0.06 ± 0.10	2.22	0.113
Neutral	0.18 (0.00,0.45)	0.18 (0.00,0.45)	0.36 (0.00,0.91)	16.12	<0.001**
Content					
Life-threatening events	0	0	/	/	/
Exploration/recreation	0.09 ± 0.09	0.08 ± 0.08	0.03 ± 0.05	8.86	<0.001**
Relationships	0.14 ± 0.12	0.15 ± 0.11	0.10 ± 0.10	2.59	0.079
Achievement/mastery	0.16 ± 0.12	0.16 ± 0.14	0.08 ± 0.11	6.29	0.002*
Guilt/shame	0	0	/	/	/
Drug/alcohol events	0	0	/	/	/
Hospitalization/stigmatization	0	0	/	/	/
Failure	0.09	0.09	0.09	0.00	1.00
Happy events	0.18 (0.00,0.64)	0.18 (0.00,0.45)	0.18 (0.00,0.36)	5.83	0.054
Career events	0.13 ± 0.13	0.16 ± 0.13	0.18 ± 0.17	1.22	0.300
Neutral events	0.05 ± 0.09	0.02 ± 0.07	0.07 ± 0.14	1.91	0.153
Not classifiable	0.18 (0.00,0.82)	0.18 (0.00,0.82)	0.18 (0.00,0.91)	3.69	0.158

For data that does not conform to a normal distribution, the form of "median (min, max)" was used to describe them. For data that conforms to a normal distribution, the "mean ± SD" was adopted to describe them. *$p < 0.05$. **$p < 0.001$.

Specificity

Regarding the specificity, imagined future events were categorized into five types: specific events, extended events, categorical events, semantic associates, and omission. The results indicated significant differences in the proportion of specific events among the three groups [$F(2,125) = 3.45$, $p < 0.05$], as shown in Figure 2A. The Tukey's *post hoc* test analysis showed that nurses with severe burnout imagined significant fewer specific events than nurses with mild burnout ($p < 0.05$). However, no significant difference was found between nurses with moderate burnout and other two groups (all $ps > 0.05$). For omissions, Kruskal-Wallis test showed that statistically significant differences occurred among the three groups ($H = 47.68$, $p < 0.001$). Specifically, nurses with severe burnout had significantly more omissions when imagining future events than nurses with mild and moderate burnout (all $ps < 0.001$). Meanwhile, no significant difference was found between nurses with mild and moderate burnout ($p > 0.05$), as illustrated in Figure 2B. For the extended events, the three groups also exhibited statistically significant differences ($H = 6.87$, $p < 0.05$). No significant differences were found among the three groups for the categorical events ($H = 2.14$, $p > 0.05$) and semantic associate events ($H = 3.27$, $p > 0.05$).

Emotional valence

In terms of the emotional valence, imagined future events were categorized as positive, neutral, or negative. The results showed significant differences in the proportion of positive events among the three groups [$F(2,125) = 16.33$, $p < 0.001$]. Nurses with severe burnout produced significant fewer positive future events than nurses with mild and moderate burnout, while no significant difference was found between nurses with mild and moderate burnout (all $ps < 0.001$), as showed in Figure 2C. For the neutral events, there was also a significant difference among the three groups ($H = 16.121$, $p < 0.001$). However, no significant difference was revealed for the negative events among the three groups [$F(2,125) = 2.22$, $p > 0.05$].

Content

For the specific content of the imagined future events, the three groups of nurses showed significant difference in the proportion of events concerning achievement/mastery [$F(2,125) = 6.29$, $p < 0.05$]. That is, nurses with severe burnout imagined fewer future events associated with achievement/mastery than nurses with moderate ($p = 0.02$) and mild ($p < 0.001$) burnout, while the latter two groups did not differ significantly ($p = 0.45$), as shown in Figure 2D. In addition, the results showed that there were significant difference for exploration/recreation events [$F(2,125) = 8.86$, $p < 0.001$] among the three groups. For all nurses, no events about life-threatening, guilt/shame, drug/alcohol, or hospitalization/stigmatization were reported. There were no significant differences for neutral [$F(2,125) = 1.91$, $p > 0.05$], unclassifiable ($H = 3.69$, $p > 0.05$) events, relationship [$F(2,125) = 2.59$, $p > 0.05$], failure

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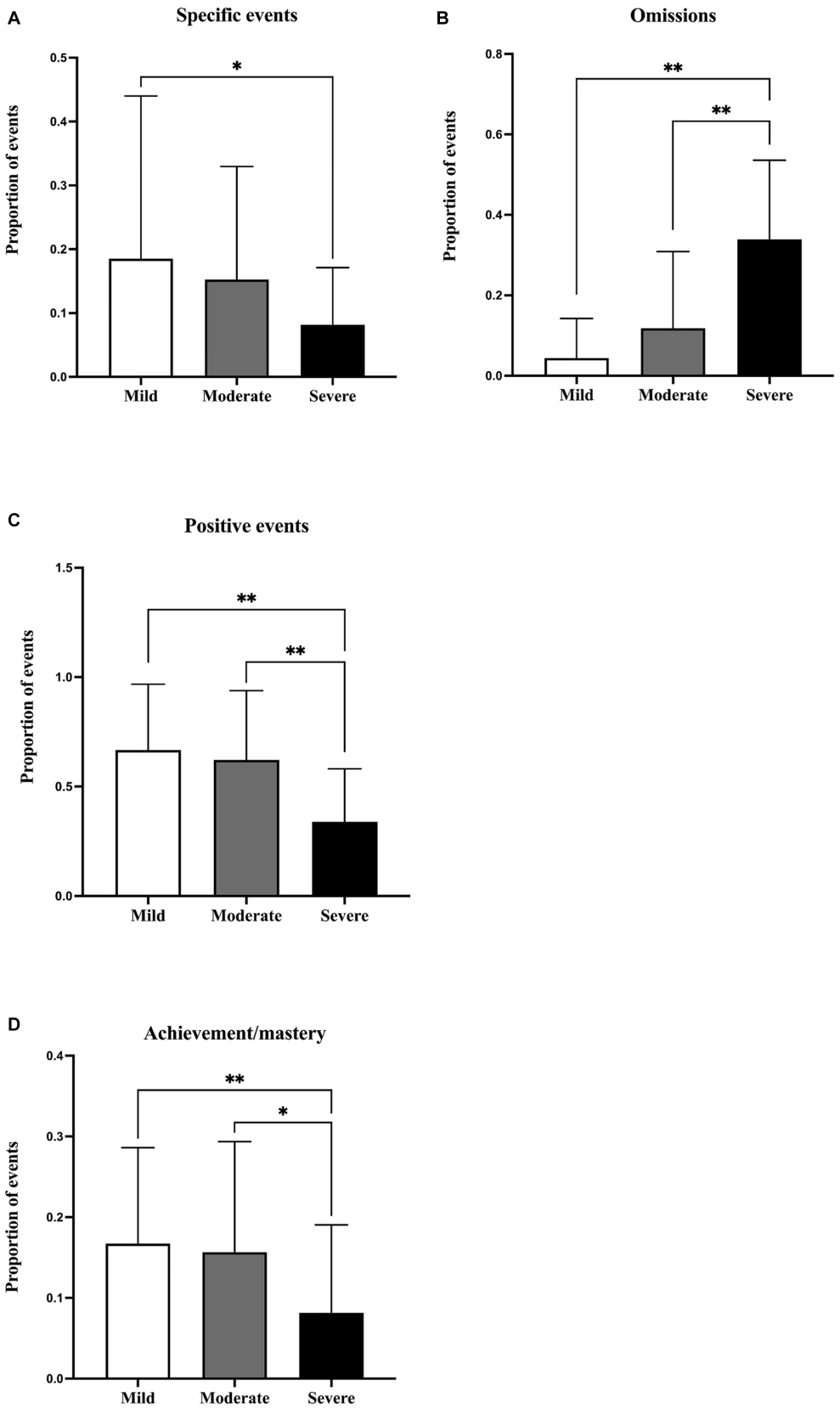

FIGURE 2
Comparison of the proportion of different categories in imagined future events among nurses with different burnout levels: **(A)** specific events, **(B)** omission, **(C)** positive events, **(D)** achievement/mastery. *$p < 0.05$. **$p < 0.001$.

TABLE 3 Correlations of nurses' burnout and future thinking.

Item	1	2	3	4	5	6	7	8	9
1	1								
2	0.81**	1							
3	−0.57**	−0.52**	1						
4	−0.26**	−0.24**	0.28**	1					
5	0.27**	0.32**	−0.42**	−0.39**	1				
6	−0.21*	−0.24**	0.34**	0.36**	−0.53**	1			
7	−0.29**	−0.38**	0.28**	0.07	−0.18*	0.04	1		
8	−0.17*	−0.19*	0.23**	−0.05	−0.26**	0.32**	−0.13	1	
9	−0.30**	−0.26**	0.34**	0.39**	−0.30**	0.31**	−0.05	0.03	1
10	0.30**	0.25**	−0.15**	−0.01	−0.08	−0.10	−0.15	−0.23**	−0.13

1 = Emotional exhaustion, 2 = Depersonalization, 3 = Personal accomplishment, 4 = Specific events, 5 = Omissions, 6 = Positive events, 7 = Relationships events, 8 = Achievement/mastery events, 9 = Happy events, 10 = Neutral event. *$p < 0.05$. **$p < 0.001$.

[$F(2,125) = 0.00$, $p > 0.05$], happy events ($H = 5.83$, $p > 0.05$), and career events [$F(2,125) = 1.22$, $p > 0.05$] among the three groups.

The relation between burnout and future thinking

To explore the relationship between the indicators of burnout and future thinking, Spearman correlations were used between the scores of the sub-dimensions (i.e., emotional exhaustion, depersonalization, and personal accomplishment) and the proportions of the certain events for which significant differences were found among groups (i.e., specific events, omissions, positive events, events on relationships, events on achievement/mastery, happy events, and neutral events). The correlation results are presented in Table 3. It was found that the scores of emotional exhaustion and depersonalization had significant negative correlations with the proportions of specific events, positive events, events on relationships, events on achievement/mastery, and happy events, while they had significant positive correlations with the proportions of neutral events and omissions. However, the score of personal accomplishment showed a reverse pattern concerning the correlations with indices of future thinking.

Sensitivity analysis

To ensure the methodological rigor of this study, we conducted a sensitivity analysis to explore whether our main findings remained consistent under different criteria for defining burnout (Ye et al., 2008). The main results were replicated in the sensitivity analysis (See SI for the details), which indicates the credibility of our research findings.

Discussion

Most previous studies addressing nurses with burnout have primarily explored the associated negative manifestations using scales (e.g., Barello et al., 2020; Levi et al., 2021). In the present study, we examined the features of future thinking content in nurses with burnout using a novel methodology, the SCEFT. We found that, compared to nurses without burnout, nurses with burnout had impaired imaginations of future events. Specifically, they expected less specific future events, positive events and events on relationships and achievement. With the burnout level increased, their impairment in the future thinking also worsened, as demonstrated by the results in the future thinking in nurses with mild, moderate and severe burnout. Furthermore, our study found significant correlations between the scores of emotional exhaustion, depersonalization, and personal accomplishment, and the proportions of positive events, as well as events related to relationships and achievement/mastery in nurses' future thinking content. These results support our hypothesis that nurses' ability of future thinking was impaired. When thinking about events in the future, nurses with burnout performed differently from nurses without burnout. They imagined a vague, less positive, or even omitted future. Similar results have been found in studies on future thinking in depressed people (Stöber, 2000; King et al., 2011). The current results provide empirical evidence that nurses with burnout experience deficits in future thinking, similar to individuals with depressive symptoms.

We found that nurses with burnout produced significantly fewer specific events than nurses without burnout. This suggested that nurses experiencing burnout demonstrated a significant impairment in constructing vivid future scenarios. This may be attributed to the influence of negative emotions on the subjective quality of individual scenes in future thinking, as negative emotions potentially hinder the process of generating expectations (Hepburn et al., 2009). Meanwhile, personality disintegration, a state in which individuals perceive themselves as insignificant, can lead to feelings of despair and indifference toward the past, present, and future, and thus disrupt the complex metacognitive judgments necessary for making decisions about the future (Kinley et al., 2021). Since there is a close relationship between achieving accomplishments and realizing future goals (Lee et al., 2010), lacking personal accomplishment in nurses with burnout might lead to less specific future imagination.

Additionally, we found that nurses with burnout envisioned significantly fewer positive future events than nurses without burnout. This is further validated by the findings that nurses with burnout envisioned fewer happy events and events associated with relationships and achievement/mastery in their future, as well as the significant correlations between the scores of burnout and proportions of positive events, happy events and events on relationships and achievement/mastery. This observation could be attributed to the challenges that nurses with burnout encounter (e.g., serious emotional exhaustion

and depersonalization, and decreased personal accomplishment), which making it difficult for them to envision positive scenarios during the chronic stress (Pines and Kanner, 1982). Given the evident significance of interpersonal relationships in nursing practice (D'Antonio et al., 2014), nurses are often required to manage complex interpersonal conflicts, which may contribute to job burnout (Duddle and Boughton, 2007; Carod-Artal and Vázquez-Cabrera, 2013). These findings suggest that nursing managers should focus on promoting positive emotional experiences and interpersonal relationships among nurses to prevent and alleviate job burnout (Lee and Jang, 2019).

However, no group difference was found concerning the negative future events between the nurses with burnout and without burnout. Previous studies showed that depressed people have decreased positive future expectations and increased negative expectations (Beck et al., 2006; Szőllősi et al., 2015). This is in line with our results of the deficits of positive envisioning, but does not agree with the absence of the enhancement of negative expectation. This inconsistent manifestations might be explained by the different features between depression and burnout (Brenninkmeyer et al., 2001). The core problem of burnout is the exhaustion of positive emotions, but depression is also accompanied by an increase in negative thinking. These findings suggested that interventions for burnout may require a different strategy from that for depression. Specifically, interventions for burnout should prioritize fostering positive thinking.

Few previous studies have addressed the problem of omission. We found that future thinking omission was severer among nurses with burnout than nurses without burnout. This result was further consolidated by the results concerning the levels of burnout, i.e., nurses with severe burnout were linked with more omissions than nurses with mild and moderate burnout. This suggested that nurses with burnout had difficulty when envisioning future events. Nurses with burnout generally experience chronic stress, which manifests as a low spirit and perceived dim prospects (Taormina and Law, 2000). They are often busy and struggle to balance work and family life. Over time, their image of the future becomes increasingly blurred, and their ability to imagine the future gradually diminishes. Therefore, in nursing practice, managers should prioritize training nurses in future thinking to alleviate burnout.

Furthermore, we found that the impairment of nurses' future thinking became more serious as the levels of burnout increased. Nurses experiencing severe burnout face a dual challenge compared to nurses with mild or moderate burnout, they not only display greater ambiguity and omissions in their future thinking but also tend to perceive future events as less positive. These results suggested that when alleviating nurse burnout, it is essential to treat nurses suffering from different levels of burnout with various ways (Maslach and Leiter, 2016). Specifically, there is a critical need to focus on nurses experiencing severe burnout and provide targeted training to enhance their future thinking abilities (Szpunar and Schacter, 2013).

Implications

In our study, we observed that nurses experiencing burnout demonstrated a significant impairment in constructing future scenarios and had difficulty envisioning future events, especially positive future events. These findings have vital implications for nursing managers. Studies have demonstrated that repeated mental simulations of future events can enhance an individual's ability to vividly imagine the future with more details (Szpunar and Schacter, 2013). Nursing managers can utilize future thinking intervention to alleviate nurses' burnout, such as future-oriented interventions (e.g., solution-focused brief therapy; Luo H. et al., 2019), future-oriented therapy (FOT) (Landkroon et al., 2022), and future-oriented occupational health services and workplace health promotion programs (Nucera et al., 2023). This intervention may help nurses with burnout develop a positive and hopeful future (Salmela-aro et al., 2004), which, in turn, can alleviate burnout, improve work efficiency, and enhance overall work quality. Furthermore, nursing managers can use positive psychological interventions, such as gratitude journal writing (Camero and Carrico, 2022), cultivating resilience (Alonazi et al., 2023), and focusing on personal strengths and values, to create a positive work environment that fosters positive emotions in nurses (Giorgi et al., 2016; Luo Y. H. et al., 2019).

Limitations

Several limitations should be acknowledged in this study. First, the nurses in the present study were all female, whether the findings could be extended in male nurses remains to be investigated in future studies. Second, the nurses in our study came from a single hospital in eastern China, which might have its unique organizational culture and stressors that could potentially affect the nurses' burnout and future thinking. Therefore, future research on the future thinking of nurses with job burnout can be conducted in a multi-center setting with a larger sample from different hospitals and even diverse countries with multi-culture. This will contribute to the generalizability of the findings. Third, we did not set a time limit for completing the SCEFT task, which might have influenced participants' responses (Anderson and Dewhurst, 2009; Crane et al., 2013). Future research could consider implementing time constraints on future thinking to explore the effect.

Conclusion

The current study found that nurses with burnout had impaired ability of future thinking. They could envision less specific and positive future events. In addition, as their symptoms of burnout progresses, the deficit in future thinking becomes worsen. The results of the present study indicated that burnout among nurses not only disturbs their present life but also have negative influence on their future thinking. Thus, our findings advocate effective interventions of positive future thinking to mitigate nurses' burnout.

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 humans were approved by the Ethics Committee of the School of Nursing Hangzhou Normal University (Approval no. 2022002). The studies were conducted in accordance with the local legislation and institutional requirements. The 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

BX, ZH, and HL contributed to conception and design of the study. BX, YF, YiZ, XL, and XY organized the database. BX, JZ, YZ, and SW performed the statistical analysis. BX wrote the first draft of the manuscript. YF and JZ wrote sections of the manuscript. All authors contributed to manuscript revision, read, 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.

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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.2023.1216036/full#supplementary-material

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General work stress and suicide cognitions in health-care workers: mediating effect of hopelessness and job satisfaction

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Individuals with a satisfactory level of job satisfaction are much less likely to feel hopeless about their future and are more likely to perform efficiently in the workplace. General work stress (i.e., the work-related stress subjectively experienced) is a significant predictor of suicide cognitions. Furthermore, it has been posited that satisfaction and hope are fundamental to life from an existential perspective. We, therefore, tested a hypothetical model of general work stress, suicide cognitions, hopelessness, and job satisfaction. The data were collected from 416 health-care workers through a convenience sampling method. The mediation analysis results revealed significant negative and positive relationships among general work stress, suicide conceptions, hopelessness, and job satisfaction. The findings indicate that hopelessness and job satisfaction have a parallel mediating effect in the relationship between general work stress and suicide cognitions. The result of the study is of great importance, which suggests that interventions to alleviate hopelessness and work stress and to boost the job satisfaction of medical staff may help prevent suicide cognitions.

KEYWORDS

general work stress, suicide cognitions, hopelessness, job satisfaction, health-care workers

Introduction

Work stress refers to the mental and physical discomfort health-care staff in health-care workplaces experience because of their duties (1, 2). General work stress arises due to the interaction between employees and their work, negatively affecting mental and physical health, reducing the employee's standard of living, and causing various work-related negativities (3). As well as having physical consequences such as behavioral disorders, there may also be mental consequences such as depression, burnout, anxiety, and suicidal thoughts (4, 5). A variety of

types of stress may affect an employee's performance at work, such as job stress, academic stress, environmental stress, health stress, relationship stress, and especially family stress (6–8).

Work stress can create intense pressure on health-care workers (9, 10). Several epidemiological studies have indicated that employees exposed to work stress may experience intense suicidal thoughts (11–14). An effort-reward imbalance (ERI) model describes the disparity between employee job pressure, the amount of effort they put into their jobs, and the low reward they get (15). Those who put forth great effort at work and perform tasks that risk their health will likely experience chronic work-related stress in the long run if the reward they receive is not commensurate with their effort (16). Employees may ultimately realize their thoughts are hurting them, resulting in suicidal thoughts (17, 18). It is essential to disclose other risk factors that may lead to suicide cognitions in health-care workers to prevent suicide (19). Health-care workers have been found to have higher suicide cognitions than the general population due to work stress (20–22).

The work stress in health-care staff can be associated with various mental health problems (e.g., depression, anxiety, and stress) (23). According to Godifay et al. (24), health-care workers may be at greater risk for work stress than others, and it is closely linked to job satisfaction. In general, job satisfaction refers to a sense of well-being based on the profession's role in society, the experience of the employee, and the ability to evaluate them as a professional (25). The level of job satisfaction has been reported to affect the quality and delivery of health-care services and mediate the relationship between patient health outcomes (26).

Job satisfaction is closely related to individuals' emotional relationship with their work and the pleasure and dissatisfaction they feel while doing their work (27). The high job satisfaction of health-care workers reduces their work stress while also helping them to perform more effectively. (28, 29). A lack of job satisfaction results in reduced ability to be productive at work and problems with attendance and negativity, which may result in termination from the position (30). Health workers are more likely to increase their work productivity if they are satisfied with their jobs, and those with increased work stress are less likely to be satisfied with their jobs (31–33). Stress may result in a decrease in job satisfaction and an increase in mental health symptoms such as anxiety, depression, and thoughts of suicide (34–39). Among health-care workers, stress at work may have led to problems in personal relationships, concentration problems, and physical problems, leading to hopelessness (40, 41). In addition to work-related stress, personal isolation, the possibility of death, and fatigue caused by wearing protective clothing for an extended period of time may have contributed to hopelessness among health-care personnel (41–45).

Hopelessness has been associated with psychological concepts such as work-related stress, suicide, anxiety, conflict, and burnout (43, 46–48). This refers to emotional states in which the individual believes any attempt to affect change will be futile (49). The studies suggest that self-harm, anxiety, fear, anxiety, depression, and suicidal ideation are some negative outcomes that hopelessness might be related (50, 51). Suicide can result from an individual's belief that they are unable to do something due to hopelessness (52, 53). Hopelessness theory suggests that individuals may develop a greater risk of suicidal ideation when they perceive themselves trapped in an impossible situation without a sense of escape or improvement (52). This may lead individuals to consider suicide a viable option to escape their pain if they do not have hope for the future.

Aims and objectives

This cross-sectional study is grounded in the framework of the Hopelessness Theory and Effort–Reward Imbalance. Previous empirical research has demonstrated that general work-related stress is a significant predictor of suicide cognitions (54, 55). Additionally, various studies have identified the relationships between general work stress, suicide cognitions, hopelessness, and job satisfaction (22, 32, 33, 47, 54, 56–58). In light of both theoretical foundations and empirical evidence, we propose a new model to investigate the relationships between the above-mentioned variables. This model examines the mediating effect of hopelessness and job satisfaction in the relationship between general work stress and suicide cognitions (see Figure 1). The following hypotheses were addressed in our study: (i) general work stress would have a significant negative impact on job satisfaction and a significant positive impact on hopelessness and suicide cognitions, (ii) hopelessness would serve as a mediating factor in the relationship between general work stress and suicide cognitions, and (iii) job satisfaction would serve as a mediator in the relationship between general work stress and suicide cognitions.

Method

Participants and ethics

Participants included 416 medical staff (70.9% female and 121 male) working in Türkiye. The age range of the participants was 21–60, with a mean age of 26.96 (SD = 7.16). They self-expressed themselves regarding their socioeconomic status (Low SES = 28.8%, Moderate SES = 64.9%, and High SES = 6.3%). Eligibility criteria included (i) being a health worker, (ii) working in any public or private health institution, (iii) participating voluntarily. Incentives were not provided to participants. The ethics committee at the university of the first author approved the study (reference number: E.73559). The study was conducted from October 2022 to May 2023.

Power analysis

The power analysis was performed in order to reveal accurately and strongly the relationships between the predictor and predicted variable determined within the scope of the study. The analysis was conducted using the G* Power 3.1.9.7 program to determine the sample size required. Accordingly, with conventional significance levels of 0.05 and power of 0.80, a small effect size is defined as $r = 0.20$ (59). A total of 395 samples were required based on the results of the analysis. Upon reaching a sufficient sample size, the power analysis was repeated as a *post hoc* procedure under the same conditions. The power of the sample size of the study was calculated as 0.82 (1-β err probe). The results of this analysis indicate that the sample had a sufficient level of power for the analyses.

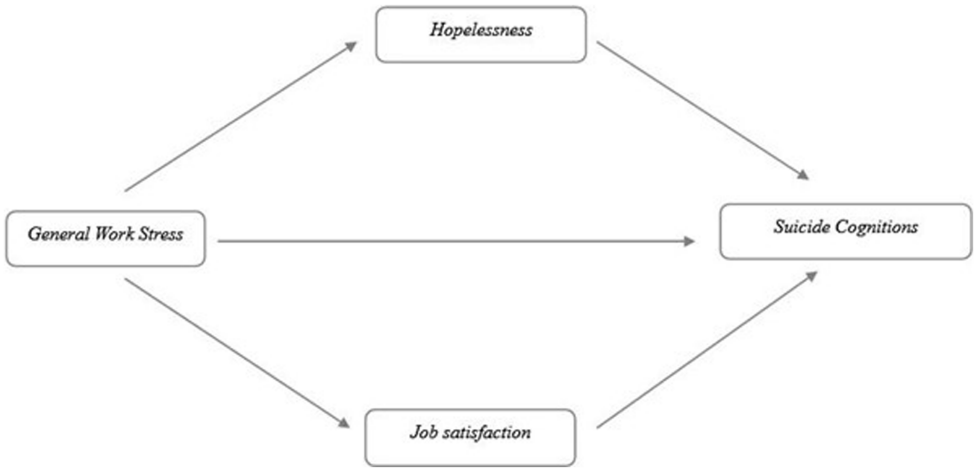

FIGURE 1
The proposed structural model.

Measures

General Work Stress Scale [GWSS: (60); Turkish version: (61)]. The GWSS was developed to measure one's general work stress level. The scale includes 9 items (e.g., *Have you ever lost your temper due to stress at work? or When you are stressed at work, do you forget to complete important tasks?*), and all items are rated on a 5-point Likert scale type ranging from 1 (*Never*) to 5 (*Every time*). The higher the score, the greater the level of general work stress. Cronbach's α was 0.91, and McDonald's ω was 0.91, in this study.

Suicide Cognitions Scale [SCS: (Rudd et al., unpublished)[1]; Turkish version: (62)]. The BRS was developed to measure one's suicide cognitions. The scale includes 18 items (e.g., *My only solution to my problems is to end my life. Or I would rather die right now than endure this unbearable pain*). The higher the score on the scale, the greater the level of suicide cognition. Cronbach's α was 0.95, and McDonald's ω was 0.95, in this study.

Beck Hopelessness Scale [BHS: (63, 64)]. The BHS was developed to measure one's hopelessness level by using 20 items including true and false propositions (e.g., *As I cannot change myself, it is best to stop trying. Or Even when something goes wrong, it is comforting to know that things will not always remain the same*). Higher scores on the scale indicate greater hopelessness. Cronbach's α was 0.75, and McDonald's ω was 0.75, in this study.

Job Satisfaction Scale [JSS: (65); Turkish version: (66)]. The BRS was developed to measure positive emotional state resulting from the subjective perception of the person's work experiences. The scale includes 5 items ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*) (e.g., *My job is enjoyable to me. Or My current job is very satisfying to me*). A higher score on the scale indicates, a higher level of suicide cognition. In this study, Cronbach's α was 0.81, and McDonald's ω was 0.81.

1 Rudd MD, Schmitz B, McClenen R, Joiner T, Elkins G, Claassen C. The suicide cognitions scale: a suicide-specific measure of hopelessness. *J Abnorm Psychol*. (unpublished).

Procedures

We followed the Declaration of Helsinki at all stages of the study. We used an online survey to collect data. The online survey provided participants with a brief explanation of the study's purpose. Healthcare professionals working at different hospitals in Turkey received an invitation text/email containing study information and an informed consent form. It provided information about the study, including its objectives and duration, assurances of anonymity and confidentiality, and voluntary participation in the study. Additionally, the survey is stated to be limited to one completion per participant. The questionnaires were administered only after informed consent had been obtained from the participants. Participants in the study were asked whether they would be willing to participate voluntarily. Those who indicated that they had not participated in the study voluntarily were not permitted to continue. There was a warning to participants that if they did not wish to fill out the questionnaires or if they did not feel comfortable, they could leave at any time during the research. Participants were eligible for inclusion if they were over 18 years of age, participating voluntarily, and were health workers. To avoid trust problems that may arise during the answering process on the scales, they have been asked not to enter their personal information into the online form. The confidentiality and anonymity of the responses were assured. Since the research subject was suicide cognitions, some participants did not want to complete questionnaires. We did not include in the study those participants who refused to participate.

Data analysis

A number of assumptions, including multicollinearity and normality, were tested before the primary analysis was conducted. The skewness and kurtosis statistics were calculated in order to test the assumption of normality. The Variance inflation factor (VIF), Tolerance statistics, and Condition index have been computed to test the multicollinearity assumption. There should be a tolerance value of less than 0.2, a VIF value of less than 10, and a condition index of less than 15 (67, 68). A Mahalanobis distance was calculated to remove

outliers, and it was determined that 23 participants should be removed from the data set as a result of the analysis. Outliers are often detected by using a technique called Mahalanobis distance (69, 70). After examining the preliminary analysis, we tested a parallel mediation model to determine whether hopelessness and job satisfaction mediated the relationship between general work stress and suicide cognitions. A confidence interval of 95% was used to explain the indirect effects of the proposed model (71). In order to test whether indirect effects were significant, bias-corrected bootstrapping procedures were applied. The bootstrap value was set to 10,000. We analyzed all of the data using SPSS 26.0 and used the R-based Jamovi 1.6.23 (The Jamovi Project, 2022) in conjunction with the jAMM module for the mediation analysis (72).

Results

Table 1 presents participants' demographic details, including means (M) and standard deviations (SD) for the variables. An independent sample *t*-test was performed to compare the general work stress, suicidal cognitions, hopelessness, and job satisfaction by gender, marital status, and Covid-19 experience. General work stress, suicidal cognitions, hopelessness, and job satisfaction did not differ significantly based on gender and Covid-19 experience. There were statistically significant differences in general work stress, hopelessness, and job satisfaction for single health-care staff compared with those who were married (35.41 vs. 40.66).

One-way ANOVA was used to examine general work stress, suicidal cognitions, hopelessness, and job satisfaction by socioeconomic status, occupation, and working hours (see Table 1). There were statistically significant differences between group means concerning socioeconomic status and working hours, while there were no differences in occupation. In order to reveal the source of the difference, a Tukey post-hoc test was conducted. The results indicated that low (26.90 ± 10.11), and average socioeconomic status (22.23 ± 8.57) had more general work stresses than high socioeconomic status (17.69 ± 7.95). Low (47.46 ± 19.36), and average socioeconomic status (35.74 ± 15.01) had more suicide cognitions than high socioeconomic status (23.42 ± 12.22). Moreover, low socioeconomic status (7.67 ± 3.99) had more hopelessness than high socioeconomic status (5.80 ± 4.47). To detect the difference of source for working hours, a Tukey *post hoc* test was conducted. According to the results, the general work stress of healthcare workers who work over 12 h (30.38 ± 8.70), between 10 and 12 h (26.73 ± 9.64), and between 6 and 9 h (22.74 ± 8.66) was significantly higher than that of those who work less than 6 h (18.42 ± 7.99). The level of suicide cognitions of health care workers working more than 12 h (67.59 ± 14.10), between 9 and 12 h (49.80 ± 15.85), between 6 and 9 h (35.97 ± 11.34), was significantly

TABLE 1 Demographic characteristics of the sample and descriptive characteristics of scales (*N* = 416).

		General work stress		Suicide cognitions		Hopelessness		Job satisfaction	
Variable	Level	*M*	SD	*M*	SD	*M*	SD	*M*	SD
Gender	Female	23.28	9.38	38,54	17,47	7,05	3,88	13,19	3,87
	Male	23.31	9.28	37,88	17,51	6,72	3,74	13,42	4,34
	Test (*t*-test)	*t* (1, 414) = −0.029		*t* (1, 414) = 0.350		*t* (1, 414) = 0.779		*t* (1, 414) = −0.529	
Marital status	Married	22,97	9,32	35,41	16,78	7,03	3,60	13,33	4,03
	Single	23,69	9,37	40,66	17,68	6,85	4,13	13,16	3,99
	t-test	*t* (1, 414) = 0.433		*t* (1, 414) = 0.002**		*t* (1, 414) = 0.625		*t* (1, 414) = 0.685	
Socioeconomic status	Low	26,90	10,11	47,46	19,36	7,67	3,98	12,45	4,45
	Average	22,2,296	8,57	35,74	15,01	6,74	3,67	13,54	3,82
	High	17,6,923	7,94	23,42	12,21	5,80	4,47	14,07	3,28
	Test (ANOVA)	*F* (2, 413) = 16.503**		*F* (2, 413) = 33.346**		*F* (2, 413) = 3.700*		*F* (2, 413) = 3.688**	
Health-care workers	Doctor	23,51	8,15	34,82	15,04	6,71	3,81	13,30	4,25
	Nurse	23,24	9,65	39,41	18,54	7,07	3,77	13,41	4,06
	Others	23,18	9,87	39,59	16,78	6,94	4,10	12,81	3,6
	Test (ANOVA)	*F* (2, 413) = 0.035		*F* (2, 413) = 2.686		*F* (2, 413) = 0.307		*F* (2, 413) = 0.737	
Working hours	<6 h	18,42	7,99	21,3	8,70	6,19	4,41	14,25	3,81
	6–9 h	22,75	8,66	35,97	11,35	6,65	3,42	13,40	3,42
	10–12 h	26,73	9,64	49,81	15,86	7,59	3,49	13,45	4,69
	>12 h	30,38	8,71	67,59	14,11	9,26	4,73	9,47	4,25
	Test (ANOVA)	*F* (2, 412) = 20.737**		*F* (2, 412) = 147.636**		F (2, 412) = 6.677**		*F* (2, 412) = 12.983**	
COVID-19 experience	Infected	22,76	9,25	38,61	17,3	6,84	3,92	13,44	3,93
	Non-infected	24,58	9,48	37,75	17,93	7,24	3,66	12,82	4,19
	Test (*t*-test)	*t* (1, 414) = 0.070		*t* (1, 414) = 0.648		*t* (1, 414) = 0.338		*t* (1, 414) = 0.150	

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

higher than those working less than 6 h (21.29 ± 8.69). The hopelessness of health-care workers working more than 12 h (9.26 ± 4.25), was significantly higher than those working less than 6 h (6.16 ± 4.40). Besides, the level of job satisfaction of health-care workers working less than 6 h (14.25 ± 3.80), was significantly higher than those working more than 12 h (9.47 ± 4.25).

Table 2 presents descriptive statistics and correlation coefficients among the variables included in the study. These variables' skewness and kurtosis values fall within the acceptable normal distribution range of the proposed threshold value of ±2; therefore, we did not find evidence that the normality assumption had been violated (73). The correlation analysis revealed that general work stress positively and significantly negatively correlated with suicide cognitions and hopelessness, indicating that one variable changes in the same direction as the other. All variables were found to be either low or moderately correlated, according to the study results.

Mediation analysis

The mediation analysis results are presented in Table 2 and Figure 2. A direct relationship of general work stress on suicide cognitions (total, $\beta = 0.50$, $p < 0.001$) was found. General work stress also had a positive relationship with hopelessness (direct effect, $\beta = 0.20$, $p < 0.001$). It was also a negative relationship with job satisfaction (direct, $\beta = -0.35$, $p < 0.001$). Hypothesis 1 was confirmed based on the results obtained. Path coefficients were examined to examine the relationship between hopelessness and suicide cognitions, and the results indicated that hopelessness had a relationship with suicide cognitions (direct, $\beta = 0.22$, $p < 0.001$). Moreover, job satisfaction also had a relationship with suicide cognitions (direct, $\beta = -0.11$, $p < 0.001$). Hypothesis 2 was confirmed based on the results obtained. The results showed that this coefficient remained significant when mediators were included in the analysis (i.e., hopelessness and job satisfaction) (direct, $\beta = 0.41$, $p < 0.001$). General work stress had a significant indirect relationship with suicide cognitions through hopelessness [indirect = 0.08, SE = 0.03, 95% CI = (0.03, 0.13)]. Furthermore, General work stress had a significant indirect relationship with suicide cognitions through job satisfaction [indirect = 0.07, SE = 0.03, 95% CI = (0.01, 0.13)]. The results indicated that the relationship between general work stress and suicide cognitions was parallelly mediated by hopelessness and job satisfaction. Hypothesis 3 was confirmed based on the results obtained (Table 3).

TABLE 2 The descriptive statistics and correlations between the variables ($N = 416$).

Variable	1.	2.	3.	4.
1. General work stress	—			
2. Suicide cognitions	0.50**	—		
3. Hopelessness	0.20**	0.33**	—	
4. Job satisfaction	−0.35**	−0.31**	−0.24**	—
Mean	23.29	38.35	6.96	13.26
Std. Deviation	9.34	17.47	3.84	4.01
Skewness	0.39	0.61	0.70	0.07
Kurtosis	−0.33	−0.36	0.87	0.30

**$p < 0.05$.

Discussion

This study aimed to explore the influence of general work stress on suicide cognitions and its potential mediating mechanisms of job satisfaction and hopelessness. As hypothesized, the results of this study demonstrated that general work stress significantly and negatively predicts job satisfaction, while it significantly and positively predicts hopelessness and suicide cognitions. This confirms the first research hypothesis. These results are consistent with the results of previous studies, showing the positive associations between general work stress and suicide cognition (74–76). Considerable job-related stress and are more prone to exhibit a variety of psychological disorders, such as PTSD and suicidal thoughts (77). The greatest rates of psychological distress were recorded among nurses, women workers, frontline health-care workers, younger medical personnel, and employees in locations with higher infection rates, according to a systematic analysis analyzing the mental health concerns among health-care workers after the pandemic (78). Related research has proposed a 7-factor model linking PTSD to elevated suicide risk (79). Another research found that health-care workers were more likely to have mental health problems after exposure to long and irregular work hours (80). In the study of Rahman and Plummer (81), factors associated with nurses' mental stress and the consequences of suicide were identified. These studies' findings indicate a strong association between general work stress and suicide cognition.

Researchers examined the path coefficients between hopelessness and suicidal cognitions and found that the former was significantly significant. Accordingly, hopelessness had a mediating effect on the relationship between general work stress and suicide cognitions. The findings support the second hypothesis. When a person engages in ruminative, negative thought patterns, they are more likely to develop hopelessness or suicide cognitions (82, 83), and suicide attempts among those suffering from depression are frequently triggered by hopelessness (84). Therefore, suicide-specific (e.g., poor life-affirming) cognitions may be important in figuring out the associations between depression and despair and suicidal thoughts and actions (85). Although hopelessness and suicide cognitions are positively correlated, some studies have shown that certain practices can boost job satisfaction and reduce negative thoughts, including suicide cognitions (86, 87).

The coefficient remained statistically significant even after adding hopelessness and job satisfaction as mediators. In terms of suicidal cognitions, hopelessness was a major factor associated with general work stress. Moreover, job satisfaction was a strong mediator between general work stress and suicidal ideation. Both feelings of hopelessness and job satisfaction were found to mediate the link between general work stress and suicidal thoughts. As a result of the analysis, the third hypothesis is supported. Consequently, health-care workers with higher levels of work stress and hopelessness but lower levels of job satisfaction tend to have more suicide cognitions. This can lead to a decrease in focus and concentration, as well as productivity and efficiency. It can also lead to increased negative emotions such as anxiety and depression. Ultimately, this can affect health-care workers' quality of care. Much recent research revealed the relationship between stress and suicide cognitions (88–90), and there are studies giving the association between suicide cognitions and negative thoughts like hopelessness (91–93).

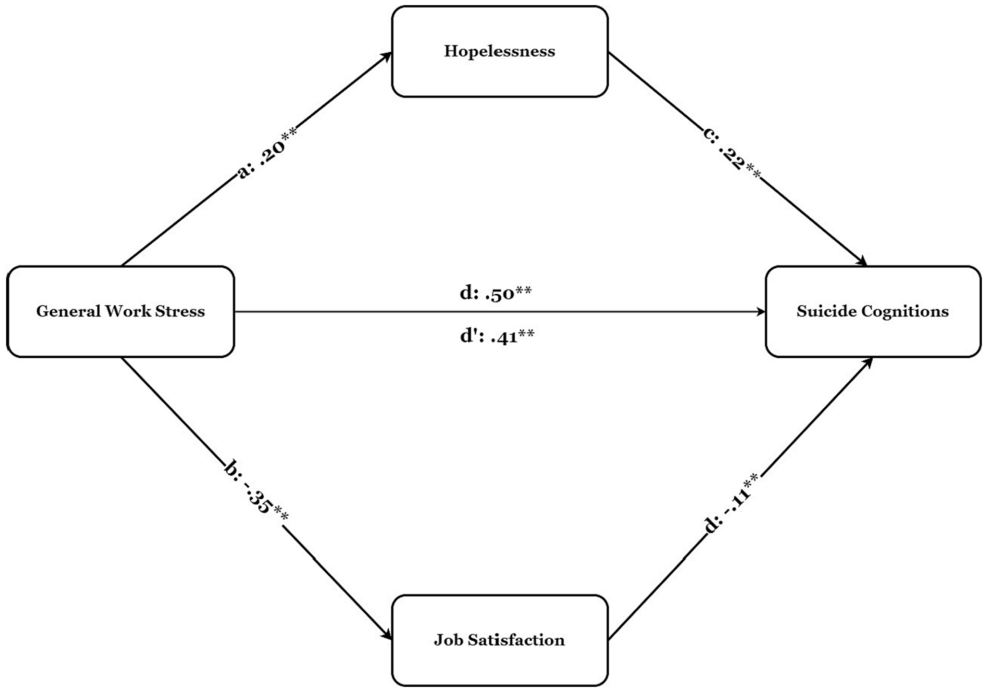

FIGURE 2
Parallel mediation model showing path coefficients of the proposed model.

TABLE 3 Statistical significance of the variables and their path coefficients.

				95% C.I.				
Path	Effect	Coefficient	SE	Lower	Upper	β	z	p
Indirect	GWSS ⇒ BHS ⇒ SCS	0.08	0.03	0.03	0.13	0.04	3.30	<0.001**
	GWSS ⇒ JSS ⇒ SCS	0.07	0.03	0.01	0.13	0.04	2.38	<0.05*
Components	GWSS ⇒ JSS	−0.15	0.02	−0.19	−0.11	−0.35	−7.63	<0.05*
	JSS ⇒ SCS	−0.47	0.19	−0.84	−0.10	−0.11	−2.50	<0.001**
	GWSS ⇒ BHS	0.08	0.02	0.04	0.12	0.20	4.20	<0.001**
	BHS ⇒ SCS	1.01	0.19	0.64	1.38	0.22	5.34	<0.001**
Direct	GWSS ⇒ SCS	0.77	0.09	0.61	0.93	0.41	9.33	<0.001**
Total	GWSS ⇒ SCS	0.92	0.08	0.77	1.08	0.50	11.63	<0.001**

**$p < 0.001$; *$p < 0.05$; SE, standard error; GWSS, general work stress; SCS, suicide cognitions; BHS; hopelessness; JSS, job satisfaction.

Implications

The present study significantly advances our understanding of the relationship between general work stress and suicide cognitions by showing the mediating roles played by hopelessness and job satisfaction in this relationship. The findings of this study demonstrated the pivotal significance of hopelessness and job satisfaction in dealing with the mental well-being of health-care workers within the workplace context. General work stress increases hopelessness and reduces job satisfaction, which in turn increases suicide cognitions. As higher hopelessness and lower job satisfaction were associated with higher general work stress and suicide cognitions, it is important that hospitals tailor training programs to improve the capacity of health-care workers to effectively cope with stressors and provide better care for patients. The results highlight the need for hospitals and health-care institutions for tailored training programs. These programs should aim to contribute to the coping mechanisms of health-care workers, enabling them to deal with stressors effectively and deliver better care for patients. Such training interventions can be executed through diverse ways, including both conventional face-to-face sessions and contemporary virtual platforms, including social media channels, webinars, and video technologies.

Limitations

While this study enhances our understanding of the associations between general work stress, suicide cognitions, hopelessness, and job

satisfaction, it is not exempt from limitations. The cross-sectional design restricts our ability to establish causality among the variables. To address this, future studies could benefit from incorporating longitudinal designs by collecting data at multiple time points to account for dynamic processes influencing the results. Furthermore, the sample demographic characteristics, including age, gender, and socioeconomic status, may have introduced confounding variables. It is important to consider these variables when interpreting the findings. Further research is warranted to validate the results. Additionally, the study relied on online survey data collection, which is susceptible to selection bias and exclusion of participants without internet access due to factors like affordability and accessibility. Therefore, generalizing these findings to the entire population may be challenging. Future studies should aim for a more representative sample, ensuring equal gender representation among health-care workers.

Conclusion

In conclusion, this study contributes to the growing body of literature indicating that various psychological factors, both positive and negative, including hopelessness and job satisfaction, play important roles in influencing suicide cognitions among health-care workers. These findings hold implications for the development and implementation of targeted interventions aimed at addressing factors associated with suicide cognitions. Therefore, these results underscore the significance of hospital-based prevention and intervention services designed to mitigate hopelessness, enhance job satisfaction, and consequently, alleviate the impact of general work stress and suicide cognitions.

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 humans were approved by the Ağrı İbrahim Çeçen University Ethics Committee. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

AS: Writing – original draft, Writing – review & editing, Project administration. AK: Project administration, Writing – original draft, Writing – review & editing, Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software. IA: Writing – review & editing. MY: Conceptualization, Writing – original draft, Writing – review & editing, Supervision, Validation. HÖ: Conceptualization, Data curation, Software, Writing – review & editing. FC: Writing – review & editing. SZ: Funding acquisition, Writing – review & editing.

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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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The mediation effect analysis of nurse's mental health status and burnout under COVID-19 epidemic

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Aim: The objective of this study is to investigate the mental health status of nurses during the outbreak of novel coronavirus pneumonia. Additionally, we aim to analyze the relationship between anxiety, depression, and burnout among nurses. The findings will provide a scientific basis for promoting the psychological health of nurses.

Methods: Using a cross-sectional study, nurses in Quanzhou in May 2020 completed a general information questionnaire, the 7-item Generalized Anxiety Disorder Questionnaire (GAD-7), Patient Health Questionnaire-9 (PHQ-9), and the Maslach Burnout Inventory (MBI). Data analysis was conducted using structural equation model.

Results: 372 questionnaires were returned, with a response rate of 92.5%. The prevalence of anxiety and depression among the participants were 45.2 and 41.4%, respectively. The prevalence of severe burnout among nurses was found to be 7.3%. There was a correlation between nurses' anxiety, depression, and job burnout. The correlation coefficients between anxiety and job burnout, depression and job burnout, and anxiety and depression were found to be statistically significant ($p < 0.001$). Depression plays a mediating role between anxiety and jod burnout (0.584/1.413, 41.3%).

Conclusion: The COVID-19 epidemic has resulted in moderate to high levels of job burnout among nurses. In this context, depression has been found to play a mediating role in the relationship between anxiety and job burnout. It is imperative for hospital administrators to prioritize the mental health of nurses and the provide necessary support to ensure their well-being.

KEYWORDS

nurse, anxiety, depression, burnout, occupational health, structural equation model

1. Introduction

Nurses are increasingly being acknowledged for their significant contributions in the areas of primary care, public health emergencies, chronic disease management, surveillance, and the identification of new and emerging infectious diseases (1, 2). Four distinct roles for nurses in primary care and public health collaboration have been identified: relationship builder, outreach professional, program facilitator, and care coordinator (3). The prolonged engagement in these medical tasks will have an impact on the physical and mental health of nurses.

Nurses are a significant group within the medical field, comprising the largest proportion of personnel in various medical institutions at all levels. Research conducted in the past has demonstrated a correlation between nurse burnout and negative mental health outcomes, specifically depression and anxiety (4, 5). Numerous studies have demonstrated that public health emergencies, including infectious disease outbreaks and natural disasters, can significantly impact the physical and mental well-being of nurses, leading to job burnout (6, 7). In addition to their daily workload, nurses are also at the forefront of preventing and controlling the spread of the new coronavirus in a unique work environment. As a result, their workload has significantly increased. The scale and duration of the COVID-19 pandemic is larger and longer compared to previous infectious disease epidemics. As a result, the impact on the mental health of nurses has been more significant and widespread (8, 9). Prolonged exposure to high levels of stress can cause nurses to experience emotional, attitudinal, and behavioral exhaustion, ultimately resulting in job burnout.

The concept of burnout was first introduced by Freudenberger in 1974 (10), who believed that long-term exposure to interpersonal stressors at work caused a state of physical and mental exhaustion related to nursing activities. Later, Maslach identified the psychological syndrome caused by long-term emotional and interpersonal stressors at work as job burnout, which is characterized by emotional exhaustion, depersonalization, and decreased personal accomplishment (11). This study employed the aforementioned concept to establish a comprehensive definition of burnout within the nursing profession.

This study aims to investigate the current state of job burnout among nurses in Quanzhou City during the COVID-19 epidemic, as well as the factors that contribute to it. The study hypothesizes that there is a close relationship between anxiety, depression and job burnout, and utilizes a structural equation model to explore the relationship between the three variables. The findings of this study will provide valuable data to help alleviate nurses' job burnout, maintain their mental health, and increase their motivation to work.

2. Theoretical background

There is a body of research that has focused extensively on COVID-19 pandemic affected the mental health of nurses. Mental problems related to the health emergency, such as stress, anxiety, depression, traumatic distress response, post-traumatic stress disorder (PTSD), and sleep disorders are more likely to affect medical and nursing staff (12–15). The first paper carried on the mental health of 994 healthcare workers in Wuhan, and the results indicated that 36.9% had subthreshold mental health disturbances, 34.4% had mild disturbances, 22.4% had moderate disturbances and 6.2% had severe disturbance (16). A systematic review and meta-analysis, which included in the analysis with a combined total of 33,062 participants from thirteen studies, showed that anxiety with a pooled prevalence of 23.2%, depression with a prevalence rate of 22.8% and insomnia with a prevalence rate of 38.9% (17). Another literature was reviewed for mental health problems of healthcare workers during the COVID-19 pandemic. The findings reported that pooled prevalence of mental health problems for post-traumatic stress disorder, anxiety, depression, and distress was 49, 40, 37, and 37%, respectively (18).

Amidst the COVID-19 pandemic, nurses find themselves susceptible to experiencing anxiety and depression due to the numerous psychological stressors they encounter. Consequently, managing and coping with these mental health challenges has become a prevalent issue worldwide (19). The current literature on COVID-19 supports the idea that the increased workload during a pandemic can lead to higher levels of anxiety and depression among individuals, which in turn poses a significant threat to the overall well-being of nurses (20, 21). Anxiety and depression often occur together (22, 23), although the exact relationship between these two conditions is still uncertain (24). The temporal relationship between anxiety and depression is a topic that has been widely discussed and debated among researchers. Some researchers posit that anxiety serves as a precursor to depression, implying a unidirectional association (25, 26). On the contrary, there are proponents who suggest a bidirectional association between the two aforementioned conditions (27, 28). Nevertheless, it has been observed that symptoms of anxiety have a stronger predictive value for later depressive symptoms compared to the reverse relationship.

Burnout is often occurred in the nurse, which has negatively impacted the quality of care, patient safety, and the functioning of staff workers in the health care industry (29). Substantial systematic reviews and meta-analyses have already shown that the prevalence of burnout is different between regions and times (30, 31). Mental health is one of primary health outcomes of burnout, and it refers to the nurse's mental health as an individual, the high rates of trauma, depression, stress, and anxiety seen in many nurses, and how poor mental health often leads to burnout and *vice-versa* (32). Due to, the pandemic of COVID-19 exacerbating the complexity of the work environment, the problem of burnout among nurses has become more pronounced. Anxiety and depression are the most common psychological problems that can easily lead to job burnout, as evidenced by many literatures (5, 33, 34). In addition, burnout is affected by many other factors such as psychological resilience (35, 36), fear (37, 38), and psychological inflexibility (39).

Burnout, depression, and anxiety are postulated to exhibit interrelationships. We aimed to test the mediating role of depression in the relationship between anxiety and burnout. Based on the above literature review, we propose the following model. From this model, we propose three main hypotheses: (see Figure 1)

> *H1*: Anxiety has a positive and significant impact on job burnout.
>
> *H2*: Depression has a positive and significant impact on job burnout.
>
> *H3*: Depression mediate the relationship between anxiety and job burnout.

3. Materials and methods

3.1. Participants

The sample for this study included 372 nurses (96.5% females) whose ages ranged between 20 and 59 years, with a mean age of 30.8 ± 6.3 years. 64.8% of participants were married and 190 (51.1%) have a junior college degree. The majority of nurses (76.9%) have less than 10 years of work experience (Table 1).

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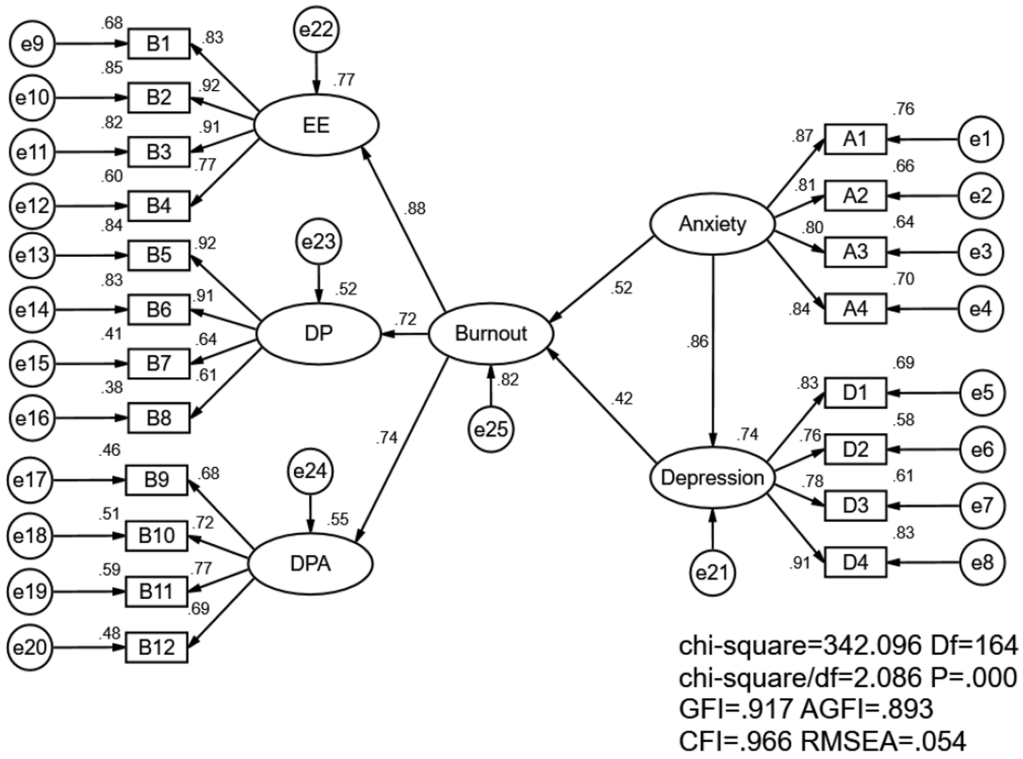

FIGURE 1
Structural equation model for nurse burnout, anxiety, and depression. EE indicate emotional exhaustion; DP indicate depersonalization and DPA indicate decreased personal accomplishment.

TABLE 1 Characteristics of the sample.

Variables	Classification	*N*	%
Sex	Female	359	96.5
	Male	13	3.5
Marriage	Married	241	64.8
	Others	131	35.2
Education	High school	11	3.0
	College	190	51.1
	Bachelor or above degree	171	45.9
Work experience	<5 years	138	37.1
	5–10 years	148	39.8
	11–20 years	56	15.0
	>20 years	30	8.1

3.2. Measures

3.2.1. General information questionnaire

A self-designed general situation questionnaire has been created based on literature research and expert opinions The questionnaire includes basic demographic information such as age, gender, and marital status.

3.2.2. The 7-item generalized anxiety disorder questionnaire (GAD-7)

There are 9 items in the scale, and 4 grades are used for scoring (40). The scoring rules are as follows: 0–4 is normal, 5–9 is mild anxiety, 10–14 is moderate anxiety, and 15–21 is severe anxiety (41). In this study, Cronbach's α coefficient = 0.943; KMO = 0.926, Bartlett sphericity test $p < 0.01$.

3.2.3. Patient health questionnaire-9 (PHQ-9)

There are 9 items in the scale, and 4 grades are used for scoring (42). The scoring rules are as follows: 0–4 means no depression, 5–9 means mild depression, 10–14 means moderate depression, and 15–19 means moderate depression. Major depressive disorder, 20–27 may have major depressive disorder (43). In this study, Cronbach's α coefficient = 0.922; KMO = 0.902, Bartlett sphericity test $p < 0.01$.

3.2.4. Maslach burnout inventory (MBI)

This test includes three aspects of job burnout: the scale contains 3 dimensions, 22 items, and uses Likert 7-level scoring, scoring rules: 9 items of emotional exhaustion (EE), indicating the emotional response caused by work pressure, with a total score of 0–54. Scores ≤19, 20–25 and ≥26 represent low, medium and high level of EE respectively; 5 items of depersonalization (DP) indicate the attitudes and feelings of clients caused by work pressure, with a total score of 0–30 and scores ≤6, 7 ~ 8 and ≥9 represent low, medium, and high level of DP respectively; 8 items with decreased personal accomplishment (DPA) indicate negative self-evaluation, accompanied by a decline in work ability experience and achievement experience (11). The total score is 0 ~ 48 points, and the score is ≤34, 35 ~ 38, and ≥39 represent high, medium, and low level of DPA, respectively, and the scores are reversed. We operationalized high-level burnout as the presence of elevated levels in all three dimensions. Medium-level burnout was defined as elevated levels in two

dimensions, while low-level burnout was characterized by elevated levels in only one dimension. The absence of burnout was indicated when all levels were low (44–46). In this study, Cronbach's α coefficient = 0.906, KMO = 0.926, Bartlett sphericity test $p < 0.01$.

3.3. Procedures

A quantitative research design using a self-reported questionnaire was used to collect data from a tertiary designated hospital in Quanzhou, Fujian Province who were treating patients with new coronary pneumonia. The hospital has a total of 1,621 nurses, who are assigned to various wards, with a distribution of 67 wards. To gather data from nurses, the quota sampling method was employed, wherein 6 participants were randomly selected from each ward, resulting in a total sample size of 402.

The inclusion criteria were: (1) working for at least one year, (2) providing informed consent to participate in the study, and (3) working during the COVID-19 epidemic. The exclusion criteria were: (1) receiving psychological counseling or treatment in the past year, and (2) having a prior history of mental illness.

We designed the online questionnaire using the Wenjuanxing platform and sent the survey link to nurses *via* WeChat, QQ or email. We completed data collection from May 1st to 30th, 2020. The entire questionnaire took at least 5 min to complete, and samples with response times below this standard were removed. At the beginning of the questionnaire, there is an informed consent form, participants need to read this section and click on consent. We are also making a statement that the data from this survey will only be used for scientific research and will not disclose the personal information of the participants. This study was approved by the ethical committee of Quanzhou First Hospital (NO.Quan Yi lun 2,020,181).

3.4. Data analysis

Data cleaning, normality test and correlation analysis were performed using SPSS Version 26.0. A structural equation model was established using AMOS24.0 software to fit the relationship model between nurses' anxiety, depression and job burnout. Following the suggestion of Gerbing and Anderson (47), we estimate the measurement model separately for each construct before constructing the model. In this study, the model was estimated by the maximum likelihood estimation, and the model was corrected with square multiple correlation (SMC) (48) and the modification index (MI). Since all aspects are reflective indicators, if the requirements of SMC and MI are not met during model modification, we will delete the question (49, 50). We has performed the Sobel test (51) and bootstrap method (52) for assessing the mediating effects. Five indices were employed to evaluate the adequacy of fit for both the measurement and structural models: Normed Chi-square ($\chi 2/df < 3$) (53, 54), Goodness of Fit Index (GFI > 0.90), Adjusted-Goodness of Fit Index (AGFI>0.90), Comparative Fit Index (CFI > 0.90) (55), Root Mean Square Error of Approximation (RMSEA<0.08) (56).

4. Results

4.1. Anxiety, depression and burnout among nurses based on demographic information

Burnout was statistically different in education and work experience, but the rest were not different (Table 2).

TABLE 2 Anxiety, depression and burnout among nurses based on demographic information.

Variables	Classification	*N*	Anxiety	Depression	Burnout
Sex	Female	359	4.12 ± 4.38	5.15 ± 5.68	58.50 ± 17.98
	Male	13	3.62 ± 3.33	3.62 ± 3.22	56.62 ± 15.25
	t		−0.411	−0.966	−0.372
	p		0.681	0.335	0.710
Marriage	Married	241	4.31 ± 4.49	5.20 ± 5.82	59.68 ± 18.59
	Others	131	3.73 ± 4.05	4.91 ± 5.24	56.14 ± 16.30
	t		−1.235	−0.470	−1.830
	p		0.218	0.639	0.068
Education	High school	11	5.36 ± 5.278	8.64 ± 7.032	59.10 ± 16.69
	College	190	3.73 ± 4.441	4.71 ± 5.671	55.72 ± 18.67
	Bachelor or above degree	171	4.43 ± 4.152	5.3 ± 5.404	61.40 ± 16.62
	F		1.657	2.781	4.654
	p		0.192	0.063	0.010*
Work experience	<5 years	138	3.62 ± 3.82	4.49 ± 5.02	55.22 ± 16.60
	5–10 years	148	4.37 ± 4.796	5.68 ± 5.952	59.18 ± 19.61
	11–20 years	56	4.07 ± 3.726	4.61 ± 4.979	60.34 ± 15.38
	>20 years	30	5.07 ± 5.199	5.9 ± 7.317	65.97 ± 16.40
	F		1.263	1.406	3.639
	p		0.287	0.241	0.013*

*Indicate *p* less than 0.05.

TABLE 3 Classification and scores of nurse burnout.

Dimension	Low (*n*, %)	Moderate (*n*, %)	High (*n*, %)	$\bar{x}\pm s$
Emotional exhaustion	151 (40.6)	122 (32.8)	99 (26.6)	22.12 ± 9.40
Depersonalization	110 (29.6)	102 (27.4)	160 (43.0)	9.62 ± 4.35
Decreased personal accomplishment	134 (36.0)	83 (22.3)	155 (41.7)	26.70 ± 9.70

TABLE 4 Analysis of anxiety, depression and burnout among nurses.

	Anxiety	Depression	Burnout
Anxiety	1.000		
Depression	0.851*	1.000	
Burnout	0.639*	0.616*	1.000

*Indicate *p* less than 0.001.

4.2. Anxiety, depression and burnout among nurses

The anxiety score was (4.10 ± 4.34), and the depression score was (5.09 ± 5.62). The prevalence of anxiety and depression among the participants were 45.2 and 41.4%, respectively.

The research conducted on the phenomenon of job burnout among nurses yielded noteworthy findings. Specifically, the average score for emotional exhaustion was determined to be 22.12, with a significant proportion of participants (59.4%) displaying medium to high levels of this particular dimension. Similarly, the average score for depersonalization was found to be 9.62, and a substantial majority of nurses (70.4%) exhibited moderate to high levels of this aspect. Additionally, the average score for decreased personal accomplishment was calculated to be 26.70, with 64.0% of participants falling within the medium to high range for this dimension. The prevalence of severe burnout among nurses was found to be 7.3% (Table 3).

4.3. Analysis of anxiety, depression and burnout among nurses

The pearson correlation was used to analyze the relationship between anxiety, depression and burnout among nurses, which showed a positive correlation between anxiety and depression on burnout (Table 4).

4.4. Structural equation model of burnout, anxiety, and depression among nurses

4.4.1. Selection of the model metrics

To assess whether the measurement indicators accurately reflected the latent variables, a Confirmatory Factor Analysis (CFA) was conducted on all constructs.

Out of the original 7 items in the anxiety questionnaire, only 4 items had standardized factor loadings above 0.7 (but not exceeding 0.95) and significant positive residuals after CFA. These 4 questions were deemed reliable with a Composite Reliability (CR) of 0.899 (exceeding the standard of 0.7) (57) and an Average Variance Extracted (AVE) of 0.690 (exceeding the standard of 0.5) (58). Additionally, the fitting index fell within the acceptable range, thus confirming the retention of these 4 questions.

Out of the 9 items in the depression questionnaire, only 4 had standardized factor loadings exceeding 0.7 but not exceeding 0.95, and all residuals were positive and significant after CFA. The CR was 0.892, surpassing the standard of 0.7, and the AVE was 0.677, surpassing the standard of 0.5. The fitting index was within the acceptable range, therefore, these 4 questions were retained.

In this study, job burnout was analyzed as a second-order aspect and deconstructed into three dimensions: emotional exhaustion, depersonalization, and decreased personal accomplishment. To ensure the validity of these dimensions, a first-order three-factor complete correlation model and a second-order factor model were analyzed. This study utilized the first-order three-factor complete correlation model to analyze the data. The results showed that the first-order factors had moderate to high correlations. Specifically, emotional exhaustion and job apathy had a correlation coefficient of 0.66, depersonalization and decreased personal accomplishment had a correlation coefficient of 0.52, and emotional exhaustion and decreased personal accomplishment had a correlation coefficient of 0.63. Additionally, the target coefficient was 100%, indicating that the second-order job burnout in this study met the requirements of the theoretical model. The residuals of the standardized factor loadings for the three deconstructed constructs were all found to be positive and significant after the second-order CFA. Additionally, the CR exceeded the standard of 0.7, the AVE exceeded the standard of 0.5, and the fitting index fell within the acceptable range. As a result, the second-order three-facet model was retained for further analysis (Tables 5, 6).

4.4.2. Construction of the model

This study explores the relationship between job burnout, anxiety, and depression based on a theoretical model. The model suggests that anxiety and depression can impact job burnout, and a hypothetical model was created using nurses' anxiety as an independent variable and depression as an intermediary variable. The model fit indices, with $\chi2 = 342.096$, $df = 164$, $\chi2/df = 2.086$, $GFI = 0.917$, $AGFI = 0.893$、$CFI = 0.966$, $RMSEA = 0.054$, falls within an acceptable range, indicating a good model fitting effect (Figure 1).

4.4.3. Analysis of the total, direct, and indirect effects of the model

To determine if the model had a mediation effect, both Sobel and Bootstrap methods were used. The Sobel mediation effect was verified with a Z value of 4.55, which exceeded the standard of 2, indicating a mediation effect. The Bootstrap method also confirmed a partial mediation effect. The results indicate that anxiety has a total effect of 1.413 on job burnout, with a direct effect of 0.829 and an indirect effect of 0.584 (Table 7).

TABLE 5 The model estimation parameters and fit indices for different surfaces.

Surfaces	Indices	*Unstd.*	*S.E.*	*t*	*p*	*std.*	*SMC*	*CR*	*AVE*	*χ2*	*df*	*χ2/df*	*GFI*	*AGFI*	*RMSEA*
Anxiety	A1	1.000				0.887	0.787	0.899	0.690	0.817	2	0.409	0.999	0.994	0.000
	A2	0.894	0.047	19.146	*	0.806	0.650								
	A3	0.925	0.048	19.120	*	0.805	0.648								
	A4	0.998	0.051	19.729	*	0.822	0.676								
Depression	D1	1.000			*	0.824	0.679	0.892	0.677	4.342	2	2.171	0.994	0.970	0.056
	D2	1.021	0.059	17.422	*	0.786	0.618								
	D3	1.156	0.054	21.284	*	0.937	0.878								
	D4	0.772	0.049	15.681	*	0.729	0.531								
Emotional exhaustion	B1	1.000			*	0.808	0.653	0.917	0.736	5.085	2	2.543	0.993	0.996	0.064
	B2	1.384	0.063	22.060	*	0.941	0.885								
	B3	1.320	0.063	21.011	*	0.903	0.815								
	B4	1.095	0.066	16.701	*	0.768	0.590								
Depersonalization	B5	1.000			*	0.922	0.850	0.858	0.611	3.125	2	1.562	0.996	0.980	0.039
	B6	1.046	0.045	23.158	*	0.909	0.826								
	B7	0.602	0.043	14.075	*	0.640	0.410								
	B8	0.676	0.053	12.847	*	0.599	0.359								
Decreased personal accomplishment	B9	1			*	0.677	0.458	0.806	0.510	0.685	2	0.342	0.999	0.995	0.000
	B10	1.143	0.103	11.066	*	0.715	0.511								
	B11	1.062	0.092	11.509	*	0.767	0.588								
	B12	1.114	0.103	10.860	*	0.696	0.484								

*Indicate *p* less than 0.001.

TABLE 6 Burnout competition model fitting indicators.

Patterns of second-order validation factors for burnout	χ2	df	χ2/df	GFI	AGFI	CFI	RMSEA
0.Null model	2748.931	66	41.650	0.292	0.630	0.000	0.331
1.The first-order third factor has a fully correlated model	95.925	51	1.881	0.962	0.942	0.983	0.049
2.Second order factor model	95.925	51	1.881	0.962	0.942	0.983	0.049
3.Suggested value	The smaller the better	The bigger the better	<5	>0.9	>0.9 (59)	>0.9	<0.08

TABLE 7 Analysis of the total, direct, and indirect effects of the model.

Effects	Variables	Point Estimation	Product of Coefficients		Bootstrapping					
					Bias-Corrected 95% CI			Percentile 95% CI		
			S.E.	Z	Lower	Upper	*p*	Lower	Upper	*p*
Total	Anxiety→Burnout	1.413	0.124	11.4	1.175	1.664	0.001	1.178	1.667	0.001
Direct	Anxiety→Burnout	0.829	0.167	5.0	0.517	1.184	0.001	0.501	1.167	0.001
Indirect	Anxiety→Burnout	0.584	0.150	3.9	0.312	0.915	0.001	0.313	0.917	0.001

2,000 bootstrap samples.

5. Discussion

The findings of the study indicate that the mean score for emotional exhaustion among participants is 22.12, indicating moderate levels of this phenomenon. Similarly, the average score for depersonalization is 9.62, suggesting high levels of this condition. Additionally, the mean score for decreased personal accomplishment is 26.70, indicating high levels of this aspect. Furthermore, the study reveals that the prevalence of severe burnout among nurses is 7.3%. The scores obtained in this study were found to be higher than the

previous record of burnout among 1,621 nurses in Rizhao City before the epidemic. Specifically, the average score for emotional exhaustion was 18.14, depersonalization was 4.64, and decreased personal accomplishment was 34.59 (60). The study found that the average subdimension score of emotional exhaustion was 18.9, the average score of depersonalization subdimension was 7.3, and the average score of decreased personal accomplishment subdimension was 11.4, which was higher than another study (61). In comparison, the average subdimension score of emotional exhaustion was 26.6, the average score of depersonalization subdimension was 10.2, and the average score of decreased personal accomplishment subdimension was 27.3 in the other study (62). These results suggest that burnout scores differ across time, regions, and groups. Overall, nurses experienced higher burnout scores during the epidemic than before. This is likely due to the added pressure of the uncertain hospital environment of the new crown epidemic, as well as additional tasks such as nursing, sample collection, and out-of-home support. These factors increase the work pressure of nurses and promote the emergence of job burnout. However, a systematic review found that nurses' burnout scores did not differ significantly before and during the pandemic (63). Consequently, both in emergencies and in normal daily routines, healthcare institutions should develop tailored occupational health programs and improve working conditions (64).

The incidence of job burnout is known to increase in poor psychological conditions. Various studies conducted both domestically and internationally have found a positive correlation between anxiety, depression, and job burnout. A cross-sectional survey of 3,527 samples found anxiety (OR = 4.87) and depression (OR = 4.06) to be risk factors for job burnout (65). One study in China have also found anxiety to be positively correlated with emotional exhaustion ($r = 0.637$), depersonalization ($r = 0.417$), and decreased personal accomplishment ($r = -0.242$), while depression is positively correlated with job burnout (34). This study also found a positive correlation between anxiety, depression, and job burnout (emotional exhaustion: $r = 0.569$, depersonalization: $r = 0.406$, decreased personal accomplishment: $r = -0.378$), but the causal relationship between the three is still unclear. To further explore the relationship between anxiety, depression, and job burnout, a structural equation model was constructed.

Previous studies have shown that anxiety and depression can both impact job burnout through other mediating variables (66, 67). Additionally, other investigations have revealed that burnout can serve as a mediating factor in the regulation of anxiety and depression (68–70). In the current research, we have developed a hypothesis positing that anxiety could potentially exert an indirect influence on burnout through the mediating factor of depression. This particular aspect of our study sets it apart from previous inquiries in the field. The findings of our study further corroborate this hypothesis. The results indicate that anxiety has a partial mediating effect on job burnout, with both direct (0.829) and indirect (0.584) effects observed. The direct effect accounts for 58.7% of the total effect, while the indirect effect accounts for 41.3%. These findings suggest that nurses who experience higher levels of anxiety are more likely to experience burnout, and that depression can exacerbate this relationship. Overall, these results highlight the importance of addressing both anxiety and depression in the prevention and management of job burnout among nurses. The comprehensive findings of the study offer substantial evidence in favor of accepting all the proposed hypotheses and their underlying assumptions.

Some questions in the scale were deleted in this study based on the modification index and square multiple correlation. The model fit could be improved based on the modification index. However, it is important to note that this correction is data-driven and may introduce coincidental errors in probability, limiting its generalizability to other samples (71). If the square multiple correlation falls below 0.6, it suggests that the corresponding topic should be removed from the analysis as it fails to adequately represent the construct characteristics (47, 48). Furthermore, it is recommended that a construct should ideally consist of 4 to 6 measurement variables (72), and all constructs in this study met this criterion by including 4 variables. Since the process of model generation is implicated in data-driven issues and there is no guarantee that the results of the model correction will be consistent with the overall results, the current study requires a new set of samples to perform the test of cross validity to assess the stability of the model (73, 74).

There are many scales used to measure different symptoms of anxiety and depression, this study used GAD-7 and PHQ-9 to measure anxiety and depression, respectively, (75). Although these two scales are classic psychological scales with high reliability and validity, the process of using the scales is only to add up the scores of the respondents to get a total score, and then determine whether there are symptoms of anxiety and depression according to the criteria. Anxiety and depression, as a complex mental illness, have many different symptoms, and the practice of grouping different symptoms into a total score cannot truly reflect the behavior and symptoms of an individual (40, 76). In addition, the current study deleted some questions in the scale to obtain a better model during model modification, a practice that improves the fit of the model but loses important information to a certain extent. Therefore, the scale can only be used as an auxiliary tool in clinical applications, and the most crucial thing is to rely on the questioning technique.

6. Limitations

Several limitations of the study should be settled. First, an self-assessment online questionnaire was implemented in this study, the participants will fill in the answer at random affected by response and social desirability bias. Second, we only surveyed health workers in Quanzhou, the calculated sample size could not be fully achieved, and the applicability to other regions requires further research. At last, SEM was often used to quantitatively verify relationships between variables, limiting conclusions about causality because of the cross-sectional data.

7. Contributions and conclusions

Our findings showed that a positive correlation between anxiety and depression on burnout, which was conform to our hypothesis. This finding contributes to understanding the relationship between burnout and mental health as well as providing additional data support for existing models. In addition, this result may also explain that during times of emergency, such as a pandemic with COVID-19

or public health emergencies, caregivers may be under more stress leading to burnout.

Nurses exhibit a greater prevalence of anxiety, depression, and burnout. Anxiety not only directly impacts burnout, but also indirectly influences burnout through its association with depression. Depression was identified as a mediating factor in the connection between anxiety and burnout. It is imperative for hospital administrators to prioritize the mental health of nurses and support them to strengthen psychological testing and counselling.

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.

Ethics statement

The studies involving humans were approved by the ethical committee of Quanzhou First Hospital (NO.Quan Yi lun 2020181). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

FL conceived and designed the experiments, performed the experiments, analyzed the data, prepared figures and/or tables, authored or reviewed drafts of the article, and approved the final draft. YZ authored or reviewed drafts of the article, and approved the final draft. YC prepared figures and/or tables and authored or reviewed drafts of the article. ZT conceived and designed the experiments, authored or reviewed drafts of the article, and approved the final draft. 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.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1221501/full#supplementary-material

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Glossary

SEM	Structural Equation Model
COVID-19	Corona Virus Disease 2019
PTSD	Post-Traumatic Stress Disorder
GAD-7	the 7-item Generalized Anxiety Disorder Questionnaire
PHQ-9	Patient Health Questionnaire-9
MBI	Maslach Burnout Inventory
KMO	Kaiser-Meyer-Olkin
SMC	Square Multiple Correlation
MI	Modification Index
CFA	Confirmatory Factor Analysis
CR	Composite Reliability
AVE	Average Variance Extracted
χ^2	Chi-square
χ^2/df	Normed Chi-square
GFI	Goodness of Fit Index
AGFI	Adjusted-Goodness of Fit Index
CFI	Comparative Fit Index
RMSEA	Root Mean Square Error of Approximation

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Psychosocial impact of COVID-19 pandemic: experience of healthcare workers in Qatar

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Background: The COVID-19 pandemic has had a profound and global impact on healthcare systems worldwide, presenting unprecedented challenges for healthcare workers (HCWs) on the front. We aimed to evaluate the prevalence of anxiety and depression symptoms during the coronavirus pandemic among healthcare professionals in Qatar.

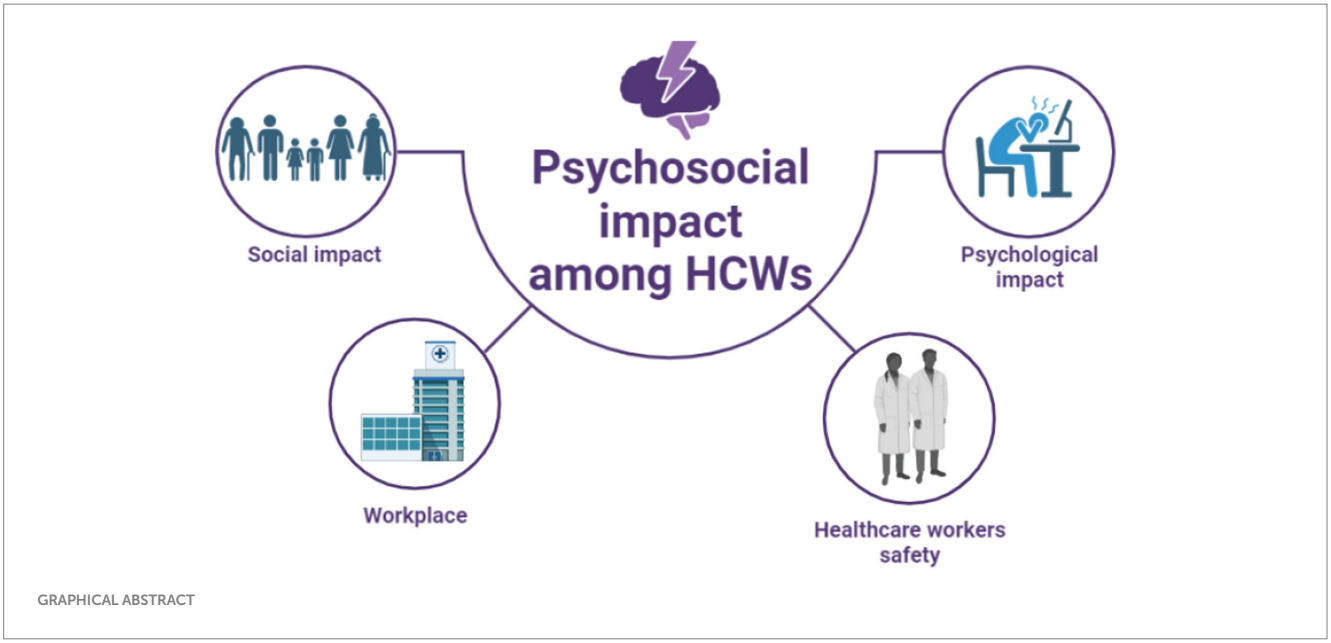
Methods: A cross-sectional study where an electronic questionnaire containing demographics, and psychosocial questions were made on Google Docs and Microsoft Team, and were sent through email and WhatsApp to healthcare workers, including doctors, nurses, allied health and others working at Hamad Medical Corporation in Qatar, from June 1, 2021, to January 1st 2023. ANOVA, *t*-test and multiple linear regression were used to see the association between the psychological factors and sociodemographic variables using STATA version 17 software.

Results: A total of 829 participants were included in this study (response rate: 55%). The average age of the participants is 36.0±7.1; 65.9% were males; 2.3% were doctors and 53% were nurses, 38.7% were allied healthcare professionals and 6% were others. Psychological, social effects, and workplace were shown to significantly related to their marital status, career, and hospital setting ($p<0.01$ for each). Similar to this, dealing with COVID-19 patients and their education level with the length of time working at the designated facility were all connected with the health professional safety score ($p<0.05$).

Conclusion: During the COVID-19 epidemic, healthcare workers in Qatar experienced a high incidence of negative psychosocial symptoms. To alleviate these outcomes, it would be useful to implement screening procedures for such symptoms and to devise preventive measures accordingly.

KEYWORDS

COVID-19, healthcare, workers, psychosocial, impact, Qatar



1. Introduction

The COVID-19 pandemic has had a profound and global impact on healthcare systems worldwide, presenting unprecedented challenges for healthcare workers (HCWs) on the front lines (1, 2). In response, various precautionary measures such as self-quarantine, social distancing, mandatory mask-wearing, and travel restrictions have been implemented to mitigate the spread of the highly contagious COVID-19 virus (3–8). However, these measures coupled with the suspension of elective medical procedures and strain on healthcare resources have significantly burdened HCWs and amplifying the pressure and presenting immense challenges (9–14).

Healthcare workers have faced not only an increased risk of infection but also prolonged periods of wearing cumbersome personal protective equipment (PPE), extended work shifts, and overwhelming patient caseloads (15–18). Furthermore, many studies reported the adverse effects of prolonged PPE usage. These effects include headaches, difficulty in breathing, and impaired cognition. Moreover, the continuous use of PPE interferes with vision, and communication, and disrupts thermal equilibrium (19–23). These demanding circumstances have taken a toll on the mental well-being of HCWs, leading to psychological distress, anxiety, sadness, and potential post-traumatic stress symptoms (24). Research conducted in countries such as the United States, Italy, and China has consistently reported high levels of anxiety, depression, and insomnia among HCWs during this unprecedented global health crisis (5, 25, 26).

On the other hand, several reports documented the diverse coping mechanisms adopted by healthcare workers. These strategies encompass seeking psychological support through counseling and therapy, engaging in stress-relieving activities such as physical exercise, meditation, and yoga, nurturing peer support from family and friends, as well as prioritizing effective self-care routines, and others. These endeavors played a critical role in preserving resilience and upholding an exceptional standard of patient care during this challenging period (27–30).

Despite the global recognition of the psychological impact on HCWs, limited research exists specifically examining the psychosocial effects of the COVID-19 pandemic on HCWs in the Gulf region, particularly in Qatar. To bridge this knowledge gap, the present study conducted a comprehensive cross-sectional examination of HCWs, encompassing various professional roles within significant hospitals under the Hamad Medical Corporation (HMC).

2. Methodology

2.1. Design

The study used descriptive, cross-sectional hospital-based study.

2.2. Setting and samples

The study included a total of 829 healthcare workers (HCWs), including doctors, nurses, pharmacists, laboratory technicians, ambulance staff, and administrative personnel working in four major hospitals under Hamad Medical Corporation (HMC) in Qatar between January 2021 and December 2022. The response rate for this study was 78% across various hospitals, including Hamad General Hospital and HMGH. Incomplete surveys from HCWs were excluded from the study. We utilized a convenience sampling method, and the sample size was determined using the following equation: $n = [(Z_{0.95})^2 \times p \times (1-p)]/(0.05)^2$, where n represents the sample size, Z: constant (1.96), p: is the estimated proportion or prevalence that meets our criteria." p will be set as 0.5, as the proportion is not known. To attain a confidence level of 95% with a precision of +/− 0.05, the recommended calculated sample size is a minimum of 500 participants.

Data were collected using an anonymous online questionnaire. The use of an online survey form was conducted on Google Docs and Microsoft Team forms in English and sent to healthcare workers via email and WhatsApp. There was no direct contact or face-to-face interaction with the HCWs.

2.3. Questionnaire

We developed a questionnaire using multiple English-language tools (31–33). The developed tools in consultation with mental health professionals. We conducted a pilot study involving 20 conveniently selected HWCs. We discussed with them the comprehensiveness, language, and grammar of the questions.

To assess the face and content validity of the questionnaire, we distributed it to four reviewers, consisting of two mental health professionals and two senior researchers. Each reviewer was asked to independently rate each item in the questionnaire and provide feedback on its readability, comprehensiveness, clarity, language, and grammar. Upon analyzing the results, we found that the questionnaire demonstrated accepted content validity.

2.4. Description of the data collection tool

The questionnaire consists of five sections, developed through an extensive literature review. The first section focuses on demographic characteristics and background information, such as age, sex, marital status, education level, nationality, specialty, hospital name, living status, family members, and other relevant details using multiple choice questions. The second section addresses 9 questions related to psychological impact, while the third section focuses on social impact with 5 questions. The fourth section delves into the workplace impact with 6 questions, and finally, the fifth section covers 4 questions on health professional safety. Likert scale (strongly disagree, disagree, neutral, agree, strongly agree) was used to answer questions for section 2 till section 5.

2.5. Statistical analysis

Descriptive statistics were calculated for the demographics and dependent variables of the study participants. Pearson correlations were used to examine the relationships between the four main variables, i.e., psychological impact, social impact, workplace and health professional safety. We used Q–Q plot and P–P plot and Schapiro Wilk test to check the normal distribution of psychological impact, social impact, workplace and health professional safety variables. ANOVA and *t*-tests were conducted to compare the level of psychological well-being, needs, resources, and job support satisfaction between the sector and socio-demographic characteristics (age, gender, education level, nationality, specialty, working with COVID-19 patient). A multiple linear regression was used to see the association between the psychological well-being, social impact, workplace and health professionals' safety with the different sociodemographic variables. All statistical analysis was done using STATA 17 software with statistical significance level $p < 0.05$.

2.6. Ethical considerations

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval for the study was obtained from HMC (Ethical Approval Number: MRC-01-21-235), and consent was obtained from all participants. Participants were provided with information about the study's objectives, and assurance of the confidentiality of all shared information was given.

3. Results

3.1. Participant characteristics

The questionnaire was distributed via email and WhatsApp, and 829 people responded in total. The age of healthcare professionals was 36 ± 7.1. Moreover, 65.9% of the population were men, 70.8% were married, and 76% had a bachelor's degree. Eighty-three percent (83.2%) of the participants were Asian, with 58.1% of them working at Hamad General Hospital and 35.6% at Hazm Mebaireek General Hospital (HMGH) (Table 1).

In this sample, physicians made up 2.3% of the workforce, nurses (53%), allied healthcare workers including pharmacists, rehabilitation staff, dentists, dietitians, educators, researchers, technicians, respiratory therapists made up 38.7%, and other hospital staff such as administrative staff and engineers made up 6%. Most of the healthcare workers (70%) had direct contact with a COVID-19 positive patient and 67% were working in the COVID-19 facility last 12 months. About 76% of healthcare workers lived with their families, and 57.3% had three to five family members. 76% of healthcare workers who had the PCR test done at least four times or more had 71% of their relatives, co-workers or friends who tested positive.

Figure 1 shows the correlation between all four variables, i.e., psychological, social, workplace and health professional safety.

The mean of psychological impact, social impact, workplace and health professional safety scores of the participants were 23.6 ± 7.37, 13.3 ± 4.0, 18.5 ± 3.3 and 13.6 ± 2.4, respectively.

Females had considerably greater (13.9 ± 1.7) health professional safety as compared to males (13.5 ± 2.7, $p = 0.03$), while males had a significantly larger (24.2 ± 8.3) psychological impact as compared to females (22.4 ± 4.9, $p \leq 0.001$).

When compared to married and widowed/divorced individuals, those who were single had a considerably higher psychological and social impact ($p = 0.004$ and $p = 0.022$), respectively. Married people (18.6 ± 3.5), followed by single people (18.5 ± 2.9), had stronger workplace impacts than widowed or divorced people (14.9 ± 3.4), $p = 0.013$. As comparison to individuals who earned a bachelor's, master's, or diploma, healthcare practitioners who earned a Ph.D. had better psychological, social impact, and health professional safety ($p < 0.001$, $p < 0.001$ and $p = 0.01$), respectively. North Americans (30.2 ± 8.0) were more psychologically affected than Europeans (24.7 ± 13.5) and Asians (23.7 ± 8.0) in terms of nationality $p = 0.035$.

Compared to nurses, allied health professionals, physicians, and others had greater psychological, social, and occupational effects ($p < 0.001$), respectively.

Other factors like indirect exposure with COVID-19 patients, those are not having any experience with COVID-19 had significantly higher psychological and social impact $p < 0.001$, $p < 0.001$ and $p < 0.001$, $p = 0.002$, respectively. Those were living with others had greater psychological and social impact as compared to those who were with family and single $p < 0.001$ and $p < 0.001$, respectively.

In terms of family members those were having 6–7 family members and their family members, relatives and colleagues tested

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TABLE 1 Characteristic of HCWs.

Variables	Label	*N* = 829
Age		36.0 (7.1)
Sex	Female	282 (34.1%)
	Male	544 (65.9%)
Marital status	Married	587 (70.8%)
	Single	235 (28.3%)
	Widow/divorced	7 (0.8%)
Education level	Bachelor	627 (76.0%)
	Diploma	44 (5.3%)
	Master	115 (13.9%)
	Ph.D.	39 (4.7%)
Nationality	African	104 (14.5%)
	Asia	596 (83.2%)
	Europe	6 (0.8%)
	North America	10 (1.4%)
Specialty	Physician	19 (2.3%)
	Nurses	432 (53.0%)
	Allied health	315 (38.7%)
	Others	49 (6.0%)
Hospital name	Al Khor Hospital	4 (0.5%)
	Al Wakra Hospital	12 (1.4%)
	HMGH (Hazm)	295 (35.6%)
	Hamad General Hospital	482 (58.1%)
	PHCC	36 (4.3%)
Working with COVID-19 patient contact	Direct	574 (70.0%)
	In-direct	246 (30.0%)
How long you have been working in the designated COVID-19 facility?	1–3 months	60 (7.3%)
	4–6 months	75 (9.1%)
	7–12 months	51 (6.2%)
	>12 months	553 (66.9%)
	No experience	88 (10.6%)
	not mention	137 (16.6%)
Living status	Alone	624 (75.6%)
	With family	64 (7.8%)
	With others	222 (28.6%)
Family members	≤2	445 (57.3%)
	3–5	87 (11.2%)
	6–7	23 (3.0%)
	≥7	21 (2.5%)
Any family member/ colleague/friend tested positive	I do not know	219 (26.4%)
	No	589 (71.0%)
	Yes	15 (1.9%)

positive had significantly higher psychological impact $p < 0.001$ and $p = 0.02$ (Table 2).

Table 3 shows the adjusted relationship between sociodemographic characteristics, workplace, social, and health professional safety. Age was significantly associated with psychological impact Coef. 0.25: 95% CI (0.16, 0.35). Men had more of an emotional influence Coef. 2.28: 95% CI (0.94, 3.61); $p = 0.001$ and lower health professional safety Coef. −0.49: 95% CI (−0.83, −0.12); $p = 0.009$ as compared to females.

In comparison to married, being single had higher psychological impact Coef. 2.81 95% CI (1.07, 4.55); $p = 0.002$ and being widow/divorced had lower workplace impact Coef. −4.06: 95% CI (−6.44, −1.68); $p = 0.001$. When compared to those who earned a bachelor's degree, those with a diploma had a significantly lower psychological effect Coef. −4.22: 95% CI (−6.68, −1.75); $p = 0.001$ and those who completed a Ph.D. had higher health professional safety Coef. 1.47: 95% CI (0.59, 2.37), $p = 0.001$.

The psychological effect was lower among the allied health professionals Coef. −5.29: 95% CI (−9.2, −1.38); $p = 0.008$; nurses Coef. −2.03: 95% CI (−4.03, −0.03); $p = 0.047$; allied health professionals Coef. −2.3: 95% CI (−4.35, −0.25); $p = 0.028$; and others Coef. −2.38: 95% CI (−4.72, −0.05); $p = 0.045$ had lower social impact as compared to physicians. As compared to physicians, nurses Coef. −2.03: 95% CI (−3.54, −0.53), $p = 0.008$, allied health professional Coef. −3.26: 95% CI (−4.77, −1.75), $p = <0.001$ and others Coef. −2.98: 95% CI (−4.73, −1.23), $p = 0.001$ had lower workplace impact. Alwakra hospital also had lower workplace impact Coef. −4.72 95% CI (−8.34, −1.1), $p = 0.011$ as compared to Alkhor hospital.

Those who worked with COVID-19 patients indirectly had greater social impacts Coef. 1.03 95% CI (0.27, 1.78), $p = 0.008$ compared to those working directly with COVID-19 patients. Health workers who lived with families had a lower social impact on Coef. −1.20: 95% CI (−2.17, −0.04), $p = 0.042$, and those living with others had a higher social impact Coef. 1.70: 95% CI (0.2, 3.17), $p = 0.026$ compared to those living alone.

Those who know that their family members, co-workers or friends tested positive had a lower social impact Coef. −1.57: 95% CI (−3.08, −0.06), $p = 0.042$, and those who have no friends, colleagues, or family members had a lower social impact Coef. −2.14: 95% CI (−3.73, −0.56), $p = 0.008$ compared to those who were unaware that their friends, co-workers and family members have tested positive.

4. Discussion

As previously mentioned, numerous reports have detailed the various coping strategies adopted by healthcare professionals. These approaches include seeking psychological support through counseling and therapy, engaging in stress-reduction activities like physical exercise, meditation, and yoga, fostering peer support from family and friends, and prioritizing effective self-care routines, among others. These efforts played a pivotal role in maintaining resilience and upholding an exceptional standard of patient care during this challenging period (27–30). Additionally, some scholars have highlighted individual and environmental factors, such as incidents of violence or psychiatric illnesses, prolonged wait times, understaffing in emergency rooms, a history of drug or alcohol abuse, and unrestricted public movement, as contributing to the challenges faced in healthcare settings (34).

This study aimed to elucidate the psychosocial experiences of HCWs who worked undergone the COVID-19 crisis. Drawing from the accounts of the participants, various domains were explored, including the psychological impact, social consequences, safety, and workplace.

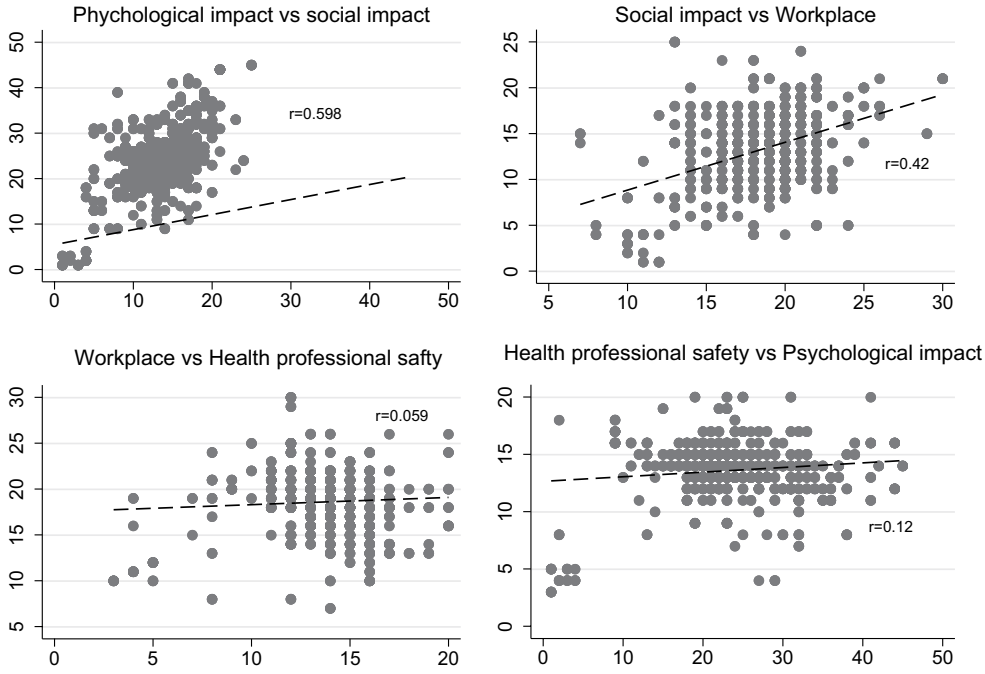

FIGURE 1
Correlation between psychosocial impact, social impact, workplace and health profession safety.

4.1. Levels of anxiety, depression, and insomnia among Qatar HCWs

In this study, healthcare workers (HCWs) experienced moderate psychological distress, which aligns with international research showing high levels of anxiety and depression among HCWs during the COVID-19 pandemic. The unprecedented challenges posed by the pandemic, such as increased work demands, fear of infection, and concerns about transmitting the virus, contribute to the psychological burden on HCWs (5, 35–43).

The social impact observed among HCWs in Qatar indicates a moderate disruption to social connections, consistent with international studies highlighting social isolation and loneliness experienced by HCWs (44–48). Implementing physical distancing measures and reducing social interactions have contributed to a sense of isolation among HCWs (48).

The findings indicate a high perception of workplace safety among participants, reflecting their confidence in the safety measures implemented by healthcare institutions in Qatar. This finding confirms that healthcare institutions have prioritized the safety of HCWs in the region. Studies conducted in Taiwan (49) and Saudi Arabia (50) have emphasized the importance of personal protective equipment (PPE) and infection control measures in reducing the risk of COVID-19 transmission among HCWs. Adequate provision of PPE, adherence to infection control guidelines, regular testing protocols, and vaccination have contributed to the high safety perception among participants.

Regular testing programs in Qatar enable early detection of COVID-19 cases among HCWs, facilitating prompt isolation and reducing the risk of transmission within healthcare settings (50, 51). Vaccination is another crucial factor in ensuring the safety of HCWs, and Qatar has made significant efforts to provide COVID-19 vaccines to its healthcare workforce (42, 52). Prioritizing immunization helps minimize the risk of infection and associated complications. This approach aligns with international best practices, as studies conducted in countries like the United States (53) and Canada (54) have also emphasized the importance of regular testing and vaccination in protecting HCWs from COVID-19.

These findings support the global understanding of the benefits of vaccination and regular testing as essential measures for safeguarding the health and safety of HCWs.

4.2. Factors influencing psychological distress in Qatar

Our findings imply that age significantly impacts how the pandemic affects HCWs psychologically. Older HCWs may have heightened concerns about their vulnerability to the virus due to age-related health conditions, leading to increased psychological distress (55). Additionally, their professional experience and knowledge may contribute to higher levels of responsibility and pressure, further impacting their psychological well-being (56). International studies have also reported similar associations between age and psychological impact among HCWs. For instance, a study conducted in Jordan found higher levels of psychological distress among older HCWs compared to younger individuals (57). Conversely, a study in Saudi Arabia indicated that younger HCWs experienced more psychological distress (58). These findings underscore the importance of considering age-related factors when addressing the psychological well-being of HCWs during the COVID-19 pandemic.

Our findings indicate that females perceived higher levels of safety, while males reported a more significant psychological impact. The higher perception of safety among females may be attributed to

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TABLE 2 The association between socio demographic factors, psychological, social, workplace and health professional safety.

Variables	*N*	Psychological impact, mean ± SD	Social impact, mean ± SD	Workplace, mean ± SD	Health professional safety, mean ± SD
Gender					
Female	282	22.4 ± 4.9	13.5 ± 2.9	18.5 ± 2.8	13.9 ± 1.7
Male	544	24.2 ± 8.3	13.2 ± 4.5	18.5 ± 3.6	13.5 ± 2.7
p-value		<0.001	0.37	0.73	0.031
Marital status					
Married	587	23.3 ± 7.9	13.2 ± 4.3	18.6 ± 3.5	13.6 ± 2.6
Single	235	24.6 ± 5.5	13.6 ± 3.3	18.5 ± 2.9	13.7 ± 2.0
Widow/divorced	7	17.0 ± 9.6	9.4 ± 5.4	14.9 ± 3.4	11.6 ± 4.5
p-value		0.004	0.022	0.013	0.079
Education level					
Bachelor	627	23.4 ± 7.4	13.1 ± 4.1	18.6 ± 3.4	13.6 ± 2.4
Diploma	44	19.2 ± 5.4	12.2 ± 4.1	17.7 ± 2.5	13.4 ± 2.8
Master	115	25.7 ± 7.4	14.0 ± 3.6	18.4 ± 3.4	13.3 ± 2.5
Ph.D.	39	26.3 ± 5.6	15.5 ± 2.8	19.1 ± 2.1	14.8 ± 1.5
p-value		<0.001	<0.001	0.21	0.01
Nationality					
African	104	23.4 ± 4.7	13.3 ± 2.9	18.3 ± 3.1	13.3 ± 2.1
Asia	596	23.7 ± 7.3	13.4 ± 4.0	18.7 ± 3.3	13.8 ± 2.3
Europe	6	24.7 ± 13.5	14.3 ± 2.1	19.3 ± 0.8	14.2 ± 0.4
North America	10	30.2 ± 8.0	15.4 ± 5.9	18.0 ± 4.0	14.4 ± 0.8
p-value		0.035	0.39	0.65	0.13
Profession					
Physician	19	29.8 ± 5.6	16.4 ± 3.0	21.2 ± 2.3	12.4 ± 2.2
Nurses	432	22.5 ± 8.3	12.7 ± 4.4	18.7 ± 3.8	13.6 ± 2.8
Allied health	315	23.3 ± 7.3	13.2 ± 4.1	18.5 ± 3.3	13.6 ± 2.5
Others	49	26.7 ± 7.7	14.1 ± 3.9	18.3 ± 2.4	13.5 ± 2.4
p-value		<0.001	<0.001	<0.001	0.12
Hospital					
Al Khor Hospital	4	30.0 ± 1.2	14.5 ± 2.9	20.5 ± 0.6	14.5 ± 0.6
Al Wakra Hospital	12	29.1 ± 10.6	16.6 ± 5.1	16.6 ± 2.9	13.8 ± 0.4
HMGH (Hazm)	295	22.4 ± 9.5	12.1 ± 5.1	18.0 ± 4.2	13.7 ± 3.2
Hamad General Hospital	482	24.1 ± 5.5	13.9 ± 2.9	19.0 ± 2.5	13.6 ± 1.8
PHCC	36	25.6 ± 6.9	13.4 ± 4.4	17.1 ± 4.4	13.1 ± 2.7
p-value		<0.001	<0.001	<0.001	0.63
Working with COVID-19 patient contact					
Direct	574	22.9 ± 7.7	12.9 ± 4.2	18.5 ± 3.5	13.7 ± 2.6
In-direct	246	25.4 ± 6.3	14.1 ± 3.5	18.7 ± 2.8	13.3 ± 2.0
p-value		<0.001	<0.001	0.43	0.038
How long you have been working in the designated COVID-19 facility?					
1–3 months	60	22.8 ± 6.7	14.0 ± 3.9	17.5 ± 3.3	13.6 ± 1.9
4–6 months	75	25.6 ± 6.2	13.8 ± 3.8	18.8 ± 2.9	13.6 ± 1.9
7–12 months	51	22.8 ± 8.9	12.7 ± 4.5	18.8 ± 3.8	12.8 ± 3.6

(Continued)

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TABLE 2 (Continued)

Variables	*N*	Psychological impact, mean ± SD	Social impact, mean ± SD	Workplace, mean ± SD	Health professional safety, mean ± SD
>12 months	553	23.1 ± 7.4	13.0 ± 4.1	18.6 ± 3.3	13.8 ± 2.4
No experience	88	26.7 ± 6.3	14.7 ± 3.2	18.1 ± 3.6	12.9 ± 2.3
p-value		<0.001	0.002	0.076	0.005
Living status					
Alone	137	24.5 ± 7.2	13.2 ± 4.1	18.5 ± 3.0	13.7 ± 2.6
With family	624	23.2 ± 7.4	13.0 ± 4.0	18.6 ± 3.4	13.6 ± 2.5
With others	64	26.9 ± 6.8	16.3 ± 3.5	18.4 ± 2.7	13.3 ± 1.5
p-value		<0.001	<0.001	0.87	0.42
Family numbers					
≤2	222	23.8 ± 6.6	13.1 ± 3.4	18.9 ± 3.0	13.7 ± 2.1
3–5	445	23.0 ± 7.7	13.4 ± 4.1	18.5 ± 3.3	13.5 ± 2.5
6–7	87	26.7 ± 6.1	14.3 ± 3.9	18.3 ± 3.4	13.7 ± 2.3
≥7	23	24.7 ± 5.8	13.7 ± 4.9	18.5 ± 4.1	14.1 ± 1.9
p-value		<0.001	0.1	0.44	0.4
Any family member/colleague/friend tested positive					
I do not know	21	27.3 ± 4.9	14.9 ± 1.6	18.7 ± 4.0	12.7 ± 0.7
No	219	22.9 ± 8.8	12.5 ± 4.7	18.0 ± 3.2	13.6 ± 2.8
Yes	589	23.8 ± 6.8	13.5 ± 3.8	18.7 ± 3.3	13.6 ± 2.3
p-value		0.02	0.001	0.022	0.2

their greater compliance with infection control measures and adherence to safety protocols (59). Additionally, female HCWs may possess a heightened awareness of COVID-19 risks and a stronger sense of responsibility toward their safety and that of their colleagues. On the other hand, males may experience additional stress and emotional burden due to societal expectations related to strength, resilience, and leadership in their professional roles (60). These unique challenges male HCWs face may contribute to their higher reported psychological impact. Therefore, it is crucial to consider these gender-specific factors when addressing the well-being of HCWs during the pandemic.

Furthermore, the results of this study are consistent with those of a study by Alhofaian et al. (61) carried out in Saudi Arabia, which also revealed that female HCWs perceived higher levels of safety than males. This suggests that gender differences in safety perception may transcend the specific context of this study. However, studies conducted in other regions, such as the US (53), have yielded different results, indicating that gender differences in safety perception may vary across cultural, social, and organizational contexts. Therefore, it is essential to consider these contextual factors when interpreting and generalizing the findings of this study.

The study findings revealed significant associations between marital status, educational level, and nationality, and the psychological, social, workplace, and health professional safety impacts experienced by HCWs during the pandemic. For example, single individuals reported higher psychological and social impacts than married and widowed/divorced individuals (62, 63). Married individuals, on the other hand, reported more substantial workplace impacts compared to widowed or divorced individuals (64). These findings suggest that marital status can influence the experiences and challenges faced by HCWs during the pandemic. In addition, the study findings indicate that HCWs with a Ph.D. qualification demonstrated better psychological and social impact and health professional safety than those with lower educational levels (65). This suggests that higher levels of education contribute to better coping strategies and a greater sense of control among HCWs.

On the other hand, the study discovered that North Americans suffered more significant psychological effects than Europeans and Asians, possibly due to cultural variations, healthcare systems, and the severity of the pandemic in various regions. When comparing the findings of this study with international, Middle Eastern, and Arabic studies, several similarities and differences emerge. For instance, Tan's et al. (66) study in Singapore found similar results regarding the higher psychological impact single HCWs experience. This suggests that the association between marital status and psychological impact extends beyond regional boundaries. Additionally, studies conducted in Turkey (67) and India (68) showed that higher educational qualifications are associated with better psychological well-being and coping mechanisms among HCWs, aligning with the findings of this study.

However, limited research comparing North Americans, Europeans, and Asians regarding psychological impact among HCWs during the pandemic was found, making this finding regarding nationality a novel contribution that warrants further investigation.

Physicians in this study experienced more significant psychological, social, and occupational impacts than nurses, allied health professionals, and others. The higher psychological impact among physicians can be attributed to their direct involvement in

TABLE 3 Multiple linear regression for psychological impact, social impact, workplace and health professional safety.

Variables	Psychological impact		Social impact		Workplace		Health professional safety	
	β (95% CI)	*p*-value	*β* (95% CI)	*p*-value	*β* (95% CI)	*p*-value	*β* (95% CI)	*p*-value
Age	0.25 (0.16, 0.35)	<0.001*	0.07 (0.01, 0.12)	0.013	0.07 (0.03, 0.11)	0	0.003 (−0.02, 0.03)	0.813
Gender								
Female	Ref						Ref	
Male	2.28 (0.94, 3.61)	0.001*	—	—	—	—	-0.49 (−0.85, −0.12)	0.009
Marital status								
Married	Ref		Ref		Ref			
Single	2.81 (1.07, 4.55)	0.002*	−0.25 (−1.19, 0.69)	0.6	0.56 (−0.05, 1.17)	0.07	—	—
Widow/divorced	1.51 (−7.6, 10.61)	0.745	−1.01 (−4.36, 2.35)	0.556	−4.06 (−6.44, −1.68)	0.001*	—	—
Education level								
Bachelor	Ref		Ref				Ref	
Diploma	−4.22 (−6.68, −1.75)	0.001*	0.08 (−1.25, 1.41)	0.909	—	—	−0.34 (−1.10, 0.43)	0.389
Master	0.84 (−0.87, 2.54)	0.336	0.65 (−0.27, 1.56)	0.165	—	—	−0.02 (−0.54, 0.51)	0.946
Ph.D.	−0.37 (−3.18, 2.44)	0.795	0.08 (−1.45, 1.6)	0.922	—	—	1.47 (0.59, 2.36)	0.001*
Nationality	Ref							
African								
Asia	1.11 (−0.52, 2.74)	0.181	—	—	—	—	—	—
Europe	−1.08 (−6.73, 4.58)	0.708	—	—	—	—	—	—
North America	4 (−0.92, 8.93)	0.111	—	—	—	—	—	—
Specialty								
Physician	Ref		Ref		Ref			
Nurses	−3.6 (−7.4, 0.19)	0.063	−2.03 (−4.03, −0.03)	0.047	−2.03 (−3.54, −0.53)	0.008	—	—
Allied health	−5.29 (−9.2, −1.38)	0.008	−2.3 (−4.35, −0.25)	0.028	−3.26 (−4.77, −1.75)	<0.001*	—	—
Others	−2.2 (−6.66, 2.27)	0.334	−2.38 (−4.72, −0.05)	0.045	−2.98 (−4.73, −1.23)	0.001*	—	—
Hospital								
Al Khor Hospital	Ref		Ref		Ref			
Al Wakra Hospital	−1.17 (−8.81, 6.48)	0.764	0.43 (−3.96, 4.81)	0.848	−4.72 (−8.34, −1.1)	0.011	—	—
HMGH (Hazm)	−6.03 (−12.93, 0.87)	0.087	−2.1 (−6.03, 1.83)	0.294	−3.19 (−6.37, −0.01)	0.049	—	—
Hamad General Hospital	−4.29 (−11.15, 2.57)	0.219	−1.12 (−5.02, 2.78)	0.573	−2.23 (−5.38, 0.92)	0.166	—	—
PHCC	−5.04 (−12.27, 2.19)	0.172	−2.2 (−6.28, 1.89)	0.291	−3.14 (−6.47, 0.2)	0.065	—	—
Working with COVID-19 patient contact								
Direct	Ref		Ref				Ref	
In-direct	0.63 (−0.85, 2.1)	0.405	1.03 (0.27, 1.78)	0.008	—	—	−0.14 (−0.56, 0.29)	0.531
How long you have been working in the designated COVID-19 facility?								
1–3 months	Ref		Ref				Ref	
4–6 months	2.19 (−0.54, 4.92)	0.116	−0.13 (−1.54, 1.28)	0.856	—	—	0.17 (−0.66, 0.99)	0.695
7–12 months	−1.2 (−4.06, 1.66)	0.411	−0.74 (−2.31, 0.83)	0.354	—	—	−0.65 (−1.56, 0.27)	0.165
>12 months	−0.21 (−2.45, 2.02)	0.851	−0.58 (−1.8, 0.63)	0.345	—	—	0.34 (−0.34, 1.03)	0.327
No experience	3.04 (0.3, 5.78)	0.03	0.17 (−1.29, 1.63)	0.821	—	—	−0.45 (−1.32, 0.43)	0.319
Living status								
Alone	Ref		Ref					

(Continued)

TABLE 3 (Continued)

Variables	Psychological impact		Social impact		Workplace		Health professional safety	
	β (95% CI)	*p*-value	*β* (95% CI)	*p*-value	*β* (95% CI)	*p*-value	*β* (95% CI)	*p*-value
With family	0.74 (−1.32, 2.8)	0.481	−1.1 (−2.17, −0.04)	0.042	—	—	—	—
With others	0.92 (−1.97, 3.8)	0.533	1.69 (0.2, 3.17)	0.026	—	—	—	—
Family numbers								
≤2	Ref		Ref					
3–5	−0.55 (−1.83, 0.73)	0.402	−0.14 (−0.83, 0.55)	0.695	—	—	—	—
6–7	1.63 (−0.37, 3.62)	0.11	0.62 (−0.44, 1.68)	0.249	—	—	—	—
≥7	2.02 (−1.23, 5.26)	0.222	1.13 (−0.68, 2.93)	0.221	—	—	—	—
Any family member/colleague/friend tested positive								
I do not know	Ref		Ref		Ref			
No	1.69 (−3.41, 6.8)	0.515	−0.09 (−2.21, 2.03)	0.931	−2.14 (−3.73, −0.56)	0.008	—	—
Yes	1.79 (−3.21, 6.8)	0.482	1.03 (−1.02, 3.07)	0.324	−1.57 (−3.08, −0.06)	0.042	—	—

Model 1: psychological impact adjusted with age, gender, marital status, education level, nationality, specialty, hospital, working with COVID-19 patient, working experience, living status, family members, any family member colleague. Model 2: social impact adjusted with age, marital status, education level, specialty, hospital, working with COVID-19 patient, working experience, living status, family members, any family member colleague. Model 3: workplace adjusted with age, marital status, specialty, hospital, any family member colleague. Model 4: health professional safety adjusted with age, gender, education level, working with COVID-19 patient, working experience.

diagnosing and treating COVID-19 patients, which exposes them to higher stress levels and emotional burdens. Difficult decisions regarding patient care, resource allocation, and ethical dilemmas further contribute to their psychological distress. The demanding nature of their profession, long working hours, and limited social engagement outside of work also play a role. Similar patterns have been observed in studies conducted in the United States (69) and Belgium (70), highlighting the global nature of physicians' challenges. These findings underscore the importance of targeted interventions to support physicians' well-being.

Participants without any prior experience with COVID-19 had significantly higher psychological and social impacts than those with previous exposure (71). This can be attributed to limited knowledge and understanding of the virus, increased anxiety, and uncertainty. The fear of contracting the virus and its potential consequences for personal and loved ones' health further contribute to the observed impact. Moreover, individuals living with others, such as roommates or colleagues, experienced more significant psychological and social impacts than those living with their families or being single (72). This suggests that the dynamics of shared living spaces and interactions with others may contribute to increased stress and emotional burden. The challenges of maintaining physical distance, addressing potential conflicts, and navigating shared spaces could all contribute to the observed impact.

While these findings provide valuable insights, comparing them with international, Middle Eastern and Arabic studies is challenging due to the novelty of this specific discovery. Therefore, this finding represents a novel discovery and highlights the need for further research to understand the underlying mechanisms and explore potential interventions.

5. Limitations

In spite of the findings presented in this study, it is important to acknowledge several limitations. The first limitation of this study is that the measurements, they were conducted after a peak of COVID-19. This timing may have influenced the psychosocial working conditions experienced during the data collection period. It is worth considering that the results might have varied if the measurements had been taken during peak hospitalization periods. The second limitation is that only participants who had given permission in 2019 were contacted to participate. This approach introduces the possibility of selection bias, as the sample may not accurately represent the entire population of interest.

6. Implications for the healthcare sector in Qatar and beyond

The findings of this study have several implications for the healthcare sector in Qatar and beyond. First, acknowledging the psychological distress that HCWs experience emphasizes the need for extensive mental health support services and interventions. Therefore, healthcare organizations in Qatar should prioritize providing resources, such as access to mental health services and tailored coping mechanisms, to address the specific needs of HCWs. Additionally, efforts should be made to foster supportive environments, promote peer support programs, and facilitate opportunities for HCWs to maintain social connections while adhering to safety protocols.

The study's findings regarding the perceived safety of HCWs highlight the effectiveness of infection control measures, PPE, regular testing, and vaccination in protecting HCWs. These measures should continue to be implemented and prioritized in Qatar's healthcare institutions to ensure the safety of HCWs. Furthermore, these findings are consistent with international best practices, emphasizing the importance of regular testing and vaccination in protecting HCWs from COVID-19. Qatar's adherence to these practices aligns with global recommendations and demonstrates its commitment to the safety and well-being of its healthcare workforce.

7. Conclusion

In conclusion, this study examined anxiety, depression, insomnia, psychological impact, social impact, workplace safety, and health professional safety among HCWs in Qatar during the COVID-19 pandemic. The findings revealed moderate levels of psychological distress, disruption to social connections, and perceived safety among HCWs. In addition, age, gender, marital status, educational level, nationality, and designation were identified as significant factors influencing the psychological and social impacts experienced by HCWs. The study also highlighted the importance of robust infection control measures, adequate PPE, regular testing, and vaccination in ensuring the safety and well-being of HCWs.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the corresponding author upon request.

Ethics statement

The studies involving humans were approved by Medical Research Center (MRC)/Hamad Medical Corporation/Qatar. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

Author contributions

AA-Q: Conceptualization, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing. KS: Formal analysis, Writing – review & editing. EM: Writing – review & editing. AN: Writing – review & editing. RA-Z: Writing – review & editing. AY: Supervision, Writing – review & editing. OA: Supervision, Writing – review & editing. AA-A: Supervision, Writing – review & editing.

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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.

Publisher's note

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Evolution of psychopathology, purpose in life, and moral courage in healthcare workers during the COVID-19 pandemic: a longitudinal study

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Introduction: Almost 2 years and five infection waves after the COVID-19 pandemic started, healthcare workers continued dealing with the pandemic situation and facing the health consequences and the mental health disorders it caused. This study aimed to evaluate the onset and progression of psychopathology as well as the role of predictor variables such as purpose in life and moral courage among healthcare workers during this time.

Materials and methods: This was a longitudinal prospective study carried out with 45 Spanish healthcare workers who answered two questionnaires, the first questionnaire in April–May 2020 (T1) and the second questionnaire in September–October 2021 (T2).

Results: Although 29.5% of the sample considered that their mental health had improved over this time, almost half of them (47.7%) said it had not changed, while 22.7% reported a decline in their mental health from the first time they were asked. Specifically, 46.8% presented anxiety, 23.4% depression, and 42.6% acute stress at T1, and 38.3% had anxiety, 17% depression, and 27.7% post-traumatic stress disorder at T2. Despite this, there were no differences between T1 and T2 anxiety scores ($p = 0.53$), although there was a decrease in depression ($p = 0.03$) and acute stress ($p = 0.02$) scores. Predictor variable outcomes such as purpose in life ($p = 0.88$) and moral courage ($p = 0.86$; $p = 0.38$) did not change over time, but when modelling the data, purpose in life predicted psychopathology at T1, which in turn affected the psychopathology results at T2.

Conclusion: This study showed that, although psychopathology decreased over the months, its prevalence remained high. Even though the purpose in life predicted psychopathology at T1, it seems that once the psychopathology is established (T2), the factors that would improve it would be different from the protective factors that prevented its establishment, which become secondary.

KEYWORDS

anxiety, burnout, COVID-19, depression, longitudinal, moral courage, post-traumatic stress disorder, purpose in life

1. Introduction

In late 2019, a new coronavirus variant called SARS-CoV-2, responsible for COVID-19 disease, was first detected in Wuhan (China); it changed societal behaviour and soon overtook health systems worldwide. One of the most affected populations was healthcare workers (HCWs), who had to face both work and personal COVID-19-related difficulties (1).

At the beginning of the pandemic, HCWs had to deal with exposure to an unknown virus, a high infection rate, and a lack of the required personal protective equipment (2, 3). They also faced staffing shortages, which in many cases resulted in overwhelming workloads and increased working hours (4). As a result, HCWs worldwide have been prone to developing psychopathology and burnout (5, 6), a dysfunctional response to prolonged work stress characterised by the appearance of emotional exhaustion, depersonalisation, and low personal fulfillment (7) that has also been associated with the development of psychopathology (8). In this regard, coping styles may have played a relevant role in the burnout, and thus the psychopathology of HCWs during COVID-19, as avoidance-oriented and maladaptive coping predicted burnout (9). One of the most affected countries during the early phases of the COVID-19 pandemic was Spain, where HCWs showed high rates of anxiety, depression, post-traumatic stress disorder (PTSD), and medium and high levels of burnout (7, 10). In addition to their work, HCWs also had to cope with personal and family concerns such as social isolation, managing the work-life balance, and the risk of transmitting the virus to their loved ones. In fact, a previous study demonstrated that the latter would be the main reason why HCWs would not go to work (11), and one of the concerns that has been responsible for the negative impact that the pandemic has had on their mental health, resulting in a high prevalence of anxiety, depression, and acute stress (12).

In the fifth wave, the situation changed: the initial shortage of personnel and resources improved, the workload decreased, new information on SARS-CoV-2 became available, and society recovered most of its usual activities (13, 14). However, several longitudinal studies from remarkably different countries, such as Singapore, Germany, or Australia, have shown long-term psychopathology and burnout (15–17). COVID-19 and long COVID, a condition involving persistent long-term symptoms of SARS-CoV-2 infection, have also been associated with neuropsychiatric symptoms such as anxiety or depression (18). In this regard, there are precedents for long-lasting mental health problems among HCWs due to epidemics. For example, 1 year after the SARS outbreak, HCWs with high-risk exposure to SARS during the outbreak continue to show higher levels of perceived stress than those with low-risk exposure. This perceived stress was associated with high levels of anxiety, depression, and post-traumatic stress scores (19).

The causes of the onset, evolution, and maintenance of psychopathology are varied and its mechanisms are complicated. However, some dimensions related to the characteristics of HCWs may have had an influence, including purpose in life (PIL) and moral courage (MC). PIL refers to the perception an individual has about the purpose and value of their life (12). Several studies prior to the COVID-19 pandemic have demonstrated the predictive role of PIL in the development of psychopathology (20, 21), and during the pandemic, high levels of PIL were associated with a lower prevalence of psychopathology in HCWs (12). MC is defined as the ability to face danger or social disapproval when performing what one believes to be their duty (22). Paradoxically, not being able to act in accordance with these moral values may generate "moral distress" and, in turn, favour the onset of psychopathology (23). The role of MC and moral distress may have been especially important in the early stages of the COVID-19 pandemic when, because of the lack of resources, HCW had to prioritise which patients received treatment or even decide to risk their own health to help patients (24).

Although several studies have registered the prevalence of mental disorders such as anxiety, depression, PTSD, and burnout during epidemics and pandemics, none have related the longitudinal evolution of psychopathology as a function of factors such as PIL or MC. Therefore, in this current study, we aimed to explore the evolution of the mental health status of HCWs throughout the pandemic in terms of these predictors and provide a broader perspective on this issue. We hypothesised that (1) psychopathology would decrease in HCWs over time; (2) the scores for PIL and MC at T1 would predict the psychopathology and burnout levels measured in the HCWs at T2.

2. Materials and methods

Given the research objective, we designed an observational prospective study. A Spanish cohort of 47 HCWs (including physicians, nurses, nursing assistants, administrative staff, etc.) was recruited by convenience sampling from the Consorcio Hospitalario Provincial de Castellón (Spain), the second largest hospital in the city. The G*Power software (v3.1.9.4) was used to calculate that, considering an expected effect size of $d = 0.2$, an alpha of 5%, and a beta of 5%, the critical sample size was 41 and a total sample size of 67 would be required when performing the sign test.

The first assessment was obtained from a previous study (12) that evaluated the sample in April–May 2020 (T1), during the peak of the first wave of COVID-19 in Spain. The second assessment was completed by the same sample in September–October 2021 (T2), just after the fifth wave of COVID-19.

After signing their informed consent, the study participants completed a series of self-administered questionnaire-based instruments in Spanish. All these instruments have been previously validated for Spanish speakers and have already been used in the COVID-19 research context (7, 12, 22). The questionnaires could be completed online or by hand. In T1, we distributed both the online and handwritten versions in each hospital department. Participants were asked for permission to be contacted again after a period of time. In T2, we re-contacted participants by email and sent them the online version, as well as providing the handwritten version in the same hospital departments for those who preferred this option.

First, they completed a sociodemographic questionnaire that asked about their age, sex, marital status, religiosity, professional category, role of responsibility, history of physical conditions or mental health disorders, and whether they smoked.

As independent and predictor variables, personal and family/friends' exposure to SARS-CoV-2 was assessed using a questionnaire for this purpose (12); PIL was analysed using the PIL scale (25), and a dichotomous variable was also calculated to differentiate between individuals who had a sense of PIL and those who did not [cutoff point (CP) = 113]; and MC was assessed with the Moral Courage Scale for Physicians (MCSP) (26) and the Professional Moral Courage Scale (PMCS) (27).

Variables that evaluated psychopathology and burnout were considered dependent variables. Total scores and dichotomous variables for these were calculated, and the participants were classified into individuals that exceeded the CP of each scale and those that did not. Anxiety was assessed using the Beck Anxiety Inventory (28) (BAI; CP = 8), depression using the Beck Depression Inventory (29) (BDI-II; CP = 14), acute stress disorder using the Acute/Post-Traumatic Stress Disorder Scale (12) (ETEA-PT; CP = 9), and PTSD at T2 by considering the additional ETEA-PT questionnaire item that asks if the symptoms lasted more than 1 month. Drug abuse was assessed with the Drug Abuse Screening Test-10 (30) (DAST-10; CP = 1) and alcohol abuse was tested employing the Alcohol Use Disorders Identification Test (31) (AUDIT; CP for women = 6, CP for men = 8). The Maslach Burnout Inventory-Human Services Survey (MBI-HSS) (32) was used to evaluate the presence of burnout at T2, defining high levels either of emotional exhaustion (CP ≥27) or depersonalisation (CP ≥10) (33).

The SPSS software (version 27) for Microsoft (IBM Corp., Armonk, NY), a reliable and valid data analysis tool (34), was used for all the statistical analyses. After the exploratory (normality, independence, homoscedasticity, linearity, and non-collinearity) and descriptive studies, the variables were compared using the sign test for quantitative variables and the Pearson chi-square test for categorical variables. Generalized linear models and logistic regressions were created for the dependent variables, introducing personal and family/friends' exposure to SARS-CoV-2, PIL, PMCS, and psychopathology scale scores at T1. MCSP was excluded from the regression analyses due to collinearity problems with PMCS, as both measure variables were related to MC and therefore significantly correlated ($r = 0.417$; $p = 0.007$). Finally, the data were modelled using the PROCESS plugin (v3.4) for SPSS, a well-known tool for this purpose (35). The use of these programmes is supported by current studies (7, 12, 22).

The ethical principles set out in the Declaration of Helsinki and by the Council of Europe Convention were followed, and the informed consent of all participants was obtained. Moreover, data confidentiality was guaranteed according to the General Data Protection Regulation (GDPR; 2018). This study was authorised by the Institutional Review Board of the Consorcio Hospitalario Provincial de Castellón (ref. A-15/04/20) and the Clinical Research Ethics Committee at the Cardenal Herrera-CEU University (ref. CEI20/068).

3. Results

3.1. Sociodemographic characteristics

Table 1 shows the sociodemographic characteristics of the sample.

Of the total of 47 Spanish HCWs evaluated, the majority were women (70.2%; $n = 33$), and the mean (M) age was 43.8 years. Almost 60% of the sample were married (59.6%; $n = 28$), and around half reported being practicing Christians, i.e., religious (53.2%; $n = 25$). Regarding their professional category, the sample mostly comprised physicians (34%; $n = 16$), nurses (31.9%; $n = 15$), and nursing assistants (12.8%; $n = 6$), followed by administrative staff (6.4%, n = 3). Of these, 17% ($n = 8$) held positions of responsibility. In terms of their health, 28.3% ($n = 13$) suffered from a physical condition, 21.3% ($n = 11$) had a history of having suffered from a mental disorder, and 23.9% ($n = 11$) were smokers.

TABLE 1 Sociodemographic characteristics of the study sample.

	$n = 45$ % (n)/M (SD)
Age	43.8 (11.8)
Sex (female)	70.2 (33)
Marital status	
Married	59.6 (28)
Single	27.7 (13)
Divorced	10.6 (5)
Widowed	2.1 (1)
Religiosity (yes)	53.2 (25)
Professional category	
Physician	34 (16)
Nurse	31.9 (15)
Nursing assistant	12.8 (6)
Administrative staff	6.4 (3)
Psychologist	2.4 (3)
Ancillary nurse	2.1 (1)
Pharmacist	2.1 (1)
Security staff	2.1 (1)
Occupational therapist	2.1 (1)
Social worker	2.1 (1)
Role of responsibility	17 (8)
History of a physical condition	28.3 (13)
History of a mental health disorder	21.3 (11)
Smoker	23.9 (11)

n, number of participants; %, percentage; M, mean; SD, standard deviation.

No significant differences in sociodemographic characteristics were observed between T1 and T2.

3.2. Evolution of SARS-CoV-2 exposure, purpose in life, and moral courage

Table 2 shows the evolution of personal and family/friends' exposure to SARS-CoV-2, PIL, and MC at T1 and T2.

3.2.1. Personal and family/friends' exposure to SARS-CoV-2

HCWs reported lower personal and family/friends' exposure to SARS-CoV-2 at T1 [Median (Me) = 0.5; interquartile range (IQR) = 2] than at T2 (Me = 1; IQR = 2), although this finding did not reach significance ($p = 0.07$).

3.2.2. Purpose in life and moral courage

Some 53.2% ($n = 25$) of the sample presented low PIL at T1 and 55.3% ($n = 26$) showed low PIL at T2. Thus, 42.6% ($n = 20$) presented low PIL at both T1 and T2, and 10.6% ($n = 5$) presented low PIL at T1 but not at T2. In turn, 34% ($n = 16$) of the sample showed high PIL at

TABLE 2 COVID-19 exposure, purpose in life, moral courage, psychopathology, and burnout at T1 and T2.

	T1 $n = 45$ % (n)/Me (IQR)	T2 $n = 45$ % (n)/Me (IQR)	p-value
Personal and family/ friends' exposure to SARS-CoV-2	0.5 (2)	1 (2)	0.07
PIL (score)	111 (19)	110 (21)	0.88
PIL (yes)	53.2 (25)	55.3 (26)	
MCSP	8 (2)	8 (2)	0.38
PMCS	11 (2)	11 (1.25)	0.86
BAI	5.5 (12.25)	5 (10)	0.53
Anxiety (yes)	47.8 (22)	38.3 (18)	
BDI-II	7 (11)	4 (11)	0.03*
Depression (yes)	23.4 (11)	17 (8)	
ETEA-PT	6 (9)	4 (8)	0.02*
Acute stress (yes)	42.6 (20)	27.7 (13)	
PTSD (yes)		27.7 (13)	
DAST-10	0 (0)	0 (0)	0.62
Drug (yes)	6.4 (3)	6.4 (3)	
AUDIT	2.5 (2.1)	2.5 (3)	1
Alcohol (yes)	10.6 (5)	6.4 (3)	
Psychopathology (score)	20 (31)	18 (26)	0.02*
Al least one mental disorder (yes)	61.7 (29)	53.2 (25)	
MBI-HSS		−25 (44)	
Burnout (yes)		34 (16)	

n, number of participants; %, percentage; Me, median; IQR, interquartile range; T1, first assessment; T2, second assessment; PIL, purpose in life; MCSP, Moral Courage Scale for Physicians; PMCS, Professional Moral Courage Scale; BAI, Beck Anxiety Inventory; BDI-II, Beck Depression Inventory; ETEA-PT, Acute/Post-Traumatic Stress Disorder Scale; PTSD, Post-Traumatic Stress Disorder; DAST-10, Drug Abuse Screening Test-10; AUDIT, Alcohol Use Disorders Identification Test; MBI-HSS, Maslach Burnout Inventory-Human Services Survey. *$p < 0.05$.

both T1 and T2.- No significant differences were found between T1 and T2 PIL scores (Me = 111, IQR = 19 vs. Me = 110, IQR = 21; $p = 0.88$).

No significant differences were found between T1 and T2 MCSP (Me = 8, IQR = 2 vs. Me = 8, IQR = 2; $p = 0.38$) or PMCS scores (Me = 11, IQR = 2 vs. Me = 11, IQR = 1.25; $p = 0.86$).

3.3. Evolution of self-perceived mental health, psychopathology, and burnout

3.3.1. Self-perceived mental health and psychopathology

Table 2 shows the evolution of psychopathology at T1 and T2.

Almost half of the sample (47.7%; $n = 21$) said there had been no changes in their mental health since they were first asked at T1, while 22.7% ($n = 10$) reported a decline. Lastly, 29.5% ($n = 13$) considered that their mental health had improved over time. When stratifying these results to those with psychopathology only at T2 or both T1 and T2, 40.9% ($n = 9$) said there had been no changes, 40.9% ($n = 9$) cited a decline, and 18.2% ($n = 4$) reported an improvement.

In turn, 47.8% ($n = 22$) of the sample presented anxiety at T1, while 38.3% ($n = 18$) reported it at T2. Thus, 28.3% ($n = 13$) presented anxiety at both T1 and T2, and 19.5% ($n = 9$) that had presented anxiety at T1 did not report it at T2. Nonetheless, most of the sample (43.5%; $n = 20$) said they had not experienced anxiety in either T1 or T2. Furthermore, no significant differences were found between T1 and T2 BAI scores (Me = 5.5, IQR = 12.25 vs. Me = 5, IQR = 10; $p = 0.53$).

Regarding depression, 23.4% ($n = 11$) of the sample presented it at T1 and 17% ($n = 8$) at T2. Thus, 14.9% ($n = 7$) had remained depressed at both T1 and T2, 8.5% ($n = 4$) that had presented depression in T1 did not report at T2, and 74.5% ($n = 35$) said they were not depressed at either time point. Nevertheless, the BDI-II scores were significantly decreased from T1 to T2 (Me = 7, IQR = 11 vs. Me = 4; IQR = 11; $p = 0.03$).

Some 42.6% ($n = 20$) of the sample presented acute stress at T1, and 27.7% ($n = 13$) reported it at T2. Thus, 19.1% ($n = 9$) of the sample presented it at both T1 and T2, and 8.5% ($n = 4$) who did not have acute stress at T1 showed it at T2. Therefore, more than a quarter of the sample (27.7%; $n = 13$) stated at T2 that they had had acute stress for more than a month, meaning that they had developed PTSD. Also of note is that 48.9% ($n = 23$) of the sample did not show acute stress at any time and that 23.4% ($n = 11$) with acute stress at T1 did not present it at T2. In fact, scores in the ETEA-PT decreased from T1 to T2 (Me = 6, IQR = 9 vs. Me = 4, IQR = 8; $p = 0.02$).

In terms of the use of drugs, 6.4% ($n = 3$) reported having done so at T1, and 6.4% ($n = 3$) reported at T2. Thus, 4.3% ($n = 2$) said they used drugs at both T1 and T2. However, most of the sample did not report drug abuse (97.7%; $n = 43$) in either T1 or T2. Indeed, there were no significant differences in the DAST-10 scores between T1 and T2 (Me = 0, IQR = 0 vs. Me = 0, IQR = 0; $p = 0.62$).

Regarding alcohol abuse, there was 10.6% ($n = 5$) of abuse reported at T1 and 6.4% ($n = 3$) at T2. Thus, 4.3% ($n = 2$) presented this problem at both T1 and T2, although most of the sample did not report alcohol abuse (93%; $n = 40$) in either T1 or T2. Moreover, there were no significant differences in the AUDIT scores between T1 and T2 (Me = 2.5, IQR = 2.1 vs. Me = 2.5, IQR = 3; $p = 1$).

Considering all the aforementioned, 61.7% ($n = 29$) had at least one mental disorder at T1, while 53.2% ($n = 25$) at T2. Similarly, higher overall psychopathology scores were reported at T1 than at T2 (Me = 20, IQR = 31 vs. Me = 18, IQR = 26; $p = 0.02$).

3.3.2. Burnout

Finally, in reference to burnout, at T2, 17% ($n = 8$) showed high scores in emotional exhaustion (Me = 12, IQR = 18), 27.7% ($n = 13$) had high scores in depersonalisation (Me = 5, IQR = 9), and 23.4% ($n = 11$) presented low scores in personal accomplishment (Me = 41, IQR = 11) subscales. Thus, 34% ($n = 16$) reached the CP for the depersonalisation or emotional exhaustion subscales, which was the criterion to be considered as having burnout (Table 2).

3.4. Generalized linear models, logistic regressions, and psychopathology data models

Table 3 shows the generalized linear models predicting psychopathology at T1.

T1 PIL scores predicted T1 BAI [OR = 0.67; 95% CI (0.56, 0.81); $p < 0.001$], BDI-II [OR = 0.67; 95% CI (0.57, 0.79); $p < 0.001$], and ETEA-PT scores [OR = 0.72; 95% CI (0.64, 0.80); $p < 0.001$]. Thus, it also predicted T1 overall psychopathology scores [OR = 0.30; 95% CI (0.18, 0.49); $p < 0.001$]. On the other hand, T1 personal and family/friends' exposure to SARS-CoV-2 scores predicted T1 BAI [OR = 8.01; 95% CI (2.17, 29.53); $p = 0.002$], BDI-II [OR = 7.67; 95% CI (1.27, 46.32); $p = 0.02$], and ETEA-PT scores [OR = 5.76; 95% CI (2.14, 15.53); $p = 0.001$]. Thus, it also predicted T1 overall psychopathology scores [OR = 328.84; 95% CI (8.87, 12,184.10); $p = 0.002$].

Table 4 shows the generalized linear models and logistic regression predicting psychopathology and burnout at T2.

T1 PIL scores predicted T2 BAI [OR = 0.68; 95% CI (0.54, 0.85); $p = 0.001$], BDI-II [OR = 0.72; 95% CI (0.59, 0.87); $p = 0.001$], and ETEA-PT scores [OR = 0.80; 95% CI (0.70, 0.91); $p = 0.001$]. Thus, it also predicted T2 overall psychopathology scores [OR = 0.38; 95% CI (0.23, 0.62); $p < 0.001$]. In turn, T1 PIL scores predicted T2 MBI-HSS scores [OR = 0.47; 95% CI (0.32, 0.70); $p < 0.001$], emotional exhaustion [OR = 0.69; 95% CI (0.56, 0.86); $p = 0.001$], depersonalisation [OR = 0.86; 95% CI (0.76, 0.96); $p = 0.01$], and personal accomplishment [OR = 1.26; 95% CI (1.12, 1.41); $p < 0.001$] burnout subscales scores.

However, when T1 scores of each questionnaire were introduced in the regressions, T1 BAI predicted T2 BAI scores [OR = 1.90; 95% CI (1.46, 2.49); $p < 0.001$]; T1 BDI-II predicted T2 BDI-II scores [OR = 1.88; 95% CI (1.24, 2.85); $p = 0.003$]; T1 ETEA-PT predicted T2 ETEA-PT [OR = 1.36; 95% CI (1.01, 1.83); $p = 0.04$] and T2 PTSD scores [OR = 1.14; 95% CI (1.02, 1.27); $p = 0.01$]; T1 DAST-10 predicted T2 DAST-10 scores [OR = 2.98; 95% CI (2.44, 3.64); $p < 0.001$]; T1 AUDIT predicted T2 AUDIT scores [OR = 1.70; 95% CI (1.40, 2.06); $p < 0.001$]; and T1 psychopathology predicted T2 overall psychopathology scores [OR = 1.84; 95% CI (1.33, 2.54); $p < 0.001$].

We modelled the data according to the results obtained in the generalized linear models, and those with best fit were included in Figure 1. Model 1 shows the reciprocal influence between T1 PIL and T1 BAI [$B = -0.41$; 95% CI (-0.55, -0.28); $p < 0.001$; $B = -1.10$; 95% CI (-1.46, -0.74); $p < 0.001$], and how T1 BAI predicted T2 BAI [$B = 0.53$; 95% CI (0.20, 0.85); $p = 0.002$]. Model 2 shows the reciprocal influence between T1 PIL and T1 BDI-II [$B = -0.41$; 95% CI (-0.53, -0.29); $p < 0.001$; $B = -1.28$; 95% CI (-1.64, -0.92); $p < 0.001$], and how T1 BDI-II predicted T2 BDI-II [$B = 0.50$; 95% CI (0.17, 0.82); $p = 0.003$]. Similarly, model 3 shows the reciprocal influence between T1 PIL and T1 psychopathology [$B = -0.41$; 95% CI (-0.55, -0.28); $p < 0.001$; $B = -1.27$; 95% CI (-1.61, -0.93); $p < 0.001$]. In addition, T1 psychopathology predicted T2 overall psychopathology scores [$B = 0.49$; 95% CI (0.24, 0.74); $p < 0.001$].

TABLE 3 Generalized linear models predicting psychopathology at T1.

Response	Predictors[a]	OR (95% confidence interval) *p*-value
BAI	PIL (T1)	0.67 (0.56, 0.81); $p < 0.001$***
	Personal and family/friends' exposure to SARS-CoV-2 (T1)	8.01 (2.17, 29.53); $p = 0.002$**
BDI-II	PIL (T1)	0.67 (0.57, 0.79); $p < 0.001$***
	Personal and family/friends' exposure to SARS-CoV-2 (T1)	7.67 (1.27, 46.32); $p = 0.02$*
ETEA-PT	PIL (T1)	0.72 (0.64, 0.80); $p < 0.001$***
	Personal and family/friends' exposure to SARS-CoV-2 (T1)	5.76 (2.14, 15.53); $p = 0.001$**
Psychopathology	PIL (T1)	0.30 (0.18, 0.49); $p < 0.001$***
	Personal and family/friends' exposure to SARS-CoV-2 (T1)	328.84 (8.87, 12,184.10); $p = 0.002$**

OR, odds ratio; PIL, purpose in life; BAI, Beck Anxiety Inventory; BDI-II, Beck Depression Inventory; ETEA-PT, Acute/Post-Traumatic Stress Disorder Scale; DAST-10, Drug Abuse Screening Test-10; AUDIT, Alcohol Use Disorders Identification Test. *$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

[a]Personal and family/friends' exposure to SARS-CoV-2, PMCS, and PIL scores at T1 were introduced as predictor variables.

4. Discussion

This study aimed to longitudinally evaluate the evolution of the psychopathology presented by HCWs after the different waves of COVID-19 infections and to elucidate the role of predictors such as PIL or MC.

According to our first hypothesis, psychopathology has decreased since the beginning of the pandemic. However, this decrease is lower than would be expected, taking into account that the conditions of HCWs in the fifth wave have generally improved, with more information about the virus, personnel, resources, and vaccines available, fewer infections, a reduced workload, etc., over time. This fact coincides with the impressions given by the HCWs in the questionnaires, with most stating that their mental health had not improved (47.7%) or that it had worsened (22.7%). Nevertheless, it was striking that approximately 20% of HCWs who still had psychopathology at T2 said their mental health had improved, which is indicative of the severity of the psychopathology they initially had.

Considering the above, there may be several explanations for why there has not been a greater improvement in their mental health as time passed. The main reason may be that in the fifth wave, the pandemic was still ongoing, and even with the improving conditions, insufficient time had passed for the psychopathology to have subsided. In fact, a longitudinal study conducted in the general population (36) stated that 2 years after the onset of the COVID-19 pandemic, psychopathology scores had not yet returned to pre-pandemic scores. Moreover, a study conducted during the SARS-CoV-1 epidemic (37) showed that, 1 year after the epidemic, psychopathology prevalence was higher among HCWs than in the general population. Another research study (38) noted that further reduction in the psychopathology of HCWs may not have occurred due to the high persistence of baseline mental health disorders (in our study, more than two-thirds of those with disorders at T1 were still suffering from

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TABLE 4 Generalized linear models and logistic regression predicting psychopathology and burnout at T2.

Response	Predictors[a]	OR (95% confidence interval) *p*-value	Predictors[b]	OR (95% confidence interval) *p*-value
BAI	PIL (T1)	0.68	BAI (T1)	1.90
		(0.54, 0.85)		(1.46, 2.49)
		$p = 0.001$**		$p < 0.001$***
BDI-II	PIL (T1)	0.72	BDI-II (T1)	1.88
		(0.59, 0.87)		(1.24, 2.85)
		$p = 0.001$**		$p = 0.003$**
ETEA-PT	PIL (T1)	0.80	ETEA-PT (T1)	1.36
		(0.70, 0.91)		(1.01, 1.83)
		$p = 0.001$**		$p = 0.04$*
PTSD	—	—	ETEA-PT (T1)	1.14
				(1.02, 1.27)
				$p = 0.01$*
DAST-10	—	—	DAST-10 (T1)	2.98
				(2.44, 3.64)
				$p < 0.001$***
AUDIT	—	—	AUDIT (T1)	1.70
				(1.40, 2.06)
				$p < 0.001$***
Psychopathology	PIL (T1)	0.38	Psychopathology (T1)	1.84
		(0.23, 0.62)		(1.33, 2.54)
		$p < 0.001$***		$p < 0.001$***
MBI-HSS	PIL (T1)	0.47	—	—
		(0.32, 0.70)		
		$p < 0.001$***		
MBI-HSS—emotional exhaustion	PIL (T1)	0.69	—	—
		(0.56, 0.86)		
		$p = 0.001$**		
MBI-HSS—depersonalisation	PIL (T1)	0.86	—	—
		(0.76, 0.96)		
		$p = 0.01$*		
MBI-HSS—personal accomplishment	PIL (T1)	1.26	—	—
		(1.12, 1.41)		
		$p < 0.001$***		

OR, odds ratio; PIL, purpose in life; BAI, Beck Anxiety Inventory; BDI-II, Beck Depression Inventory; ETEA-PT, Acute/Post-Traumatic Stress Disorder Scale; PTSD, Post-Traumatic Stress Disorder; DAST-10, Drug Abuse Screening Test-10; AUDIT, Alcohol Use Disorders Identification Test; MBI-HSS, Maslach Burnout Inventory-Human Services Survey. *$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

[a]Personal and family/friends' exposure to SARS-CoV-2, PMCS, and PIL scores at T1 were introduced as predictor variables.

[b]Personal and family/friends' exposure to SARS-CoV-2, PMCS, PIL, and overall psychopathology scores at T1 were introduced as predictor variables.

them at T2) and the incidence of new mental disorders during subsequent waves of COVID-19 (in our study, one in three HCWs without mental disorders at T1 developed one at T2).

Furthermore, certain elements may have worsened throughout the COVID-19 pandemic, such as personal and family/friends' exposure to SARS-CoV-2. In that regard, this study and previous studies have shown how this type of exposure was a relevant predictor of HCWs presenting psychopathology at the onset of the pandemic (7, 12). While this exposure increased, a study conducted during the first to third wave of COVID-19 in Spain (39) showed that fear of COVID-19 contagion, which was related to the presence of anxiety and depressive symptoms (40), decreased over time. Thus, fear of contagion would be an element to take into account when assessing the role of exposure to SARS-CoV-2 in the development of psychopathology.

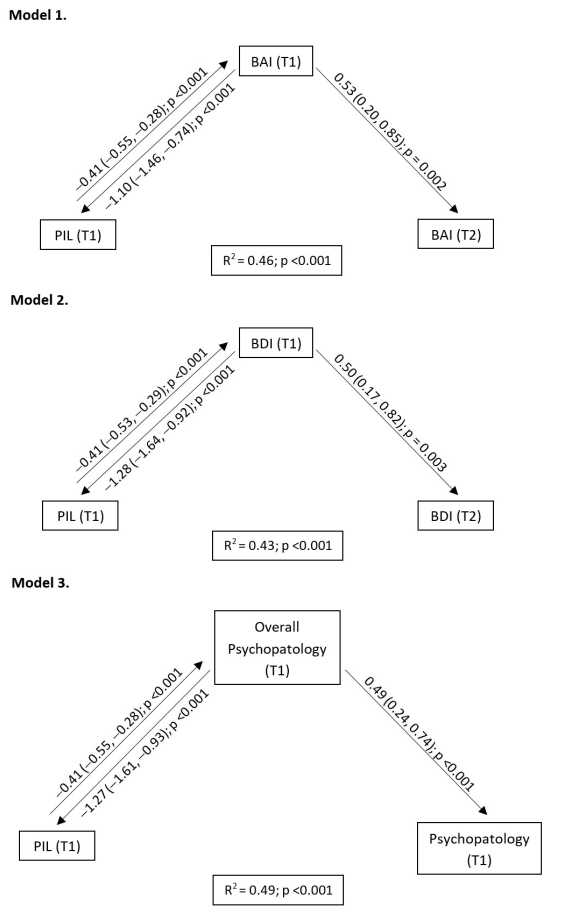

FIGURE 1
Explanatory models of the psychopathology at T1 and T2. PIL, purpose in life; BAI, Beck anxiety inventory; BDI-II, Beck depression inventory.

Although multiple studies have analysed the role of extrinsic characteristics such as those discussed above (exposure to SARS-CoV-2, availability of vaccines, work burden, etc.), few have considered intrinsic characteristics like PIL or MC in the appearance of psychopathology in HCWs during the SARS-CoV-2 pandemic. In this sense, our second hypothesis was partially fulfilled.

We found that a high PIL predicted lower anxiety, depression, and acute stress at T1 and T2, and lower burnout scores at T2, coinciding with previous cross-sectional studies conducted during the COVID-19 pandemic (7, 12, 22). Indeed, PIL is framed within the salutogenic model, which is a global orientation to perceive the world as comprehensible, manageable, and meaningful despite the stressful situations one encounters, thus acting as a coping mechanism (41). However, the predictive role of PIL on psychopathology at T2 disappeared when psychopathology at T1 was introduced, which became the only predictor of psychopathology at T2. Thus, PIL would be the main predictor that influences the onset of psychopathology but not its maintenance, where other factors that have not been studied in this work may have a relevant influence. For all of the above, MC may not have played any role.

Finally, it is important to mention the limitations of this current work. First, the main shortcoming was the lack of assessment of the occupational exposure of HCWs to SARS-CoV-2. However, by the time this study was completed, the hospital in which it was conducted had already gone through several waves of cases within the context of the COVID-19 pandemic, and so most HCWs had already been exposed. Furthermore, burnout was only assessed at T2, so burnout at T1 is unknown. However, given that burnout is by definition a dysfunctional response to prolonged work stress, the prevalence that would have been collected at such an early stage as T1 would predictably correspond to the idiosyncratic burnout of the Spanish healthcare system and not to the overload derived from the pandemic, which would not yet have occurred. Regarding PIL and MC, we could not compare our results with those of other authors because, to the best of our knowledge, this is the first study to longitudinally examine these dimensions in the development of psychopathology and burnout in HCWs during COVID-19. In fact, existing studies are on the meaning in life (which is a much broader concept) (42) or on moral distress (which is a different term than MC) (43). On the other hand, this research was carried out at a single hospital, which, together with the small sample size, may have reduced its external validity compared to multicentre studies of larger sample sizes. Although the inclusion of both clinical and non-clinical staff as HCWs may be considered a limitation, we would like to point out that non-clinical staff continued to work and have contact with patients during the COVID-19 pandemic, as did clinical staff. Therefore, we want to recognise their work during the pandemic but also acknowledge their differences from clinical staff.

5. Conclusion

This study showed that even though the psychopathology caused by the COVID-19 pandemic in HCWs has decreased as time has passed, its prevalence is still high. Personal and family/friends' exposure to SARS-CoV-2 and purpose in life have been shown to be predictors of psychopathology at the beginning of the pandemic. Although purpose in life predicted the onset of psychopathology, it seems that once the psychopathology is established, the factors responsible for its maintenance will be others. For this very reason, the role of moral courage may have been overshadowed by other factors, such as purpose in life. The present research could be useful to get an idea of the evolution of the mental health of healthcare workers in future epidemics/pandemics and the importance of strengthening the purpose in life and moral courage of workers to avoid initial psychopathology and change its tendency during a health crisis. Finally, it also supports future longitudinal studies on the evolution of post-pandemic psychopathology and the role of purpose in life and moral courage on it.

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 humans were approved by Investigation Commission at the Provincial Hospital Consortium in Castellon (ref. A-15/04/20) and the Clinical Research Ethics Committee at the Cardenal Herrera-CEU University (ref. CEI20/068). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

IE: Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. LR-J: Data curation, Investigation, Writing – original draft, Writing – review & editing. AB: Conceptualization, Formal analysis, Methodology, Supervision, Writing – review & editing. LAR-B: Data curation, Investigation, Writing – review & editing. MO'H: Data curation, Investigation, Writing – review & editing. GH: Conceptualization, Funding acquisition, Project administration, Supervision, Writing – review & editing.

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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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Emotional intelligence as a predictor of job satisfaction: the mediating role of conflict management in nurses

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Background: Emotional Intelligence (EI) has emerged as a pivotal factor in work effectiveness and well-being within the healthcare domain. Specifically, its significance is heightened in the nursing sector, where emotional and social demands are high. Additionally, job satisfaction and conflict management are recognized as vital predictors of patient care service quality. However, there is a dearth of research addressing the mediating role of conflict management in the relationship between EI and job satisfaction within a nursing context.

Objective: This study aims to assess the mediating role of conflict management in the relationship between emotional intelligence and job satisfaction among nurses.

Methods: The STROBE checklist for cross-sectional studies was followed. A cross-sectional and explanatory design was employed. Data were collected using self-reported questionnaires to measure emotional intelligence, conflict management, and job satisfaction. Structural Equation Modeling (SEM) was conducted to test the proposed hypotheses.

Results: A total of 208 nurses aged between 18 and 65 years participated ($M = 41.18$, $SD = 8.942$). The findings confirmed a positive relationship between emotional intelligence and conflict management ($\beta = 0.64$, $p < 0.001$). Similarly, a positive relationship between conflict management and job satisfaction was observed ($\beta = 0.37$, $p < 0.001$). Moreover, conflict management was validated as a mediator in the relationship between emotional intelligence and job satisfaction ($\beta = 0.77$, $p = 0.002$).

Conclusion: The study underscores the importance of emotional intelligence and conflict management as predictors of job satisfaction in nurses. The results suggest that interventions aimed at enhancing emotional intelligence might be an effective avenue for increasing job satisfaction, especially when conflict management strategies are integrated.

KEYWORDS

emotional intelligence, conflict management, job satisfaction, nurses, mediation

1. Introduction

In the realm of nursing, Emotional Intelligence (EI) has surfaced as a topic of mounting interest due to its impact on a range of job outcomes and its significance in professions marked by intense emotional demands and interactions with patients and colleagues (1, 2). EI has been linked with job performance, job satisfaction, organizational commitment, and the mental health of nurses (3, 4). In a field where job satisfaction is pivotal for efficiency and the quality of healthcare (5–7), conflict management emerges as a key component. Recognized as essential within nursing, conflict management has been closely tied with EI and job satisfaction (8–10). Conflicts in the workplace can adversely impact productivity, patient care, mental health of the healthcare staff, and the quality of services rendered (11, 12). Therefore, the ability to effectively manage conflicts among healthcare personnel becomes integral to enhancing job satisfaction and delivering timely, efficient, and patient-centered care (13).

Particularly in challenging contexts such as in Peru, job satisfaction among nurses is pertinent as they grapple with resource scarcity, excessive workloads, and high emotional burdens (14, 15). Additionally, cultural and organizational factors, including gender expectations and healthcare system hierarchies, influence the job satisfaction of Peruvian nurses (16, 17). In this respect, job satisfaction is shaped by both intrinsic and extrinsic factors (18), playing a crucial role in staff retention, work commitment, and patient care quality (19, 20). Addressing these challenges and promoting job satisfaction among nursing personnel necessitates viewing EI as a critical skill. EI not only equips nurses to handle stress better and make informed decisions, but also bolsters organizational commitment, reduces burnout and turnover rates, ultimately contributing to safer and higher-quality patient care (21). Given the heightened stress and emotional demands in healthcare, EI becomes pivotal in enhancing professional competence, mental well-being, and effective stress and conflict management, benefiting both healthcare professionals and patients (22).

The relationship between EI and job satisfaction in nursing is intricate and multifaceted. EI serves as a catalyst for other paramount factors such as empathy and communicative satisfaction, which in turn influence work well-being (23). In an environment where nurses encounter a broad spectrum of emotional experiences, EI becomes vital in balancing professional objectivity with empathy and care, thereby enhancing job satisfaction and organizational commitment (24). EI not only elevates overall clinical performance but can also be instrumental in retaining professionals within the nursing domain (25).

In this backdrop, conflict management stands out as a critical element in amplifying the relationship between EI and job satisfaction among nurses. Conflict management styles, like collaborative and integrative approaches, are indispensable in addressing emotional challenges and tensions within the medical care setting. Conflict resolution strategies, such as structured training and team-building, are pivotal tools in maintaining a healthy work environment and fostering job satisfaction (26). Moreover, EI in nurse managers not only enhances their conflict-handling capabilities but also aids in their professional development and commitment to healthcare management (27).

1.1. Literature review

1.1.1. Emotional intelligence

Emotional intelligence (EI) is a multidimensional construct that refers to the ability to recognize, understand, use, and regulate emotions in oneself and others (28). EI has been linked to a number of advantageous outcomes in the workplace, including job performance, job satisfaction, mental health, and healthcare quality (3, 29). As a result, emotional intelligence may be crucial in the health services industry since nursing practitioners engage with customers more, must adhere to patient care, and bear a bigger emotional weight (3, 30).

EI and conflict management have been linked in studies conducted in a variety of settings, including the workplace and classroom (31–33). EI has been associated with a higher capacity in nursing to address and settle problems at work. As a result, nurses with higher EI are less likely to employ evasive or competitive strategies and more likely to handle conflict management techniques (9, 34). In this sense, nurses with high EI may be more sensitive to the emotions of others and, as a result, be able to foresee and resolve possible conflicts before they worsen. Additionally, being able to control one's emotions can help nurses remain composed and objective in the face of conflict, which promotes problem-solving, the quest for win-win solutions, and improved job satisfaction (23, 35).

On the other hand, the relationship between emotional intelligence (EI) and job satisfaction has been studied in various contexts, highlighting its particular relevance in the field of nursing, a sector known for its high emotional and social demands. Studies show that elevated levels of EI are associated with greater job satisfaction and organizational commitment (36, 37). Furthermore, EI is especially critical in high-tension contexts, such as the COVID-19 pandemic, where it acts as a moderator in the effects of psychosocial risks, including burnout and psychosomatic issues (29, 38). Thus, emotional intelligence and job satisfaction emerge as critical predictors of occupational well-being, especially given the high rates of turnover and burnout in the nursing sector (23). This highlights the need for hospital policies that focus not only on technical efficiency but also on the development of emotional and communicative skills (23, 36).

1.1.2. Job satisfaction

Job satisfaction is a complex, multifaceted construct that refers to an individual's positive attitude and feelings about their job, and values the working conditions and associated rewards (39). Due to its effects on patient safety, staff retention, productivity, and performance, job satisfaction is significant in the lives of nurses (40, 41). Workplace circumstances, pay, social support from managers and coworkers, possibilities for professional growth, and decision-making autonomy are only a few of the variables that have an impact on job satisfaction (42–44). To deal with the problems nurses encounter at work and increase job satisfaction, emotional skills and tactics might be essential. EI may also serve as a stress-relieving buffer for nurses, resulting in higher work satisfaction (45–47). Because of the growing expectations and difficulties that nurses encounter in today's healthcare system, work satisfaction is particularly important.

1.1.3. Conflict management

Conflict, understood as a process involving two or more individuals with divergent interests, perceived threats to their needs, or concerns (48), is commonplace within the realm of nursing. These conflicts can occur between direct care nurses or with nursing managers. Underlying causes often relate to limited human resources, discrepancies in demands between nursing leaders, and interpersonal communication issues (49, 50). Conflict management emerges as a vital interpersonal skill, aiming at an individual's ability to confront and resolve conflict situations (51). Its importance in the workplace cannot be underestimated since it directly impacts job satisfaction, performance, and employee well-being (52, 53). This management is particularly critical in nursing due to the interpersonal nature of the work, high emotional burden, and the need to collaborate with other healthcare professionals (54, 55). Nurses with heightened emotional intelligence tend to manage these conflicts more effectively, being able to anticipate and resolve disputes before they escalate (56, 57).

Furthermore, five primary styles to address conflicts have been proposed, according to Rahim (51). The "Integrating" style seeks collaborative solutions that satisfy all involved (49) and is especially favored in patient care situations, as observed among Peruvian nurses (49) and in intensive care units (58). On the other hand, the "Obliging or Accommodating" style seeks to maintain peace (59) and is less utilized by nurses (60), while the "Dominating" style is effective in critical situations requiring quick decisions (61). The "Avoiding" style involves evading the conflict, useful when time is needed or the conflict is trivial (62), although it's not the predominant style among emergency nurses (63). Lastly, the "Compromising" style seeks middle-ground solutions and is commonly used in practice (64, 65). However, no style is superior in itself, as its selection depends on the context and relationship between parties. In this regard, it's essential for nursing leaders to apply effective communication, positive leadership, and proper conflict management for a healthy work environment and to harness potential benefits of conflict, such as innovation and development (26, 66, 67).

Few studies across different populations specifically address the mediating role of conflict management (68–70). Despite the growing evidence linking emotional intelligence, conflict management, and job satisfaction, research in the context of nursing has been reported in a theoretical manner up to this point (71). Given the pivotal role of conflict management in nursing practice and its potential connection with emotional intelligence and job satisfaction, it's crucial to explore how conflict management might mediate this relationship. This could offer valuable insights for designing nursing interventions and training programs that address not only emotional skills development but also conflict resolution. Considering the arguments presented, the following hypotheses are proposed (Figure 1):

> *H1:* There is a positive relationship between emotional intelligence and conflict management.
>
> *H2:* There is a positive relationship between conflict management and job satisfaction.
>
> *H3:* Conflict management mediates the relationship between emotional intelligence and job satisfaction.

2. Methods

2.1. Design and participants

The study was conducted under the guidelines proposed by STROBE. From the initial design, including the title (item 1), to details like funding (item 22), the stipulations set forth by this set of guidelines were followed (72). Within the parameters of this article, items 4 through 12 were specifically applied. These items are fundamental in guiding and structuring cross-sectional studies, ensuring their quality and transparency. For a more thorough review, please refer to Appendix A, where the complete STROBE checklist is broken down.

A cross-sectional and explanatory study was conducted, incorporating latent variables represented by a structural equation model (SEM) (73). A non-probabilistic sampling approach was used, in line with the consensus guidelines for measurement instruments in the healthcare sector (74). Inclusion criteria considered were: (1) employment in both critical and non-critical areas, with varying employment conditions that include outsourcing, contractual agreements, fixed-term, and appointment; (2) varying lengths of

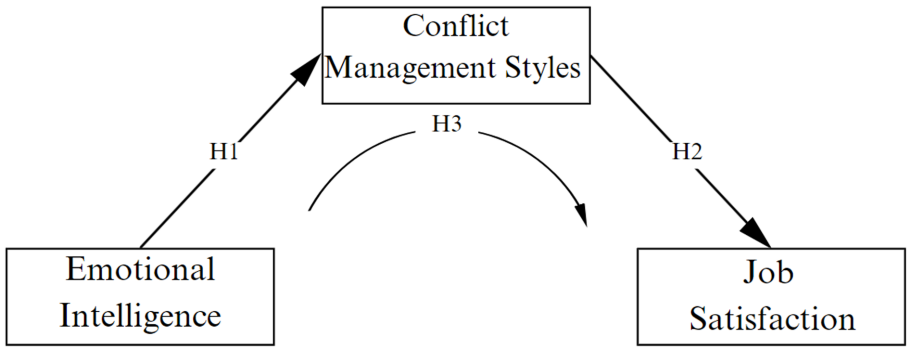

FIGURE 1
Theoretical model.

service, ranging from less than 1 year to more than 5 years. Exclusion criteria were: (1) retired or inactive nurses, (2) nurses on extended leave or absence during the study period. The sample size was determined using Soper's software, which takes into account the number of observed and latent variables for SEM models. Through the anticipated effect size ($\lambda = 0.3$), statistical power levels ($1 - \beta = 0.95$), and desired probability ($\alpha = 0.05$), the software recommended a sample size of 119 participants (75). However, the study ultimately included a total of 208 nurses, thereby exceeding the initial recommendations to enhance the robustness of the analysis.

2.2. Instruments

2.2.1. Sociodemographic variables

Several sociodemographic variables were considered, including gender, marital status, employment status, length of time in the current service, and type of work area (critical or non-critical).

2.2.2. Conflict management styles

The Spanish version (76) of the Rahim Organizational Conflict Inventory-II (ROCI-II), created by Rahim in 1983, was used. It consists of 28 evaluation items with five dimensions: integrating, dominating, avoiding, obliging, and compromising, and a 5-point Likert response scale (1 = Never to 5 = Always). Additionally, it showed adequate internal consistency through Cronbach's Alpha for each of the dimensions, which were 0.70, 0.79, 0.72, and 0.88, respectively.

2.2.3. Emotional intelligence

The Spanish version (77) of the Rotterdam Emotional Intelligence Scale (REIS) (78) was used. It consists of 28 items in four dimensions: (1) self-focused emotional appraisal, (2) other-focused emotional appraisal, (3) self-focused emotion regulation, and (4) other-focused emotion regulation, with a 5-point Likert response scale ranging from 1 (strongly disagree) to 5 (strongly agree). The internal consistency was adequate through Cronbach's Alpha, being 0.86, 0.85, 0.80, and 0.86 for the dimensions, respectively.

2.2.4. Job satisfaction

The Spanish version of the job satisfaction S20/23 (79) was used. It consists of 23 items and presents four dimensions: (1) relationship with supervision, (2) physical work space, (3) professional achievement, and (4) opportunity for training and decision-making. It presents 7 response alternatives: (1) Very Dissatisfied, (2) Quite Dissatisfied, (3) Somewhat Dissatisfied, (4) Indifferent, (5) Somewhat Satisfied, (6) Quite Satisfied, and (7) Very Satisfied. The scale showed adequate reliability through Cronbach's Alpha of 0.92, 0.86, 0.78, and 0.73, respectively.

2.3. Procedure

Contact was established with the administrators of two selected hospitals, who not only approved the conduct of the study but also provided email addresses for the online administration of the survey. Data collection took place from February 14 to May 25, 2022, utilizing two methods: face-to-face and online. In the face-to-face method, measurement instruments were directly administered to nursing professionals in their respective work environments. Concurrently, in the online method, emails containing a link to the digital survey were sent out. It's crucial to note that, prior to the administration of any instrument, participants were provided with a detailed explanation of the study's objectives and purpose. This step was essential in obtaining informed consent from the participants.

2.4. Ethics statement

The study was reviewed and approved by the Institutional Ethics Committee of a Peruvian university (2023-CEUPeU-011) for hospital research. Ethical standards based on the Helsinki Declaration (80) were adhered to.

2.5. Statistical analysis

Descriptive statistics were calculated. Specifically, central tendency and dispersion measures were determined, such as the mean (M) and standard deviation (SD). Additionally, the measure of shape, skewness (A), was evaluated, where values within the range of ±2 for these measures suggest an approximately normal distribution (81, 82).

The analysis of the theoretical model of the study was carried out through structural equation modeling using the WLSMV estimator, appropriate for its robustness against deviations from inferential normality (83). The evaluation of the fit was carried out with the Comparative Fit Index (CFI), the Tucker Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). Values of CFI and TLI > 0.90 (84), RMSEA <0.080 (85), and SRMR <0.080 (86) were used. For the mediation analysis, the bootstrapping method was applied with 5,000 iterations and a 95% confidence interval (87). As for reliability analysis, the internal consistency method was used using the Cronbach's alpha coefficient (α) expecting high magnitudes (> 0.70).

The structural equation modeling analysis was carried out with the "R" software in its version 4.0.5, using the "lavaan" library (88).

3. Results

3.1. Sociodemographic characteristics

A total of 208 nurses participated in the study, of which 88% were women and 12% were men, ranging in age from 18 to 65 years ($M = 41.18$, SD = 8.942). Additionally, 46.6% reported being married, 64.4% were tenured employees, 62% had been working in the service for more than 5 years, and 75.5% belonged to a non-critical area (Table 1).

3.2. Preliminary analysis

Table 2 presents the descriptive statistics for each variable including the mean (M), standard deviation (SD), and skewness (A). The correlations between the variables indicate that there is a significant positive correlation between conflict management styles, EI is (0.48, $p < 0.001$), and job satisfaction (0.31, $p < 0.001$). Also, the correlation between EI and job satisfaction (0.19, $p < 0.001$) was positive and significant.

TABLE 1 Sociodemographic information.

Characteristics		*n*	%
Sex	Female	183	88.0
	Male	25	12.0
Marital status	Single	82	39.4
	Married	97	46.6
	Free union	16	7.7
	Widowed	3	1.4
	Divorced	10	4.8
Employment condition	Outsourcing	4	1.9
	Contract	60	28.8
	Fixed term	10	4.8
	Permanent	134	64.4
Time working in the service	Less than 1 year	17	8.2
	1 year	20	9.6
	2 to 5 years	42	20.2
	More than 5 years	129	62.0
Area where you work	Critical	51	24.5
	Non-critical	157	75.5

TABLE 2 Descriptive statistics and correlations for the study variables.

Variable	M	DE	A	1	2	3
Conflict management styles	31.63	4.64	0.22	-		
Emotional intelligence	79.09	8.98	−0.39	0.48**	-	
Job satisfaction	95.26	23.38	−0.12	0.31**	0.19**	-

M, Mean; SD, Standard Deviation; A, Skewness; α, Cronbach's Alpha. **$p < 0.010$.

3.3. Theoretical model analysis

A first model (M1) is made, in which the relationships between variables are incorporated, which obtained an adequate fit, $\chi^2 = 1802.390$, df = 1,213, $p = 0.000$, CFI = 0.95, TLI = 0.95, RMSEA = 0.05 (90% CI 0.04–0.05), SRMR = 0.08. However, due to the null effect value between emotional intelligence and satisfaction ($\beta = 0.02$ $p > 0.5$) and the considerations of parsimony criteria proposed in the model, a second model (M2) is chosen in which this relationship is restricted to zero, obtaining a good fit ($\chi^2 = 1768.690$, df = 1,214, $p = <0.001$, CFI = 0.95, TLI = 0.95, RMSEA = 0.05 [90% CI 0.04–0.05], SRMR = 0.08). In addition, H1 is confirmed, in which a positive relationship between emotional intelligence and conflict management is evidenced ($\beta = 0.64$, $p < 0.001$) and H2 in which conflict management is related to job satisfaction ($\beta = 0.37$, $p < 0.001$) (Figure 2).

3.4. Mediation model

For the mediation analysis, bootstrapping of 5,000 iterations was used and these results are shown in Table 3. The mediating role of conflict management in the relationship between emotional intelligence and job satisfaction is confirmed, $\beta = 0.77$, $p = 0.002$ (H3).

4. Discussion

Emotional Intelligence (EI) is an increasingly relevant topic in both social and occupational settings, especially in professions characterized by high emotional demands and human interaction, such as nursing. The present research focuses on an emerging issue in healthcare, particularly in the nursing sector. It aims to analyze the mediating role of conflict management in the relationship between emotional intelligence and job satisfaction among Peruvian nurses. The results confirmed that conflict management effectively acts as a mediator between emotional intelligence and job satisfaction, thereby enhancing our understanding of the critical role emotional competencies play in workplace well-being. This research holds significant implications for the design of training programs and hospital policies, particularly in high-stress emotional and social settings like nursing. By highlighting the importance of emotional intelligence and conflict management, this study lays the groundwork for future interventions aimed at improving healthcare quality and the well-being of healthcare professionals.

The results of this study focused on the relationships proposed by the research model, providing evidence that confirms Hypothesis 1. This revealed a positive relationship between emotional intelligence (EI) and conflict management in nurses. This finding is consistent with previous research that has demonstrated a positive correlation between these two constructs (89, 90). A key aspect of this relationship is the intrapersonal and interpersonal skill that EI provides, allowing individuals to recognize and regulate their own emotions as well as those of others (21, 25). Adaptability and stress management, inherent traits of EI, facilitate conflict resolution (28). The ability to identify and understand emotions, for instance, can enable nurses to anticipate and avoid confrontational situations (35, 57). Moreover, emotional self-regulation, a subset of EI, can positively influence objective decision-making, promoting less polarized conflict resolutions (91). In workplace environments like healthcare services, the relevance of EI becomes even more pronounced. The nursing profession, with its high interaction with patients and emotional load, frequently faces challenges in conflict management. In this context, nurses with high levels of EI tend to employ more effective and less evasive or competitive strategies to address such conflicts (9, 34). These skills not only enhance conflict resolution but also positively influence job satisfaction, staff retention, and overall care quality (40, 41). However, it's crucial to highlight the unique context of Peru, which, with its cultural and structural diversity, presents additional challenges for nurses (92). Skills derived from high EI are essential to tackle these specificities and the multiple sources of conflict that can arise due to divergences in objectives, demands, and interpersonal communication (49, 50). Organizations must recognize the importance of fostering EI, particularly in nursing. Since this profession continually interacts with human well-being, robust conflict management skills are essential to ensure optimal care and improve professionals' well-being (51).

Hypothesis 2 was also confirmed, which evidenced a positive relationship between conflict management and job satisfaction in nurses. This is supported by previous studies that identified a similar connection across various professions (93, 94). Proper conflict management promotes a harmonious work environment and strengthens interpersonal relationships (95, 96), influencing nurses' decisions to remain in their roles (97, 98). On the other hand, emotional intelligence (EI) plays a crucial role in effective conflict

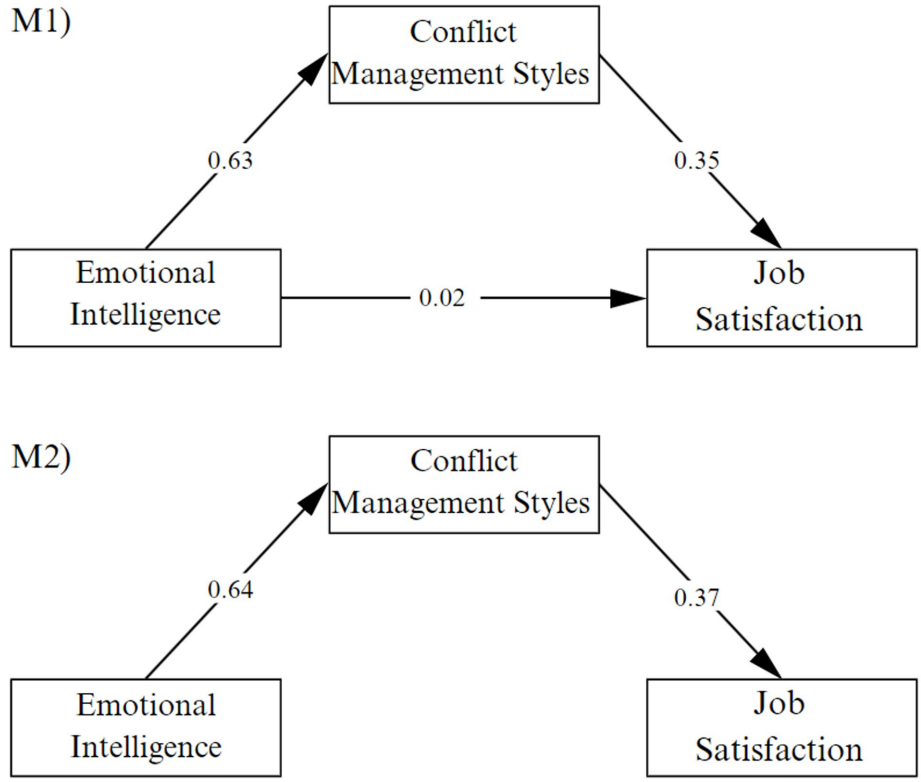

FIGURE 2
Structural model results: (M1) including direct effect and (M2) excluding direct effect.

TABLE 3 Research hypotheses on indirect effects and their estimates.

				95%CI	
Hypothesis	Path in the model	*β*	*p*	LL	UL
Hypothesis 5a	Emotional Intelligence → Conflict Management → Job Satisfaction	0.77	0.002	0.40	0.23

management in nursing. Nurses with high EI avoid evasive strategies and adopt more collaborative approaches (9, 34). These skills directly impact the creation of harmonious work environments, subsequently influencing job satisfaction (8). Moreover, EI has proven to be a valuable tool during crises, such as the COVID-19 pandemic, mitigating job stress and burnout (29, 38). Nonetheless, it's essential to acknowledge that job satisfaction in nursing is influenced by several factors, including working conditions, compensation, social support, and autonomy (42). Therefore, healthcare institutions are concerned about nurse retention, as factors like inefficient management can influence their decision to stay or leave their roles (99). Also, conflicts in nursing can arise from various factors, including resource limitations or communication issues (50). Additionally, various conflict management styles exist, and Peruvian nurses tend to favor a collaborative approach (49). A combination of high EI and a collaborative approach in conflict management might, therefore, be the key to improving job satisfaction in nursing.

Moreover, Hypothesis 3 was confirmed, in which conflict management mediates the relationship between emotional intelligence (EI) and job satisfaction. This finding emerges as a significant contribution to the body of research in the field of nursing. This three-way relationship not only broadens the understanding of the role of emotional intelligence in high emotional labor contexts but also highlights the importance of conflict management as a crucial mediator (9, 100). Professionals with well-developed EI tend to be more effective in conflict management, leading to greater satisfaction in their work environment (91, 101). In challenging situations, such as the recent COVID-19 pandemic, it has been demonstrated that EI can act as a protective shield against psychosocial risks, underlining its role in job well-being (29, 38). Past literature has explored the relationship between EI and other constructs, such as social support (102) and work engagement (103). However, the focus on conflict management in this study provides a fresh and essential perspective (31). It's pertinent to stress that a satisfactory work environment is crucial for nurse retention, as unfavorable conditions can lead to high turnover rates (99, 104). The importance of policies prioritizing the development of emotional and communicative skills in this context is undeniable (36). Conflict, often arising from limited resources, opposing objectives, or issues in interpersonal communication, should not be seen as detrimental (50, 105). Instead, it can be viewed as an opportunity for growth and strengthening of healthcare teams (106). It's important to consider that in specific regions, like Peru, nursing professionals may face unique cultural and organizational challenges that require specialized conflict management skills (92). Lastly, professional training can benefit from these insights

by integrating conflict management techniques. However, it's essential to adjust these strategies considering contextual variables, such as organizational culture (9, 92).

4.1. Limitations

This study possesses several limitations that should be kept in mind when interpreting its findings. Firstly, the sample of nurses used may not adequately represent the broader nurse population, constraining the ability to generalize the results to wider contexts. To address this limitation, future research should consider more diversified samples, including nurses from various specialties, with different levels of experience, and from diverse geographical regions. Moreover, the cross-sectional design of the study prevents the establishment of robust causal relationships between emotional intelligence, conflict management, and job satisfaction. A longitudinal design, tracking nurses over time, would be more suitable to understand the temporal and causal dynamics between these variables. The non-probabilistic sampling is another constraint, as it focuses the study on a specific geographical and professional context, further limiting its generalizability. It's crucial to account for uncontrolled variables in this study, such as work experience, educational level, and organizational support. These factors, which were not adequately addressed, could significantly impact job satisfaction and conflict management, potentially acting as moderator or mediator factors in the relationship between emotional intelligence and job satisfaction. A significant limitation is the lack of examination into the leadership style of key figures in the nursing realm, such as managers and head nurses. This oversight might exclude critical aspects influencing work dynamics and nurses' satisfaction. Another point worth noting is the use of instruments which, although probing conflict management, do so indirectly and rely on nurses' perceptions, potentially introducing biases. Looking forward, research should explore specific interventions aimed at enhancing the competencies identified as critical in this study. Replicating the study in different cultural and organizational contexts will validate and broaden the applicability of the findings. Additionally, it would be beneficial to explore the role of other psychosocial variables that might influence these relationships, thus deepening the understanding of the studied phenomenon.

4.2. Implications

As highlighted by this study, the nursing field underscores the significant interconnection between Emotional Intelligence (EI), conflict management, and job satisfaction. Within this context, it has been revealed that EI not only plays a pivotal role on its own but also directly influences conflict management, which in turn acts as a mediating factor toward job satisfaction. Effective application of emotional intelligence fosters a more harmonious work environment, especially in a critical area like nursing. By recognizing and managing one's own emotions and those of others, misunderstandings are minimized, cultivating a conducive work atmosphere. The significance of these findings is not solely academic; it has far-reaching practical and strategic applications. Healthcare institutions, recognizing the importance of these competencies, should promote training programs focused on enhancing EI and conflict management skills. In doing so, they are not just investing in improving staff job satisfaction but are indirectly raising the quality of care provided to patients. Specifically, for head nurses and the director of nursing, there's an imperative need to lead with ethics and authenticity. Their positions bestow upon them an added responsibility to model and encourage a leadership style that fosters a positive and collaborative work environment. Training in these areas not only benefits these leaders in their managerial roles but also has a cascading impact on all the staff under their charge. On a broader scale, health authorities should consider incorporating these findings into their policies, especially those related to staff retention and well-being. By doing this, they are not only advocating for the well-being of healthcare professionals but also ensuring high-quality medical care for society. In conclusion, this study's contribution to existing literature is invaluable, shedding light on the mediating role of conflict management between EI and job satisfaction. In the future, it would be relevant to replicate and expand this research in various geographical and cultural contexts, solidifying the universality of these findings and potentially enriching understanding even further in this area.

5. Conclusion

In conclusion, this study has demonstrated the importance of emotional intelligence and conflict management as predictors of job satisfaction in nurses. The findings indicate that conflict management mediates the relationship between emotional intelligence and job satisfaction, suggesting that emotionally intelligent nurses may experience greater job satisfaction in part due to their ability to effectively manage conflicts.

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 humans were approved by the study was reviewed and approved by the Ethics Committee of the Universidad Peruana Unión (2023-CEUPeU-011). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

IS-V, MC, and WM-G participated in the conceptualization, validation, formal analysis and research, were in charge of the methodology and software, commissioned data and resource conservation, and handled first draft writing, review, editing, visualization, and supervision. All authors have read and approved the final version of the manuscript.

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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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1249020/full#supplementary-material

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Mental health of healthcare workers during the first year of the COVID-19 pandemic in the Netherlands: a longitudinal study

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Purpose: In March 2020, the WHO declared COVID-19 a pandemic. Previous virus outbreaks, such as the SARS outbreak in 2003, appeared to have a great impact on the mental health of healthcare workers. The aim of this study is to examine to what extent mental health of healthcare workers differed from non-healthcare workers during the first year of the COVID-19 pandemic.

Methods: We used data from a large-scale longitudinal online survey conducted by the Corona Behavioral Unit in the Netherlands. Eleven measurement rounds were analyzed, from April 2020 to March 2021 ($N = 16{,}615$; number of observations = 64,206). Mental health, as measured by the 5-item Mental Health Inventory, was compared between healthcare workers and non-healthcare workers over time, by performing linear GEE-analyses.

Results: Mental health scores were higher among healthcare workers compared to non-healthcare workers during the first year of the pandemic (1.29 on a 0–100 scale, 95%-CI = 0.75–1.84). During peak periods of the pandemic, with over 100 hospital admissions or over 25 ICU admissions per day and subsequently more restrictive measures, mental health scores were observed to be lower in both healthcare workers and non-healthcare workers.

Conclusion: During the first year of the COVID-19 pandemic, we observed no relevant difference in mental health between healthcare workers and non-healthcare workers in the Netherlands. To be better prepared for another pandemic, future research should investigate which factors hinder and which factors support healthcare workers to maintain a good mental health.

KEYWORDS

healthcare workers, mental health, COVID-19, longitudinal study, occupational health

Introduction

In March 2020, the World Health Organization declared COVID-19 a pandemic (1). Previous virus outbreaks such as the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003, demonstrated a great impact on the mental health of healthcare workers (2–5). Several factors were identified to explain higher levels of distress among healthcare workers during the SARS-outbreak, including fear of infection, social isolation, and job stress (5). With the severity of the coronavirus SARS-CoV-2 and the uncertainty caused by it, it is plausible to expect an impact of the COVID-19 pandemic on the mental health of healthcare workers (6, 7). Insight in the mental health of healthcare workers during the COVID-19 pandemic is needed to provide recommendations for healthcare workers, employers and policy makers to maintain good health and employability of healthcare workers during a pandemic.

Two systematic reviews showed that healthcare workers reported high levels of depression, anxiety, insomnia and distress early in the COVID-19 pandemic (8, 9). A meta-analysis showed a pooled prevalence of 22.8% for depression, 23.2% for anxiety and 38.9% for insomnia during the first months of the pandemic among healthcare workers (9). In contrast, the prevalence of depression before the pandemic was 7.0% among the working-age population in the European Union in 2019 (10). Risk factors identified for mental health problems in this pandemic situation were inadequate personal protective equipment, close contact with COVID-19 patients, heavy workload, being female and underlying illness (8). The studies included in the reviews focused mainly on "frontline" hospital workers, i.e., those working directly with COVID-19 patients. It can be expected that other healthcare workers also experience more stress than non-healthcare workers, as most of them come in close contact with patients, leading to increased risk of getting infected (11). Some may fear to get ill themselves, others to become the source of infection to their loved ones, i.e., family members who are older, immunocompromised, or chronically ill. This fear may lead to excessive stress and mental health problems (12, 13).

When comparing mental health between healthcare workers and non-healthcare workers, studies showed that healthcare workers actually appeared to have similar, or even lower prevalence of stress, anxiety, depression and post-traumatic stress disorder compared to non-healthcare workers during the first wave of the pandemic (14–17). The main explanations for these findings were that healthcare workers feel better informed about the virus and measures to avoid getting infected, and better understand why these measures are needed (14). Moreover, it is noted that (frontline) healthcare workers have access to formal psychological support, in contrast to non-healthcare workers (15). Finally, they suggest that healthcare workers were less exposed to lockdown measures such as social distancing, and economic instability (17).

So far, most research examined the mental health of healthcare workers cross-sectionally during the first wave of the pandemic (8, 9). However, there are indications that different points in the outbreak curve have affected mental health differently (8). As infections rise, the pressure on the healthcare workers rises as well, and measures to prevent the virus from spreading become more restrictive (18–20). It is therefore of interest to assess the mental health status of healthcare workers over time. To our knowledge, only one study examined mental health of (Finnish) hospital workers longitudinally from June to November 2020. It shows that mental health of the hospital workers fluctuated, and was associated with the number of infections and subsequent restrictive measures (21). In Finland, the pressure on healthcare workers in this study period was not as high as in other countries and risk of infection was relatively low, due to a limited number of COVID-19 cases (22). Our study focusses on the first full year of the pandemic in the Netherlands, a country that experienced peak levels of the pandemic (i.e., the highest risk level of >100 hospital admissions/day or > 25 ICU admissions/day) from March 18 to April 23 (2020) and from September 28 (2020) to May 26 (2021) (18).

The aim of this study is to examine to what extent mental health of healthcare workers differed from non-healthcare workers during the COVID-19 pandemic, using longitudinal data collected in the Netherlands during the first year of the pandemic (April 2020 until March 2021).

Methods

Study design

From the start of the COVID-19 pandemic in the Netherlands a large-scale longitudinal online survey (Corona Behavioral Unit (CBU) Cohort; first wave April 2020) was carried out by the Dutch National Institute for Public Health and the Environment in collaboration with the Association of Municipal Health Services and Regional Medical Emergency Preparedness and Planning offices in the Netherlands and 25 Municipal Health Services (23). Participants of pre-existing panels of the Municipal Health Services ($n = 1{,}000$ to 10,000 per panel) were invited to participate in the cohort study. Participants of the various panels were recruited in different ways, including random sample selection, through specific ongoing studies or via (social) media. The first questionnaire was sent out on April 17, 2020, followed by additional questionnaires every 3 weeks. After round 5, the frequency of the questionnaires was reduced to a six-week cycle. From round 3 onwards, the cohort became a "dynamic cohort," as new participants could enter the survey in rounds 3, 5, 6, 8, and 10. Participants were additionally recruited via social media and various mailing networks (e.g., of higher education organizations), in order to recruit additional participants who were underrepresented in the cohort (e.g., young people). To limit the questionnaire length, participants were randomly assigned to one of three groups upon entering the cohort. Each group received different blocks of questions and there was a one-time crossover of blocks after enrollment. To specify with regard to mental health, one of the three groups received questions about mental health only during enrollment. Another group received questions about mental health in all the subsequent rounds. The third group never received any questions about mental health and was therefore not included in the analyses of the present study. The CBU cohort study does not meet the requirement as laid down in the Law for Research Involving Human Subjects (WMO) and was therefore exempted by the Centre for Clinical Expertise at RIVM from formal ethical review (Study number G&M-561).

Study sample

Data from round 1 (17–24 April 2020) to round 11 (24–28 March 2021) were analyzed. Data from round 11 were used for selection of participants for our study as questions about being a healthcare

worker or non-healthcare worker were only asked in round 11. In total, 47,254 people participated in round 11 of the CBU Cohort. Of those, participants aged 18–69 years who had a job in round 11 and also during enrollment in the study were selected ($n = 26,160$). Participants were excluded if they started to work as a healthcare worker during the pandemic ($n = 127$), because it was unknown when they had exactly started. Subsequently, the subgroup of participants that did not receive questions on mental health (based on block randomization, see Study design) was excluded ($n = 9,111$). Participants with missing data on selected covariates (e.g., sex, age, education) were also excluded ($n = 307$). Finally, 16,615 participants remained in the sample for the analyses, who yielded a total of 64,206 observations. See the flowchart in Figure 1 for details. All participants participated at least two times in the survey: during enrollment and in round 11. Due to the use of different blocks of questions with a one-time cross-over, participants could contribute 1–10 observations of the 11 rounds. Of the 16,615 participants selected for this study, 8,754 contributed one observation, 5,770 participants contributed 2 to 9 observations and 2,091 participants contributed 10 observations to the analyses.

Measures

Work

To distinguish healthcare workers from non-healthcare workers, the following questions were used. First: "In which occupational sector do you work?" Fourteen response categories were given, listing 13 occupational sectors and one answer category: "I do not work/I am retired." Respondents who indicated to work in the occupational sector "Healthcare/welfare" were subsequently asked whether they were healthcare workers. Response categories were: 1. "Yes, I was a healthcare worker before the pandemic and I still am," 2. "Yes, I am a healthcare worker since the first wave of the pandemic (March 2020–Juni 2020)," 3. "Yes, I am a healthcare worker since the second wave of the pandemic (July 2020–March 2021)," or 4. "No." Only respondents who answered "Yes, I was a healthcare worker before the pandemic and I still am" (response category 1) were categorized as a "healthcare worker." Respondents who answered to start working as a healthcare worker during the pandemic (response category 2 or 3) were excluded from the sample (view paragraph "study sample"). Respondents who answered "No" (response category

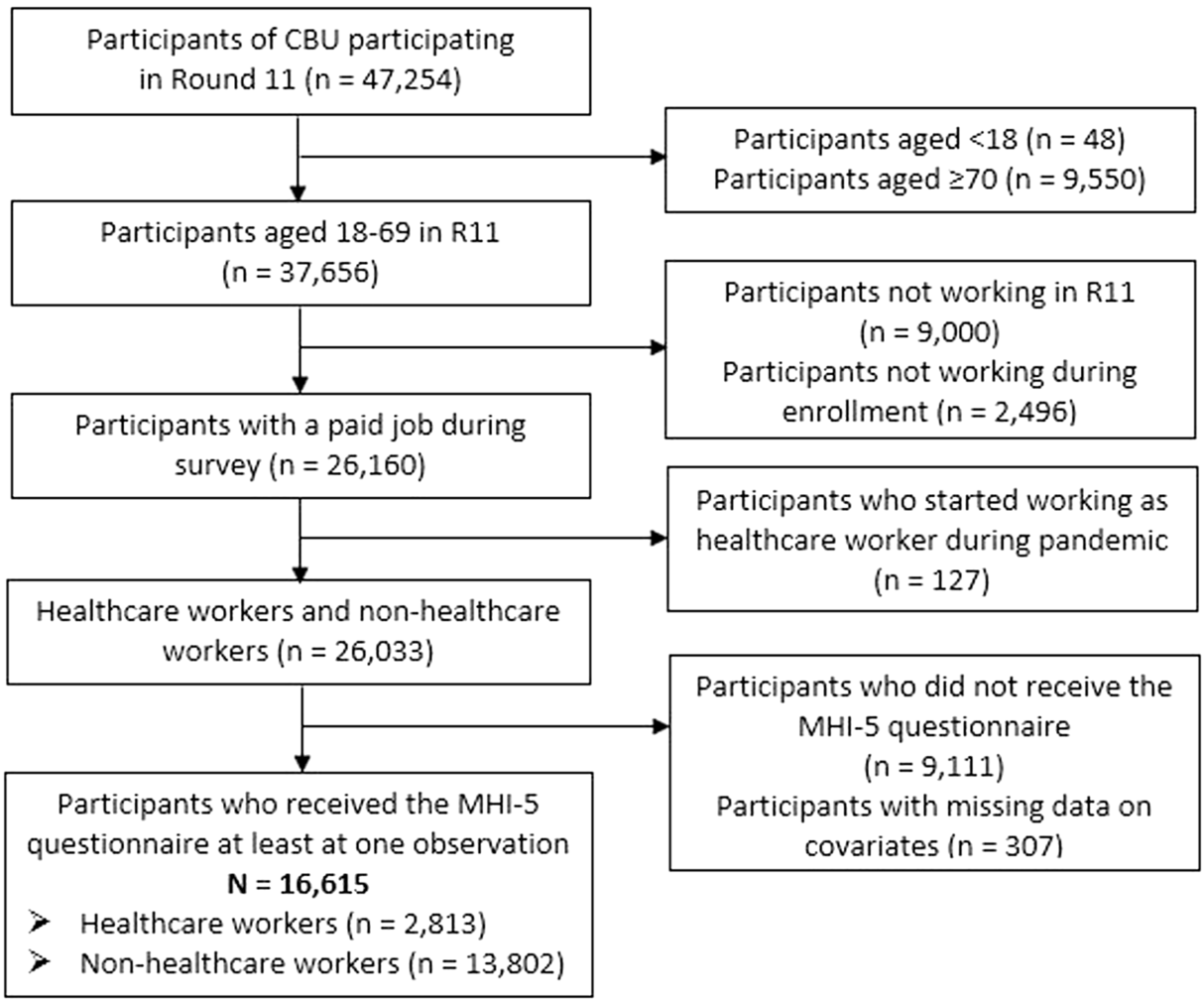

FIGURE 1
Flowchart of the selection of the study sample.

4), and those who indicated they were working in one of the other 12 sectors were categorized as "non-healthcare workers."

Respondents who indicated they were healthcare workers were also asked to indicate their workplace: 1. Hospital, 2. Nursing home, care home or hospice, 3. General practice, 4. Home care, 5. Mental healthcare, or 6. Other healthcare setting.

Mental health

Mental health was measured with an adapted version of the Mental Health Inventory (MHI-5). The MHI-5 measures general mental health (24) and is part of the 36-item Short Form Health Survey, a questionnaire for measuring health-related quality of life (25). The MHI-5 contains the following items: "How much of the time during the last 4 weeks have you: (i) been a very nervous person?; (ii) felt so down in the dumps that nothing could cheer you up?; (iii) felt calm and peaceful?; (iv) felt downhearted and blue?; and (v) been a happy person?" For each question response categories were: 1. all of the time, 2. most of the time, 3. a good bit of the time, 4. some of the time, 5. a little of the time, or 6. none of the time. Because items (iii) and (v) ask about positive feelings, their scoring was reversed. Instead of referring to *the last four weeks*, the adapted version referred to *the last week*, because questionnaires were initially send out every 3 weeks. The mean MHI-5 score was computed by summing up the scores of each item and then multiplying the raw scores by 4, to transform it into a 0–100-point scale. A score of 100 represents optimal mental health (25). The mean scores are reported.

Covariates

Various categories of covariates were included: demographics (age, sex and educational level), health (health condition and past suspected/confirmed COVID-19 infection) and social environment (household composition and quality of social contacts). The demographic covariates were fixed variables. Health and social environment variables were time-varying variables derived from each individual round. See Supplementary Appendix for details on the construction of these variables.

Statistical analysis

Differences between healthcare workers and non-healthcare workers in the study sample were tested using chi-square tests and one Mann–Whitney-test regarding the MHI-5 scores.

Four linear Generalized Estimating Equations (GEE) analyses were performed to test the associations between working in health care and general mental health during the pandemic. The crude model (model 1) was adjusted step-by-step for demographic variables (model 2), health variables (model 3), and social environment variables (model 4). Since the distributions of the MHI-5 scores and its residuals were negatively skewed, a cross-validation analysis was performed using a square root transformation of the MHI-5 scores to test the validity of the results (26).

Next, to examine whether the mental health trajectories over time differed between healthcare workers and non-healthcare workers, an adjusted linear GEE-analysis was performed in which measurement round was also included in the model as factor. Reported means were adjusted for all covariates. The mental health trajectories for healthcare workers and non-healthcare workers were plotted in a graph and compared to the risk levels (18).

Finally, to examine differences in mental health between healthcare workers working at different workplaces, a linear GEE-analysis was performed among health care workers with healthcare setting as main determinant and mental health as outcome. Statistical differences were tested using 95% confidence intervals. This analysis was also adjusted for all covariates.

Analyses were conducted using IBM SPSS Statistics, version 24.0.

Results

Study population

Table 1 shows the characteristics of healthcare workers and non-healthcare workers in Round 11. It shows that the composition of the groups differ in demographic characteristics (sex, age, and educational level) and household composition. For example, healthcare workers were more often female (90.4% vs. 66.5%) and less often highly educated (60.4% vs. 69.7%), compared to the non-healthcare workers. In addition, healthcare workers reported more often a suspected/confirmed infection by COVID-19 during the first year of the pandemic (22.9% vs. 17.7%), which could reflect infection risk but also differences in the availability of COVID-19 testing facilities.

Mental health

The crude linear regression analysis shows that the mean MHI-5 score in the period from April 2020 to March 2021 was 0.62 (95%-CI = 0.03–1.21) points higher among healthcare workers compared to non-healthcare workers (Table 2; model 1). Higher scores on the 0–100 scale indicate better mental health. After adjusting for demographic factors, mean scores differed slightly more (B = 1.50; 95%-CI = 0.90–2.09) (model 2). After adjusting for all potential confounders, the average mental health of healthcare workers was 1.29 (95%-CI = 0.75–1.84) points higher compared to non-healthcare workers (model 4). The adjusted mean MHI-5 scores in this final model were 71.5 among healthcare workers and 70.3 among non-healthcare workers. Square root transformation of the MHI-5 scores confirmed these findings as no substantial difference between health-care workers and non-healthcare workers were found. After back-transformation the effect estimate of the fully adjusted model was 1.27 points.

Trend in mental health over time

The course of the adjusted MHI-5 scores paralleled for both groups, with consistently higher scores among healthcare workers. Mean MHI-5 scores fluctuated throughout the year among both healthcare workers (range 70.4–74.1) and non-healthcare workers (range 69.3–73.0) (Figure 2). Adjusted MHI-5 scores were lower during peak periods of the pandemic, implying poorer mental health at those times.

TABLE 1 Characteristics of the study population stratified for healthcare workers and non-healthcare workers during the COVID-19 pandemic (round 11—March 2021) ($n = 16,615$).

	Healthcare workers ($n = 2,813$)		Non-healthcare workers ($n = 13,802$)	
	%	n	%	n
Sex (% female)*	90.4	2,544	66.5	9,173
Age*				
18-29	5.8	163	6.4	885
30–39	23.1	651	19.0	2,622
40–49	25.2	710	27.6	3,808
50–59	29.5	830	30.0	4,134
60–69	16.3	459	17.0	2,353
Educational level (%)*				
Low	5.0	141	5.5	756
Middle	34.8	978	24.8	3,429
High	60.2	1,694	69.7	9,617
Health condition (% yes)	18.7	525	17.4	2,396
Suspected or confirmed COVID-19 infection (% yes)*	23.1	649	17.8	2,452
Household composition (%)*				
Living alone	12.2	343	14.1	1938
Living with partner	27.8	781	31.8	4,360
Living with children ≤ 12 years	31.6	887	29.5	4,052
Living with children > 12	25.3	711	21.2	2,907
Living with others	3.0	83	3.4	460
Missing		8		85
Quality of social contacts (%)				
Not good	21.5	306	23.1	1,626
Neutral	28.4	404	27.5	1936
Good	50.2	715	49.4	3,478
Missing[a]		1,388		6,762
Healthcare setting (%)				
Hospital	17.9	504		
Nursing home	16.5	464		
General practice	5.8	163		
Homecare	11.2	316		
Mental healthcare	10.6	297		
Other healthcare setting	38.0	1,069		
Occupational sector				
Agricultural			0.8	110
Business/ administrative			9.7	1,335
Commercial			6.5	891
Creative/linguistic			3.4	465
Services			11.3	1,559
IT			7.1	986
Managers			4.7	647
Public administration/ security/legal			11.6	1,597
Educational			10.2	1,413
Technical			5.8	802
Transport/logistics			2.7	370
Healthcare (other than healthcare worker)			7.5	1,035
Other			18.8	2,592
	Mean	SD	Mean	SD
Mental health (mean MHI-5 score)	74.0	16.8	73.3	17.2
Missing (n)[a]		1,388		6,762

*Characteristic differs significantly between healthcare workers and non-healthcare workers ($p < 0.05$). [a]Variable information in round 11 only available for a subsample, i.e., the respondents assigned to the module with questions about mental health.

Mental health of healthcare workers in different healthcare settings

Healthcare workers who work in mental health services, older adult care or hospice, and homecare were significantly in poorer mental health (adjusted MHI-5 scores 68.9, 69.3, and 70.6, respectively) compared to those working in a hospital and general practice (72.8 and 73.8, respectively), on average during the first year of the pandemic (Figure 3).

Discussion

During the first year of the COVID-19 pandemic, from April 2020 until March 2021, healthcare workers had a slightly better mental health compared to non-healthcare workers. Mental health fluctuated throughout the year for both groups, with poorer mental health during peak periods of the pandemic, i.e., periods with a higher number of COVID-19 infections and subsequently more restrictive measures to prevent the coronavirus from spreading. Mental health trajectories of healthcare workers and non-healthcare workers had the same course over time and the small difference persisted throughout the year.

The small difference observed (1.29 on a 0–100 scale, 95%-CI = 0.75–1.84) is considered not clinically relevant. Although a relevant difference in MHI-5 scores has not been formally defined, Cohen suggests that a difference in outcome of at least 1/5th (0.2) of

TABLE 2 Effect estimates of the association between healthcare worker and mental health (difference in mean MHI-5 score).

		Model 1		Model 2		Model 3		Model 4
	B	95% CI	B	95% CI	B	95% CI	B	95% CI
Healthcare worker (yes vs. no)	0.62	0.03; 1.21	1.50	0.90; 1.09	1.57	0.97; 2.16	1.29	0.75; 1.84
Sex (male vs. female)			2.89	2.37; 3.40	2.90	2.39; 3.42	3.47	3.00; 3.94
Age								
18–29			−12.07	−13.23; −10.90	−11.93	−13.09; −10.78	−10.30	−11.42; −9.19
30–39			−5.52	−6.27; −4.76	−5.40	−6.15; −4.64	−5.57	−6.35; −4.79
40–49			−2.88	−3.55; −2.21	−2.76	−3.43; −2.09	−3.33	−4.04; −2.63
50–59			−1.89	−2.53; −1.25	−1.71	−2.34; −1.07	−1.74	−2.36; −1.13
60–69 (ref)								
Educational level								
Low			−1.29	−2.33; −0.24	−1.13	−2.17; −0.09	−0.95	−1.90; 0.00
Middle			−0.94	−1.46; −0.42	−0.84	−1.36; −0.32	−0.66	−1.14; −0.19
High (ref)								
Health condition (yes vs. no)					1.89	1.46; 2.32	1.70	1.29; 2.10
Suspected or confirmed COVID-19 infection (yes vs. no)					−1.81	−2.23; −1.40	−1.62	−2.01; −1.22
Household composition								
Living alone							−3.37	−4.05; −2.68
Living with children ≤ 12 years							1.18	0.54; 1.82
Living with children > 12							0.29	−0.30; 0.88
Living with others							−2.81	−4.20; −1.41
Living with partner (ref)								
Quality of social contacts								
Good							9.41	9.06; 9.75
Neutral							4.89	4.56; 5.21
Not good (ref)								

B, beta; CI, confidence interval.

the outcome standard deviation implies a small effect size and Norman et al. concludes that a difference in outcome of half of the outcome standard deviation reflects a minimally important difference (27, 28). These cut-off points both exceed our effect size, being 0.08 of the standard deviation in round 11 (SD = 17.2).

It could have been expected that mental health of healthcare workers would have been affected negatively by the pandemic because for this occupational group it is generally not possible to keep the advised distance from patients, which increases infection risk (11). Subsequent health fear, for themselves or their loved ones surrounding them, may lead to excessive stress and mental health problems (12, 13). The results show that healthcare workers did not have poorer mental health compared to non-healthcare workers. These findings are in line with virtually all previous studies comparing healthcare workers with non-healthcare workers, which show that healthcare workers have reported similar or even better mental health outcomes (i.e., stress, anxiety, depression, and PTSD) compared to non-healthcare workers during the first wave of the COVID-19 pandemic (14–17). Our study adds that also general mental health, measured by the Mental Health Inventory-5 (29), did not differ between healthcare workers and non-healthcare workers, and this nondifference persisted throughout the complete first year of the pandemic.

Mental health of healthcare workers fluctuated over time, with poorer mental health during peak levels of the pandemic, which corresponds to findings among Finnish hospital workers (21). In our study the highest score (in August 2020) and lowest score (in February/March 2021) differed 3.7 points among both healthcare workers and non-healthcare workers on the MHI-5 scale. This corresponds to 0.22 of the standard deviation at round 11, which indicates that, compared to a relatively calm period, the peak period of the pandemic had a small negative effect on the mental health of both healthcare workers and non-healthcare workers (>0.20 of SD), although this effect was not clinically meaningful

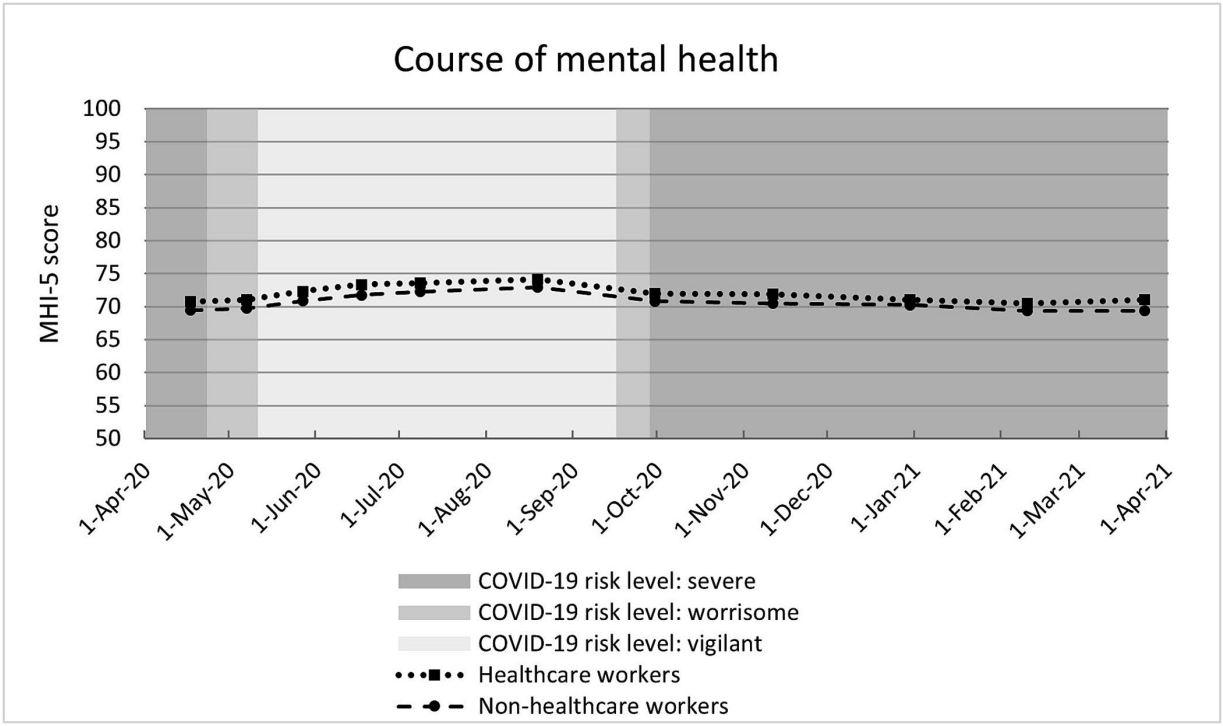

FIGURE 2
Course of mental health (mean MHI-5 score per round) stratified for healthcare workers and non-healthcare workers. Estimates adjusted for all covariates. NB 1. COVID-19 risk levels: Severe: >100 hospital admissions/day or > 25 ICU admissions/day; Worrisome: 40–100 hospital admissions/day or 10–25 ICU admissions/day; Vigilant: <40 hospital admissions/day and < 10 ICU admissions/day. NB 2. The y-axis ranges from 50 to 100 for visibility purposes (full MHI-5 scale runs from 0 to 100).

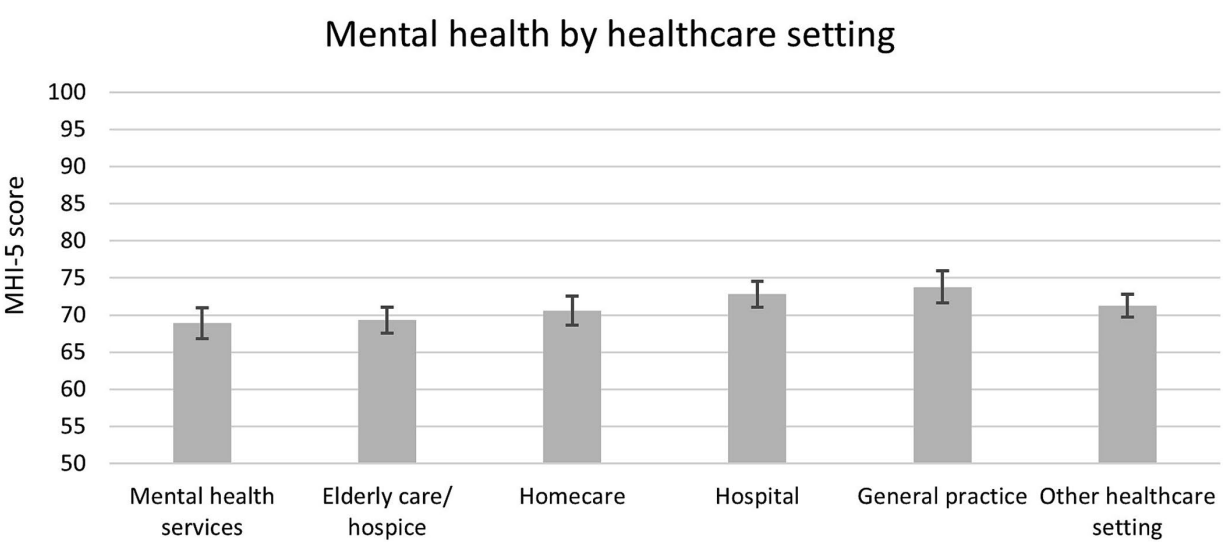

FIGURE 3
Mental health (mean MHI-5 score with 95%-CI) among healthcare workers during first year of COVID-19 pandemic stratified for healthcare setting. Estimates adjusted for all covariates. NB. The y-axis ranges from 50 to 100 for visibility purposes (full MHI-5 scale runs from 0 to 100).

(<0.50 of SD). This is in line with a systematic review, examining the impact of the pandemic by comparing the first months of the pandemic with the pre-pandemic period, which showed that there was an overall increase in mental health symptoms observed in March–April 2020. This review also reveals that mental health of the general population was back at the "normal" level in August 2020 (30). To what extent seasonal influences played a role in the trajectories is not clear, but literature contests a general population shift toward lower mood and more sub-threshold symptoms in spring, autumn or winter (31).

There are several potential explanations for the absence of a relevant difference in mental health during the first year of the COVID-19 pandemic between healthcare workers and non-healthcare workers. A first potential explanation is that mental health of non-healthcare workers has been affected negatively by other aspects of the pandemic than mental health of healthcare workers. One aspect is that a large part of the non-healthcare workers were requested to work from home, which has increased feelings of social isolation (17, 32). A Dutch survey among employees shows that the prevalence of burnout symptoms among home workers increased during peak periods of the pandemic compared to the pre-pandemic period, while the prevalence among location workers remained the same (33). Another aspect that may have affected mental health of non-healthcare workers negatively is the increased job insecurity among employees and self-employed workers (17, 34). Nine percent of employees was afraid to lose their job in the coming 3 months, especially those in the cultural, hospitality and events sectors (35). Over 50% of self-employed workers saw a decrease in the demand for their products or services (36).

Another potential explanation is that, besides the negative mental health effects, there also have been protective factors of the pandemic for healthcare workers. One of these aspects is the finding that healthcare workers feel better informed about the virus and the measures to avoid an infection, and better understand why these measures are needed (14). Also, good psychosocial support, by employers and the community, may have been a protective factor. In some Dutch cities, hospital managers have put together teams of psychologists to support the healthcare workers, and during the first wave of infections, hospital personnel were showered by the community with gifts, flowers and schoolchildren's drawings (37).

Strengths and limitations

A strength of this study is that it uses data from a prospective cohort starting from the beginning of the COVID-19 pandemic, which includes a large sample of adults (i.e., 47,254 in Round 11) with representation of all regions of the Netherlands. The longitudinal dynamic design of the survey, with repeated measures of the MHI-5 and high turnover of sent out questionnaires, provides a good indication of how mental health of healthcare workers and non-healthcare workers developed during different stages of the first year of the pandemic.

In the interpretation of the findings, it should also be noted that the CBU cohort is not fully representative: the cohort includes relatively more women, highly educated and people aged 40–60 years compared to the Dutch population. However, for the aim of this study, i.e., examining the association between working in health care and mental health, a representative sample is not required. Among healthcare workers, especially the number of men was low. We considered to exclude male participants from this study, but we checked and determined that gender was not an effect modifier and thus it was methodologically correct to keep male participants in the study sample.

Moreover, from the data it is not clear whether healthcare workers are working directly with COVID-19 patients or not. Multiple studies show that working in the frontline is a risk factor for depression, anxiety, insomnia, distress and trauma-related symptoms (8, 9, 17). It is possible that, due to an immense work-load during the pandemic, the number of frontline workers who found time to participate in the study is relatively low, which could have led to a more positive impression of the mental health of healthcare workers.

Finally, it should be noted that the results only relate to the first year of the pandemic. As the pandemic continued, community support declined while high work demands remained for healthcare workers (38). In later stages of the pandemic, it is possible that another mechanism plays a role, where exhaustion may have an adverse effect on mental health instead of fear of infection. As a result, it is possible that mental health of healthcare workers in later stages of the pandemic deteriorates more strongly compared to the first year.

Implications policy and research

To further understand what factors played a role in preventing mental health problems among healthcare workers, more research is needed. Regarding hospital workers, it is of interest to examine which factors supported them to maintain good mental health. Considering the poorer mental health among healthcare workers in mental health services, homecare, and older adult care and hospices, it is of interest to examine whether this is related to the pandemic, and if so, what tools (physical/psychological) they lacked and needed during this pandemic to prevent mental health problems. Recent literature shows that during a pandemic, mental health of healthcare workers benefits from informational support, instrumental support, organizational support and emotional and psychosocial support (39). Qualitative research can further identify the needs of healthcare workers within each category and in each workplace setting. These insights are useful to respond to in order to maintain good mental health among healthcare workers during another pandemic.

Conclusion

During the first year of the COVID-19 pandemic, there was no relevant difference in mental health between healthcare workers and non-healthcare workers in the Netherlands. During peak periods of the pandemic, mental health of both healthcare workers and non-healthcare workers was poorer. To be better prepared for another pandemic, future research should reveal which factors hindered and which factors supported healthcare workers to maintain good mental health.

Data availability statement

The datasets presented in this article are not readily available because the AVG ('Algemene Verordening Gegevensbescherming') data cannot be shared publicly, unless aggregated. For academic collaborations and publishing in scientific journals, a Behavioral Science Consortium ('Be-Prepared') has been initiated with researchers working at universities as well as the RIVM. Requests to access the datasets should be directed to coronagedragsunit@rivm.nl.

Ethics statement

Ethical approval was not required for the studies involving humans because the CBU cohort study does not meet the requirement as laid down in the Law for Research Involving Human Subjects (WMO) and was therefore exempted by the Centre for Clinical Expertise at RIVM from formal ethical review (Study number G&M-561). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

MN, SO, KP, BL, and CB contributed to the study conception and design. MB and FK coordinated the data collection. MN performed the analysis and wrote the first draft of the manuscript. All authors commented on previous versions of the manuscript, read, and approved the final manuscript.

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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.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1224112/full#supplementary-material

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Anxiety among healthcare workers during the COVID-19 pandemic: a longitudinal study

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Background: During the COVID-19 pandemic, many healthcare workers faced extreme working conditions and were at higher risk of infection with the coronavirus. These circumstances may have led to mental health problems, such as anxiety, among healthcare workers. Most studies that examined anxiety among healthcare workers during the COVID-19 pandemic were cross-sectional and focused on the first months of the pandemic only. Therefore, this study aimed to investigate the longitudinal association between working in healthcare and anxiety during a long-term period (i.e., 18 months) of the COVID-19 pandemic.

Methods: Data were used from online questionnaires of the Lifelines COVID-19 prospective cohort with 22 included time-points (March 2020–November 2021). In total, 2,750 healthcare workers and 9,335 non-healthcare workers were included. Anxiety was assessed with questions from the Mini-International Neuropsychiatric Interview, and an anxiety sum score (0–7) was calculated. Negative binomial generalized estimating equations (GEE), adjusted for demographic, work and health covariates, were used to examine the association between working in healthcare and anxiety.

Results: Anxiety sum scores over time during the COVID-19 pandemic were similar for healthcare workers and non-healthcare workers. No differences between the anxiety sum scores of healthcare workers and non-healthcare workers were found [incidence rate ratio (IRR) = 0.97, 95% CI = 0.91–1.04].

Conclusion: This study did not find differences between healthcare workers and non-healthcare in perceived anxiety during the COVID-19 pandemic.

KEYWORDS

healthcare workers, anxiety, mental health, COVID-19 pandemic, longitudinal data

Introduction

Since the outbreak of the COVID-19 pandemic in March 2020, healthcare systems in many countries have been struggling to offer adequate care to all patients (1, 2). The large number of COVID-19 cases and the risk of death of those who were infected led to a high demand for medical care. This increased demand for care also meant that care capacity and resources reached their limits. Many healthcare workers were faced with a high workload, high work pace and long shifts (1, 2). In addition, healthcare workers were at an increased risk of being infected

with SARS-CoV-2 when caring for COVID-19 patients (1, 3). The extreme working conditions and the high infection risk during the pandemic may have led to emotional distress and may have negatively affected the mental health of healthcare workers (1, 2).

During earlier virus outbreaks, healthcare workers faced several risk factors for mental health problems, among which anxiety (4–6). During the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003, risk factors for mental health problems included fear for a decline in one's own health and the health of others, social isolation and work stress (4–6). Health concerns were caused by the fear of getting infected and infecting others. To lower the infection rate, healthcare workers had to socially isolate themselves. Higher perceived work stress was related to increased workload, changes in work tasks and tension between colleagues during the SARS outbreak (4–6).

Also during the COVID-19 pandemic, these risk factors are frequently reported as potentially harmful to the mental health of healthcare workers (7–11). In addition, concerns about personal protective equipment and feeling unprepared for the COVID-19 pandemic are identified as risk factors for mental health problems in healthcare workers (7–9, 11). Because of these severe psychosocial working conditions for healthcare workers, it is plausible to expect a higher prevalence of mental health problems, amongst others anxiety among healthcare workers compared to workers in other sectors. However, research to this is currently limited. The present study compares healthcare workers with workers in other sectors and focuses specifically on anxiety as an important mental health condition, because for many healthcare workers it was not possible to keep their distance from the patient, which could in turn lead to experiencing anxiety of becoming infected themselves or contamination for vulnerable patients or family members. The lack of personal protective equipment among some healthcare workers might additionally have increased anxiety.

Several systematic reviews revealed that a large proportion of healthcare workers suffered from anxiety during the COVID-19 pandemic (7, 9, 10, 12, 13). The majority of studies on which these reviews are based include an Asian, mostly Chinese, population. A systematic review of Li et al. (12), which was published during the pandemic and includes studies from various world regions, reports a pooled prevalence of 7.9% (95% CI = 4.4%–12.3%) for generalized anxiety disorder (GAD) among healthcare workers (based on studies with random sampling). GAD is an anxiety disorder, defined by chronic excessive worry for at least 6 months, in combination with at least three psychological or somatic symptoms (14–17). Anxiety can negatively influence work and social functioning, productivity, and quality of life among healthcare workers (18–21). Because of the association between anxiety symptoms and functioning at work, it is important to understand whether there are higher levels of anxiety among healthcare workers during the COVID-19 compared to other workers, in order for healthcare workers to be supported.

Studies that have compared anxiety levels among healthcare workers with anxiety levels among workers in other sectors, hereinafter referred to as non-healthcare workers, reveal contradicting results. A Chinese study found no difference in the occurrence of anxiety between occupational groups during the COVID-19 pandemic (3). A German study concluded that in the first month of the pandemic, the occurrence of anxiety was even lower among healthcare workers compared to non-healthcare workers (22), which was explained by the relatively high subjective levels of information regarding COVID-19 among healthcare workers (22). However, most studies that examined anxiety among healthcare workers during the COVID-19 pandemic were cross-sectional, were limited to the first months of the pandemic, used no reference group, or only used 2 or 3 timepoints (3, 7, 9, 10, 12, 22–25). Therefore, the current study aims to investigate the longitudinal association between working in healthcare and anxiety during a long-term period during the pandemic (March 2020–November 2021), where anxiety was measured in periods of high and low COVID-19 infection rates. It was hypothesized that healthcare workers experienced anxiety to a greater extent than non-healthcare workers during the COVID-19 pandemic.

Methods

Study design and population

Data from the Lifelines COVID-19 prospective cohort study were used. This cohort was initiated at the beginning of the COVID-19 pandemic, to examine COVID-19 infections and its health and societal impacts in the Dutch population (26). The Lifelines COVID-19 cohort is part of the larger Lifelines population cohort which is a multi-disciplinary prospective population-based cohort study examining in a unique three-generation design the health and health-related behaviors of 167,729 persons living in the North of the Netherlands (provinces Drenthe, Groningen, and Friesland) (26, 27). It employs a broad range of investigative procedures in assessing the biomedical, socio-demographic, behavioral, physical and psychological factors which contribute to the health and disease of the general population.

To be included in the Lifelines COVID-19 cohort, participants of the Lifelines population cohort had to be ≥18 years old, their email address had to be available (n = 140,145) and they had to have filled in at least one of the included questionnaire rounds (n = 75,598) (Figure 1) (26). As the current study focuses on workers, participants were selected if they (i) were ≤67 years old (n = 62,635), (ii) had a paid job (n = 52,538), (iii) worked for the majority (>75%) of questionnaire rounds that they had completed (n = 48,061), (iv) had complete data on their profession in the general assessments in the Lifelines population cohort and in questionnaire round 8 (in the other rounds, no questions were asked about profession) of the Lifelines COVID-19 cohort (n = 16,205) and (v) had complete data on all covariates (n = 12,085). Participants that did not meet these criteria were excluded (n = 128,060).

Data collection

For data collection, digital self-administered questionnaires were used (26). These questionnaires included questions on socio-demographic characteristics, general health, chronic diseases, well-being, mental health, social relationships and lifestyle factors (26).

The first questionnaire was sent out on March 30, 2020 (26) (Table 1 in Supplementary Material). After this, new questionnaires were sent out weekly until May 18, 2020, after which the questionnaires became biweekly. From the eighth questionnaire round (May 23, 2020-June 24, 2020), participants were only invited to follow-up Lifelines COVID-19 questionnaires if they had completed at least one of the previous questionnaires. As of July 2020, the questionnaires were sent out monthly. Data of the same participants in different study rounds could be linked to each other by a pseudonymized linking

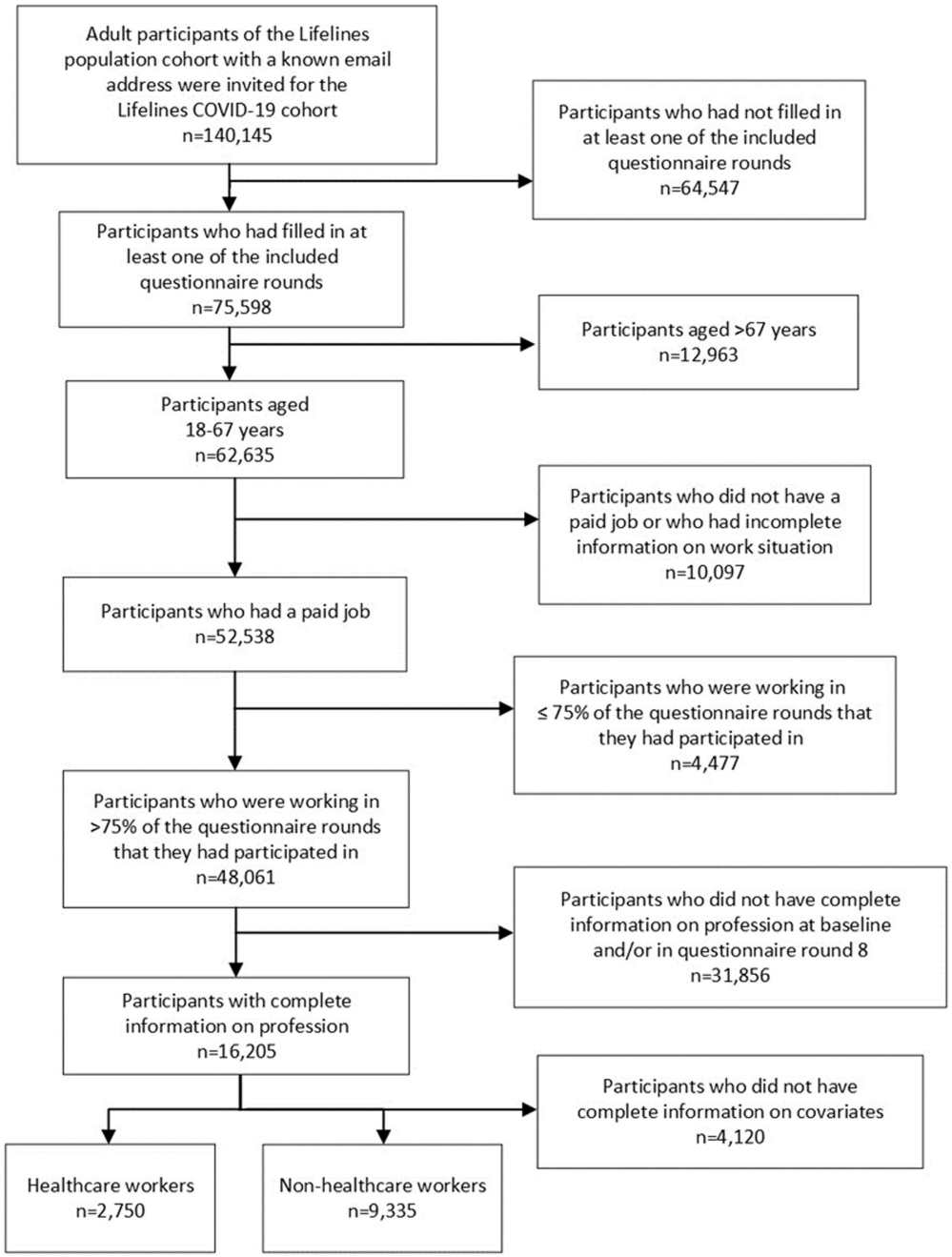

FIGURE 1
Flow diagram of the study population.

variable which was provided by the Lifelines COVID-19 cohort. The current study comprises data from 22 time-points, between March 2020 and November 2021 (26). Questionnaire round 12 (24 July-2 September) was excluded, because no data on anxiety symptoms were collected in this round.

Measures

Healthcare workers

To determine whether participants had a paid job, each questionnaire included a question on what participants currently do in their daily lives (I am a student; on disability; unemployed; retired; on maternity leave; work; other). Participants who answered 'I work' in the majority of questionnaire rounds (>75%) that they had filled in, were classified as having a paid job.

Participants were divided into healthcare workers and non-healthcare workers. Participants were considered healthcare workers, when they had indicated that they (i) had a care and welfare profession at the general assessments of the Lifelines population cohort by means of an open-ended question, professions were categorized into 13 classes (Table 2 in Supplementary Material); (ii) were working within the health services sector in questionnaire round 8 (only round 8 contained the relevant question, Table 3 in Supplementary Material)

and (iii) had not started working in another occupational sector than the health services sector ('have you changed your profession or employer in the last month?') in questionnaire rounds 10, 13, 16, 19, 22, and/or 23 (this question was not asked in the other rounds). Participants were considered non-healthcare workers, when they had indicated that they (i) had a profession that is not related to care and welfare at the baseline measurements; (ii) were working within another occupational sector than the health services sector in questionnaire round 8; and (iii) had not started working within the health services sector in questionnaire rounds 10, 13, 16, 19, 22 and/or 23.

Anxiety

Anxiety was assessed with questions from the Mini-International Neuropsychiatric Interview (MINI) (26–28). The MINI is a brief structured diagnostic interview that is compatible with international diagnostic criteria as the Classification for Diseases (ICD-10), DSM-III-R, DSM-IV and DSM-V (29, 30). In the Lifelines COVID-19 cohort, anxiety symptoms belonging to a generalized anxiety disorder (GAD) were questioned with the MINI following the definition of DSM-IV (see Table 4 in Supplementary Material for all items) (31). The MINI was not conducted as a diagnostic interview, but by means of a self-reported questionnaire. The self-reported questionnaire version of the MINI has also been used in previous studies on the Lifelines COVID-19 cohort (32, 33).

The weekly and biweekly Lifelines Covid-19 questionnaires refer to the symptoms since the last observation ('in the last 7 days' or 'in the last 14 days'), Consequently, the symptom duration does not match the definition of GAD (symptom duration of at least 6 months) (17). Therefore, an anxiety score was calculated for every questionnaire round based on a sum score (range 0–7) of seven anxiety symptoms: excessive worry, restlessness, tenseness, tiredness, difficulty concentrating and making decisions, irritability, and sleeping problems. Given the time between sending out the questionnaires, questionnaire rounds 1–6 measured the presence of anxiety symptoms in the last 7 days and questionnaire rounds 7–11 and 13–23 used a recall period of 14 days. All questions could be answered with either yes or no.

In rounds 1–9, one of the anxiety symptoms (tiredness) was not part of the questionnaire. Therefore, a dataset was provided in which these missing values, and limited missing values due to non-response for a specific item, were imputed single dataset imputation with Multivariate Imputation by Chained Equations package in R, as was done for the study by Ori et al. (33). Information used for imputation included age, sex, body mass index, household composition, income, profession and mental health characteristics from other time points within the Lifelines COVID-19 study and from the Lifelines general assessments. If a participant did not fill out an entire questionnaire, the symptoms were not imputed on this time point.

Covariates

Covariates on demographic (sex, age, education level, household composition), work (employment, working hours) and health characteristics [chronic health condition(s), chronic psychological illness, COVID-19 test result, COVID-19 vaccination] were included.

Sex was classified as female or male. Age in years at the time of the first questionnaire round was calculated using the given month and year of birth at the baseline measurements. Subsequently, age was categorized into the age groups; 18–35, 36–50, 51–67. Participants' educational level was based on the highest level of education attained and categorized as low (no education; primary education; lower or secondary vocational education; junior general secondary education), middle (secondary vocational education or work-based learning pathway; senior general secondary education or pre-university secondary education) or high (higher vocational education; university education). Participants who are living with others could indicate how many household members of specific age groups (0–12, 13–18, 19–30, 31–60; >60) they had. Household composition was categorized into; living alone, living together with adult(s), living together with child(ren), living together with child(ren) and adult(s) and living together but unknown with whom.

Employment contract of participants was assessed in questionnaire rounds 1–10, 13, 16, 17, 19, and 21–23. The response options (permanent; temporary; zero hour, flexible, on call; freelance; other) were categorized into three groups; permanent contract, temporary contract and both permanent and temporary contract. The number of working hours per week was assessed in questionnaire rounds 8, 10, 13, 16, 19, 22, and 23. The mean of the indicated working hours at these time-points was determined.

The presence of a chronic health condition including chronic psychological illness was determined if participants indicated this in questionnaire rounds 1, 2, 14, or 22. The following chronic health conditions were measured; cardiovascular disease, high blood pressure, heart attack, narrowing of the arteries in the legs, stroke and/or tia, other heart and/or coronary disease, lung disease, liver disease, kidney disease, diabetes, chronic muscle disease, psychological illness, auto-immune illness, cancer, neurological disease, problems with spleen, other chronic condition. For each questionnaire round, participants were asked about a positive test result for a SARS-CoV-2 infection, based on testing at an organization (Municipal Health Services, work or school, access test organization, or a different organization) or self-testing. Furthermore, in questionnaire rounds 18–23, information was obtained on whether participants had been vaccinated against SARS-CoV-2. Participants were defined as vaccinated, if they had indicated in at least one of the questionnaires that they had received at least one COVID-19 vaccination.

Data analyses

Characteristics of the study population were stratified for healthcare workers and non-healthcare workers and tested using chi-square tests and independent-sample t-tests. The anxiety sum scores over time are presented visually through a figure with the percentages of participants without any anxiety symptom (sum score = 0) and the median anxiety sum score for scores >0 for both healthcare workers and non-healthcare workers.

The longitudinal association between working in healthcare and anxiety during the COVID-19 pandemic was studied using negative binomial generalized estimating equations analysis with an exchangeable correlation structure (34, 35). The longitudinal data contain repeated observations on each subject, leading to correlation between the observations within a subject. Generalized estimating equations (GEE) account for this correlation by providing reliable estimators of the

regression coefficients and the variances (34). The negative binomial analysis was chosen in order to account for the non-normal distribution of the outcome measure, which can be compared with the distribution of a count variable. The incidence rate ratios were calculated from the negative binomial regression coefficients by exponentiating the Beta coefficients (36). Non-healthcare workers were used as a reference group. The first analysis included a crude GEE model (model 1), followed by three models in which the covariates were added stepwise; model 2 (model 1 + sex, age, education level, household composition), model 3 (model 2 + employment contract, working hours), model 4 (model 3 + chronic health condition(s), chronic psychological illness, COVID-19 test result, COVID-19 vaccination). The covariate COVID-19 test result was included in all models as a time-varying variable, the other covariates were included as time-invariant variables. All analyses were conducted using IBM SPSS Statistics (version 25). A value of p of <0.05 was considered statistically significant.

Results

Study population

The study population consisted of 12,085 participants, including 2,750 healthcare workers and 9,335 non-healthcare workers (Figure 1). The percentage of females was higher (91.7%) among healthcare workers compared to non-healthcare workers (47.6%) (Table 1).

TABLE 1 Characteristics of the study population stratified for healthcare workers and non-healthcare workers during the COVID-19 pandemic (March 2020–November 2021, *n* = 12,085 participants).

	Healthcare workers (*n* = 2,750)		Non-healthcare workers (*n* = 9,335)	
	Mean or %	SD or n	Mean or %	SD or n
Sex (% female/*n*)*	91.7	2,523	47.6	4,447
Age (in years) (mean/SD)*	50.9	9.2	51.8	8.2
18–35 (%/*n*)	8.9	244	4.9	458
36–50 (%/*n*)	29.7	816	31.5	2,944
51–67 (%/*n*)	61.5	1,690	63.6	5,933
Education level (%/*n*)*				
Low	4.4	120	13.9	1,301
Middle	46.9	1,289	39.3	3,670
High	48.8	1,341	46.7	4,364
Household composition (%/*n*)				
Living alone	8	219	8.7	813
Living with child(ren)	1.3	36	1.4	131
Living with adult(s)	55.3	1,520	54.8	5,116
Living with child(ren) and adult(s)	34.6	951	33.9	3,164
Living together but unknown with whom	0.9	24	1.2	111
Employment contract during COVID-19 pandemic (%/*n*)*				
Permanent	81.5	2,242	73.8	6,886
Temporary	7.5	207	14.9	1,388
Both permanent and temporary	10.9	301	11.4	1,061
Working hours per week (mean/SD)*	26.1	7.8	32.4	9.9
Occupational class (%/n)*				
High-skilled white-collar	77.2	2,124	54.6	5,099
Low-skilled white-collar	22.8	626	29.5	2,754
High-skilled blue-collar	–	–	8.1	759
Low-skilled blue-collar	–	–	7.7	723
Chronic health condition(s) (% yes/*n*)*	30.4	836	26.9	2,512
Chronic psychological illness (% yes/*n*)*	2.2	61	1.6	145
COVID-19 test result[1] (% positive/*n*)*	10.5	289	7.9	741
COVID-19 vaccination (% yes/*n*)*	88.3	2,429	79.1	7,386

[1]In at least one of the questionnaire rounds.
* Statistically significant ($p < 0.05$) difference of the characteristic between healthcare workers and non-healthcare workers tested with independent-samples *t*-test and chi-square test.
SD, standard deviation.

Moreover, healthcare workers had less often a low education level (4.4%), compared to non-healthcare workers (13.9%). The mean age of healthcare workers and non-healthcare workers was 50.9 and 51.8 years, respectively.

The percentages of participants testing positive for COVID-19 was higher among healthcare workers compared to non-healthcare workers (10.5% vs. 7.9% respectively) and healthcare workers were more often vaccinated against SARS-CoV-2 (88.3% vs. 79.1% respectively). The majority of characteristics were significantly different ($p < 0.05$) between healthcare workers and non-healthcare workers (Table 1).

Anxiety symptoms over time

Figure 2 shows the anxiety sum scores over time by presenting the percentages of participants without any anxiety symptom (sum score = 0). The percentages of participants without any anxiety symptom were relatively low in the first questionnaire rounds and ranged from 54.1–72.6% over time for healthcare workers as compared to 61.0–76.5% for non-healthcare workers. Figure 3 shows the median anxiety sum score for scores >0. There was some variation in the median sum score of anxiety over time, but the scores for healthcare workers and non-healthcare workers were comparable. Across all questionnaire rounds, the median sum score of anxiety varied between 1 and 2 (with IQR = 1–3 in every round). During the periods with a high COVID-19 risk level, the median anxiety score was most often 2 for both healthcare workers and non-healthcare workers.

Anxiety in healthcare and non-healthcare workers

In the crude GEE model, the incidence rate ratio (IRR) for the anxiety score during the COVID-19 pandemic was different for healthcare and non-healthcare workers. Following this model, healthcare workers scored on average 1.15 times higher on the anxiety score compared to non-healthcare workers [IRR = 1.15, 95% confidence interval (CI) = 1.08–1.22] (model 1, Table 2). However after adjusting for demographic covariates, differences between healthcare workers and non-healthcare workers in the anxiety score during the COVID-19 pandemic were no longer observed (model 2, Table 2). The full model (model 4, Table 2) including demographic,

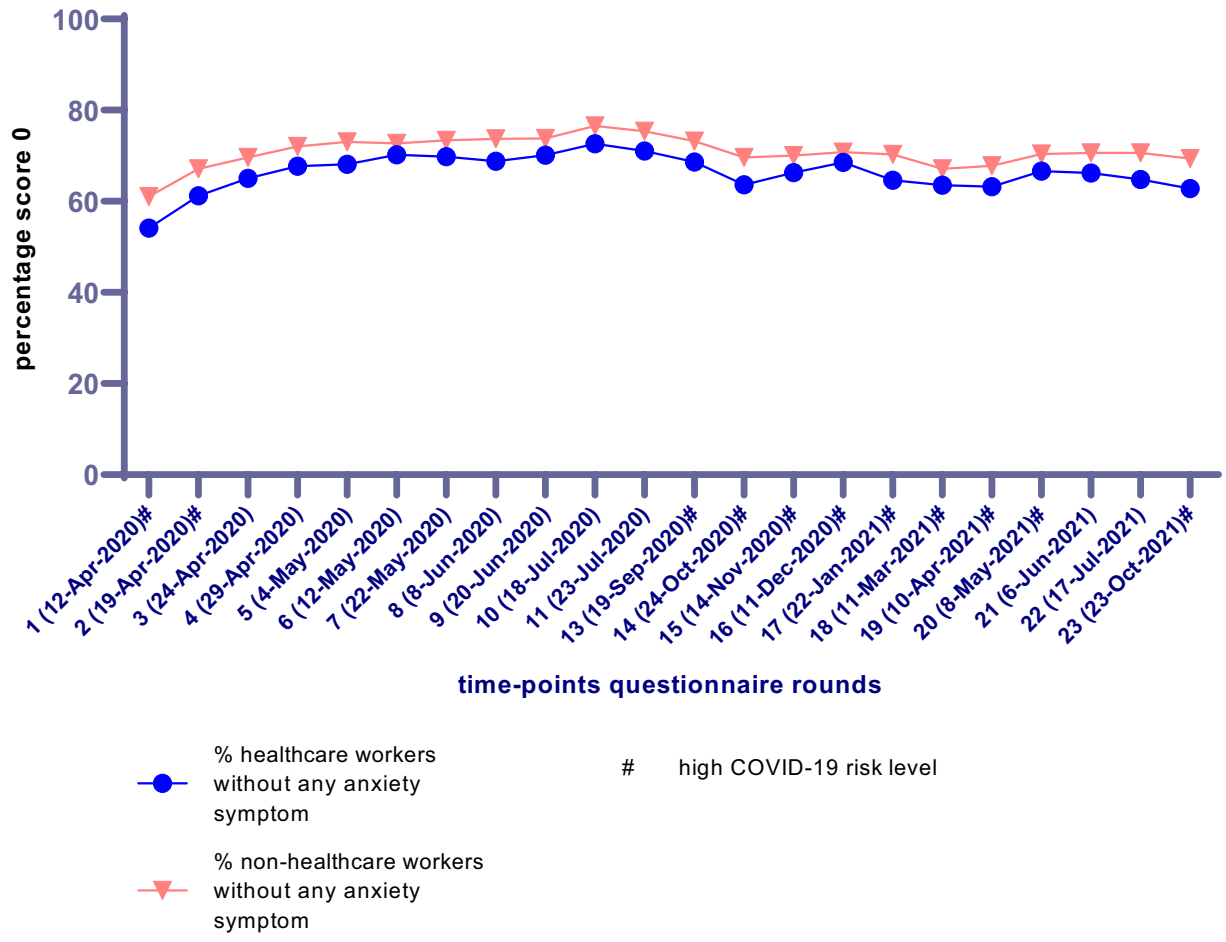

FIGURE 2
Percentages of participants without any anxiety symptoms over the different COVID-19 questionnaire rounds (March 2020–November 2021), stratified for healthcare workers (n = 2,750) and non-healthcare workers (n = 9,335). # High COVID-19 risk level (>100 COVID-19 associated hospitalizations per day) (37).

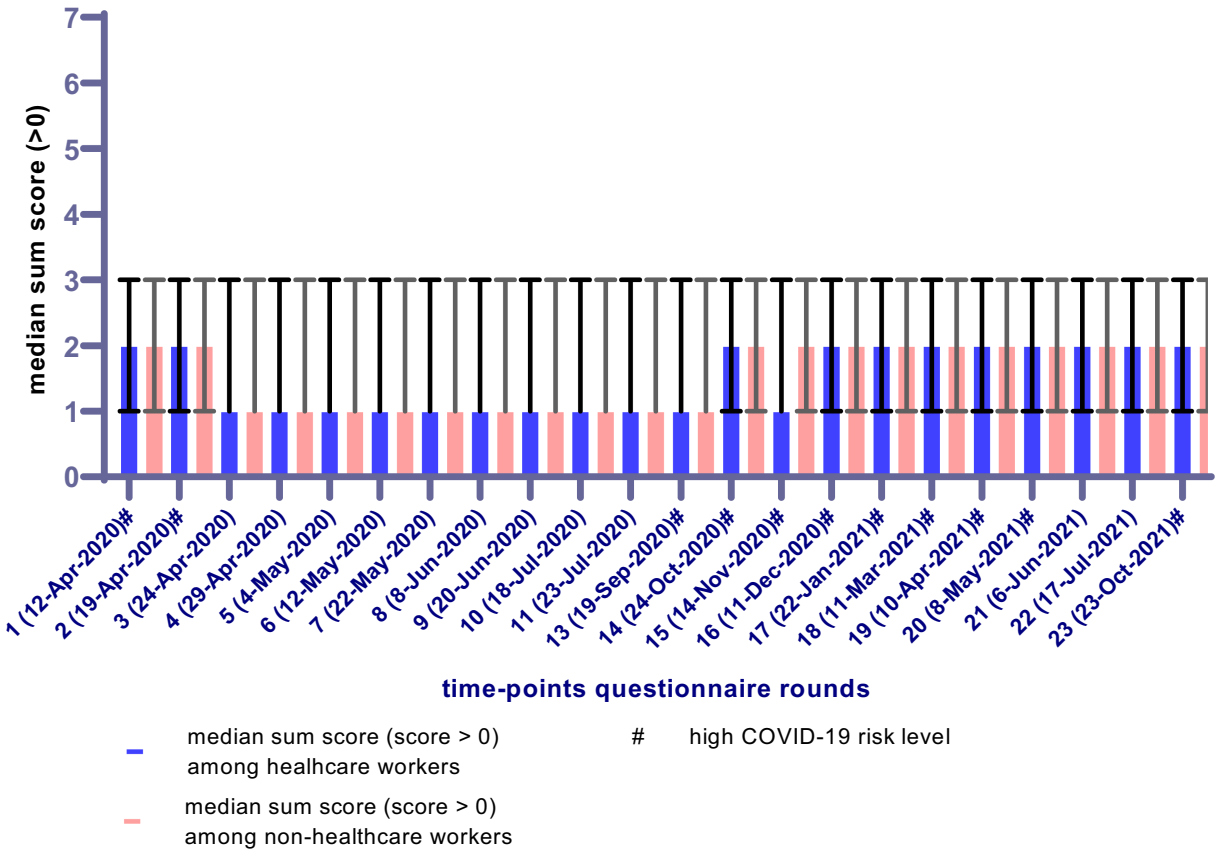

FIGURE 3
Median (and IQR) anxiety scores (for scores >0) over the different COVID-19 questionnaire rounds (March 2020–November 2021), stratified for healthcare workers (n = 2,750) and non-healthcare workers (n = 9,335). # High COVID-19 risk level (>100 COVID-19 associated hospitalizations per day) (37).

TABLE 2 Incidence rate ratios from the negative binomial GEE analyses on the longitudinal association between working in healthcare and the anxiety score during the COVID-19 pandemic, based on 22 measurement rounds (March 2020–November 2021, n = 12,085 participants).

	IRR	95% Confidence interval	value of p
Model 1: crude model	1.15	1.08–1.22	<0.001
Model 2: model 1 + demographic characteristics	0.99	0.93–1.06	0.811
Model 3: model 2 + work characteristics	0.98	0.92–1.04	0.474
Model 4: model 3 + health characteristics	0.97	0.91–1.04	0.383

Non-healthcare workers is the reference group. Demographic characteristics are sex, age, education level and household composition. Work characteristics are employment contract and working hours. Health characteristics are chronic health condition(s), chronic psychological illness, COVID-19 test result and COVID-19 vaccination.

work and health characteristics was the best fitting model and also shows that the incidence rate ratio did not differ between healthcare workers and non-healthcare workers [incidence rate ratio (IRR) = 0.97, 95% (CI) = 0.91–1.04].

Discussion

The aim of the current study was to investigate the longitudinal association between working in healthcare and anxiety symptoms during the COVID-19 pandemic. We observed no differences in anxiety symptoms between healthcare workers and non-healthcare workers during the COVID-19 pandemic. The anxiety scores over time during the COVID-19 pandemic were similar for healthcare workers and non-healthcare workers.

The results did not confirm our hypothesis that healthcare workers experienced anxiety to a greater extent than non-healthcare workers during the COVID-19 pandemic, which was consistent with results from Chinese and Iranian studies (3, 38). These cross-sectional studies found no differences between healthcare workers and non-healthcare workers in their likelihood of experiencing anxiety during the COVID-19 pandemic as well. In the current study, the median anxiety sum score for both healthcare workers and non-healthcare workers was in general somewhat higher during peak periods of COVID-19 associated hospitalizations. This is in line with previous studies on mental health complaints during different

periods of the COVID-19 pandemic (39–41). Yet, as periods with a high COVID-19 risk level occurred mostly in autumn and winter, seasonal variation could also have contributed to the higher anxiety score. To explain, research has shown that during autumn and winter, mental health complaints may occur more frequently among the general population (42–44).

Further, the results showed that before the demographic characteristics sex, age, education level and household composition were added to the model, healthcare workers scored on average 1.15 times higher on the anxiety score compared to non-healthcare workers. This could be due to the fact that being female is a major predictor of higher anxiety during the COVID-19 pandemic (45, 46). 91.7% of the healthcare workers in our sample was female and this percentage was considerably lower among the non-healthcare workers in our sample (47.6%).

A potential explanation for the fact that we found no differences in anxiety between healthcare workers and non-healthcare workers, could be that the working population in general was faced with uncertainty and risk of infection with SARS-CoV-2 (47, 48). A study from MacDonald et al. (49) found that intolerance of uncertainty and worries about contracting SARS-CoV-2 were associated with anxiety and other mental health problems among American adults.

Another possible explanation is that healthcare workers may have felt better informed about the pandemic than non-healthcare workers, which may have reduced negative mental health consequences of the pandemic among healthcare workers. Skoda et al. (22) found that the subjective level of being informed about COVID-19 and related measures was negatively associated with anxiety and that healthcare workers had a higher subjective level of information regarding COVID-19 than non-healthcare workers. In addition, a study from Cai et al. (50) showed that knowledge about COVID-19 and how to prevent the viral infection reduced distress among healthcare workers. If healthcare workers felt better informed and had more knowledge about COVID-19 compared to non-healthcare workers, this may have canceled out the negative effects of the COVID-19 pandemic on anxiety for healthcare workers.

In addition, the negative impact of the pandemic on healthcare workers might have been reduced by adequate preventive mental health care which was offered to healthcare workers during the COVID-19 pandemic (51). For example, activities such as mindfulness and psychosocial counseling at work and a specially opened national helpline to speak to specialized psychologists were offered to healthcare workers.

This study was one of the first longitudinal studies on anxiety among healthcare workers and non-healthcare workers during the COVID-19 pandemic. Anxiety was measured in periods of high and low COVID-19 infection rates, providing a complete overview of the situation in the first one-and-a-half year (March 2020–November 2021) of the pandemic in the Netherlands. Additional strengths are the large sample size, and the broad range of covariates that were included.

The study also has some limitations. First, the study population only consists of residents of the northern part of the Netherlands. This region had relatively low COVID-19 infection and mortality rates compared to other regions (52, 53). Because more severely affected regions were not examined, the degree of anxiety during the pandemic in the Netherlands may thus have been underestimated in the current study. Second, we were not able to distinguish between type of healthcare workers, while it is likely that healthcare workers in COVID-19 specific intensive care units experienced more anxiety, for example through being in contact with sick or deceased patients, than healthcare workers who were not in direct contact with COVID-19 patients. Third, nonresponse bias possibly occurred if workers (including those in healthcare) experiencing high levels of anxiety or mental health problems have not completed the surveys. Fourth, we used single dataset imputation for the 1 item missingness in rounds 1–9, whereas multiple imputation would have been more accurate.

Further longitudinal research could be insightful as some mental health problems may develop after a longer period of time (54–56). The SARS outbreak in 2003 showed that anxiety and other mental health problems in healthcare workers can persist and even increase long after the event (57). McAlonan et al. (57) explained these post-event complaints by the ending of direct threat and the allowance of suppressed emotions. Therefore, it is important to pay attention to the impact of the COVID-19 pandemic on the mental health of healthcare workers, for example by offering psychological help or support from the occupational physician, also after the pandemic.

Conclusion

During the COVID-19 pandemic, many healthcare workers faced extreme working conditions and were at higher risk of being infected with SARS-CoV-2. Notwithstanding, we found no differences between healthcare workers and non-healthcare workers in their likelihood of experiencing anxiety symptoms during the COVID-19 pandemic. Considering the current and future high workload and workforce shortages especially in the healthcare sector (58, 59), it is important to continue monitoring the mental health of healthcare workers for the long term.

Data availability statement

The data analyzed in this study is subject to the following licenses/restrictions: obtained from a third party, i.e., Lifelines (https://www.lifelines.nl/researcher). Requests to access these datasets should be directed to Lifelines Research Office (research@lifelines.nl).

Ethics statement

The studies involving humans were approved by the UMCG Medical ethical committee. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

VF and EB performed the data analyses. VF wrote the first draft of the manuscript. EB wrote the final draft of the manuscript. All authors contributed to the study conception, design, commented

on previous versions of the manuscript, read, and approved the final manuscript.

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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.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1236931/full#supplementary-material

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Job burnout among primary healthcare workers during COVID-19 pandemic: cross-sectional study in China

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Objective: This study evaluated job burnout among primary healthcare workers (PHCWs) in China during the COVID-19 pandemic, explored its influencing factors, and examined PHCWs' preferences for reducing job burnout.

Method: We conducted a multicenter cross-sectional study in Heilongjiang, Sichuan, Anhui, Gansu, and Shandong Provinces. An electronic questionnaire survey was conducted through convenience sampling in communities from May to July 2022. We collected sociodemographic characteristics, job burnout level, job satisfaction, and preferred ways to reduce job burnout among PHCWs.

Results: The job burnout rate among PHCWs in China was 59.87% (937/1565). Scores for each dimension of job burnout were lower among PHCWs who had a better work environment (emotional exhaustion OR: 0.60; depersonalization OR: 0.73; personal accomplishment OR: 0.76) and higher professional pride (emotional exhaustion OR: 0.63; depersonalization OR: 0.70; personal accomplishment OR: 0.44). PHCWs with higher work intensity (emotional exhaustion OR: 2.37; depersonalization OR: 1.34; personal accomplishment OR: 1.19) had higher scores in all job burnout dimensions. Improving work environments and raising salaries were the preferred ways for PHCWs to reduce job burnout.

Conclusion: Strategies should be developed to improve job satisfaction among PHCWs, enhance their professional identity, and alleviate burnout to ensure the effective operation of the healthcare system, especially during periods of overwork.

KEYWORDS

job burnout, COVID-19, primary healthcare workers, occupational health, MBI scale

1 Introduction

Job burnout is an important issue in the field of occupational health. A response to prolonged exposure to workplace stress, burnout is a syndrome manifested by emotional exhaustion, depersonalization, and a diminished sense of personal accomplishment at work (1). Job burnout has three main characteristics: (1) a feeling of energy expenditure or exhaustion, (2) increased perceptual distance from work or negative work-related emotions or feelings of cynicism, and (3) lowered professional performance. Burnout can occur in various industries and can be costly, resulting in employee tardiness, absenteeism, turnover, decreased performance, or even negative employee health outcomes (2–5).

Studies in Europe and the US have shown that long work hours are a major cause of burnout (6, 7). The phenomenon of long work hours is commonly found among healthcare workers worldwide, and the situation is particularly critical in China (1). The long, high-intensity work hours characteristic of healthcare work cause these workers to be highly prone to burnout. Job satisfaction is defined as the extent that the health workers are positive, negative or affective toward their work (8). The 2011 China Primary Care Workforce Survey showed that low job satisfaction and high occupational burnout were widespread (9). It was confirmed that lower job satisfaction can significantly contribute to job burnout of healthcare workers (10, 11). Studies suggest that healthcare worker burnout has both direct and indirect negative effects on healthcare institutions, healthcare workers themselves, and patients, including errors in diagnosis and treatment (12, 13), lowered professionalism and efficiency in healthcare services (14), and risks to the health and safety of physicians (15, 16). Burnout can even affect the orderly functioning of the whole healthcare system (14). Compared with the West, Asia has limited research on healthcare worker burnout, although its overall level is quite high. Cross-sectional studies in Malaysia (17), Yemen (18), and Hong Kong (19) found that more than 30% of healthcare workers had a high degree of job burnout. The Maslach Burnout Inventory (MBI) is the most widely used scale for measuring job burnout, includes subscales purported to measure each of these three dimensions. Many researchers have found the MBI had the greatest predictive validity (20).

China has a large population (21) and 2.2 physicians per 1,000 people (22), which is below the World Health Organization's recommendation. As a result, Chinese healthcare workers generally work long hours and have heavy workloads. High levels of burnout are prevalent among China's healthcare workers. One systematic review estimated that the job burnout rate in the medical field in China was 66.5–76.9% (23). A national cross-sectional survey of physicians in Chinese tertiary hospitals found that 38.4% of respondents met the criteria for burnout (24).

Since 2019, the COVID-19 pandemic has brought new challenges to healthcare workers. Primary healthcare workers (PHCWs) in China have made great contributions and borne high work stress under the country's evolving pandemic-prevention policies. It is important, then, to assess the level of burnout among PHCWs in China during the COVID-19 pandemic, analyze the factors affecting burnout, and explore PHCWs' preferences for reducing job burnout to promote healthy career development. To this end, we conducted a cross-sectional study to assess the prevalence of burnout among PHCWs during the COVID-19 pandemic and explore the factors affecting burnout.

2 Methods

2.1 Data collection

We used a cross-sectional survey method and selected five provinces (Heilongjiang, Sichuan, Anhui, Gansu, and Shandong) as survey sites to recruit subjects from May to July 2022. Using nonrandom convenience sampling, we recruited subjects from the community who met the survey criteria. The selected study subjects filled out an anonymous questionnaire via an online platform (Survey Star, Changsha Ran Xing Science and Technology, Shanghai, China). The key variables in the questionnaire were all required and assigned logical values. Data were screened according to the requirements of the study, finally the questionnaire information of 1,561 cases were selected, and then the database was locked.

2.2 Study subjects

The inclusion criteria for survey respondents included the following: they needed to be PHCWs who had online access so they could complete the survey. Participation was voluntary.

Sample size calculation was based on the cross-sectional survey design. The overall burnout indicator for healthcare work obtained from the data was approximately $p = 0.3$, $\alpha = 0.05$, and $d = 0.1 \times p = 0.03$. The sample size for a purely random sample was derived from the formula for cross-sectional survey sample size. Considering the sample size expansion (1.5–2.0 times) problem for nonrandom sampling, the minimum sample size is expanded to $N_{srs} = 897 \times 1.5 = 1{,}346$:

$$N_{srs} = \frac{t^2_{\frac{\alpha}{2}} \times P(1-P)}{d^2}.$$

2.3 Measures and variables

The questionnaire was divided into four parts:

(1) Basic sociodemographic characteristics, such as gender, technical title, work unit, years of work, and education level.
(2) Maslach Burnout Inventory (MBI): The MBI contains three dimensions: emotional exhaustion, depersonalization, and lack of personal accomplishment. The scale was designed by Maslach and Jackson (25) and was adapted and refined for China by ChaoPing Li of Renmin University of China.
(3) Job satisfaction, divided into three evaluation aspects: work environment, salary, and work intensity.
(4) Preferences for reducing job burnout: Five improvement methods are given: (1) awarding honorary certificates or titles, (2) reducing work intensity, (3) improving work environment,

(4) providing opportunities for further education, and (5) increasing salaries. The survey of preference for improving job burnout adopts the method of option ranking. PHCWs were first asked to select the three options that they personally thought would be most effective in improving burnout, and then the three options were ranked from most important to least important.

2.4 Burnout definition

Burnout was measured using the MBI scale, quantified using the Likert-type scale, and evaluated according to the SS′ scoring principle: SS′ = 0.4 × mean score for emotional exhaustion + 0.3 × mean score for depersonalization + 0.3 × (6 – mean score for personal accomplishment) (26, 27). Based on the scores, the subjects were divided into three categories: (1) no job burnout ($0 \leq SS' < 1.50$), (2) mild job burnout ($1.50 \leq SS' < 3.50$), and (3) severe job burnout ($3.50 \leq SS' < 6$).

In this study, mild and severe job burnout are regarded as the levels of job burnout that are in need of improvement; that is, the detection rate of job burnout is positive:

$$Job\ burnout\ rate = \frac{mild\ job\ burnout + severe\ job\ burnout}{total\ number} \times 100\%.$$

2.5 Statistical analysis

The questionnaire was analyzed using R 4.1.2 (R Development Core Team) and IBM SPSS AMOS 26.0.0 (IBM Corporation, Armonk, NY, USA). Differences were statistically significant at $p < 0.05$.

We used the chi-square test to analyze the correlation between the job burnout level of healthcare workers and demographic factors. Stepwise logistic regression was used to analyze the factors affecting job burnout. We established a structural equation model (SEM) based on theoretical assumptions and the factors affecting burnout to explore the path coefficients of potential variables influencing burnout. The generalized least-squares (GLS) method was used to estimate the path coefficients. We computed the fit of the model to the data using the following: chi-squared/degree of freedom (CMIN/df), root-mean-square error of approximation (RMSEA), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), and comparative fit index (CFI). Furthermore, multigroup SEM was used to explore similarities and differences in the model according to age, gender, years of work, and whether engaged in new COVID-19-related work.

We used Thurstone's pairwise comparison method to analyze the ranked items of burnout improvement methods. In this method, option combination information is converted into pairwise comparison information, and the value of column j for row i is divided into three cases: R_α, R_β, and R_γ. The formula for calculating the probability table p_{ij} and the scale value S_i is

$$p_{ij} = \frac{R_\alpha + R_\beta + 0.5 \times R_\gamma}{N},$$

$$S_i = \frac{\sqrt{2}}{n} \sum_{j=1}^{n} x_{ij}\ (i = 1, 2, \ldots, n).$$

3 Results

We collected 1,561 valid questionnaires. Among the investigated PHCWs, the average age was 37.50 ± 10.30 years, 1,139 (72.97%) were female, and 45.16% (705/1,561) worked in rural areas. Most worked in village clinics (45.16%) and community healthcare centers (41.13%). Table 1 shows the personal and professional characteristics of the respondents.

3.1 Reliability and validity analysis

The overall Cronbach's α coefficient of the Chinese version of the MBI scale in this study was 0.859. The internal Cronbach's α coefficients of the dimensions of emotional exhaustion, depersonalization, and personal accomplishment were 0.926, 0.914, and 0.843, respectively. The split-half reliabilities of emotional exhaustion, depersonalization, and personal accomplishment were 0.869, 0.712, and 0.878, respectively.

The χ^2 value of Bartlett's sphericity test was 20,333.90, $p < 0.001$. The Kaiser–Meyer–Olkin measure of sampling adequacy was 0.922. Three factors with the characteristic root $\lambda > 1$ were extracted by exploratory factor analysis, and the cumulative variance contribution rate was 73.01%. Factors 1, 2, and 3 explained the three dimensions of personal accomplishment, depersonalization, and emotional exhaustion in the MBI scale, respectively (Supplementary Table S1).

3.2 Factors affecting job burnout based on MBI

3.2.1 Univariate analysis of factors affecting job burnout

The scores for the emotional exhaustion, depersonalization, and personal accomplishment dimensions of the PHCWs were 2.89 ± 1.38, 2.20 ± 1.34, and 3.74 ± 1.42 (see Supplementary Table S2).

The category scores measured by the MBI subscale were taken as the norm (28) and compared with our results. The mean scores for emotional exhaustion and depersonalization among Chinese PHCWs were higher than the general population norm and medical personnel norm; meanwhile, the mean scores for the personal accomplishment dimension were lower. All differences were statistically significant. This indicates that there is a high level of burnout among PHCWs in China (Supplementary Table S2).

The survey revealed that the burnout rate of PHCWs in China was 59.77% (933/1,561), among which 857 (54.90%) had mild burnout and 76 (4.87%) had severe burnout. Univariate statistical analysis revealed significant differences between burnout

TABLE 1 Social demographic and burnout level of PHCWs.

Characteristics	Total (%) $N = 1,561$	Without job burnout (%) $n = 628$	With job burnout (%) $n = 933$	*P*
Sex				0.310
Male	422 (27.03)	179 (28.50)	243 (26.05)	
Female	1,139 (72.97)	449 (71.50)	690 (73.95)	
Age				<0.001
≤35 years	737 (47.21)	245 (39.01)	492 (52.73)	
>35 years	824 (52.79)	383 (60.99)	441 (47.27)	
Work unit				0.037
Center for Disease Control and Prevention	123 (7.88)	54 (8.60)	69 (7.40)	
Grade III Level A hospital	91 (5.83)	37 (5.89)	54 (5.79)	
Community healthcare center	642 (41.13)	231 (36.78)	411 (44.05)	
Township Health Center and Village Clinic	705 (45.16)	306 (48.73)	399 (42.77)	
Technical title				>0.999
Junior or unverified	1,018 (65.21)	410 (65.29)	608 (65.17)	
Middle level and above	543 (34.79)	218 (34.71)	325 (34.83)	
Work years				<0.001
≤10 years	733 (46.96)	255 (40.61)	478 (51.23)	
>10 years	828 (53.04)	373 (59.39)	455 (48.77)	
Education level				<0.001
Senior high school and below	348 (22.29)	172 (27.39)	176 (18.86)	
Bachelor degree or above	1,213 (77.71)	456 (72.61)	757 (81.14)	
Political status				0.188
Other	1,206 (77.26)	474 (75.48)	732 (78.46)	
Member of the Communist Party of China	355 (22.74)	154 (24.52)	201 (21.54)	
Job location				0.023
Rural	705 (45.16)	306 (48.73)	399 (42.77)	
Urban	856 (54.84)	322 (51.27)	534 (57.23)	
Work environment				<0.001
Mean (SD)	4.01 (0.87)	4.37 (0.66)	3.77 (0.90)	
Remuneration				<0.001
Mean (SD)	3.47 (1.11)	3.80 (1.01)	3.25 (1.11)	
Work intensity				<0.001
Mean (SD)	3.39 (1.06)	2.92 (1.09)	3.70 (0.92)	

and non-burnout PHCWs for the following variables: age, work unit, years of work, education level, and work location ($p < 0.05$).

3.2.2 Logistic analysis of factors affecting PHCW burnout

We established a logistic regression model using the stepwise regression method. Sociodemographic factors, work environment, work treatment, work intensity, and professional pride were included as independent variables in the initial logistic regression. Taking the no-job-burnout group as the control group, we conducted regression analysis with emotional exhaustion, personality disintegration, and personal accomplishment burnout (mild job burnout + severe job burnout) as dependent variables. Figure 1 shows the results.

For the emotional exhaustion dimension, the results showed that PHCWs aged > 35 years had lower scores for emotional exhaustion (OR: 0.67; 95% CI: 0.52–0.86). Better work environment

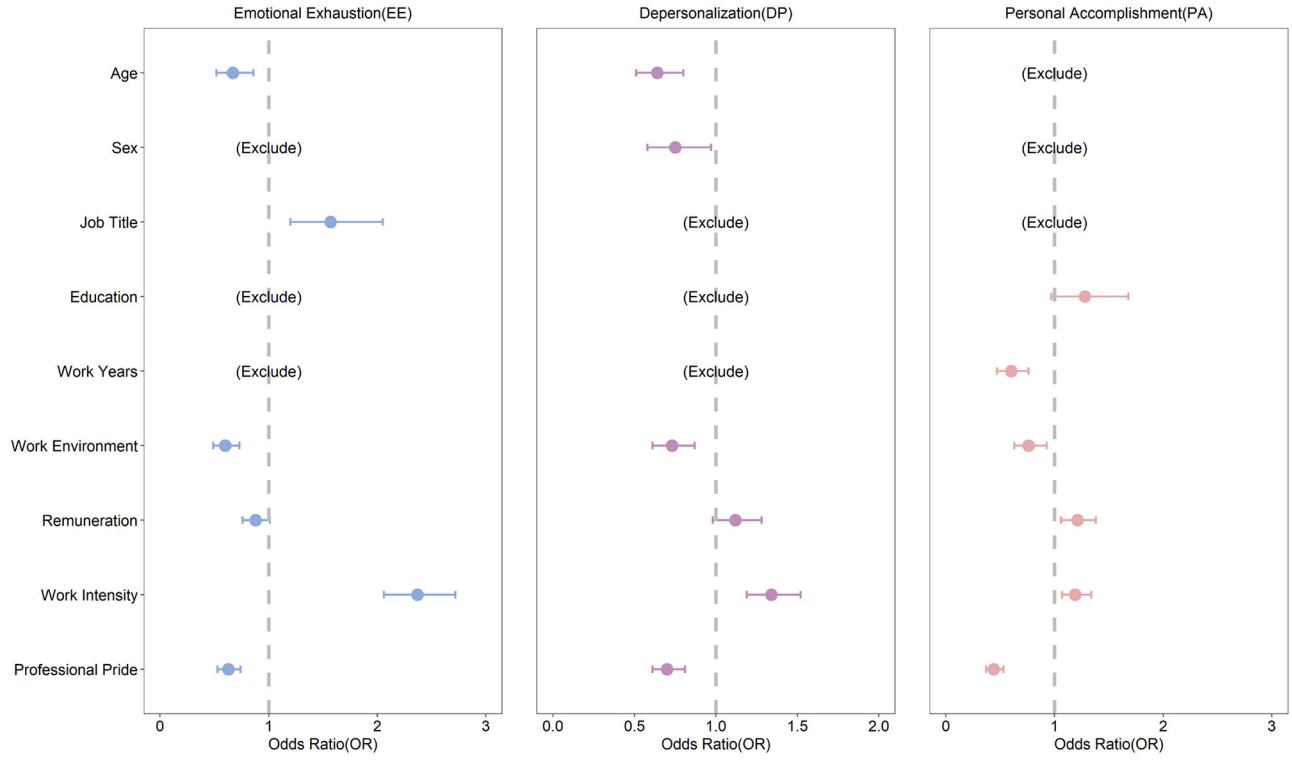

FIGURE 1
Forest plot of logistic analysis of burnout influencing factors.

(OR: 0.60; 95% CI: 0.49–0.73) and higher professional pride (OR: 0.63; 95% CI: 0.53–0.74) were associated with lower scores for emotional exhaustion. Meanwhile, PHCWs with high work intensity (OR: 2.37; 95% CI: 2.06–2.72) and higher technical titles (OR: 1.57; 95% CI: 1.20–2.05) had higher scores for emotional exhaustion.

For the depersonalization dimension, PHCWs aged > 35 years had lower depersonalization scores compared with those aged ≤ 35 years (OR: 0.64; 95% CI: 0.51–0.80). Females had lower depersonalization scores compared with males (OR: 0.75; 95% CI: 0.58–0.97). Similar to the emotional exhaustion dimension, better work environment (OR: 0.73; 95% CI: 0.61–0.87) and higher professional pride (OR: 0.70; 95% CI: 0.61–0.81) were associated with lower scores for depersonalization while high work intensity (OR: 1.34; 95% CI: 1.19–1.52) was associated with higher scores.

For the personal accomplishment dimension, over 10 years of work experience (OR: 0.60; 95% CI: 0.47–0.76), better work environment (OR: 0.76; 95% CI: 0.63–0.93), and lower professional pride (OR: 0.44; 95% CI: 0.37–0.53) were significantly associated with lower scores for personal accomplishment. Higher remuneration (OR: 1.21; 95% CI: 1.06–1.38) and higher work intensity (OR: 1.19; 95% CI: 1.07–1.34) were significantly associated with higher scores for personal accomplishment.

3.2.3 Structural equation model analysis

Based on this study's theoretical hypothesis and the previous analysis of the factors affecting job burnout, SEM was constructed as shown in Figure 2. There were three observed variables of social status: education, technical title, and workplace; three observed variables of job satisfaction: work environment, salary, and work intensity; and three observed variables of burnout: emotional exhaustion, personality disintegration, and personal fulfillment.

The observed variable data were substituted into the SEM, and the model was fitted using the maximum likelihood method. The main fitting indexes of the model roughly reached the criteria for fitness, indicating acceptable model fit (Supplementary Table S3).

In the SEM, the standardized direct effect of job satisfaction on burnout was −0.352, that of social status on job satisfaction was −0.260, and that of social status on burnout was 0.165. All standardized direct effects were statistically significant. The regression coefficients of all observed variables of job satisfaction and social status reached statistical significance, indicating that each observed variable of the measurement model could explain the latent variables well.

We further used multigroup invariance modeling to explore the similarities and differences in the SEM between different groups to improve the empirical validity of the factors affecting burnout. We selected the sociodemographic variables of age, gender, years of work, and whether engaged in new COVID-19-related work for multigroup analysis.

PHCWs were divided into a younger group (≤35 years) and elder group (>35 years), a male and female group, a COVID-19-related work group and others, and a short work experience group (≤10 years) and long work experience group (>10 years). When the absolute value of the critical ratio of the path coefficient

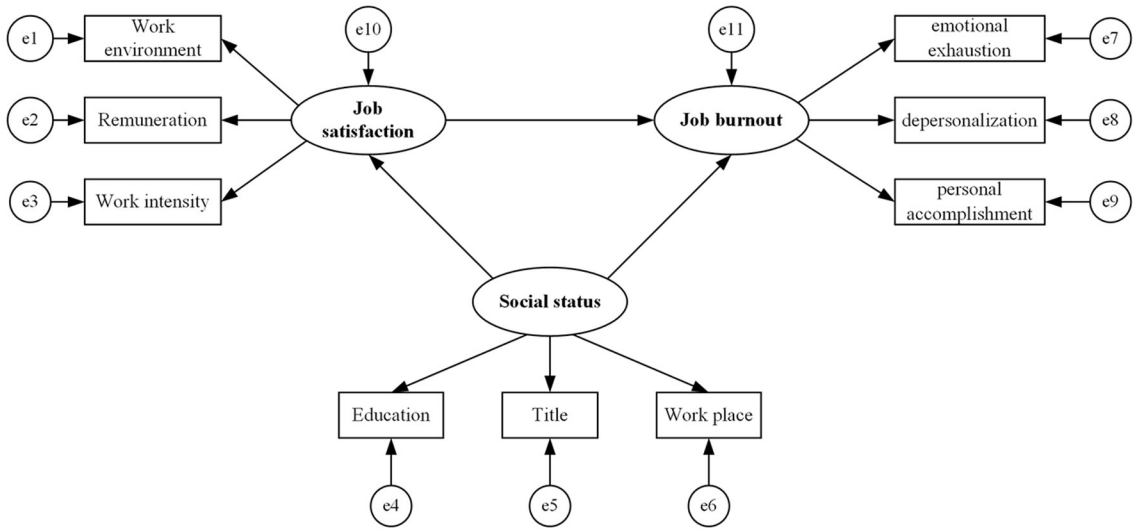

FIGURE 2
Structural equation model framework of job burnout.

difference between different groups is >1.96, the corresponding path coefficient difference between groups is significant; that is, $p < 0.05$. Multigroup analysis showed that the influence of job satisfaction on job burnout was more significant among females (−3.079 vs. −1.940). The effect of social status on job burnout was more significant for the COVID-19-related work group (−0.221 vs. −0.029). There was no significant difference in the path coefficients among other models (Figure 3).

3.3 Preferred ways to reduce job burnout

The option ranking method was used for the preferred ways to reduce job burnout. We presented five ways to reduce job burnout: (1) awarding an honorary certificate, (2) reducing work intensity, (3) improving the work environment, (4) providing opportunities for further study, and (5) Increasing wages.

Increasing wages (88.68%) and improving the work environment (83.09%) were found to be most effective. Analyzing the combination of options, most healthcare workers (34.98%) reduced their work intensity, improved their work environment, and increased their salaries. According to the ranking analysis of the importance of the options, the most effective healthcare workers (64.95%) can improve the work environment (Figure 4).

Based on the Thurston method, the scale values of the five options (1, 2, 3, 4, and 5) were ranked on a psychological valence chart. The results showed that the most-preferred ways for PHCWs to reduce job burnout were improving the work environment (0.913) and increasing salaries (0.810). Meanwhile, the scale values of awarding honorary certificates or titles (−0.342), reducing work intensity (−0.594), and providing opportunities for further study (−0.787) were all negative (Supplementary Figure S1).

4 Discussion

4.1 Chinese version of the MBI scale has good reliability and validity

The MBI scale has been widely used to measure job burnout. During COVID-19, this scale was used in Italy, the US, Belgium, India, Singapore, and other countries to measure the job burnout of frontline healthcare workers, and its reliability and validity were verified (29–32).

We used a modified Chinese version of the MBI burnout scale to conduct a presurvey and test scale reliability and validity at 10 sites in Heilongjiang, Sichuan, Gansu, Anhui, and Shandong Provinces. The Cronbach's α coefficients for emotional exhaustion, depersonalization, and personal accomplishment were >0.7, demonstrating that the scale had good reliability, internal consistency, and external consistency.

4.2 During the COVID-19 pandemic, job burnout was common among PHCWs

The overall reported job burnout rate among PHCWs was about 60%; mild burnout accounted for 55%, and severe burnout accounted for 5%. Galanis summarized 16 studies where the MBI was used to measure nurses' job burnout and found that the emotional exhaustion rate was 34%, the personality disintegration rate was 12%, and the low personal achievement rate was 15% (33). Compared with previous findings, the job burnout rate among PHCWs in China was found to be significantly higher (34, 35), suggesting that this issue warrants attention in China.

The results suggested that job burnout among PHCWs is characterized by high emotional exhaustion, high personality

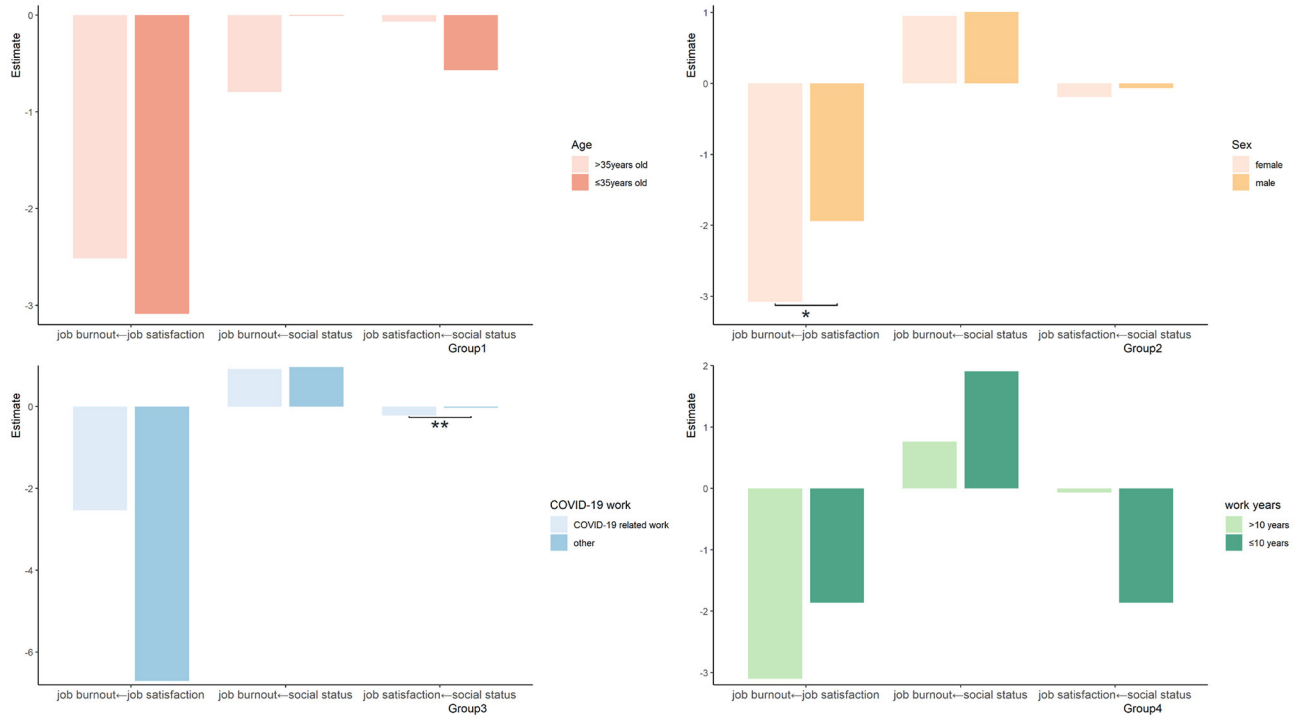

FIGURE 3
Multigroup invariance modeling of job burnout in different groups. *$p < 0.05$, **$p < 0.01$.

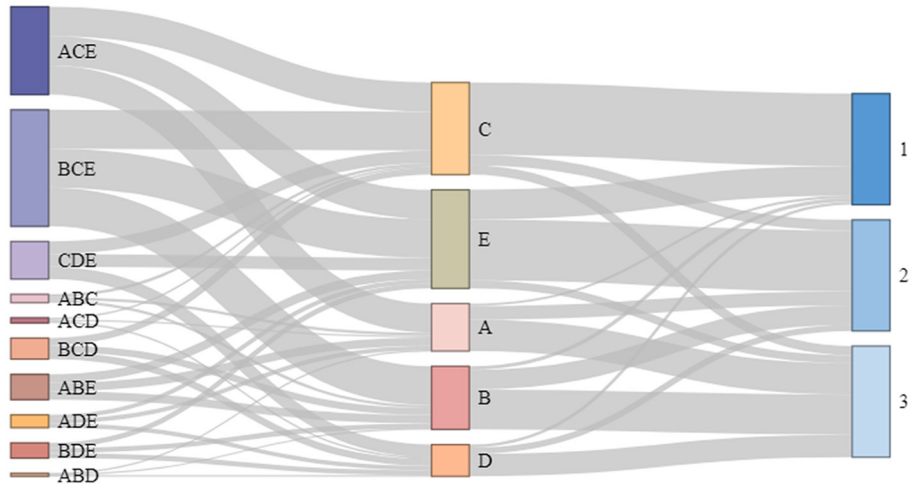

FIGURE 4
Sankey diagram of preference for improving job burnout. **(A)** Awarding an honorary certificate, **(B)** Improving work intensity, **(C)** Improving work environment, **(D)** Providing opportunities for further study, and **(E)** Increasing wages and allowances.

disintegration, and low personal accomplishment, among which the score for personal accomplishment was significantly below the norm. This is similar to the findings of Hu et al. (36) and Parandeh et al. (37). It can be attributed to the fact that PHCWs in China were mostly engaged in repetitive tasks with high work pressure and long work hours during the pandemic (38) and may have encountered unsupportive or uncooperative patients (39).

PHCWs played an important role in the struggle to contain COVID-19 (40). From 2020 to 2022, China's approach to the pandemic shifted from "zero clearing" to "dynamic clearing" (41, 42). PHCWs took on the tedious work of COVID-19 patient treatment, nucleic acid testing, epidemiological investigation, vaccination, isolation and prevention, and decontamination (43, 44), which involved long work hours and high work pressure.

4.3 Factors affecting burnout among PHCWs in China

The factors affecting burnout were diverse and changed over time, and could be both subjective and objective. Our findings showed that burnout level was associated with the age, years of work, education level, and work location of healthcare workers. Among them, age $\geq$ 35 years, better work environments, and more professional pride inhibited emotional exhaustion while more intense work exacerbated it. Gambaro et al.'s study on job burnout of healthcare workers also showed a negative correlation between age and job burnout. Similar to our findings, work experience has been shown to supply healthcare workers with the knowledge and emotion regulation skills they need to mitigate burnout (45). During the COVID-19 pandemic, healthcare staff with higher titles often had to assume more responsibilities, thus leading to emotional exhaustion (8, 46).

The depersonalization dimension was similar to that of emotional exhaustion. Therefore, PHCWs who are younger, have higher technical titles, and have higher work intensity should be the focus of interventions for burnout. In addition, females were less likely to show symptoms of depersonalization (i.e., holding negative or inappropriate attitudes toward their work objects) (47). Previous studies have also shown that female healthcare workers have more empathy for patients, better understand patients, and devote more time to them (48–50).

In the personal accomplishment dimension, healthcare workers with more than 10 years of work experience had lower levels of personal fulfillment. Studies have shown that longer years of work are usually a contributing factor to burnout (51, 52). Different from previous studies, we found that those with high work intensity showed a higher level of personal accomplishment (36). This reflects the sense of social responsibility and dedication shown by Chinese healthcare workers during the pandemic (38).

Our results highlight the important role of job satisfaction in reducing healthcare workers' job burnout. SEM showed that improving job satisfaction could reduce job burnout. Our findings partly confirm Goulet's and Singh theory of career commitment—that is, job satisfaction has a negative effect on job burnout (53). Therefore, as an important factor affecting PHCWs' professional development, job satisfaction should be an important intervention strategy in occupational health (54). Social status also affects the job satisfaction of healthcare workers, thus affecting job burnout. Thus, more attention should be paid to groups with higher social status (38).

4.4 Burnout improvement preferences of PHCWs in China

Among the ways to reduce the job burnout among PHCWs, improving the work environment and increasing wages are the most important. During the COVID-19 pandemic, healthcare workers often worked in isolation wards and temporary nucleic acid test sites, and the work environments were relatively harsh, which could easily lead to burnout (38). Healthcare workers expressed the most dissatisfaction with the remuneration dimension. PHCWs in China have low salaries but bear higher workloads, greater risks of infection, and heavier physical and mental pressure (8, 55, 56). Incentive policies should be implemented to improve healthcare workers' job satisfaction and alleviate burnout by increasing their income.

5 Strength and limitations

This study used a cross-sectional survey that only reflected burnout levels at the time of the survey. Preexisting psychopathological conditions should be taken into consideration. It would be beneficial to confirm causality with longitudinal data in future studies. Second, we used the revised MBI scale to measure job burnout. Although the scale has good reliability and validity, it might be slightly different from the norm, which reduces comparability to some extent. Finally, we used multicenter convenience sampling. Although the survey area was selected in consideration of economic and geographic location and balanced urban/rural distribution, it did not strictly follow random sampling for the whole country, and the sample had large gender differences. Our research was based on the respondents and did not collect the characteristics of non-respondents. Therefore, the conclusions only represent the respondents, which might lead to non-response bias and underestimate or overestimate the level of job burnout. Thus, caution should be exercised in extrapolating from the conclusions.

6 Conclusion

We found that PHCWs in China had high levels of job burnout during the COVID-19 pandemic. Job burnout among PHCWs was related to their age, years of work, education level, and workplace and was influenced by job satisfaction and professional identity. At present, PHCWs in China have average salaries but high work intensity. Improving their work environments and salaries could reduce their job burnout. Healthcare managers can refer to healthcare workers' preferred ways to reduce job burnout and provide support to maintain their work enthusiasm and thus the stability of the whole healthcare system.

We evaluated the level of job burnout among PHCWs in China during COVID-19, analyzed its influencing factors, and summarized the preferred ways to reduce job burnout. However, this study is a cross-sectional study with a risk of non-response bias. Further evaluation is needed to inform future practice.

Data availability statement

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics statement

This study was approved by the Ethics Committee of Peking University Health Science Center, China (approval number: IRB00001052-21132) and the signal-free informed consent application was approved.

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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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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1266864/full#supplementary-material

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The impact of COVID-19 on nurses' job satisfaction: a systematic review and meta-analysis

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Background: The global healthcare landscape was profoundly impacted by the COVID-19 pandemic placing nurses squarely at the heart of this emergency. This review aimed to identify the factors correlated with nurses' job satisfaction, the impact of their job satisfaction on both themselves and their patients, and to explore strategies that might have counteracted their job dissatisfaction during the COVID-19 pandemic.

Methods: The Joanna Briggs Institute (JBI) methodology for systematic reviews of prevalence and incidence was used in this review. The electronic databases of CINAHL, MEDLINE, SCOPUS, PsycINFO and Academic Search Complete were searched between January 2020 to February 2023.

Results: The literature review identified 23 studies from 20 countries on nurses' job satisfaction during the COVID-19 pandemic. A pooled prevalence of 69.6% of nurses were satisfied with personal, environmental, and psychological factors influencing their job satisfaction. Job satisfaction improved psychological wellbeing and quality of life, while dissatisfaction was linked to turnover and mental health issues.

Conclusion: This systematic review elucidates key factors impacting nurses' job satisfaction during the COVID-19 pandemic, its effects on healthcare provision, and the potential countermeasures for job dissatisfaction. Core influences include working conditions, staff relationships, and career opportunities. High job satisfaction correlates with improved patient care, reduced burnout, and greater staff retention.

Systematic review registration: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42023405947, the review title has been registered in PROSPERO and the registration number is CRD42023405947.

KEYWORDS

job satisfaction, COVID-19, systematic review, healthy work environment, healthcare management

1 Introduction

The COVID-19 pandemic significantly affected multiple dimensions of healthcare systems across the globe, with nurses being at the epicenter of this crisis (1, 2). In the midst of the COVID-19 outbreak, nurses encountered distinct stressors encompassing both personal and professional spheres, which have the potential to substantially affect their levels of job satisfaction

and intentions to remain in their positions (3). Nurses experiencing anxiety related to COVID-19 exhibited higher levels of work-related stress, greater inclination towards leaving their jobs (4). Furthermore, nurses reported a marked increase in their burnout level (5). As fundamental healthcare professionals accountable for patient care, nurses have grappled with unparalleled challenges that include an escalation in workload (6), scarcity of resources, vulnerability to infection (7), and emotional distress (8). The emotional toll from seeing increased patient morbidity and mortality during the pandemic, and the limited psychological support provided by the organization, significantly affected nurses' emotional wellbeing and job satisfaction (9). Reduction in salaries and increased workload played a significant role as well, with adequate remuneration and acknowledgment acting as motivational factors (9).

Nurse's job satisfaction during COVID-19 was a critical factor affecting their performance, productivity, and retention (10). Nurses experiencing low job satisfaction may be prone to burnout (11), reduced job performance (12), and increased likelihood of leaving the profession (10). Furthermore, job dissatisfaction may negatively impact nurses' mental and physical health, exacerbating stress, anxiety, and other mental health conditions (1, 6, 10). Low job satisfaction among nurses during the COVID-19 pandemic could have had far-reaching consequences, not only for themselves but also for patient care and healthcare organizations as a whole (10).

Recognizing the significance of addressing job satisfaction among nurses, especially during the COVID-19 pandemic, the implementation of effective mitigation strategies is imperative (3, 13). These strategies may include promoting supportive work environments (8), providing adequate resources and training (7, 13), fostering open communication channels (14), and offering mental health support services (8).

Although the repercussions of the COVID-19 pandemic on various facets of healthcare and the welfare of healthcare professionals have been extensively acknowledged (8), there is a notable scarcity of exhaustive scholarly literature specifically zeroing in on nurses' job satisfaction amidst this unparalleled crisis. Consequently, all-encompassing research, inclusive of systematic reviews scrutinizing the distinct impact of the pandemic on nurses' job satisfaction, has been sparse. Holistic studies centered on nurses' job satisfaction during the COVID-19 outbreak can furnish critical insights into the specific factors shaping job satisfaction levels, the ramifications of job discontentment on nurses' wellbeing and the caliber of patient care, and the formulation of efficacious ameliorative strategies. Such research may guide evidence-based interventions and policies to bolster job satisfaction and foster the resilience of nurses, which in turn may catalyze the enhancement of healthcare delivery during and in the aftermath of the pandemic. The aim of this systematic review is to investigate how the COVID-19 pandemic affected nurses' job satisfaction. Specifically, the review seeks to identify factors influencing job satisfaction, explore the consequences of job dissatisfaction on both nurses and their patients, and examine mitigation strategies employed to counteract job dissatisfaction during the pandemic.

2 Methods

This systematic review was conducted in accordance with the JBI methodology for systematic reviews of prevalence and incidence (15) and the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (16). *A priori* protocol was registered in PROSPERO and the registration number is (CRD42023405947).

2.1 Search strategy

In March 2023, a three-step search strategy was used aimed at locating published studies in English. First, an initial limited search of MEDLINE and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) was undertaken to identify articles on the topic. Text words contained in the titles and abstracts of relevant articles, and index terms used to describe the articles were used to develop a full search strategy.

In the second step in the search strategy, all identified keywords, index terms and MESH terms were adapted for each included database and/or information source. The following databases were searched: CINAHL, MEDLINE, SCOPUS, PsycINFO, and Academic Search Complete. The Boolean operators AND/OR were used to narrow or broaden the search using a combination of the keywords. Search terms included: (nurse or nurses or nursing) AND ("job satisfaction" or "work satisfaction" or "employee satisfaction") AND (determinant or factor or cause or influence or influencer or predictor or mitigation or prevention or reduction). Finally, the reference lists of the included studies were searched manually to identify any relevant studies.

2.2 Study types and participants

Any primary experimental, quasi-experimental, cohort, or cross-sectional research studies that investigated job satisfaction among nurses during the COVID-19 pandemic were included. Studies published in English and between January 2020 to February 2023 were included as this was the time when COVID-19 was declared as a pandemic across the globe. Studies that investigated job satisfaction among nurses outside the COVID-19 pandemic period were excluded. Qualitative studies were also excluded.

2.3 Study selection

Following the search, all identified citations were collated and uploaded into EndNote version 20 (17) and duplicates were removed. Following a pilot test, titles and abstracts were screened by two independent reviewers (AA, YY) for assessment against the review's inclusion criteria. Potentially relevant studies were retrieved in full, and their citation details imported into the JBI System for the Unified Management, Assessment and Review of Information (JBI SUMARI). The full text of selected citations was assessed in detail against the inclusion criteria by the two reviewers (AA, YY). Any disagreements that arose between the reviewers at each stage of the selection process was resolved through discussion. The results of the search and the study inclusion process were reported in full in the final systematic review and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) flow diagram (16). See Figure 1.

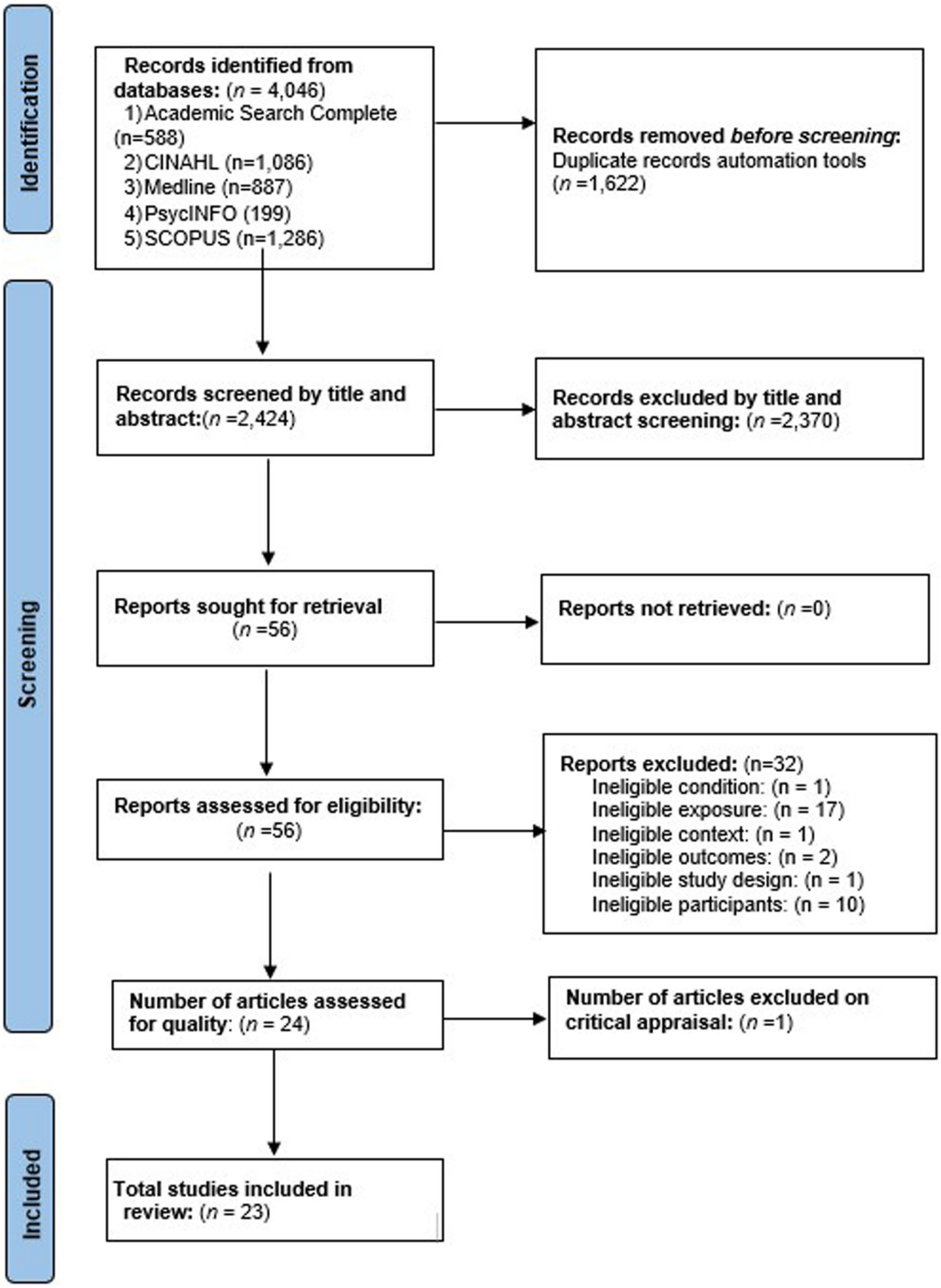

FIGURE 1
PRISMA flow diagram.

2.4 Assessment of methodological quality

Eligible studies were critically appraised independently by the two reviewers (AA, YY) at the study level for methodological quality using standardized critical appraisal instruments from JBI for experimental (18), quasi-experimental (19), and cross-sectional studies (20). The authors of papers were contacted to request missing or additional data for clarification, where required. Any disagreements that arose were resolved through discussion. The results of the critical appraisal were reported in narrative form and in a table (See Supplementary File 1). Not applicable or unclear answers were considered as not achieved. Any study that received a score of less than 50% on the quality assessment questions was excluded. The Supplementary File 1 shows the detailed methodological quality

scores, the questions asked, and the answer key to each study according to the design.

2.5 Data extraction

Data extraction from the studies included in the review was carried out independently by the two reviewers (AA, YY) using the standardized data extraction tool for prevalence and incidence available in JBI SUMARI. To resolve extraction discrepancies, a third reviewer was consulted (VK). The data extracted included specific details about the condition, populations, study methods, and proportions of interest to the review specific objectives. For the purpose of meta-analysis, the pooling of estimates was executed by using JBI SUMARI. The transformation of data was done by applying a random-effects model that employed the Freeman–Tukey transformation. In order to assess heterogeneity, the standard I^2 tests were judiciously employed. In situations where statistical pooling was deemed unfeasible, the outcomes were presented through a comprehensive narrative, supplemented with tables and figures in order to aid in the presentation of data.

3 Results

The literature search generated a total of 4,046 citations. Among these, 1,622 were identified as duplicates and were subsequently removed. The remaining 2,424 citations underwent a preliminary screening process, where titles and abstracts were examined for relevance according to the inclusion criteria. Based on this screening, 56 citations were selected for a comprehensive assessment involving full-text review. Within this subset of 56, 32 studies were also excluded for various reasons, including: ineligibility based on the condition under investigation ($n = 1$), exposure ($n = 17$), context ($n = 1$), outcomes ($n = 2$), study design ($n = 1$), and participant characteristics ($n = 10$). A critical appraisal was conducted on the remaining 24 studies, during which one study was further excluded due to a quality assessment score below the 50% threshold. Consequently, a total of 23 studies met the inclusion criteria and were incorporated in the final review.

3.1 Characteristics of included studies

The final selected studies were carried out from February 2020 to February 2022, during which the primary focus of data collection was in the peak period of the COVID-19 pandemic. Out of these, the majority of the included studies (21 out of 23) utilized a cross-sectional survey methodology. One study was open-label randomized controlled trial (21), and one study utilized a quasi-experimental design (22). The research had taken place across 20 different countries, with two of the studies being multi-national (23, 24). The countries that were part of this review included Bangladesh, Brazil, Canada, China, Egypt, Germany, Great Britain, Hong Kong, Iran, Israel, Italy, Philippines, Poland, Portugal, South Korea, Spain, Sweden, Switzerland, Turkey, and the United States. There was a diverse range in the number of participants in these studies, with the smallest sample consisting of 52 and the largest including 4,561 participants. The aggregate number of participants involved in all the studies exceeded 17,196. The settings in which these studies were conducted varied but mainly included hospital settings, specifically COVID-19 units, emergency departments, tertiary hospitals, isolation wards, inpatient hospital settings, outpatient clinics, and community facilities. Further details are provided in Supplementary File 2.

3.2 Level of job satisfaction

Six studies reported the percentage of nurses' job satisfaction during the pandemic. Of these, two provided specific cutoff points on their respective scales to delineate job satisfaction (25, 26); three presented job satisfaction data in terms of prevalence percentages (27–29); and one study utilized a 10-point single-item scale and applied a median split to categorize nurses' job satisfaction into high and low (30). The pooled data from these six studies indicated that 69.6% (95% CI: [67.7, 71.4%]) of nurses were satisfied with their jobs, as illustrated in Figure 2. Specifically, three of the studies reported that nurses' satisfaction level was more than 70% (27, 29, 30). Three other studies reported that their job satisfaction was 24.2 to 25% (25, 26, 28). The remaining studies reported means and standard deviations without categorical description of job satisfaction levels. See Supplementary File 2.

3.3 Tools used to assess job satisfaction

The 23 included studies employed a diverse set of measurement tools to evaluate job satisfaction. Among these tools were the McCloskey/Mueller Satisfaction Scale (23, 26), the Minnesota Satisfaction Questionnaire (25), the Turkish Job Satisfaction Scale (31), the Job Satisfaction Scale (24), the Safety Attitudes Questionnaire (32), the Nursing Questionnaire on Organizational Health (22), and the Brayfield and Rothe's 5-item Short Index of Job Satisfaction (33). Some of the researchers though opted for a single item scale to gauge job satisfaction (27, 29, 30, 34–38). Other researchers adapted subscales of existing questionnaires; for instance, four questions focusing on work satisfaction were adapted from Shaver and Lacey (39). The job satisfaction subscale of the UNIPSICO Battery was employed in a similar manner (14). Sampaio et al. used the job satisfaction dimension from the Copenhagen Psychosocial Questionnaire's (40), while Goktas et al. employed a 5-point scale that was a refined version of Brayfield and Rothe's scale (21). Savitsky et al. constituted an occupational satisfaction scale by utilizing items from the Minnesota Satisfaction Questionnaire, the Measure of Job Satisfaction, and other items (41). Finally, Barili et al. constructed an index "Satisfaction i" to measure job satisfaction derived from items extracted from the Labor Force Survey (42).

3.4 Factors affecting job satisfaction

The review concluded that several factors significantly contributed to better job satisfaction in nurses. These statistically significant factors were categorized into personal and demographic

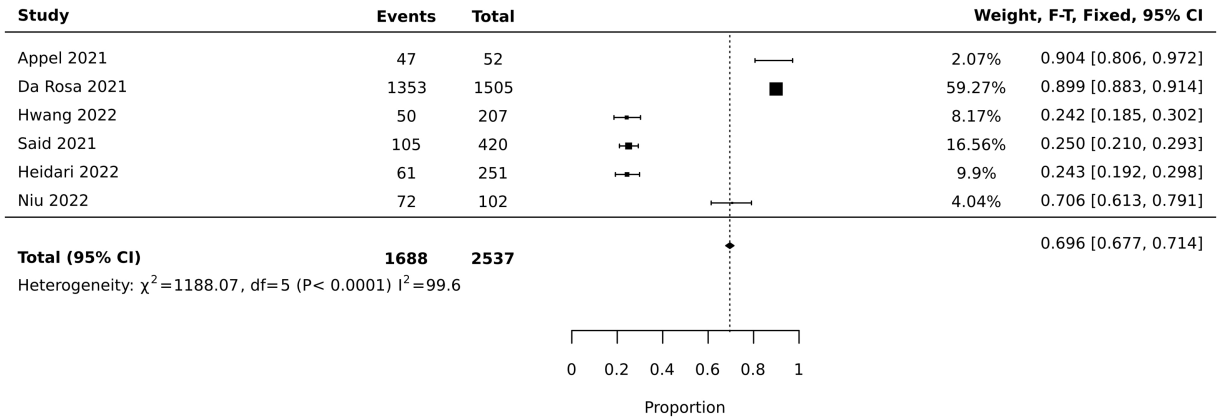

FIGURE 2
Forest Plot and Meta-analysis of nurses job satisfaction.

factors, work environment factors, and psychological and emotional factors.

3.4.1 Personal and demographic factors

Experience (37), lower education (33), and having a family (33, 36, 37, 42) were personal factors contributing to job satisfaction. Older age was generally associated with greater job satisfaction (32, 36, 37, 42), with an exception in one study (24). One study found that female nurses were less satisfied compared to male nurses (24). Financial matters, particularly salary and earnings satisfaction, were also important (33, 39, 42). Good health positively impacted job satisfaction (42), but COVID-19 infection, especially if led to hospitalization, had a negative impact (31, 42).

3.4.2 Work environment factors

The quality of the work environment, including supportive supervision (39), availability of resources (14, 33, 36), manageable workloads (14, 39), adequate staffing (32, 42), employer and coworker support (32), working in a community compared to hospital setting (41), and effective COVID-19 measures (14, 32, 36, 37, 42) were vital for job satisfaction. Conversely, working in a COVID-19 unit (30, 36, 38, 40, 43), job insecurity (14), or working overtime (42) negatively affected job satisfaction. Employment in government hospitals, training against workplace violence, job performance rewards (33), the geographical location of the health care facility, and perceived job importance (24) also contributed to nurses' job satisfaction.

3.4.3 Psychological and emotional factors

Changes in work conditions, prestige, and commitment to nursing during COVID-19 negatively impacted job satisfaction (24). Anxiety (36), role conflicts, psychosomatic problems (14), and fear of COVID-19 infection (35) also contributed to decreased job satisfaction. Concerns regarding potential infection and stigma from working in high-risk areas like COVID-19 treatment centers further decreased job satisfaction (36). In contrast, positive behaviors, specifically discretionary efforts aimed at enhanced care for COVID-19 patients, and adaptability post-trauma led to post-traumatic growth and job satisfaction, had favorable effects." (36, 39).

3.5 Consequences of job satisfaction

3.5.1 Positive consequences

Chong et al. shed light on the enhancement of psychological flexibility and mental wellbeing as positive outcomes of job satisfaction (23). Additionally, correlation was reported between better professional quality of life and higher job satisfaction (28, 29). Further, elevated job satisfaction was associated with improved quality of life and wellbeing in the workplace (40). Moreover, higher levels of job satisfaction had a positive impact on nurses' organizational commitment and their inclination to provide care to COVID-19 patients (39).

3.5.2 Negative consequences

Conversely, job dissatisfaction was associated with several undesired consequences. For instance, job dissatisfaction during COVID-19 was found to be associated with higher turnover intentions (38). Job dissatisfaction was correlated with mental health issues (23). Depression and stress were specifically identified as detrimental consequences of low job satisfaction (27, 30, 34). Anxiety was reported to be negatively affected by low job satisfaction (27, 34, 37). Chowdhury et al. showed that job dissatisfaction resulted in increased workplace violence, bullying, and burnout (33). Moreover, Heidari et al. (25) expounded on burnout as a result of job dissatisfaction, specifically highlighting that emotional exhaustion and compromised personal accomplishment, as facets of burnout, were impacted.

3.6 Interventions to enhance job satisfaction during COVID-19

This review identified two studies that investigated the efficacy of interventions aimed at bolstering job satisfaction. Goktas et al. employed a randomized controlled experiment to assess the impact of disseminating motivational messages on the job satisfaction of emergency nurses amidst the COVID-19 pandemic (21). The experimental intervention entailed transmitting motivational text messages to participants in the intervention group three times daily. These messages were crafted to augment job satisfaction and

communication skills while mitigating compassion fatigue. The findings of this study evinced a favorable effect of the intervention on the participants' job satisfaction.

Similarly, Zaghini et al. utilized a longitudinal mixed-methods design to scrutinize the implementation of organizational proactive management interventions and their impact on nurses' job satisfaction (22). The study gauged job satisfaction before and after the implementation of a spectrum of interventions. These interventions encompassed measures pertaining to the nursing work environment, staffing and workload adjustments, the enhancement of competence and learning, fostering a participatory approach and autonomy, unit-level strategies concerning COVID-19, and surveillance of healthcare nurses. The study ascertained that the execution of these organizational proactive management interventions positively influenced job satisfaction.

4 Discussion

The COVID-19 pandemic had a significant impact on all aspects of healthcare systems globally, including healthcare professionals who were in the front lines caring for patients with COVID-19 infections. Of particular concern, which is the subject of this systematic review, is the wellbeing of nurses who experienced serious stressors that had the potential to substantially affect their levels of job satisfaction and commitment to remain in their profession. While considerable number of research studies have been conducted on nurses' job satisfaction during the COVID-19 pandemic, to our best knowledge, no studies had explored this subject systematically. In planning this systematic review, we believed that our review would provide critical insights into the specific factors during the pandemic that influenced nurses' job satisfaction, and the impact of job dissatisfaction on their wellbeing and the consequential quality of patient care provided.

4.1 Level and measurement of job satisfaction

The results from the meta-analysis indicated a bifurcation in the levels of nurses' job satisfaction during the pandemic. While the pooled data from six studies showed that approximately 69.6% of nurses were satisfied with their jobs during the pandemic, there was a noticeable divergence between the studies. Half of these studies reported job satisfaction levels exceeding 70% (27, 29, 30), while the other half reported significantly lower levels between 24.2 to 25% (25, 26, 28). One possible explanation for this disparity could be the setting and context in which the studies were conducted. National policies regarding healthcare workers' remuneration, workload, and support during the pandemic might have been different between different countries (43). The studies reporting higher levels of job satisfaction were primarily conducted in the USA, Brazil, and China. These nations, despite their economic and cultural differences, may have features in their healthcare systems that contribute positively to job satisfaction during the pandemic. In contrast, studies from Iran and Egypt reported lower satisfaction scores, potentially linked to economic challenges, healthcare resource limitations, and cultural perceptions of nursing. Notably, the job satisfaction scores from South Korea presented an unexpected outcome, with levels significantly lower than other countries. This anomaly could be reflective of the particularly high rates of burnout and workload experienced by healthcare providers in South Korea during the pandemic (44). Such stressful working conditions are likely to adversely affect job satisfaction and may have accounted for the distinct results observed in this context. As well, it is important to consider the cultural differences in the way people perceived the subjective questions about job satisfaction when comparing data across countries (45). To comprehensively understand the nuances of job satisfaction among healthcare professionals in these countries, further research is warranted. Such studies should delve into the interplay of economic, cultural, and systemic factors that contribute to these differences, considering the unique resilience measures and support systems for nurses that these nations may have implemented during the pandemic.

4.2 Factors affecting job satisfaction

The findings of this review indicated that job satisfaction among nurses was influenced by a combination of personal and demographic factors, work environment factors, and psychological and emotional factors. This is consistent with previous literature which has also shown the multidimensional nature of job satisfaction (46, 47).

Regarding personal and demographic factors, our review found that higher working experience (37), lower education preparation (33), and having a family (33, 36, 37, 42) were linked to higher job satisfaction. These findings may be attributed to the potential stability and familiarity that experience brings (48), and the support systems that families could provide (49). Moreover, this interpretation may explain why older age was generally associated with higher job satisfaction. Kovner et al. suggested that older nurses might have more realistic expectations and coping skills (50). However, Makowicz et al. found an exception regarding age, which suggested that other factors might have moderated the relationship between age and job satisfaction, which might require further studies (24).

Work environment factors were found to be vital in determining job satisfaction. Positive factors included supportive supervision, availability of resources, reasonable workloads, and effective COVID-19 measures (14, 32, 33, 36, 37, 39, 42). Our findings are consistent with the conclusions of Persefoni's review (51), which synthesized evidence of a significant association between nurses' job satisfaction and the quality of their work environment. Interestingly, nurses working in community settings were found to have higher job satisfaction than those in hospital settings (41), possibly due to lower patient acuity and more autonomous practice.

Conversely, psychological and emotional factors such as anxiety, role conflicts, and fear of COVID-19 infection contributed to reduced job satisfaction (14, 35, 36). This supports the findings of Lee and Jang (52), who identified that emotional status had a significant impact on nurses' job satisfaction. Concerns regarding potential infection and stigma from working in high-risk areas like COVID-19 treatment centers further decreased job satisfaction (36), underscoring the significant impact of the pandemic on nurses' psychological wellbeing and job satisfaction.

4.3 Consequences of job satisfaction

The consequences of job satisfaction among nurses, especially during the COVID-19 pandemic, are multifaceted and crucial to understand for the betterment of healthcare services. Chong et al. illustrated that higher job satisfaction was associated with an enhancement in psychological flexibility and mental wellbeing (23). This finding is critical for healthcare service quality, aligning with earlier research that underscored the role of mental wellbeing in healthcare professionals in determining patient care quality (53). Moreover, improved professional quality of life resulting from high job satisfaction (28, 29) reiterates the importance of maintaining a positive working environment for better service delivery. Sampaio et al. supported this by associating high job satisfaction with improved quality of life and workplace wellbeing (40). Notably, Sharif Nia et al. established that job satisfaction positively influenced nurses' commitment to the organization and their willingness to provide care to COVID-19 patients (39). This is particularly significant in the context of a pandemic, as the commitment and dedication of healthcare professionals are paramount in handling healthcare crises (54).

On the contrary, job dissatisfaction has been linked to a plethora of negative consequences. Consistent with earlier research (55), Lavoie-Tremblay et al. found that job dissatisfaction during COVID-19 was associated with higher turnover intentions (38), which can be detrimental to healthcare systems that were already strained by the pandemic. Moreover, Chong et al. correlated job dissatisfaction with mental health issues (23), which is alarming considering the stress and emotional turmoil healthcare professionals already face in pandemic settings (56). Specific mental health issues like depression, anxiety burnout, and stress were also observed as consequences of low job satisfaction (25, 27, 30, 34, 37). Furthermore, the work of Chowdhury et al. showing an association between job dissatisfaction and increased workplace violence, bullying, and burnout (33) is particularly concerning.

The findings in this review elucidate the significant impact job satisfaction has on nurses' mental wellbeing, professional quality of life, and dedication to care, especially during a health crisis like COVID-19. The negative consequences of job dissatisfaction, including mental health issues, turnover intentions, and burnout, are detrimental not only to healthcare professionals but also to the quality of healthcare delivery. As such, it is imperative that measures be implemented to improve job satisfaction among nurses, thereby positively influencing their wellbeing and the overall effectiveness of healthcare systems if future pandemics or health crises.

4.4 Interventions to enhance job satisfaction during pandemics

Regarding interventions aimed at enhancing job satisfaction during the COVID-19 pandemic, this systematic review identified two studies with promising outcomes. Goktas, Gezginci et al. used a randomized controlled experiment focusing on the use of motivational messages to improve job satisfaction among emergency nurses (21). This aligns with other research highlighting the positive impact of motivational messages in nurses' life satisfaction (57). Another noteworthy study included in the review used a longitudinal mixed methods design to investigate the effects of organizational proactive management interventions (22). This is particularly relevant as several studies have stressed the importance of organizational support in improving nurse' job satisfaction (58, 59).

Taken together, these findings underscore the importance of multifaceted approaches in enhancing job satisfaction among healthcare professionals during a health crisis such as the COVID-19 pandemic. Motivational support and comprehensive organizational interventions can be critical components in addressing the unique challenges faced by nurses and ensuring their mental wellbeing and satisfaction, which in turn can contribute to better patient care.

4.5 Implications

The results of this systematic review have several implications for management, policy, practice, education, and future research. Managers and policymakers should consider implementing interventions such as motivational messaging and organizational proactive management interventions, as identified in the review, to improve job satisfaction among nurses, especially during health crises. Implementing policies that address nurses' work environment ensuring adequate staffing, and providing support and resources may lead to enhanced job satisfaction. In terms of practice, the emphasis should be on establishing supportive supervision, reasonable workloads, and effective health measures to create a conducive work environment. For education, training programs should focus on equipping nurses with the necessary skills to handle the psychological and emotional challenges of their profession, particularly during a pandemic. Educators should also aim at building resilience in nurses and teaching coping strategies. Furthermore, there is a need for standardized tools for assessing job satisfaction, as the review highlighted the use of diverse measurement tools. Future research should focus on understanding the long-term impact of pandemics on job satisfaction and mental health among healthcare professionals. It is essential to develop evidence-based interventions that may be effectively integrated into the healthcare system to bolster job satisfaction, which in turn, could lead to better patient care and wellbeing among healthcare professionals.

4.6 Review limitation

A potential limitation of this review was the exclusive consideration of English-language studies. The utilization of differing methods to measure job satisfaction may have also influenced the aggregation of all the investigations, complicating the production of a holistic conclusion. It is also important to note that despite the diligent search for relevant studies to include in this review, the systematic search process may not have captured all applicable research, leading to possible omissions.

5 Conclusion

In conclusion, job satisfaction among nurses is multifactorial and requires an integrated approach to address personal,

workplace, and psychological dimensions. During the COVID-19 pandemic, it is especially crucial to ensure that nurses have adequate support and resources to maintain their job satisfaction and wellbeing. This review yielded three principal outcomes: identification of the elements that correlated with nurses' job satisfaction; analysis of the impact of nurses' job satisfaction on nurses themselves and their patients; and the exploration of counteractive strategies linked to job satisfaction among nurses during COVID-19. The review meticulously analyzed a range of factors, including working conditions, staff relationships, compensation, and career development opportunities, that are correlated with job satisfaction. It also critically assessed the consequences of job satisfaction levels on both nurses and patients, highlighting the linkages between high job satisfaction and inclination to provide nursing care, reduced nurse burnout, and increased retention rates among nursing staff. Additionally, in recognition of the unique challenges faced during the COVID-19 pandemic, the review investigated various strategies such as organizational support, mental health resources, enhanced communication, and adaptive work environments to mitigate job dissatisfaction among nurses.

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.

Author contributions

YY: Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Software, Supervision, Writing – original draft. AA: Conceptualization, Formal analysis, Methodology, Software, Writing – original draft, Writing – review & editing. AA-H: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. VK: Conceptualization, Validation, Writing – review & editing.

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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.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1285101/full#supplementary-material

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Depression, professional self-efficacy, and job performance as predictors of life satisfaction: the mediating role of work engagement in nurses

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Background: The life satisfaction and job performance of nursing professionals are affected by a multitude of factors, including work engagement, self-efficacy, and depression. The Job Demands-Resources (JD-R) model provides a theoretical framework to explore these relationships.

Objective: Our study aimed to analyze the primary goal of this research, which is to examine the mediating role of work engagement in the relationship between depression, professional self-efficacy, job performance, and their impact on life satisfaction in nurses, using the JD-R theory as a guide.

Methods: This cross-sectional study involved 579 participants aged between 21 to 57 years ($M = 39$, SD = 9.95). Mediation analysis was used to examine the influence of depression, self-efficacy, and job performance on work engagement, and in turn, its effect on life satisfaction.

Results: Findings indicated that work engagement plays a crucial mediating role between depression, self-efficacy, job performance, and life satisfaction. Interventions to increase work engagement could assist nurses in better managing depression and improving their performance and life satisfaction.

Conclusions: Our study highlights the need for workplace policies and strategies that foster work engagement and self-efficacy among nurses while effectively managing job demands to prevent depression. Moreover, these findings underscore the importance of the JD-R theory to understand and improve nurses' job satisfaction and performance, and suggest areas for future research, including exploring other potential factors and applying these findings across different contexts and cultures.

KEYWORDS

work engagement, depression, self-efficacy, job performance, life satisfaction

1 Introduction

The work environment and life satisfaction have an essential relationship in wellbeing and a determining influence on mental health and quality of life. The relevance of this connection is particularly evident in daily interactions and people's functionality in their work activities (1, 2). In this context, factors such as depression, professional self-efficacy, and job performance become especially relevant as they can either boost or hinder workers' life satisfaction (3). This reality manifests with particular intensity in the nursing profession in Peru, a vital pillar of the nation's health system (4, 5). However, Peruvian nurses face a host of challenges and job demands that result in a significant impact on their life satisfaction. These obstacles include staff shortages, resource insufficiency, work stress, high turnover rates, and heavy workloads. Each of these factors, both individually and collectively, has the potential to negatively influence their psychological wellbeing, and consequently, their ability to provide quality patient care (6–8).

The Job Demands-Resources (JD-R) theory provides a robust conceptual framework that allows the understanding of the dynamics between job demands and resources and their eventual influence on crucial aspects such as work engagement and life satisfaction. Job demands, such as tension stemming from depression situations, emerge as strain factors that can exhaustively affect workers' personal resources, pushing them toward tension and health deterioration (9, 10). On the other hand, job resources, exemplified in job performance, as well as personal resources, notably work self-efficacy, function as driving forces that enable the achievement of objectives, promoting personal and professional growth. They become catalysts for motivation and productivity, aspects that essentially transcend the work environment and influence individuals' personal spheres (10–12). In the JD-R theory, work engagement holds particular relevance. This component plays a fundamental mediating role, positioning itself at the core of the relationship between job demands and resources and job outcomes (13, 14). In the specific case of Peruvian nurses, understanding the mediating role of work engagement becomes essential as this understanding illuminates the interconnections between individual and work factors and their correlation with their life satisfaction.

At this point, it is necessary to emphasize that the JD-R theory not only recognizes the potential effects of work factors but also takes into account the relevance of personal resources, such as work self-efficacy, in the job dynamics (10, 15–17). These resources can trigger an active coping process against job demands and improve the utilization of available work resources. Therefore, the continuous dialogue between job demands and resources, both job-related and personal, is a cross-cutting axis that shapes individuals' work experience. Hence, in the context of Peruvian nurses, understanding the mediating role of work engagement will provide valuable information about how individual and work factors relate to their life satisfaction.

Despite the growing attention paid to the relationship between these factors, less attention has been paid to work engagement in these relationships and how these variables can jointly affect life satisfaction in a specific work context, such as that of nurses. The current picture concerning this issue is certainly worrisome, as global and national data have shown a high prevalence of depression and a low level of life satisfaction among nursing professionals (18, 19). These conditions can result in negative effects both at the individual and organizational levels, including emotional exhaustion, job performance deterioration, and decreased quality of care provided to patients (20).

While growing awareness about the importance of mental health and wellbeing in the workplace has motivated the implementation of various interventions to address these issues (21), there still exists a lack of studies specifically addressing the mediating role of work engagement in these relationships and how these factors interact in specific work contexts.

Therefore, this research seeks to fill this gap in the literature and contribute to a deeper understanding of these factors. This will help identify effective interventions that can improve nurses' emotional wellbeing and life satisfaction (22, 23). In this sense, the research will contribute to a deeper understanding of these factors and help identify effective interventions that can improve nurses' emotional wellbeing and life satisfaction. Therefore, the main objective of this research is to analyze the mediation of work engagement in the relationship between depression, professional self-efficacy, job performance, and their impact on life satisfaction in nurses.

1.1 Literature review

1.1.1 Life satisfaction

Life satisfaction is a broad construct that refers to a person's overall evaluation of their life in general and their subjective well-being (24). It is associated with elements such as work engagement, performance, and self-efficacy (25, 26), as well as with job and personal demands and resources (3, 27). In this context, job resources, including self-efficacy and performance, positively impact life satisfaction, while demands, such as depression, have adverse effects (15, 28, 29). This dynamic is particularly relevant in high-stress environments, like the healthcare sector, where work-life imbalance and emotional exhaustion are common (30–32). Studies show a correlation between high work engagement and increased life satisfaction, as well as a negative association with burnout and depressive symptoms. Moreover, it was observed that job resources have positive effects on work engagement and life satisfaction, and negative effects on burnout and depressive symptoms. On the other hand, a high workload is associated with more burnout and depressive symptoms, and less life satisfaction (3). There exists an interplay between work engagement and burnout, and between life satisfaction and depressive symptoms, all influencing occupational health outcomes like recovery, work addiction, and mental health diagnoses (33). Finally, the JD-R model indicates that burnout and work engagement are interrelated and contribute to other occupational health outcomes, reflecting in the overall well-being of employees (34). This approach highlights the variability of the impacts of demands and resources throughout life, suggesting that optimizing personal and professional development may be key to improving life

satisfaction and reducing depressive symptoms at different stages of a professional's career.

1.1.2 Depression

Depression is a common mental disorder characterized by symptoms like persistent sadness and loss of interest (35). It is considered a job demand that negatively impacts performance and job satisfaction (36, 37). Burnout, associated with job strain and chronic emotional demands, is linked to negative work outcomes and health problems such as depression and anxiety (10, 38, 39). Job strain and burnout, particularly in human service professionals, can increase the risk of mental illnesses and physical problems, also affecting the quality of care in healthcare workers (40–44). The JD-R theory suggests that overall well-being or distress can influence how employees handle job demands and resources (15). The revised JD-R model proposes that high job demands and insufficient job resources lead to burnout and health problems like depression (10, 11). Furthermore, increased job strain can lead employees to adopt maladaptive coping strategies, exacerbating depression and anxiety (45).

1.1.3 Professional self-efficacy

Professional self-efficacy refers to an individual's beliefs about their ability to carry out tasks and overcome challenges in their work environment. This confidence in one's abilities to organize and execute actions aimed at achieving work goals has become a cornerstone for understanding workers' functioning in their workplace (46). Self-efficacy is considered a significant personal resource in the Job Demands-Resources (JD-R) model, influencing how workers cope with job demands and how they utilize available job resources. Thus, a worker with a high level of self-efficacy may perceive elevated job demands as challenges rather than threats, and more effectively leverage job resources at their disposal to face these demands (12, 47). Empirical literature has linked professional self-efficacy with a number of positive work outcomes, such as job satisfaction and better adaptation to job design, suggesting that beliefs in one's abilities are a critical influencer of wellbeing and performance at work (46).

Furthermore, in an increasingly digitalized work environment, the role of self-efficacy in managing job stress and strengthening emotional wellbeing has become crucial. According to the Job Demand-Resource model, professional self-efficacy is an essential resource for successfully coping with the inherent challenges of work, and therefore, to improve emotional wellbeing (48). In the context of nurses, this importance is accentuated, as their professional self-efficacy and emotional wellbeing are under constant pressure due to the demands of their professional practice. A weakened self-efficacy can jeopardize the quality of care provided to patients, highlighting the importance of strengthening this personal resource in these professionals (49).

1.1.4 Job performance

Job performance, understood as individual behavior that adds value to an organization and contributes to its objectives, has evolved in its conceptualization. Now, it not only focuses on competence in tasks, but also includes elements such as adaptability, proactivity, and organizational citizenship behaviors (50). Additionally, it is recognized that this performance can be modulated by environmental factors, such as the importance of tasks to be performed and the social support received at the workplace (51). In this line, the Job Demands and Resources (JD-R) theory provides a framework to understand how these demands and resources in the workplace can affect both job performance and employee wellbeing (51). It is interesting how, in times of crisis, job performance can be affected by the interaction between job demands and resources, a relationship that can have a direct impact on workers' motivation and wellbeing (11, 52). Specifically for nurses, their job performance is a critical factor in ensuring patient safety. This performance can be modulated by both personal and work-related factors, such as depression and professional self-efficacy. This underlines the need to investigate and promote safe behaviors that improve the quality of care (53). On the other hand, it has been shown that high job performance, along with job satisfaction and organizational commitment, can have a positive impact on nurses' performance and on the quality of care provided to patients (54).

1.1.5 Work engagement

Work engagement, defined as an emotional and cognitive state in which employees feel energetic, dedicated, and absorbed in their work (55), emerges as a key element in mediating the influences of job demands and resources on employee well-being (56). Job resources are crucial for fostering robust work engagement (57, 58). This engagement not only enhances productivity and motivation but also acts as a buffer against the negative effects of job demands, such as overload and burnout (59). In the educational context, for example, teachers' self-efficacy has shown a positive correlation with their work engagement, even in the face of challenging demands like workload and problematic student behavior (60). Work engagement also exerts a significant influence on key aspects like the intention to leave the job, job adaptation, and organizational performance. Engaged employees tend to exhibit greater loyalty and both affective and normative commitment to their organization, resulting in better performance at both individual and organizational levels (61). Furthermore, work engagement can be an indicator of the frequency of job absences, reflecting higher motivation and better overall health (10).

Depression, a particularly harmful work demand, can negatively impact work engagement and, consequently, decrease life satisfaction (12). The JD-R model proposes that various motivational and energy processes, driven by work demands and resources, determine both work engagement and burnout. Quantitative work overload is associated with burnout symptoms, whereas strong work resources, such as effective leadership, self-efficacy, and resilience, foster work engagement and life satisfaction (3). Better understanding and managing nurses' work engagement could alleviate the negative impact of depression on their life satisfaction. This claim is supported by recent research highlighting the importance of work engagement in healthcare

quality and the relationship between conflict management styles and nurses' work engagement (62).

Moreover, professional self-efficacy has been proven to influence job performance. This personal resource element has been studied in relation to work engagement and life satisfaction, establishing its role as a significant influencer (25, 63). In line with the JD-R theory, it is postulated that work and personal resources have a direct impact on work engagement. However, the theory goes beyond by suggesting that psychological empowerment acts as a mediator in this relationship, providing a deeper dimension to our understanding of work and personal interactions (10, 64).

In this context, professional self-efficacy, work engagement, and life satisfaction are not only seen as interrelated factors but crucial components that exert a significant effect on job performance and, by extension, on the wellbeing of healthcare professionals (12, 65). This multidimensional relationship suggests that nurses showing high levels of professional self-efficacy may experience more intense work engagement, which in turn can enhance their life satisfaction. This is a significant notion as it underscores the synergistic relationship between these factors and how, collectively, they can drive the performance and wellbeing of healthcare professionals (25).

In this sense, work engagement may play a pivotal role as a mediator in the relationship between depression, professional self-efficacy, job performance, and life satisfaction in nurses. By addressing the factors influencing work engagement, interventions and strategies could be designed to improve life satisfaction and the overall wellbeing of nurses within the framework of the JD-R theory.

Considering the arguments presented, the following hypotheses are proposed (Figure 1):

H1: There is a negative relationship between depression and work engagement.
H2: There is a positive relationship between professional self-efficacy and work engagement.
H3: There is a positive relationship between job performance and work engagement.
H4: There is a positive relationship between work engagement and life satisfaction.
H5a: Work engagement mediates the relationship between depression and life satisfaction.
H5b: Work engagement mediates the relationship between professional self-efficacy and life satisfaction.
H5c: Work engagement mediates the relationship between job performance and life satisfaction.

2 Methods

2.1 Design and participants

The design of this study is cross-sectional and explanatory in nature, making use of a structural equation system to consider latent variables (66). In terms of sample size, the study was based on an analysis of the effect size taking into account the number of observed and latent variables in the model. Additionally, the anticipated effect size ($\lambda = 0.3$), desired statistical significance ($\alpha = 0.05$), and level of statistical power ($1 - \beta = 0.95$) were considered. Based on these calculations, a minimum sample of 207 was estimated to be appropriate (67). However, for this study, we had the participation of 579 nurses from four hospitals in the Lima region, Peru, aged between 21 and 57 years ($M = 39$, SD $= 9.95$). For participant recruitment, a convenience sampling method was employed. The majority were female (70.5%), contracted (64.4%), and from an assisting occupational group (73.9%) (Table 1).

2.2 Procedure

The conduct of this study was governed by strict ethical standards and rigorous procedures. The research received approval from the Ethics Committee of a Peruvian University, under code 2023-CEUPeU-033, prior to data collection. This review and approval process ensured that our research fully complied with national and international ethical and scientific standards. Over a 3-month period, between January and March 2023, we conducted data collection. For this purpose, we invited participants to complete an online questionnaire. We used Google Forms, known for its ease of use and accessibility. Prior to data collection, it was paramount to ensure adherence to confidentiality standards and the principles of the Declaration of Helsinki, a set of ethical guidelines governing research involving human subjects. We informed each participant about the purpose of the research, and ensured that they fully understood the implications of their participation before obtaining their informed consent. This process allowed participants to make an informed decision about their involvement in the study, reinforcing our commitment to conducting ethical and respectful research.

2.3 Instruments

2.3.1 Life satisfaction

Life satisfaction was assessed using the Spanish version of the Satisfaction with Life Scale (SWLS), a unidimensional self-report tool designed to measure life satisfaction (68). It consists of five questions, for example, "In most aspects, my life is close to my ideal", or "I am completely satisfied with my life", using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Its reliability coefficients, omega ($\omega = 0.90$), reflect adequate internal reliability.

2.3.2 Job performance

The Spanish version of the Individual Work Performance Questionnaire (IWPQ), a self-report instrument that assesses three dimensions of job performance: task, contextual, and counterproductive behaviors was used (69). It has 13 items, for example, "I was able to do my job well because I dedicated the necessary time and effort" or "I focused on the negative aspects of the job, instead of focusing on the positive things", and uses a Likert scale from 1 (never) to 5 (always). The Cronbach's alpha coefficients for each dimension indicate adequate internal consistency (α

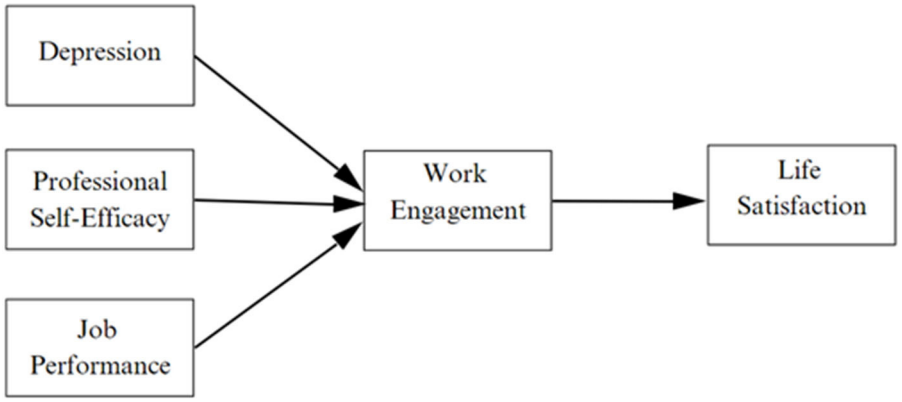

FIGURE 1
Theoretical model.

= 0.76 for task and contextual dimensions, and α = 0.72 for counterproductive behaviors).

2.3.3 Work engagement

The Spanish version of the Brief Work Engagement Scale (UWES-9) was used (70). This scale consists of nine items, for example, "I feel full of energy in my job" or "When I wake up in the morning, I look forward to going to work", rated on a six-point Likert scale ranging from "never" (0) to "always" (5). The scale focuses on three dimensions: vigor, dedication, and absorption. The Cronbach's alphas for these dimensions ranged from 0.84 to 0.92, indicating high internal consistency.

TABLE 1 Sociodemographic characteristics.

Characteristics		Frequency	Percentage
Gender	Female	408	70.5
	Male	171	29.5
Employment status	Contracted	373	64.4
	Appointed	162	28.0
	Permanent position	32	5.5
	Third-party	12	2.1
Occupational group	Administrative	151	26.1
	Caregiving	428	73.9

2.3.4 Professional self-efficacy

It was measured using the Spanish version of the work self-efficacy scale, adapted from the original English version (71). This scale consists of 10 items, for example, "I will be able to find what I want in my job even if someone opposes me" or "When I find myself in a difficult work situation, I trust that I will figure out what to do", rated on a four-point Likert scale (1 = Never, 2 = Sometimes, 3 = Often, 4 = Always). In international samples, the scale has demonstrated adequate reliability, with a Cronbach's alpha of α = 0.80 and a confirmed unidimensional structure.

2.3.5 Depression

The Patient Health Questionnaire-2 (PHQ-2) depression scale was used, which consists of two items from the PHQ-9 (72). Responses are scored on a scale ranging from 0 (Not at all) to 3 (Nearly every day). This scale has shown adequate reliability, with a Cronbach's alpha of 0.72.

To measure depression, the Patient Health Questionnaire-2 (PHQ-2) scale was used. It comprises 2 elements from the PHQ-9, for example, "Feeling down, depressed, or hopeless" or "Little interest or pleasure in doing things", with a response scale where (Not at all = 0, Several days = 1, More than half the days = 2, and Nearly every day = 3). This scale was adapted and abbreviated from the PHQ-9 and has a Cronbach's alpha of 0.72, indicating high reliability (72).

2.4 Statistical analysis

The statistical analysis was carried out through structural equation modeling, which allowed the evaluation of multiple relationships simultaneously. We used the MLR estimator, which is suitable for numerical variables and robust against deviations from normality (73). To assess the goodness of fit of the model, we used several statistical metrics. In particular, we employed the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). Following the guidelines set by Bentler (74), we considered CFI and TLI values >0.90 as indicative of a good model fit. For RMSEA and SRMR, values below 0.080 were interpreted as a good fit (75, 76).

The software used to perform these analyses was R (version 4.1.2), an open-source platform widely used in scientific research. Specifically, we used the "lavaan" library (version 06-10) for structural equation modeling (77).

To assess mediation, we used the "psych" package (78). Following established guidelines, we considered a variable M as a

TABLE 2 Descriptive statistics, internal consistencies, and correlations for the study variables.

Variable	*M*	SD	α	1	2	3	4	5
Life satisfaction	21.11	3.66	0.85	–				
Work engagement	43.36	8.27	0.88	0.58**	–			
Depression	0.39	1.05	0.88	−0.55**	−0.50**	–		
Professional self-efficacy	51.34	8.37	0.92	0.62**	0.67**	−0.56**	–	
Job performance	45.92	4.69	0.70	0.45**	0.52**	−0.39**	0.58**	–

**$p < 0.01$.
α, Cronbach's alpha.

mediator between independent variable X and dependent variable Y if M is causally located between X and Y. In this case, the variable M is influenced by X, which in turn impacts Y (79, 80). The indirect effect of X on Y is thus through M (81). This allowed us to form a causal chain to compare the mediating effect of the M variables. To test the indirect effect, we applied bootstrapping with 500 iterations.

3 Results

3.1 Preliminary analysis

The results presented in Table 2 show the means (M), standard deviations (SD), and reliability coefficients (α). Cronbach's alpha (α) is above 0.7, considered as an acceptable level of internal consistency. The bivariate analysis indicated that life satisfaction shows a significant positive correlation with work engagement ($r = 0.58$, $p < 0.01$) and with professional self-efficacy ($r = 0.62$, $p < 0.01$). It is also positively correlated with job performance ($r = 0.45$, $p < 0.01$). However, life satisfaction is negatively correlated with depression ($r = -0.55$, $p < 0.01$), meaning that as life satisfaction increases, depression decreases. Similarly, work engagement is positively correlated with professional self-efficacy ($r = 0.67$, $p < 0.01$) and with job performance ($r = 0.52$, $p < 0.01$), and negatively correlated with depression ($r = -0.50$, $p < 0.01$). Also, depression shows a negative correlation with professional self-efficacy ($r = -0.56$, $p < 0.01$) and with job performance ($r = -0.39$, $p < 0.01$). Finally, professional self-efficacy shows a positive correlation with job performance ($r = 0.58$, $p < 0.01$).

3.2 Theoretical model analysis

In the analysis of the theoretical model (Figure 2) an adequate fit was obtained, $\chi^2 = 2{,}407.300$, df = 692, $p = 0.000$, CFI = 0.92, TLI = 0.91, RMSEA = 0.07 (90% CI 0.06–0.07), SRMR = 0.07. With this result, H1 was confirmed, indicating that there is a negative relationship between depression and job engagement ($\beta = -0.31$, $p < 0.001$). H2 was also confirmed, showing a positive relationship between professional self-efficacy and job engagement ($\beta = 0.36$, $p < 0.001$). Similarly, H3 was validated, indicating a positive relationship between job performance and job engagement ($\beta = 0.31$, $p < 0.001$). Finally, H4 was confirmed, which shows a positive relationship between job engagement and life satisfaction ($\beta = 0.78$, $p < 0.001$).

3.3 Mediation model

For the mediation analysis, bootstrapping of 5,000 iterations was used, and these results are shown in Table 3. The mediating role of job engagement is confirmed in the relationship between depression (H5a; $\beta = -0.12$, $p = 0.05$), professional self-efficacy (H5b; $\beta = -0.18$, $p < 0.001$), job performance (H5c; $\beta = -0.12$, $p < 0.001$), and life satisfaction.

For the mediation analysis, bootstrapping with 5000 iterations was used, and these results show the indirect pathways of the structural model in Table 3. The mediating role of work engagement between the relationship of depression and life satisfaction (H5a; Depression → Work Engagement → Life Satisfaction) reveals a significant negative effect ($\beta = -0.120$, $p = 0.023$). Similarly, work engagement mediates the relationship between professional self-efficacy and life satisfaction (H5b; Professional Self-Efficacy → Work Engagement → Life Satisfaction) showing a significant positive effect ($\beta = 0.184$, $p < 0.001$). Furthermore, work engagement also mediates the relationship between work performance and life satisfaction (H5c: Work Performance → Work Engagement → Life Satisfaction), which is positive and significant ($\beta = 0.508$, $p < 0.001$). Regarding the direct effects, the pathway indicates that Depression has a direct and negative impact on Work Engagement ($\beta = -0.220$, $p = 0.020$), while it is confirmed that Professional Self-Efficacy improves Work Engagement ($\beta = 0.337$, $p < 0.001$). Additionally, a strong positive relationship is highlighted between Work Performance and Work Engagement ($\beta = 0.928$, $p < 0.001$), and finally, the pathway shows that higher Work Engagement leads to greater Life Satisfaction ($\beta = 0.547$, $p < 0.001$). The total effect (Total = 0.572, $p < 0.001$) synthesizes the combined impact of Depression, Professional Self-Efficacy, and Work Performance on Life Satisfaction, demonstrating how these variables, through their relationship with Work Engagement, integrally shape the experience of life satisfaction.

On the other hand, the R2 value for the variable Work Engagement is 0.704, indicating that the variables Depression, Professional Self-Efficacy, and Work Performance, together, explain 70.4% of the variation in Work Engagement. This high percentage of explained variance suggests that the model has considerable capacity to explain Work Engagement. As for the outcome variable Life Satisfaction, the R2 value is 0.516, indicating that Work Engagement explains 51.6% of the variation in Life Satisfaction. This is a significant percentage, indicating that the

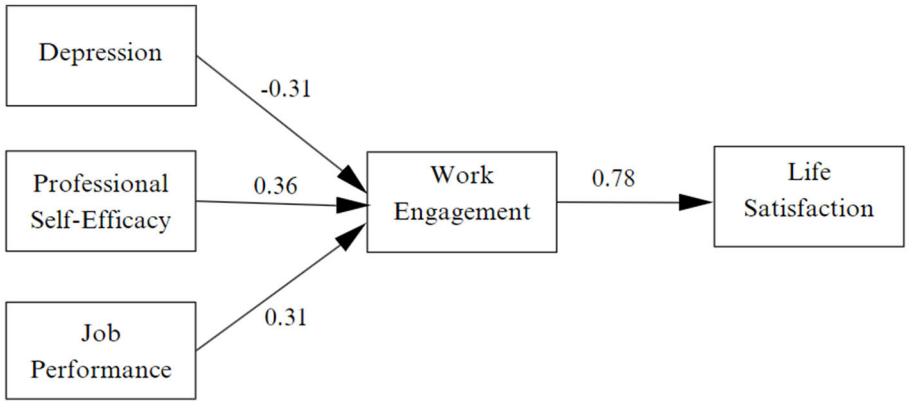

FIGURE 2
Results of the explanatory structural model of life satisfaction.

TABLE 3 Research hypotheses on indirect, total effects and their estimates.

Path in the model	β	p-value	95%CI	
			LL	UL
Indirect				
H5a: Depression → job engagement → life satisfaction	−0.12	0.003	−0.226	−0.021
H5b: Professional self-efficacy → work engagement → life satisfaction	0.184	<0.001	0.112	0.276
H5c: Work Performance → work engagement → life satisfaction	0.508	<0.001	0.335	0.692
Direct				
Depression → work engagement	−0.22	0.02	−0.408	−0.037
Professional self-efficacy → work engagement	0.337	<0.001	0.215	0.488
Work performance → work engagement	0.928	<0.001	0.617	1.284
Work engagement → life satisfaction	0.547	<0.001	0.432	0.657
Total				
Total effect of independent variables on life satisfaction	0.572	<0.001	0.364	0.795

model is quite effective in capturing the factors that contribute to Life Satisfaction.

4 Discussion

Our findings add to the existing literature on the Job Demands-Resources (JD-R) theory by highlighting the mediating role of job engagement in the relationship between depression, professional self-efficacy, job performance, and life satisfaction in nurses. Analyzing these aspects within the intricate web of work and personal relationships provides an insight into how job demands, job and personal resources relate to job engagement and influence life satisfaction in nurses. This perspective not only allows us to better understand the reality of this population, but also to suggest and evaluate potential interventions to improve nurses' wellbeing and engagement with their work.

The results showed a negative relationship between depression and job engagement, which is consistent with previous research (5, 82). Nurses working in clinics and hospitals, grappling with high job demands such as heavy workloads, long working hours, lack of institutional support, and the pressures inherent in an extreme work environment, tend to experience higher levels of stress and emotional exhaustion (83). This increase in stress and emotional exhaustion can, unfortunately, lead to a higher risk of developing depression. Added to this is the constant exposure to stressful situations and the scarcity of resources which appear to exert a negative impact on nurses' ability to maintain positive job engagement (5). Thus, it is common to find that a high number of these health professionals experience depressive symptoms, a situation that is exacerbated by job uncertainty and the daily pressures they face in their work environment. In the context of the Job Demands-Resources (JD-R) theory, demands such as anxiety can be seen as significant predictors of job engagement. This study drew on this theory to better understand how job demands and resources can influence depression and job engagement in nurses (84).

The results also indicated a positive influence between professional self-efficacy and job engagement, which aligns with previous research that has shown a positive relationship between

professional self-efficacy and job engagement (85, 86). When employees have a high degree of confidence in their abilities and competencies relevant to their assigned tasks, they engage more fully in their work, resulting in greater efficacy and job engagement (87). This self-efficacy plays a catalytic role, spurring employees to work with a dedication and persistence that enable them to overcome work problems and obstacles to successfully fulfill their tasks. This impetus translates into a job engagement that often goes beyond what is expected of them, generating organizational citizenship behaviors. This is where the power of engagement lies: not only does it enable employees to fulfill their work obligations, but it motivates them to exceed expectations (88). Similarly, our findings reaffirm that personal resources, such as self-efficacy, play a vital role in fostering job engagement. Employees who can effectively utilize these resources, such as control over work and involvement in decision-making, are more motivated and committed to the organization. In this respect, personal resources serve a dual role: on the one hand, they have an intrinsically motivating function, as they enhance individual learning and development (89). On the other hand, they extrinsically facilitate the achievement of work goals, becoming an indispensable tool for reaching professional targets. Thus, it is confirmed that nurses with a stronger sense of professional self-efficacy can face work challenges with more confidence and skill, which, in turn, can increase their job engagement (61, 84).

Also, the results indicated a positive influence between job performance and work engagement, suggesting that job performance is positively related to work engagement (54, 60). This positive influence can be attributed to the reality experienced by nurses: when they are immersed in their work with tenacity and passion to achieve their goals, their organizational commitment intensifies. This increase in commitment signifies a deeper immersion into the organizational structure and a sharper focus on their work, not only to grow personally but also to add value to the organization (54). Our analysis also builds on the job resources theory and the job demands-resources model, which suggest that work engagement improves job performance (90). In this context, the presence of employee commitment drives job performance. When nurses are committed to their work, this commitment translates into greater motivation, stronger dedication, and enthusiasm, which in turn translates into optimized job performance (60).

Our results decisively support the presence of a positive relationship between work engagement and life satisfaction, a finding that aligns with what was previously demonstrated (91, 92). This would be explained by the fact that those who experience positive feelings are more likely to experience job satisfaction. However, our study goes further, providing a deeper insight into how these factors intertwine.

Also, the results indicated a positive influence between work engagement and life satisfaction, which is consistent with previous research (91, 92). This is because people who experience more pleasant feelings tend to be more satisfied with their work. In addition, happy people tend to evaluate their skills and abilities positively, remember positive events more frequently, and share positive energy with their environment, which improves labor relations and satisfaction with work, colleagues, and the work environment in general (93). Thus, the work environment, including working conditions, organizational support, and leadership from supervisors, had a significant and positive effect on the nurses' affective commitment to the organization. A favorable work environment and adequate support from the organization and leaders can increase the emotional commitment of nurses to their work and the organization, which can have positive implications for their life satisfaction (92).

On the other hand, our results reveal the mediation of job engagement in the relationship between depression and life satisfaction, suggesting a complex intertwining of mental health, job commitment, and life happiness in the nursing profession. Following the framework of the Job Demands-Resources (JD-R) model, we have evaluated how the relationship between job engagement and life satisfaction is modulated by specific job resources and demands (90, 94). This model postulates that job resources can act as buffers against the harmful effects of job demands, such as stress and the cognitive and emotional demands of work. Thus, when job demands, both cognitive and emotional, increase, a negative relationship with job satisfaction is observed (94). In this sense, job engagement can mitigate this negative impact, acting as an essential mediator in this relationship. At the same time, nurses who have sufficient job resources, such as good teamwork, supervisor support, job control, and a sense of purpose in their work, experience less job pressure and, consequently, greater life satisfaction (95). Hence, our results also evidenced the mediation of job engagement in the relationship between job performance and life satisfaction. Likewise, the mediation of job engagement in the relationship between professional self-efficacy and life satisfaction was indicated. In line with this, personal resources such as self-efficacy, optimism, and determination to continue working, are factors that protect nurses from the negative impact of stress and contribute to greater job engagement and life satisfaction (96). Moreover, high job demands, such as psychosocial and emotional demands (depression), are linked with negative health outcomes, such as burnout and poorer self-rated health. Conversely, job resources, such as social support, cohesion, and rewards, are associated with positive health outcomes and a lower incidence of burnout (97). Nurses with high self-efficacy and positive personality traits, coupled with adequate access to job resources, are more likely to experience higher job engagement. This high job engagement, in turn, is associated with better job performance and greater life satisfaction (98). It's important to highlight that not only do job demands and job resources separately have favorable and unfavorable effects on job engagement, but the appropriate combination of job resources can influence the level of job engagement in stressful situations (64). By understanding this mechanism, interventions and policies can be developed to reduce turnover intentions and improve job satisfaction and emotional wellbeing of nurses (99).

4.1 Implications

Firstly, the importance of work engagement as a mediator between depression, self-efficacy, job performance, and life

satisfaction is highlighted. This suggests that workplace interventions should aim to increase job engagement, which can act as a barrier against depression and can enhance performance and overall life satisfaction in nurses. For nursing professionals, the findings suggest that workplace training programs and interventions should focus on fostering self-efficacy and increasing nurses' ability to handle workload and stress. This might involve the implementation of resilience and stress management training programs, as well as strengthening social support networks in the workplace. Furthermore, health managers should focus on providing a work environment that promotes job engagement, with measures including appropriate task distribution, improved working conditions, and fostering a positive and supportive work atmosphere. Additionally, these findings underscore the need for policies to improve working conditions and reduce workload in the nursing sector. This could involve promoting flexible work policies, reducing the number of working hours, and enhancing mental health support for professionals. It's also essential to foster a work environment that promotes self-efficacy and provides nurses with the necessary skills and resources to cope with job demands. Finally, from a theoretical perspective, these findings enrich our understanding of the Job Demands-Resources (JD-R) theory by demonstrating how depression, self-efficacy, and job performance interact to influence life satisfaction through job engagement. Our results underline the importance of considering both positive aspects (like self-efficacy and job performance) and negative aspects (like depression) of job demands and resources, and how these can influence the health and wellbeing of nursing professionals.

Furthermore, we suggest additional research to explore how other factors, like social support and individual characteristics, might influence the relationship between depression, self-efficacy, job performance, job engagement, and life satisfaction. It would also be valuable to investigate how specific interventions based on the JD-R theory can enhance job engagement and life satisfaction in nurses. For example, interventions that increase job resources or decrease job demands could be explored, and how these interventions might improve engagement and job satisfaction. Lastly, future research could explore these themes in other professional contexts and in different cultures to better understand how the Job Demands-Resources (JD-R) theory applies in different contexts and can be used to improve the job health and wellbeing of employees in a variety of settings and cultures.

4.2 Limitations

Our findings emphasize the crucial mediating role of work engagement in linking depression, professional self-efficacy, job performance, and life satisfaction among nurses, shedding light on the complexities that nursing professionals face. These findings are particularly relevant given the essential role that nursing professionals play in our healthcare systems, a role that has become even more critical in light of recent challenges such as the global pandemic. Furthermore, the need for comprehensive strategies that address not only job demands but also ways to strengthen nurses' work and personal resources is underscored, aiming to improve their engagement, performance, and ultimately, their life satisfaction.

We acknowledge that our research is not without limitations. The first limitation pertains to the cross-sectional nature of our study. Future research could adopt a longitudinal approach to observe how these variables change over time and how interventions based on the JD-R theory might have a long-term impact, as suggested by Tims et al. (100). The second limitation is the sample selection. Although our participants represent a broad range of nurses from various specialties and work settings, our study was primarily focused on a specific geographical region. Future research could expand the sample to include nurses from different regions and cultural backgrounds to gain a more comprehensive picture of these relationships. Lastly, while we controlled for various confounding variables, there are other potential unobserved variables that might have influenced our results, such as individuals' personalities, their social support, or their personal mental health history. Future studies could include these and other relevant variables to provide a more robust analysis and to assess the possibility that Work Engagement acts as an effect modifier in the relationship between Depression and Life Satisfaction.

5 Conclusion

Our findings emphasize the crucial mediating role of job engagement in the connection between depression, professional self-efficacy, job performance, and life satisfaction in nurses, shedding light on the complexities that nursing professionals face. These findings are particularly pertinent, given the essential role nursing professionals play in our healthcare systems, a role that has become even more critical in light of recent challenges, such as the global pandemic. Furthermore, the need for comprehensive strategies that address not only job demands but also ways to strengthen the job and personal resources of nurses is underscored, with the aim of enhancing their engagement, performance, and ultimately, their life satisfaction.

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 study was approved by the Ethics Committee of the Universidad Peruana Unión with code 2023-CEUPeU-033. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

WM-G: Conceptualization, Formal analysis, Investigation, Software, Writing—original draft, Writing—review & editing.

MV: Conceptualization, Data curation, Supervision, Validation, Visualization, Writing—original draft, Writing—review & editing. LS-S: Conceptualization, Resources, Software, Supervision, Validation, Writing—original draft. SM-G: Funding acquisition, Investigation, Resources, Software, Writing—review & editing. OR-L: Conceptualization, Resources, Software, Visualization, Writing—original draft. MM-G: Formal analysis, Investigation, Methodology, Validation, Visualization, Writing—review & editing.

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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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Psychological distress among Brazilian workers during the initial stage of the COVID-19 pandemic: a descriptive study

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Background: COVID-19 pandemic imposed drastic and abrupt changes to working environment and organization and that might have caused additional negative effects on mental health. Thus, this study aimed to quantify and assess the severity of psychological distress experienced by Brazilian essential and nonessential workers during the first months of the COVID-19 pandemic.

Methods: This descriptive study included 2,903 participants who answered an online questionnaire between April and May 2020. The research questionnaire was translated and culturally adapted to the Brazilian population from a questionnaire developed and validated for the Spanish population. Variables were analyzed using simple and cumulative percentage distributions and measures of central tendency and dispersion. The Wilson score interval was used to calculate confidence interval (CI) for the main outcome, psychological distress.

Results: It was observed a high prevalence (72.6%) of psychological distress among the study's participants. They also presented a median risk perception score of 60 (out of a maximum of 90), and their greatest concern was transmitting the virus to family members, close contacts or patients. Furthermore, it was found a lower sense of coherence and work engagement among the participants than those observed in previous studies conducted in other countries.

Conclusion: Almost three quarters of the study's participants were classified as presenting psychological distress. Thus, it is imperative to provide mental health remotely delivered interventions to workers during public health events that require prolonged social distancing measures.

KEYWORDS

COVID-19, psychological distress, sense of coherence, work engagement, workers, epidemiology

1 Introduction

A pandemic event is an extraordinary phenomenon that has major implications in many life domains, such as physical and psychological well-being, working experience, social life, economic status, leisure activities, and others. The coronavirus disease 2019 (COVID-19) pandemic - which evolved from a cluster of a novel viral pneumonia in Wuhan, China, reported on the last month of 2019, to a full pandemic scenario on 11 March 2020 (1) - was not different, since it caused significant health, social, educational, working and economic burden all around the world (2–8). In Brazil, specifically, the COVID-19 pandemic precipitated a multifaceted crisis, encompassing hundreds of thousands of deaths, reduced economic activity, decreased exports, an important surge in unemployment, increased precarious working conditions, a strong contraction of the National Gross Domestic Product, food-insecurity intensification, an increase in domestic violence and femicides, and political disputes, all of which led to an exacerbation of previous social disparities and inequalities (9). Together, this atypical situation, its related challenges and negative consequences have culminated in loneliness, insomnia, fear, grief (at various levels), anxiety and depression (10–12), jeopardizing mental and physical health all around the globe.

In Brazil, the first confirmed COVID-19 case was reported on 25 February 2020, in the city of São Paulo (13). The public universal health system (known as Sistema Unico de Saúde) already had shown the capacity to deal successfully with epidemics in the recent past (Influenza in 2009 and Zika in 2015, for example) (14). However, during the initial stage of the pandemic in Brazil, testing rates were extremely low, contact tracing was practically non-existent, epidemiological data was unspecific and not transparent (15–20). Consequently, between the first reported case and the end of May, 2020, Brazil already recorded the third-highest number of confirmed COVID-19 infections globally (21), with 498,440 cases and 28,834 deaths (22). And, a year after the first COVID-19 case was diagnosed, Brazil became the global epicenter for COVID-19 (15–17).

Several studies have highlighted the significance of examining the impact of the COVID-19 pandemic on mental health within specific socio-cultural contexts. For instance, a study by Goularte et al. emphasized the need for region-specific analyses to understand the diverse experiences of individuals during the pandemic (23). Brazil, with its unique socio-economic and cultural characteristics, presents a compelling case for such focused research. Our decision to concentrate on Brazil is aligned with the recommendations of literature who emphasized the importance of considering country-specific factors, such as variations in healthcare systems, economic conditions, and cultural factors when investigating the mental health consequences of the pandemic (24, 25).

Not surprisingly, more than 60 and 55% of Brazilians had low or no confidence in the government (26, 27) and considered the country's pandemic response to be inadequate and inefficient (27), respectively. This is concerning, since the perceived efficiency and trustworthiness of a government can influence its citizens' well-being (28). Moreover, considering that trust in governmental institutions and the perception of an adequate governmental response is a determinant of mental health during public health emergencies (29–33), this situation becomes even more severe.

In addition to the issues discussed above, the COVID-19 pandemic also imposed drastic and abrupt changes to working environment and organization which might cause additional negative effects on mental health. Workers that were doing their work from home experienced reduced social interactions, decreased overall physical activity, inadequate workstations, inappropriate distractions and/or interruptions, blurred work-life boundaries, extended working hours and higher workload (34). While those workers whose work could not be done from home were subjected to an increased likelihood of infection, constant vigilance and the adoption of new demanding hygiene measures to avoid SARS-CoV-2 exposure and the fear of being infected and transmitting the infection to family members (35). Therefore, the variables studied were the usual sociodemographic ones such as sex, age, marital status, highest education level completed, Brazilian region of residence, number of children and health status among others. Some more specific ones that could affect stress levels were included, such as residence type, pet ownership, living with someone who has disability, etc. (36). In addition, other occupational variables such as occupational group, employment relationship, work arrangement, employer provided all materials and means necessary to work efficiently and to work safely, experienced more conflicts at work, experienced an increase in the workload, experienced more work stress, and current work satisfaction, all of them can cause a disturbance at work level that can influence stress levels (37, 38). And finally, as (mis)information and the level of knowledge about COVID-19, both too much and too little, can increase or decrease stress levels, variables in this regard are included such as: information sources, number of information sources used, clarity and accuracy of employer information regarding COVID-19, hours per day exposed to COVID-19 information, fact-checking, self-perceived COVID-19 transmission knowledge, self-perceived COVID-19 preventive measures knowledge, self-perceived COVID-19 symptoms knowledge, self-perceived COVID-19 prognosis knowledge; and self-perceived COVID-19 treatment knowledge (39–41).

Amidst these challenges, fostering a strong sense of coherence and promoting work engagement may be one path to enhance the overall capacity of workers to cope with the challenges imposed by a pandemic crisis, and in doing so protect their mental health. Sense of coherence is a construct that expresses a person's ability to evaluate and understand a negative situation, to cope with it making use of adequate and available resources, and to perceive the situation as being worth of investing energy to overcome it rather than a burden that should be avoided (33, 42). While work engagement - characterized by vigor, dedication, and absorption in one's work - can be considered a valuable resource for workers to cope with unstable scenarios generated by demanding and adverse circumstances (43). Likewise, it is known from previous studies that sense of coherence and work engagement are key influencing factors for workers (22) and that lower sense of coherence level may be a protective factor in later stages of the pandemic (44). Work engagement and sense of coherence positively correlated with each other and both negatively with psychological distress. So, workers, though experiencing psychological distress, perceive their work positively and satisfactorily despite the severity of the situation and the harsh working conditions (45).

Even though many studies about the mental health consequences of the pandemic have already been published, particularly among frontline healthcare workers, the complexity of the Brazilian pandemic context deserves investigation, as do those workers that were not in the frontline but also were exposed to many factors that affect mental

health. However, there are no specific studies on the working population in Brazil, and it represents the 62.6% of total population (46). In addition to the total population it represents, the lack of studies on workers in any field, changes in their working conditions and the incidence of the disease in early stages, among other reasons, this study allows us to offer a context that has not been studied previously. Therefore, this study aimed to assess the prevalence of psychological distress experienced by Brazilian workers (essential and nonessential) during the early months of the COVID-19 pandemic, while also describing other participant's characteristics and important aspects of their pandemic experience that may have had an impact on their psychological well-being, such as the sense of coherence and work engagement.

2 Methods

This descriptive study is part of a larger international project, coordinated from Spain, and carried out in 16 countries from Latin America, Europe, Africa, and Asia. In Brazil the research was authorized by the Brazilian National Research Ethics Committee (CAAE 30437120.4.0000.5411, 04/23/2020).

The period of data collection in Brazil was from April 23 to May 30, 2020. Given the crucial need for social distancing to control the COVID-19 pandemic, mobility difficulties due to lockdowns and other distancing measures, and to protect the research team, participants were recruited through invitations sent by email and advertisements in the press and social networking sites (WhatsApp, Facebook, Instagram, Twitter, and LinkedIn). Participation in the study was voluntary, there was no incentive or remuneration, and each participant signed a virtual informed consent before answering the research questionnaire. Using a snowball sampling with multiple entry points, respondents were asked to invite other potential participants to take part in the research after they completed the survey. Snowball sampling techniques are frequently employed in cases where the study population is unknown, presenting challenges in the selection of participants who satisfy the specified eligibility criteria (47). Thus, since there is not a national registry of all Brazilian workers, due to the high percentage of informal workers (in 2019 41.6% of Brazilian workers were informal), snowball sampling was deemed a suitable method for the recruitment of study participants. It is also worth noting that, even though healthcare workers are not considered a "hard-to-reach" population, the pandemic introduced challenges such as healthcare workers stigmatization, frequent work site changes, as well as sick leaves due to suspected COVID-19 infection, making it difficult to identify and access these workers. Recognizing snowball sampling's ability to facilitate access and encourage participation, the research team chose this method for efficient identification and recruitment of participants working on the pandemic frontline. In addition, the total population size in Brazil is 203,080,756, according to the Brazilian Statistical Institute of Geography and Statistics (46), of which 6.2% are formally employed Taking as a reference the total sample size of formally employed people, which amounts to 12,591,006, the sample size required is 239 subjects, with a confidence level of 95%, a proportion of 5%, and a 15% sample failure rate expected.

The research questionnaire, Emotional Impact Questionnaire COVID-19 Brazil (EIQ-BR), was translated and culturally adapted to the Brazilian population from a questionnaire developed and validated for the Spanish population. Detailed information on the Spanish questionnaire development and validation is described elsewhere (47). EIQ-BR translation procedure followed Beaton's recommendations to translate and cross-culturally adapt questionnaires (48). Thus, EIQ's Spanish version was initially translated to Brazilian Portuguese by two translators, after that a synthesis of both translations was conducted, this version was then translated back to Spanish. Since the back translated questionnaire and the original version agreed, the questionnaire was examined by 10 academic experts for face and content validity, item relevance and comprehensibility. In response to the judges' feedback, changes were made accordingly, and the questionnaire's comprehensibility was tested in a pilot survey on a sample size of 20 Brazilian workers.

EIQ-BR was made available online at (https://cutt.ly/IMPACT_COVID-19_BRASIL) and open to anyone interested in responding. Thus, inclusion criteria for this study - residing in Brazil during the pandemic, to be working at the time of enrolment and being 18 years of age or older - were applied after questionnaire completion and resulted in a total of 2,903 participants.

To enhance survey completion rates a progress bar was incorporated into the questionnaire to display participants' progression throughout the survey and the total number of questions was limited to less than 200 (49). Hence, the questionnaire comprised 147 questions divided into 11 sections: sociodemographic characteristics, occupational profile, health-related characteristics, COVID-19 knowledge, COVID-19 contact history, COVID-19 perceived symptoms, COVID-19 risk perception, preventive measures, sense of coherence, work engagement and psychological distress.

In this study, the following sociodemographic variables were selected for analyses: sex (male and female); age (complete years); marital status (single, married or living with a partner, separated/divorced and widowed); highest education level completed (high school, bachelor, specialization, master's degree and PhD); Brazilian region of residence (North, Northeast, Midwest, Southeast and South); residence type (apartment with balcony, apartment without balcony, house with backyard, house without backyard and other); children; pet ownership; living with someone who has physical disability; living with someone who has intellectual disability; and living with someone who has visual or auditive or multiple disabilities (the last five questions had "yes or no" answers).

The occupational variables were major occupational group (white-, blue-, pink-collar and others - white-collar included scientists, artists, executive workers, administrative workers, managerial workers, and technicians; blue-collar included farmers, foresters, fishermen, workers in production of industrial goods and services, repair workers and maintenance workers; pink-collar included service sector workers; and others included military personnel, police officers, firefighters and other occupations not included in the Brazilian Occupation Classification Index); healthcare professional (yes and no); employment relationship (self-employed, civil servant and private sector employee); work arrangement (part-time at home, part-time not at home, full-time at home, full time not at home and mixed); employer provided all materials and means necessary to work efficiently; employer provided all materials and means necessary to work safely (the last two questions had 1 through 10 scale answers, where 1 means "disagree completely" and 10 means "agree

completely"); experienced more conflicts at work; experienced an increase in the workload; experienced more work stress (the last three questions had 1 through 10 scale answers, where 1 means "definitely not" and 10 means "definitely yes"); and current work satisfaction (1 through 10 scale, where 1 means "completely dissatisfied" and 10 means "completely satisfied").

The health-related variables were self-perceived health status during the last 14 days (very good, good, fair, poor, and very poor); self-identifying as having a disability; self-identifying as having a chronic disease; self-reporting medication use; self-reported health care utilization in the past 14 days; and self-reported hospitalization history in the last 14 days (the last five questions had "yes or no" answers).

Regarding COVID-19 knowledge, the following variables were analyzed: information sources (official sources, television, radio, newspapers, social media, friends and family, others - official platforms include websites of official institutions or scientific societies; others includes Google and/or other search engines, scientific articles and other sources of information) number of information sources used (one, two, three, four, five, six and seven); clarity and accuracy of employer information regarding COVID-19 (1 through 10 scale, where 1 means "completely dissatisfied" and 10 means "completely satisfied"); hours per day exposed to COVID-19 information (up to 1 h, >1 up to 4 h, >4 up to 8 h and > 8 h); fact-checking (yes and no); self-perceived COVID-19 transmission knowledge; self-perceived COVID-19 preventive measures knowledge; self-perceived COVID-19 symptoms knowledge; self-perceived COVID-19 prognosis knowledge; and self-perceived COVID-19 treatment knowledge (the last five questions had 1 through 10 scale answers, where 1 means "insufficient" and 10 means "sufficient").

EIQ-BR also presented five questions about basic COVID-19 knowledge (incubation period, symptoms, need for isolation after a positive test, form of transmission, and period of transmission), each of these questions had a possible answer of "yes," "no," or "I do not know."

For its part, COVID-19 contact history variables were: living with a family member that has been infected (yes, no and have not had an infected family member); any co-worker was infected; close contact (more than 15 min or less than two meters away) with confirmed infected person; casual contact with confirmed infected person; any type of contact with people or materials suspected of being infected (the last four questions had "yes, no and do not know" as possible answers); and tested for COVID-19 (yes and no).

In addiction EIQ-BR collected data on perceived COVID-19 symptoms (cough, shortness of breath, fever, sore throat, rhinitis, chills, headache, myalgia, dizziness, and diarrhea) over the last 14 days. Therefore, two variables were analyzed: presented at least a symptom in the last 14 days (yes and no); and number of symptoms presented in the last 14 days (none, one, between two and four, between five and seven and between eight and ten).

Likewise, EIQ-BR had nine questions about COVID-19 risk perception. Each of these questions had a scale from 1 to 10 (where 1 means "not worried at all" and 10 means "very worried") as an answer. Therefore, a risk perception score (discrete variable with a minimum of 9 and a maximum value of 90) was created by summing the score for each question. Other variables regarding risk perception were: self-perception of work as a risk for COVID-19 infection; belief that had contact with clients/patients that were a risk factor for COVID-19 transmission (this variable was analyzed only within the subset of participants who were not working remotely at the time of the survey); acceptance of COVID-19 infection as an occupational hazard (the last three questions had 1 through 10 scale answers, where 1 means "definitely not" and 10 means "definitely yes"); belief of avoidance from friends and/or relatives due to working in a high infection risk environment (this variable was analyzed only within the subset of participants who were not working remotely at the time of the survey); and belief that may have contracted COVID-19 (the last two questions had "yes, no and do not know" as possible answers).

Furthermore EIQ-BR gathered data about preventive measures. Questions with five answer choices, categorized from never to always, were used to identify the frequency of the following preventive behaviors: using the elbow to cover the mouth while sneezing or coughing; avoiding sharing eating utensils during meals; washing hands with soap and water; washing hands with hydroalcoholic solution; washing hands immediately after touching the nose, sneezing or coughing; washing hands after touching potentially contaminated objects; wearing face mask regardless of symptoms presence; keeping a distance of at least a meter and a half from others. The answers to these questions were converted to a numerical scale from 1 (never) to 5 (always) and a preventive behaviors scale was created by summing and then dividing by 8, the scores on the eight questions. Other variables regarding preventive measures adoption were also assessed: home confinement (fully, partially, and not confined); social distancing from friends and/or relatives due to perceived higher-risk work environment (yes and no - this variable was analyzed only within the subset of participants who were not working remotely at the time of the survey); and preventive measures effectiveness perception (1 through 10 scale, where 1 means "not effective at all not" and 10 means "very effective").

To evaluate participant's sense of coherence EIQ-BR made use of the Brazilian Portuguese version of the 13-item Sense of Coherence Scale (SOC-13) (50). The SOC-13 is a self-administered scale, which consists of 13 items, scored on a seven-point frequency Likert scale, and divided into three domains (comprehensibility, manageability, and meaningfulness) (51). The total scale score was obtained by the sum of the 13 item scores; and ranged from 13 to 91 points. The higher the score, the stronger the sense of coherence. Cronbach's alpha as a measure of the internal consistency for the SOC-13 Brazilian Portuguese version entire scale was 0.81 (50).

Regarding work engagement, EIQ-BR made use of the Brazilian Portuguese version of the 9-items Utrecht Work Engagement Scale (UWES-9) (52). The UWES-9 is a self-administered scale, comprised of 9 items, scored on a seven-point frequency Likert scale, and divided into three domains (vigor, dedication, and absorption). Cronbach's alpha as a measure of the internal consistency for the UWES-9 Brazilian Portuguese version entire scale was 0.94 (52). UWES-9 total score was obtained by the 9 item scores mean value and ranged from 0 to 6 points. The higher the score, the stronger the work engagement.

Finally, to evaluate psychological distress the EIQ-BR made use of the Brazilian Portuguese version of the 12-items General Health Questionnaire (GHQ-12) (53). The GHQ-12 is a self-administered screening instrument that evaluates psychological well-being and detects non-psychotic psychiatric disorders (54). Each item has four options, options 1 and 2 are worth zero points while options 3 or 4 are worth 1 point. For this study, a cut-off point of 3 was established, considering the presence of psychological distress in subjects with scores greater than or equal to 3. Cronbach's alpha as a measure of the

internal consistency for the GHQ-12 Brazilian Portuguese version entire scale was 0.88 (53).

The above variables were analyzed using simple and cumulative percentage distributions and measures of central tendency and dispersion (for discrete and continuous variables, respectively). The Wilson score interval was used to calculate confidence interval (CI) for the main outcome, psychological distress. Data analysis was conducted using the IBM Corp. Released 2019 SPSS Statistics for Windows (Version 26.0, IBM Corp., Armonk, NY). While missing data were estimated by chained equations multiple imputation using the "mice" function (package "mice," R 4.1.1) adopting the predictive mean matching method (55, 56). The following variables had missing values (numbers in parentheses are the number of participants for whom data was missing): age (1); living with someone who has physical disability (311); living with someone who has intellectual disability (327); living with someone who has visual or auditive or multiple disabilities (260); COVID-19 incubation period knowledge (166); COVID-19 symptoms knowledge (166); COVID-19 need for isolation after positive test knowledge (166); COVID-19 form of transmission knowledge (166); COVID-19 transmission period knowledge (166); belief that had contact with clients/patients that were a risk factor for transmission (346); belief of avoidance from friends and/or relatives due to working in a high infection risk environment (240); and social distancing from friends and/or relatives due to perceived higher-risk work environment (240).

3 Results

Among the 2,903 participants, 73.0% were women and 34.1% reported having a chronic disease. The majority had more than high school education (90.0%) and were white-collar workers (75.7%). Almost half were civil servants (47.2%) and were working full-time at home (41.3%). Tables 1–3 present sociodemographic characteristics, occupational profile, and health-related information of the study participants.

Regarding COVID-19 knowledge, 72.1% of the participants answered correctly all five questions. More than half of the participants were exposed to COVID-19 information for up to 4 h (70.6%) and, even more impressive, 94.0% declared engaging in fact-checking behavior. In relation to COVID-19 symptoms and contact history, 47.8% reported presenting between two and four COVID-19 symptoms during the previous 14 days and, even though, 7.4% reported that a family member had been infected only 4.6% had been tested for COVID-19. Transmitting the virus to family members, close contacts or patients was the participants' greatest concern; it is also interesting to note that the participants perceived the preventive measures as being very effective. Tables 4–6 present participants' COVID-19 knowledge, contact history, symptoms, risk perception and adhesion to preventive measures.

The SOC domains of comprehensibility, manageability and meaningfulness reached a median value of 21.0 (IQR 10.0), 18.00 (IQR 7.0) and 20.0 (IQR 8.0), respectively. And the SOC-13 total scale median score was 58.0 (IQR 21.0) (Table 7).

The median UWES-9 total scale score was 3.7 (IQR 2.2), and the domains' scores varied from 3.0 (IQR 2.3) for vigor to 3.7 (IQR 2.7) and 4.0 (IQR 2.3) for dedication and absorption, respectively (Table 8).

Finally, 72.6% (95% CI 70.1–74.2%) of the participants presented a GHQ-12 score higher or equal to three and, thus, were classified as being in psychological distress. More than 50% of the participants reported a higher than usual occurrence of: feelings of not being able to overcome difficulties; losing sleep due to worries; feelings of

TABLE 1 Participant's sociodemographic characteristics (n = 2,903).

Variables	Percentage or median (IQR)
Sex	
Male	27.0%
Female	73.0%
Age	38.0 (18.0)
Marital status	
Single	35.2%
Married or living with a partner	54.5%
Separated/Divorced	9.4%
Widowed	0.9%
Children	
Yes	46.2%
No	53.8%
Pet ownership	
Yes	60.9%
No	39.1%
Highest education level completed	
High school	10.0%
Bachelor	26.5%
Specialization	28.0%
Master	19.2%
PhD	16.3%
Brazilian region of residence	
North	1.0%
Northeast	5.0%
Midwest	8.0%
Southeast	74.3%
South	11.7%
Residence type	
Apartment with balcony	21.4%
Apartment without balcony	16.7%
House with backyard	50.8%
House without backyard	7.2%
Other	3.9%
Living with someone who has physical disability	
Yes	3.0%
No	97.0%
Living with someone who has intellectual disability	
Yes	3.5%
No	96.5%
Living with someone who has visual or auditive or multiple disabilities	
Yes	12.1%
No	87.9%

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TABLE 2 Participant's occupational characteristics (n = 2,903).

Variables	Percentage or median (IQR)
Major occupational group	
White-collar	75.7%
Blue-collar	2.9%
Pink-collar	3.8%
Others	17.6%
Healthcare professional	
Yes	39.6%
No	60.4%
Employment relationship	
Self-employed	21.4%
Civil servant	47.2%
Private sector employee	31.4%
Work arrangement	
Part-time at home	16.4%
Part-time not at home	13.2%
Full-time at home	41.3%
Full time not at home	22.5%
Mixed	6.5%
Employer provided all materials and means necessary to work efficiently	8.0 (5.0)
Employer provided all materials and means necessary to work safely	9.0 (4.0)
Experienced more conflicts at work	3.0 (6.0)
Experienced an increase in the workload	7.0 (8.0)
Experienced more work stress	8.0 (6.0)
Current work satisfaction	6.0 (4.0)

TABLE 3 Participant's health-related characteristics (n = 2,903).

Variables	Percentage or median (IQR)
Self-identifying as having a disability	
Yes	4.3%
No	95.7%
Self-identifying as having a chronic disease	
Yes	34.1%
No	65.9%
Self-reporting medication use	
Yes	44.9%
No	55.1%
Self-perceived health status during the last 14days	
Very good	32.8%
Good	48.4%
Fair	16.0%
Poor	2.4%
Very poor	0.4%
Self-reported health care utilization in the past 14days	
Yes	7.5%
No	92.5%
Self-reported hospitalization history in the last 14days	
Yes	0.7%
No	99.3%

unhappiness and depression; not being able to do enjoy normal day-to-day activities; and feeling constantly under strain (Table 9).

4 Discussion

The present study revealed a high prevalence of psychological distress among Brazilian workers (essential and nonessential) already during the first months of the COVID-19 pandemic. Furthermore, it disclosed that the participants: were mainly working remotely; experienced an increase in workload and in work stress, while being only moderately satisfied with their work; had an adequate COVID-19 basic knowledge; perceived COVID-19 as a serious health problem; and reported being highly adherent to preventive measures.

Regarding the participants' characteristics, the results show that in general they were young and highly educated white-collar workers, and that almost half of them were civil servants. The majority was married or living with a partner, less than half had children and they predominantly resided in the Southeast region. It should be highlighted that the participants' sociodemographic and occupational characteristics were quite similar to those of a previous study also conducted among Brazilian workers during the pandemic's initial phase (57).

The prevalence of psychological distress (GHQ ≥ 3) observed in this study (72.6%) was higher than in other countries where EIQ and the same GHQ-12 cutoff point was used, such as Portugal (57.2%) (58), Peru (59.6%) (59), Argentina (60.9%) (60), Ecuador (62.7%) (47) and Spain (65.1%) (61). Only Chile (78.8%) (62) presented a higher occurrence of psychological distress.

Several factors may explain this prevalence of psychological distress, including the high percentage of remote workers among the participants. Studies performed during the COVID-19 pandemic have already shown that remote work was negatively correlated with psychological distress (34, 61, 63–66). This may have been due to lack of support, isolation, loneliness, low control over long working hours, decreased work productivity and reduced job satisfaction (64, 65, 67). The participants' gender distribution may also be an explanation, since it has already been shown that women working remotely during the pandemic were more prone to being depressed, anxious, and stressed than men in the same situation (67). Remote work was conceivably over-proportionately burdensome to women, given the unequal distribution of domestic work and family responsibilities dictated by gender roles (63, 64). This issue is particularly pronounced societies that maintain a patriarchal dominance system such as that of Brazil (7, 68, 69), where entrenched gender norms still contribute to the reinforcement of gender roles and inequalities (69, 70). Another work-related factor that may have contributed to the high prevalence of psychological distress observed is the increase in

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TABLE 4 Participants' COVID-19 knowledge ($n = 2,903$).

Variables	Percentage or median (IQR)
Information sources	
Official sources	65.1%
Television	67.5%
Radio	20.1%
Newspapers	62.0%
Social media	80.8%
Friends and family	42.4%
Others	50.8%
Number of information sources used	
One	8.7%
Two	13.8%
Three	18.7%
Four	21.2%
Five	18.9%
Six	12.6%
Seven	6.1%
Clarity and accuracy of employer information regarding COVID-19	8.0 (4.0)
Hours per day exposed to COVID-19 information	
Up to 1 h	22.6%
>1 up to 4 h	48.0%
>4 up to 8 h	17.2%
>8 h	12.2%
Fact-checking	
Yes	94.0%
No	6.0%
Self-perceived COVID-19 transmission knowledge	9.0 (3.0)
Self-perceived COVID-19 preventive measures knowledge	9.0 (3.0)
Self-perceived COVID-19 symptoms knowledge	8.0 (3.0)
Self-perceived COVID-19 prognosis knowledge	7.0 (3.0)
Self-perceived COVID-19 treatment knowledge	6.0 (4.0)
COVID-19 incubation period basic knowledge question	
Correct answers	91.0%
Incorrect answers	9.0%
COVID-19 symptoms basic knowledge question	
Correct answers	92.2%
Incorrect answers	7.8%
COVID-19 need for isolation after positive test basic knowledge question	
Correct answers	93.6%
Incorrect answers	6.4%
COVID-19 form of transmission basic knowledge question	
Correct answers	98.1%
Incorrect answers	1.9%
COVID-19 transmission period basic knowledge question	
Correct answers	83.4%
Incorrect answers	16.6%
Number of correct answers on the COVID-19 basic knowledge questionnaire	
None	0.1%
One	0.3%
Two	4.8%
Three	3.1%
Four	19.6%
Five	72.1%

workload reported by the participants, since previous studies have found an association between increased workload and psychological distress (67, 71).

Non-work-related aspects may also be possible explanations for the impressive prevalence of psychological distress found in the study. More than a third (34.1%) of the participants reported having a chronic disease, since it was widely known that many of these conditions presented a greater risk of severe COVID-19 and death in case of infection (72) it is not surprising that a systematic review and meta-analysis showed that chronic diseases patients had the highest prevalence of depression, and high rates of anxiety and distress when compared to the general population, students, healthcare personnel working in clinical departments, workers in non-clinical settings, quarantined individuals and COVID-19 patients (73). Another source of stress for chronic disease patients during the pandemic was the disruption to health services and systems, which caused delay in routine healthcare, treatments interruptions and relationship changes with healthcare workers (74). It is important to note that, numerous studies have highlighted moderate associations between chronic diseases and psychological distress, irrespective of COVID-19. Nevertheless, findings from a twin-paired cross-sectional study indicate that the strength of the association between chronic diseases and psychological distress may be lower than previously presumed (75).

Another interesting result revealed during this study is that the study's participants presented a median risk perception score of 60 (out of a maximum of 90). On the one hand this is a positive finding, considering that it has already been shown that during epidemic scenarios risk perception is positively associated to preventive measures adherence (76, 77), which was also quite high among the participants. However, on the other hand, higher levels of COVID-19 risk perception were found to be inversely associated with psychological health (78, 79). Thus, it is imperative to set the correct level of risk perception during a pandemic event, in the interest of counterbalancing the adherence to preventive measures and the mitigation of psychological affliction (78, 79).

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TABLE 5 Participants' COVID-19 contact history and symptoms ($n = 2,903$).

Variables	Percentage or median (IQR)
COVID-19 contact history	
Living with a family member that has been infected	
Yes	1.0%
No	6.4%
Haven't had an infected family member	92.6%
Any co-worker was infected	
Yes	15.2%
No	51.0%
Do not know	33.8%
Close contact with confirmed infected person	
Yes	5.6%
No	46.6%
Do not know	47.8%
Casual contact with confirmed infected person	
Yes	5.6%
No	45.4%
Do not know	49.0%
Any type of contact with people or materials suspected of being infected	
Yes	8.8%
No	33.6%
Do not know	57.6%
Tested for COVID-19	
Yes	4.6%
No	95.4%
COVID-19 symptoms	
Presented at least a symptom in the last 14days	
Yes	80.6%
No	19.4%
Number of symptoms presented in the last 14days	
None	19.3%
One	21.2%
Between two and four	47.8%
Between five and seven	10.9%
Between eight and ten	0.8%

TABLE 6 Participants' COVID-19 risk perception and adhesion to preventive measures ($n = 2,903$).

Variables	Percentage or median (IQR)
COVID-19 risk perception	
General COVID-19 risk perception	10.0 (2.0)
Concern of becoming infected with COVID-19	9.0 (3.0)
Concern about the probability of becoming infected with COVID-19	4.0 (3.0)
Concern about healthcare workers ability to diagnose COVID-19	3.0 (3.0)
Concern about healthcare system ability to diagnose COVID-19	4.0 (3.0)
Concern about the difficulty to treat COVID-19 infection	8.0 (2.0)
Concern about the health consequences of COVID-19 infection	7.0 (4.0)
Concern about the probability of survival if infected with COVID-19	3.0 (3.0)
Concern of transmitting the virus to others	10.0 (0.0)
Risk perception scale total score	60.0 (13.0)
Self-perception of work as a risk for COVID-19 infection	8.0 (7.0)
Belief that had contact with clients/patients that were a risk factor for transmission*	8.0 (7.0)
Acceptance of COVID-19 infection as an occupational hazard	2.0 (6.0)
Belief of avoidance from friends and/or relatives due to working in a high infection risk environment*	
Yes	41.6%
No	40.8%
Do not know	17.6%
Belief that may have contracted COVID-19	
Yes	3.4%
No	40.2%
Do not know	56.4%
Preventive measures	
Using the elbow to cover the mouth while sneezing or coughing	
Never	1.7%
Rarely	2.6%
Sometimes	8.7%
Often	36.3%
Always	50.7%
Avoiding sharing eating utensils during meals	
Never	7.1%

(Continued)

Improving individuals' ability to cope effectively with the effects of a pandemic event may be an additional way of dealing not only with the adverse effects of an elevated risk perception but also with psychological distress. According to the salutogenic model, a high level of sense of coherence enables successful coping with regular and acute stressful events (33, 42). This study's participants presented a lower sense of coherence mean score ($M = 58.1$; $SD = 14.7$) than those reported by studies (that also made use of the SOC-13) among the

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TABLE 6 (Continued)

Variables	Percentage or median (IQR)
Rarely	4.4%
Sometimes	8.2%
Often	19.2%
Always	61.1%
Washing hands with soap and water	
Never	0.1%
Rarely	0.0%
Sometimes	1.6%
Often	16.8%
Always	81.5%
Washing hands with hydroalcoholic solution	
Never	0.4%
Rarely	2.0%
Sometimes	8.1%
Often	25.5%
Always	64.0%
Washing hands immediately after touching the nose, sneezing or coughing	
Never	2.5%
Rarely	6.2%
Sometimes	19.2%
Often	36.7%
Always	35.4%
Washing hands after touching potentially contaminated objects	
Never	0.2%
Rarely	1.2%
Sometimes	6.9%
Often	26.6%
Always	65.1%
Wearing face mask regardless of symptoms presence	
Never	6.8%
Rarely	4.7%
Sometimes	11.5%
Often	27.1%
Always	49.9%
Keeping a distance of at least a meter and a half from others	
Never	0.7%
Rarely	3.0%
Sometimes	11.5%
Often	27.1%
Always	49.9%
Preventive behaviors scale total score	4.8 (0.6)

(Continued)

TABLE 6 (Continued)

Variables	Percentage or median (IQR)
Home confinement	
Fully	20.6%
Partially	69.1%
Not confined	10.3%
Social distancing from friends and/or relatives due to perceived higher-risk work environment*	
Yes	84.7%
No	15.3%
Preventive measures effectiveness perception	9.0 (2.0)

*Variables analyzed only within the subset of participants who were not working remotely.

adult population of Spain ($M = 61.6$; SD = 12.6) (80) and healthcare workers in Ecuador ($M = 65.0$; SD = 12.7) (38), this might be another mechanism that could contribute to the high prevalence of psychological distress found in this study, since it has already been shown that sense of coherence has a positive strong and significant association with mental health (33).

It is also worthy of note that the workers who took part in this study presented a work engagement mean score ($M = 3.5$; SD = 1.3) similar to that of a study conducted in the United Kingdom ($M = 3.5$; SD = 1.1) (77), but lower than that of an Ecuadorian study ($M = 4.5$; SD = 1.2) (81) and for Spanish healthcare workers ($M = 4.0$; SD = 1.1) (45). Previous studies have shown that psychological distress is inversely associated with work engagement, and that organizations should ensure safe working conditions and promote policies that enable workers to perceive their overall contribution to organization's goals and foster workers' development to improve its employees' work engagement (37). However, even though work engagement has been perceived as a positive worker virtue, it is important to note that more recently it has been shown that over-engagement is associated with burnout (82, 83) and a predictor of exhaustion over time (84) and onset of major depression (85). Thus, it is possible to conclude that work engagement promotion should be done with utmost care, especially during periods of increased psychological distress.

Considering the discussed findings, the evidence indicating that the perception of an adequate governmental response is a determinant of mental health during public health emergencies (29–33), along with the decentralized organizational structure of the Brazilian public health system (which is decentralized and shared by the Ministry of Health and State and Municipal Health Departments), and the political context in Brazil during the studied period, it is reasonable to presume that a coordinated, evidence-based pandemic response led by the Ministry of Health would likely reduce the prevalence of psychological distress among Brazilian workers. It is crucial to bear in mind that, between April and May 2020 Brazil witnessed three changes in health ministers, epidemiological data from the Ministry of Health was unreliable and lacked transparency, while federal government coordination of the pandemic response was nearly non-existent (15–20). Additionally, there was a consistent downplaying of the COVID-19 risk by high-ranking federal government members, who not only

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TABLE 7 SOC-13 individual items and scale scores (n = 2,903).

Variables	Median (IQR)
Questions	
Do you have the feeling that you do not really care about what goes on around you?	6.0 (4.0)
Has it happened in the past that you were surprised by the behavior of people whom you thought you knew well?	4.0 (3.0)
Has it happened that people whom you counted on disappointed you?	3.0 (3.0)
Until now your life has had: no clear goals or purpose at all - very clear goals and purpose	6.0 (2.0)
Do you have the feeling that you are being treated unfairly?	5.0 (3.0)
Do you have the feeling that you are in an unfamiliar situation and do not know what to do?	5.0 (3.0)
Doing the things you do every day is: a source of deep pleasure and satisfaction - a source of pain and boredom	5.0 (2.0)
Do you have very mixed-up feelings and ideas?	5.0 (4.0)
Does it happen that you have feelings inside you would rather not feel?	4.0 (4.0)
Many people - even those with strong character - sometimes feel like sad losers in a certain situation. How often have you felt this way in the past?	4.0 (2.0)
When something has happened have you generally found that: you overestimated or underestimated its importance - you saw things in the right proportion	4.0 (3.0)
How often do you have the feeling that there's little meaning in the things you do in your daily life?	5.0 (3.0)
How often do you have the feeling that you are not sure you can keep under control?	5.0 (3.0)
Scores	
SOC-13 comprehensibility score	21.0 (10.0)
SOC-13 manageability score	18.0 (7.0)
SOC-13 meaningfulness score	20.0 (8.0)
SOC-13 total scale score	58.0 (21.0)

TABLE 8 UWES-9 individual items and scale scores (n = 2,903).

Variables	Median (IQR)
Questions	
At my work, I feel bursting with energy	3.0 (2.0)
At my job, I feel strong and vigorous	3.0 (3.0)
I am enthusiastic about my job	3.0 (3.0)
My job inspires me	4.0 (3.0)
When I get up in the morning, I feel like going to work	3.0 (3.0)
I feel happy when I am working intensely	4.0 (3.0)
I am proud on the work that I do	5.0 (3.0)
I am immersed in my work	5.0 (3.0)
I get carried away when I'm working	4.0 (3.0)
Scores	
UWES-9 vigor score	3.0 (2.3)
UWES-9 dedication score	3.7 (2.7)
UWES-9 absorption score	4.0 (2.3)
UWES-9 total scale score	3.7 (2.2)

opposed state-mandated social distancing measures but also criticized state governors' decisions to implement restrictions. They actively promoted drugs like hydroxychloroquine and ivermectin, known to be ineffective against COVID-19, while discouraging the use of face masks (15–20).

It is important to interpret this study's results while considering its limitations. Despite GHQ-12's widespread use in cross-cultural comparisons, evidence of measurement equivalence across its different language versions are still lacking. Therefore, from a stringent psychometric perspective, caution is advised in interpreting mean differences between countries as indicative of distinct levels of psychological distress (86). This is due to the inability to ascertain whether such differences genuinely reflect variations in psychological distress or are instead attributable to inherent measurement issues (86).

Regardless of its potential for biased estimates, snowball sampling was employed in this study. This sampling strategy may have limited participant representativeness, as indicated by the high percentage of female participants and of those with at least bachelor's degrees. Another potential bias related to the snowball sampling method involves the referral of individuals which tend to have similar beliefs, values, and attitudes, possibly introducing high uniformity. This could result in an unknown and immeasurable, although identifiable, selection bias in the data. Additionally, it is known that individuals with existing or severe mental illness are less likely to participate in online research than those without such conditions (87). Therefore, even though our results findings might be valuable, it is possible that they still underestimate the actual extent of psychological distress among Brazilian workers. It is worth mentioning that most of the published studies that assessed psychological distress during the COVID-19 pandemic made use of snowball sampling. It is also noteworthy that, to reduce selection bias from snowball sampling, the researchers purposefully selected from their professional and social network well-connected individuals with diverse education, socioeconomic and working backgrounds as initial seeds. It was also asked from this first wave of recruits to contact only three to five new recruits in the subsequent wave and so forth, to prevent those with larger social

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TABLE 9 GHQ-12 individual items and psychological distress prevalence ($n = 2,903$).

Variables	Percentage
Questions	
Have you recently been able to concentrate on whatever you are doing?	
Better than usual	13.8%
Same as usual	43.7%
Less than usual	31.2%
Much less than usual	11.3%
Have you recently lost much sleep over worry?	
Not at all	17.6%
No more than usual	23.5%
Rather more than usual	36.3%
Much more than usual	22.6%
Have you recently felt that you are playing a useful part in things?	
More so than usual	19.7%
Same as usual	45.3%
Less useful than usual	25.2%
Much less useful	9.8%
Have you recently felt capable of making decisions about things?	
More so than usual	9.3%
Same as usual	57.7%
Less so than usual	24.4%
Much less capable	8.6%
Have you recently felt constantly under strain?	
Not at all	8.0%
No more than usual	18.0%
Rather more than usual	41.1%
Much more than usual	32.9%
Have you recently felt you could not overcome your difficulties?	
Not at all	15.0%
No more than usual	32.5%
Rather more than usual	31.9%
Much more than usual	20.6%
Have you recently been able to enjoy your normal day-to-day activities?	
More so than usual	12.3%
Same as usual	26.0%
Less so than usual	38.7%
Much less than usual	23.0%
Have you recently been able to face up to your problems?	
More so than usual	6.9%
Same as usual	51.7%
Less able than usual	31.0%
Much less able	10.4%
Have you recently been feeling unhappy and depressed?	
Not at all	16.1%
No more than usual	22.5%
Rather more than usual	38.1%
Much more than usual	23.3%
Have you recently been losing confidence in yourself?	
Not at all	43.9%
No more than usual	26.7%
Rather more than usual	20.2%
Much more than usual	9.2%
Have you recently been thinking of yourself as a worthless person?	
Not at all	64.1%
No more than usual	16.2%
Rather more than usual	12.5%
Much more than usual	7.2%
Have you recently been feeling reasonably happy, all things considered?	
More so than usual	12.0%
Same as usual	49.8%
Less so than usual	29.1%
Much less than usual	9.1%
Score	
Psychological distress	
Yes (GHQ ≥ 3)	72.6%
NO (GHQ < 3)	27.4%

networks from dominating the sample. However, it was not possible to track social ties and collect information on participants' network sizes.

Finally, like other numerous studies conducted during the COVID-19 pandemic, data collection was online, and thus limited to individuals with internet access. Even though 79.5% of Brazilian households had internet access in 2019 (88), those of the lowest income and educational groups, which were likely to differ in many ways from the study's participants, may have been excluded. It should be highlighted that, there are evidences indicating few differences between research data collected online and those obtained through traditional self-report methods, as well as those participants recruited online may be demographically diverse and equally motivated to provide reliable data (49, 89). It should be clear that none of these dismiss the disadvantages imposed by snowball sampling discussed above. Nevertheless, it is important to note that both limitations, snowball sampling and online data collection, were imposed by legal (and ethical) issues associated with the need for containing COVID-19 transmission.

Despite the above limitations, some of the major strengths of the present study were the large and geographically distributed sample obtained, the use of internationally validated instruments, and the fact that the same research questionnaire was used in several countries making it possible to compare with caution our findings with those obtained in other nations.

In conclusion, a total of 2,903 Brazilian workers from diverse work sectors participated in the study. The study's participants presented a lower sense of coherence and work engagement than those observed in previous studies. Regarding the main outcome, almost three quarters of respondents were classified as presenting psychological distress. Therefore, the provision of remotely delivered mental health interventions for workers during the early stages of public health events that necessitate prolonged social distancing measures may be helpful to maintain mental health. Many of such interventions have been developed and implemented over the COVID-19 pandemic, now is the time to evaluate their feasibility and effectiveness in different settings, in such a way that all countries should be able to prepare emergency plans that include tools to better cope with mental health problems during future pandemics, minimizing economic, social and health consequences.

Although the present study provides valuable information that may aid in laying the groundwork for targeted interventions and policy recommendations throughout the early stages of a future pandemic, there remains a need for research that assesses the factors associated with psychological distress, the long-term effects of the COVID-19 pandemic on the mental health of essential and non-essential workers, and the effectiveness and safety of interventions aimed at preserving mental health, strengthening the sense of coherence, and promoting work engagement among working populations during a pandemic event.

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.

Ethics statement

The study was authorized by the Brazilian National Research Ethics Committee (CAAE 30437120.4.0000.5411, 04/23/2020). It was conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

MA: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. ML: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. AD: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. JC-V: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. JG-I: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. CR-F: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. JB: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. JG-S: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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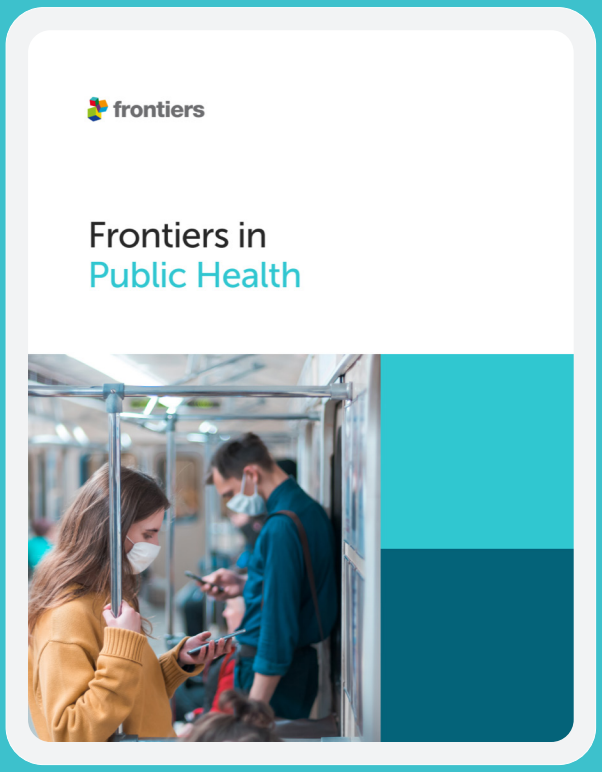

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