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Depression, anxiety, and stress in the Chilean Educational System: children and adolescents post-pandemic prevalence and variables

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The mental health of children and adolescents in the Chilean Educational System (ChES) has become a severe post-pandemic public health problem. This cross-sectional study, which included 1,174 children and adolescents from five Chilean regions, used the DASS-21 scale, focusing on determining the prevalence of depression, anxiety, and stress, as well as identifying associated risk factors. The results exposed a high prevalence of depression, anxiety, and stress (60.2%, 63.6%, and 50.2%, respectively). Risk factors for depression involve being female, having separated parents, being in high school, having a cell phone, difficulty sleeping, ruminative thoughts, and low self-esteem. For anxiety, factors included being female, being 12 years old, owning a cell phone, having sleep problems, having ruminations, having low self-esteem, and being an atheist. For stress, factors were identified as being female, owning a cell phone, sleep problems, ruminations, low self-esteem, being atheist, as well as extensive use of social networks. The research underscores the urgent need for intervention by educational authorities, given the marked deterioration in the mental health of children and adolescent students in the ChES, to prevent long-term consequences.

KEYWORDS

mental health, children, adolescents, post-pandemic, scholar system

1 Introduction

Currently, child and adolescent mental health has become a critical public health challenge worldwide. The COVID-19 pandemic broke out and affected the quality of life of people worldwide in unexpected ways, leaving a profound and lasting impact on global society (Kumar et al., 2021; Martínez-Líbano et al., 2023b; Yeomans and Silva, 2020; Martínez-Líbano and Yeomans, 2021; Martínez-Líbano and Yeomans, 2023; Yeomans et al., 2021; Martínez-Líbano et al., 2021; Martínez-Líbano et al., 2022b; Martínez-Líbano and Yeomans-Cabrera, 2023). In this context, children and adolescents

have witnessed unprecedented environmental transformation and faced significant emotional and psychological challenges (Martínez-Líbano et al., 2023b; Yeomans and Silva, 2020; Martínez-Líbano and Yeomans, 2021; Martínez-Líbano and Yeomans, 2023; Yeomans et al., 2021; Martínez-Líbano et al., 2021; Martínez-Líbano et al., 2022b; Martínez-Líbano and Yeomans-Cabrera, 2023; Singh et al., 2020). One of the central issues that deserves attention and study in this new post-pandemic reality is their mental health and the consequences that the pandemic has brought at the emotional and social levels (Martínez-Líbano and Yeomans-Cabrera, 2023; Wang J. et al., 2021; Łaskawiec et al., 2022). This research aimed to explore the complexities of this problem, recognizing that mental health disorders in this population not only represent a serious public health problem but also pose unique challenges in the context of long-term development and well-being.

The importance of mental health in young people transcends the individual level, affecting the social and economic fabric of societies (Meherali et al., 2021). Optimal mental well-being during these crucial life stages is not only critical for cognitive and emotional development (Wang, 2023) but also essential for forming healthy relationships, academic performance, and adapting to life's changes and challenges (Kwon et al., 2018). In addition, early and effective interventions can prevent the progression of mental disorders and reduce the risk of chronic problems in adulthood (Colizzi et al., 2020).

Society and, specifically, the scientific community are increasingly concerned about the prevalence of depression, anxiety, and stress in children and adolescents, as these conditions pose significant public health challenges (Martínez-Líbano et al., 2023b; Yeomans et al., 2021; Martínez-Líbano et al., 2021; Martínez-Líbano and Yeomans-Cabrera, 2023; Schlack et al., 2021; Hellström and Beckman, 2021; World Health Organization, 2020; Huerta-Ojeda et al., 2021; Martínez-Líbano et al., 2022c). Preceding the onset of the COVID-19 pandemic, mental disorders were already manifesting as a prominent health concern among the global youth demographic (Polanczyk et al., 2015). According to studies conducted in the pre-pandemic period, the prevalence of depression and anxiety was around 5.4% and 9% in children and adolescents (Vicente et al., 2012). During the pandemic, some measurements placed prevalences at 36% for depression (Moya-Vergara et al., 2023); likewise, an increase in anxiety levels was observed between 2018 and 2021 (Caqueo-Urízar et al., 2023). Depression, like anxiety and stress, not only affects the quality of life of children and adolescents but can also have lasting effects on their cognitive, emotional, and social development (Martínez-Líbano et al., 2023b; Martínez-Líbano and Yeomans, 2023; Yeomans et al., 2021; Martínez-Líbano and Yeomans-Cabrera, 2023; Alkhathami, 2014; Yeomans-Cabrera and Martínez-Líbano, 2023).

Depression in children and adolescents may manifest differently compared to adults (Rice et al., 2019), and its symptoms are often a mixture of emotional and physical behaviors (Melton et al., 2016). Young people with depression may experience persistent sadness, irritability, or anger, even over minor issues (Stringaris et al., 2018). Individuals frequently exhibit a diminished inclination towards previously pleasurable pursuits (Aprilia and Aminatun, 2022) and a marked decline in academic performance (Pascoe et al., 2020). Alterations in sleep and eating patterns—such as sleeping too much or too little or eating too much or too little—are also indicators (Begdache et al., 2019). In addition, they may

present with symptoms of fatigue and pain without apparent cause (Pinquart and Shen, 2011), concentration difficulties (Humensky et al., 2010), feelings of worthlessness or guilt (Tilghman-Osborne et al., 2008; Gambin and Sharp, 2018), and, in severe cases, thoughts of self-harm or suicide (Martínez-Líbano and Yeomans, 2021; Hawton et al., 2012). Attention to these signs is crucial, as young people may have difficulty expressing their emotions directly (Silk et al., 2003; Bariola et al., 2011).

Anxiety among children and adolescents can also manifest itself through various symptoms. On an emotional level, these young people may show excessive worry about aspects of daily life, such as academic performance, social relationships, or the safety of loved ones (Freidl et al., 2017; Lebowitz and Omer, 2013; Rapee et al., 2023). They commonly experience intense fears or irrational phobias about specific situations or objects (Essau et al., 2013; Rockhill et al., 2010; Gerhert et al., 2022). Physically, they may present symptoms such as stomach aches, headaches, fatigue, and increased heart rate (Tarbell et al., 2014; Falla et al., 2022). Behaviorally, it is possible to observe nervousness, agitation, avoidance of activities or situations that generate anxiety, difficulty concentrating, and, in some cases, panic attacks (Rockhill et al., 2010; Chiu et al., 2016; Klein et al., 2023).

In children and adolescents, stress, signs of irritability, anxiety, sadness, or frustration may appear (Brotman et al., 2017), in addition to behavioral problems at school or home (Barnes et al., 2003) and changes in sleeping and eating patterns, such as insomnia or overeating (Hong and Kim, 2014). Children and adolescents under stress may exhibit physical symptoms, including headaches, stomachaches, exhaustion, and muscle tightness (Friedrichsdorf et al., 2016). They may also have difficulty concentrating or remembering information (Aprilia and Aminatun, 2022; Lopez-Serrano et al., 2021).

The manifestations of melancholy, anxiety, and stress in children and adolescents can have a substantial impact on their everyday functioning, hence influencing their academic achievements, interpersonal connections, and overall state of being (Martínez-Líbano et al., 2023b; Martínez-Líbano and Yeomans-Cabrera, 2023; Huerta-Ojeda et al., 2021; Yeomans-Cabrera and Martínez-Líbano, 2023; Seemi et al., 2023; Pop-Jordanova, 2019).

1.1 Before the pandemic

Before the onset of the COVID-19 epidemic, the mental well-being of children and adolescents was already a subject of increasing global apprehension (Benton et al., 2021). The prevalence of mental diseases within this demographic exhibited an upward trend, indicating a multitude of obstacles and stressors that impacted their emotional and psychological welfare (Gruber et al., 2021; Viner et al., 2022). These challenges manifested diversely, from specific mental disorders to broader social and emotional adjustment problems (Compas et al., 2017). Childhood and adolescence are critical phases for developing cognitive, emotional, and social skills, significantly impacting a person's life (Yurgelun-Todd, 2007; Rueda et al., 2016).

Nevertheless, despite the significance of this developmental phase, a considerable number of children and adolescents are already susceptible to mental health issues. Some pre-pandemic

FIGURE 1
Procedure for data collection.
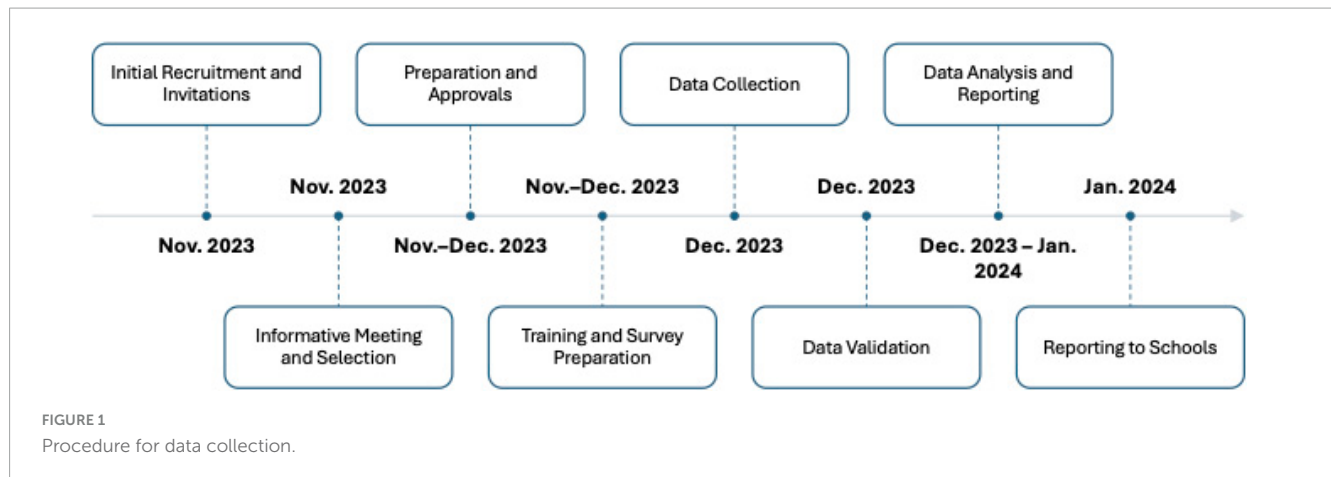
studies reported that the overall prevalence of mental disorders in this population was 13.4% (Polanczyk et al., 2015). Factors such as academic pressure (Steare et al., 2023), bullying (deLara, 2019), stressful family dynamics (Santesteban-Echarri et al., 2018), and early exposure to technology (Ospina-Pinillos et al., 2018) and social networks (Martínez-Líbano et al., 2022a) contributed to a complex and challenging picture. The emergence of the pandemic has exacerbated these pre-existing tensions by implementing mitigating measures, such as social separation and school closures (Nenna et al., 2022). These circumstances have heightened mental health concerns in this vulnerable population, highlighting the need to address these issues with greater urgency and understanding. The pandemic has not only brought new challenges. Still, it has also exacerbated existing problems (Murphy et al., 2021; Panchal et al., 2021), creating a scenario in which child and adolescent mental health alertness has become more critical than ever.

1.2 Throughout the pandemic

The lives of children and adolescents were significantly impacted by the COVID-19 pandemic, resulting in substantial transformations such as the cessation of in-person education for children and adolescents, as well as limitations on social connections (Meherali et al., 2021), plunging them into a state of constant uncertainty and fear of illness (Sandín et al., 2021; Korte et al., 2021). This new reality, intertwined with economic and health concerns at the family level, created an environment prone to mental health problems (Ravens-Sieberer et al., 2022) and has been a critical factor in the increase of anxiety disorders, depression, and stress among young people (Martínez-Líbano et al., 2023b). These challenges, exacerbated by uncertainty and environmental stress, generated a significant psychological impact, manifesting in symptoms such as anxiety (Orgilés Amorós et al., 2021), isolation (Loades et al., 2020), loss of interest in previous activities (Montreuil et al., 2023), and changes in mood and behavior (Francisco et al., 2020; Sadeghi et al., 2022). The pandemic not only disrupted their daily routines but also affected their emotional and social development, marking a critical period in their mental health that requires specialized attention and care (Gruber et al., 2021). In the case of young people, according to a systemic review with meta-analysis, it was established that the worldwide

prevalence of depression and anxiety symptoms doubled during the COVID-19 pandemic, with rates of 25.2% and 20.5%, respectively (Racine et al., 2021).

1.3 Predictors

Several predictors have been evidenced as an influence on the mental health of children and adolescents; most of them are related to social well-being, family situation, cognitive functioning, and religious beliefs.

Regarding disorders related to social networks, previous research has linked cell phone use to mental health disorders in children and adolescents, such as anxiety and depressive symptoms (Moshe et al., 2021; Augner et al., 2023), sleep problems (Lund et al., 2021; Correa et al., 2022), and addictive behaviors (Jeong et al., 2023). Considering that nowadays, most cell phones are smartphones, excessive mobile phone use can be associated with mental health problems, such as anxiety and depression, due to constant exposure to social networks and lack of face-to-face interaction (Wacks and Weinstein, 2021; Primack et al., 2017). The compulsion to use a mobile phone can interfere with daily activities and sleep, contributing to higher levels of stress and mental health problems such as anxiety and depression (Daraj et al., 2023). The excessive concern about the opinion of others—connected to social networks— can lead to low self-esteem and social anxiety, which negatively affects young people's mental health and self-image (Hamdani et al., 2023; Papapanou et al., 2023); besides, low self-esteem is an important risk factor for the development of mental health problems such as depression and anxiety, which impact on adolescents' general well-being and social development (Thuy, 2023; Solera et al., 2024). Regarding sleep disorders, they are closely linked to mental health problems, such as anxiety, depression, and cognitive difficulties, which can affect academic and social performance (Ramos et al., 2021; Gold and Gold, 2021). Finally, addiction to social networks can lead to decreased emotional well-being, increased anxiety and depression, and reduced quality of offline interpersonal relationships (Zhang et al., 2023; Vally et al., 2023).

Regarding family variables, several studies have shown that family support plays a fundamental role in the psychological and mental well-being of minors (Bersia et al., 2022; Renwick et al.,

2022); a high level of family support is associated with better mental health, as it provides a safe and emotionally supportive environment that helps to manage stress and emotional difficulties (Yang et al., 2022; Acoba, 2024). Likewise, it has been observed that separation from parents may represent a risk factor for the mental health of children and adolescents (Saurabh and Ranjan, 2020; Tullius et al., 2022); it might generate emotional instability and stress in children and adolescents, negatively affecting their mental health and psychological development (Wang F. et al., 2021; Karhina et al., 2023).

Regarding cognitive aspects, recent studies indicate that rumination can lead young people to focus negatively on their circumstances, which affects their self-esteem and is associated with major problems such as depression and suicidal ideation (Martinez et al., 2021; Lin et al., 2022). Also related to sleep disorders, rumination, or the tendency to dwell on adverse events repeatedly, is linked to depression and anxiety and prevents children and adolescents from effectively managing their emotions and solving problems (Kraft et al., 2023; Kovac et al., 2023).

Regarding religious beliefs, believing in God has been considered a protective factor in young people's mental health (Pastwa-Wojciechowska et al., 2021; Sarizadeh et al., 2020); this can provide a sense of purpose and emotional support, which can benefit mental health and resilience in the face of stress (Bouwhuis-Van Keulen et al., 2024; Bridi et al., 2023; Zubair et al., 2023).

This set of interconnected variables can provide a comprehensive analysis of factors influencing child and adolescent mental health, thus allowing for the identification of possible interventions and needed supports.

Regarding sociodemographics, it is crucial to know the context of children, which may explain mental health issues. For example, it is important to recognize the significant impact of gender differences and social factors on the mental health of children and adolescents. Research indicates that girls tend to exhibit higher levels of anxiety and depression, while boys are more likely to exhibit aggressive behaviors and oppositional defiant disorder (Babicka-Wirkus et al., 2023; Ettekal et al., 2023). These trends are further influenced by individuals' developmental stages, with older adolescents tending to be more prone to depression than their younger peers (Mangione et al., 2022; Davis et al., 2024). Also, environmental factors play a crucial role, particularly the disparity in access to mental health resources and socioeconomic conditions between urban and rural settings (Crouch et al., 2023; Hardy et al., 2024). These disparities can result in different experiences and exposures significantly affecting mental health outcomes. In addition, the type of educational setting —public, private, rural, or urban— can influence children's mental health. Public schools, for example, may find it more challenging to provide sufficient psychological support than private schools (Reupert et al., 2022; Babkina and Kochetova, 2022). In addition, immigrant and ethnic minority children often face challenges related to cultural adaptation and discrimination, which can further complicate their mental health situation (Coelho et al., 2022; Berrios-Riquelme et al., 2022). Finally, the academic level and intensity of studies are critical factors. Higher graders may experience more significant academic pressures and stress, adversely affecting their mental health and future decisions and career paths (Gedda-Muñoz et al., 2023).

1.4 Present study

The COVID-19 pandemic was announced over by the World Health Organization (WHO) on May 5, 2023 (United Nations, 2023). Regarding the fluctuation in mental disorders compared to before and after the pandemic (OECD, 2019; OECD, 2021; OECD, 2023), it is imperative to ascertain the present state of mental health among children and adolescents in the ChES after the pandemic. Therefore, this research aimed to determine the prevalence of depression, anxiety, and stress after the pandemic among children and adolescents in the Chilean Educational System as well as identify associated risk factors.

Our hypotheses were:

The prevalence of mental health disorders has risen among children and adolescents in the ChES region after the COVID-19 pandemic.

The prevalence of depression, anxiety, and stress exhibits notable disparities across all age and gender cohorts within the ChES population, indicating the unequal impact of the pandemic on different segments.

2 Materials and methods

2.1 Research methodology and sample

This study utilized a cross-sectional descriptive quantitative design, employing a self-report survey with a Likert-scale questionnaire. The sample was purposive, as we aimed to conduct a survey targeting children and adolescents between the ages of 10 and 18.

The inclusion criteria encompassed individuals aged 10 to 18, currently attending a school in the ChES, residing in Chile, possessing a consent form signed by the minors' legal guardians and/or parents, and providing informed assent by the students themselves before completing the survey. Questionnaires that were not fully completed were included.

2.2 Instruments

DASS-21 —The Depression Anxiety Stress Scale (Lovibond and Lovibond, 1995)— is a psychological instrument employed to evaluate the extent of depression, anxiety, and stress experienced by individuals. The DASS-21 scale comprises three self-report subscales that have been specifically developed to assess the severity and occurrence of Anxiety (7 items), Depression (7 items), and Stress (7 items). The grading system spans from 0 to 3, indicating the evaluation of the previous week (ranging from "relatively irrelevant to me" to "largely relevant to me"). The depression scale assesses emotions such as melancholy, emptiness, self-criticism, loss of interest, and inability to get pleasure. The Anxiety scale evaluates the psychological and physical manifestations of fear, autonomic nervous system activation, anxiety in certain circumstances, and the individual's subjective perception of feeling anxious (Huerta-Ojeda et al., 2021). The scale score is determined by summing the scores

of the related items, which range from 0 to 21. The ranges of scores for classifying levels of depression, anxiety, and stress are: (i) Normal (depression ≤ 4; anxiety ≤ 3; stress ≤ 7), which indicates normal levels or absence of significant symptoms; (ii) Mild (depression = 5 to 6; anxiety = 4 to 5; stress, 8 to 9), which reflects mild symptoms; (iii) Moderate (depression = 7 to 10; anxiety = 6 to 7; stress = 10 to 12), which indicates a moderate level of symptoms; (iv) Severe (depression = 11 to 13; anxiety = 8 to 9; stress = 13 to16), which suggests severe symptoms; (v) Extremely severe (depression ≥ 14; anxiety ≥ 10; stress ≥ 17), which indicates highly severe symptoms. In this case, Cronbach's alpha coefficient was calculated to be α = 0.949, while the omega coefficient was determined to be ω = 0.950.

2.2.1 Sociodemographic variables

Sociodemographic variables included age, gender, region, nationality, and grade. Gender differences can significantly influence the prevalence and presentation of mental health problems in children and adolescents. Girls tend to have higher levels of anxiety and depression, while boys may show more externalizing behaviors, such as aggression (Babicka-Wirkus et al., 2023; Ettekal et al., 2023). Age is a crucial factor, as rates of certain mental disorders, such as depression and anxiety, can vary significantly between developmental stages. Older adolescents may be more prone to depression than younger children (Mangione et al., 2022; Davis et al., 2024). Regarding the chosen instruments, measuring age when applying the DASS-21 is crucial for several reasons related to interpreting the results and understanding the context of the person being assessed. First, psychological development and maturity vary significantly with age; children and adolescents may manifest symptoms of depression, anxiety, and stress differently, and different ages are associated with various life events and stressors, such as the academic stress experienced by adolescents at the end of school. Comparing the results with age-specific norms allows for a more contextualized and relevant assessment, facilitating better interpretation of individual results by having similar reference groups (Simon and Bernardo, 2022). The region of residence can also influence access to mental health resources and the level of stress due to socioeconomic and environmental factors. Children in urban areas may have different experiences and stressors than those in rural areas (Crouch et al., 2023; Hardy et al., 2024). The type of school (public, private, rural, urban) can influence the student's educational and social environment, affecting their mental health. Private schools may offer more resources for psychological support, while public schools may face more difficulties in this regard (Reupert et al., 2022; Babkina and Kochetova, 2022). Nationality may reflect cultural differences in the perception and management of mental health. In addition, immigrant or ethnic minority children may experience additional stress related to cultural adaptation and discrimination (Coelho et al., 2022; Berrios-Riquelme et al., 2022). The level of study may indicate the level of academic and social stress the student faces. Higher-graders may experience more academic pressure and anxiety concerning their performance and future career decisions (Gedda-Muñoz et al., 2023).

2.2.2 Variables of interest

In developing a questionnaire to assess factors influencing the mental health of children and adolescents, we carefully selected variables based on solid empirical evidence. Cell phone ownership: research consistently links cell phone use to mental health problems in young people, such as anxiety and depressive symptoms (Moshe et al., 2021; Augner et al., 2023), sleep disorders (Lund et al., 2021; Correa et al., 2022), and addictive behaviors (Menendez-García et al., 2022; Serra et al., 2021); Family variables: Family support is crucial for the psychological and mental well-being of minors (Bersia et al., 2022; Renwick et al., 2022), while parental separation is identified as a potential risk factor for their mental health (Saurabh and Ranjan, 2020; Tullius et al., 2022); Cognitive aspect: Ruminative behaviors have been shown to negatively influence self-esteem and correlate with serious problems such as depression and suicidal ideation (Martinez et al., 2021; Lin et al., 2022); Belief in God: Several studies suggest that spiritual beliefs may serve as a protective factor against mental health problems among young individuals (Pastwa-Wojciechowska et al., 2021; Sarizadeh et al., 2020). These variables were selected to ensure a comprehensive assessment of the various influences on child and adolescent mental health to guide the development of specific interventions and support mechanisms. The variables of interest were conducted through closed questions with dichotomous answers of YES/NO. Among the questions asked were: Are my parents separated? Do I have the support of my family? Do I have trouble falling asleep? Are there things I can't stop thinking about? Do I believe I have a social media addiction? Do I worry about other people's opinions of me? Do I have low self-esteem? Do I believe in God? Do I keep my eyes on my mobile? Do I spend too much time on social media.

2.3 Procedure for data collection

The data collection occurred during November and December of 2023 (See Figure 1). The sample was intentional. To recruit schools for this study, a call was made to all candidates from a master's degree program in Emotional Education from a Chilean university (n = 169) who are professionals working in the Chilean educational system (ChES). Regarding this call, 23 schools answered: 11 declined the invitation via email, and 12 accepted the invitation to participate in an informative meeting via Zoom. Finally, due to time constraints and administrative procedures, five schools agreed to participate in the study with their students. As inclusion criteria, the schools had to belong to the Chilean educational system and have students between 10 and 18 years of age. For data collection, participating students were taken to computer labs in their respective schools to complete the questionnaire directly in Google Forms. Before starting, the principals of schools gave their formal approval to conduct the study, and informed consent was obtained from the student's parents and tutors, as well as informed assent from the participating students. The pupils completed the questionnaire directly using Google Forms. This facilitated efficient and secure data collection and analysis. At the end of the study, a descriptive report was provided to each participating school, containing only the overall results of the educational community, maintaining

the confidentiality of individual responses and ensuring that individual participants could not be identified.

Subsequently, a couple of teachers per school were trained to help in the field application of the questionnaires. The survey was inputted into Google Forms, creating distinct hyperlinks for each educational institution. The confidentiality of the surveys rendered it unfeasible to ascertain the identity of the primary respondent. Beforehand, signed informed consent was obtained from the legal guardians and/or parents of the children and adolescents, and, in addition, the minors themselves had to give their assent before answering the surveys. Out of the 1,216 surveys gathered, 42 did not match the inclusion requirements due to the lack of agreement from the children and adolescents, although having parental informed consent. The purpose of these questionnaires was to collect data for analysis.

2.4 Statistical analysis

The data in this study was analyzed using several statistical approaches. The study commenced with a descriptive analysis, wherein the means and standard deviations were computed for all variables of interest, facilitating a fundamental comprehension of the data distribution. Following that, the statistical methods of Students' t-tests and ANOVA were employed to examine noteworthy disparities among the various groups. The conducted analysis facilitated the identification of potential statistically significant differences in the important measures among the participants. The researchers conducted a logistic regression analysis utilizing the forward approach, explicitly employing the likelihood ratio (LR) to delve deeper into the associations among the variables. This approach allowed us to identify variables that contributed significantly to predicting the outcome of interest, iteratively selecting them for inclusion in the model. Logistic regression was conducted using the inclusion approach after identifying the significant variables. The concluding stage of the logistic regression study facilitated the assessment of the collective influence and associations among the chosen factors pertaining to the dependent variable. The Hosmer-Lemeshow test was used to assess the adequacy of the final logistic regression model. The test yielded a quantitative assessment of the model's goodness-of-fit, thereby verifying the extent to which the model's predictions aligned with the observed data.

Finally, a review of specific statistics reveals significant increases in depression, anxiety, and stress among the Chilean child and adolescent population compared to the prevalence reported in pre-pandemic studies.

2.5 Ethics statement

The Central Bioethics Committee of the Universidad Andrés Bello granted approval for this project on August 11, 2023. The Bioethics Committee of the Faculty of Education and Social Sciences of Universidad Andrés Bello was established under decision 88024/2016. It is essential to acknowledge that no sensitive information was solicited that may reveal the identities of the

students who participated in the study. Ultimately, the informed consent was granted by the parents and/or tutors of all participants at the outset of the questionnaire, and all participants provided their signature as their agreement. No individuals were reimbursed for their involvement.

3 Results

3.1 Participants

Table 1 displays the sociodemographic and educational attributes of the participants involved in the study. The study sample consisted of males and females in a similar proportion; the average age of the participants was 13.71 years, with the largest proportion of individuals falling within the 13-year-old age group (19.8%). Regarding the school's administration, public, half-private, and private schools participated in varied proportions. Students were mostly Chilean; however, some students in the ChES were originally from abroad. Students lived in 5 different regions of the country, and 2/5 belonged to the capital city. Most subjects had access to cell phones, and more than 1/3 lived with separated parents. Most of the sample perceived family support; half of them had sleeping disturbances, rumination was present in almost 4/5 of the sample, addiction to social networks was perceived in 2/5 of the sample, and 3/5 affirmed concern for other's opinions. 2/5 of the sample referred to low self-esteem, 1/5 were atheists, 1/2 referred to compulsion to use cell phones, and 3/5 spent a lot of time on social networks. Detailed data can be found in Table 1.

3.2 Descriptive statistics of depression, anxiety, and stress

Table 2 displays the descriptive statistics pertaining to the research variables. The average score for depression, anxiety, and stress were 7.42, 6.78, and 7.97, respectively.

3.3 Levels of depression, anxiety, and stress

The study examined the prevalence of various levels of depression, anxiety, and stress among the sample under investigation, as presented in Table 3.

3.4 Binary logistic regression for depression

Table 4 shows results from the logistic regression analysis on depression. The model's coefficient was -0.559 (standard error $= 0.395$, Wald $= 2.000$, $p = 0.157$). The Hosmer and Lemeshow tests were employed to evaluate the sufficiency of the logistic regression model. The study's findings revealed a strong alignment between the model and the data, as evidenced by a Chi-square value of $^2(8) = 8.164$, $p = 0.418$. According to this test results,

TABLE 1 Participant characteristics, differences of depression, anxiety, and stress by characteristics.

Characteristics	Categories	n (%)	Depression		Anxiety		Stress	
		M ± SD	M ± SD	t/F	M ± SD	t/F	M ± SD	t/F
Gender	Male	629 (53.6)	5.76 ± 5.36	59.39**	4.97 ± 4.56	87.96**	6.25 ± 5.071	77.38**
	Female	540 (46)	9.29 ± 6.07		8.84 ± 5.56		9.91 ± 5.31	
	Others	5 (0.4)	14.60 ± 7.16		12.20 ± 5.35		15.40 ± 4.03	
Age (yrs.)		13.71 ± 1.75		1.58		1.201		1.034
	10	33 (2.8)	7.33 ± 6.76		6.70 ± 4.32		7.88 ± 5.22	
	11	115 (9.8)	6.31 ± 5.99		6.51 ± 5.51		7.46 ± 5.68	
	12	156 (13.3)	7.94 ± 6.20		7.85 ± 5.82		8.66 ± 5.73	
	13	232 (19.8)	6.98 ± 5.75		6.31 ± 5.00		7.58 ± 5.10	
	14	213 (18.1)	8.22 ± 6.42		7.05 ± 6.06		8.43 ± 5.88	
	15	230 (19.6)	7.14 ± 5.66		6.45 ± 5.28		7.53 ± 5.38	
	16	142 (12.1)	7.42 ± 5.56		6.69 ± 4.99		8.15 ± 5.35	
	17	49 (4.2)	8.57 ± 6.24		7.04 ± 4.89		8.55 ± 5.69	
	18	4 (0.3)	6.00 ± 5.35		6.50 ± 6.40		7.50 ± 6.45	
Region	Santiago	472 (40.2)	8.67 ± 6.12	9.02**	7.77 ± 5.626	9.81**	9.15 ± 5.50	11.89**
	Coquimbo	84 (7.2)	5.42 ± 5.88		4.92 ± 5.27		5.93 ± 5.64	
	Viña del Mar	144 (12.3)	6.47 ± 5.52		5.06 ± 4.61		6.19 ± 5.12	
	Maule	117 (10)	7.09 ± 6.21		6.59 ± 5.04		7.67 ± 5.60	
	Talcahuano	357 (30.4)	6.74 ± 5.63		6.68 ± 5.29		7.73 ± 5.24	
Type of school	Public	84 (7.2)	5.42 ± 5.88	10.41**	4.92 ± 5.27	5,98*	5.93 ± 5.64	7.74**
	Half-Private	733 (62.4)	7.98 ± 6.09		7.05 ± 5.45		8.33 ± 5.57	
	Private	357 (30.4)	6.74 ± 5.63		6.68 ± 5.29		7.73 ± 5.24	
Nationality	Chilean	1047 (89.2)	7.36 ± 5.94	−0.97	6.75 ± 5.38	−0.65	7.98 ± 5.52	0.16
	Foreign	127 (10.8)	7.91 ± 6.30		7.08 ± 5.6		7.90 ± 5.45	
Level	Middle school (5th–8th)	699 (59.5)	7.31 ± 6.03	−0.80	6.84 ± 5.44	0.44	7.98 ± 5.48	0.52
	High school (9th to 12th)	475 (40.5)	7.59 ± 5.92		6.70 ± 5.36		7.96 ± 5.55	
Grade	Fifth	127 (10.8)	6.94 ± 6.43	0.97	6.66 ± 5.27	0.77	7.82 ± 5.59	0.51
	Sixth	79 (6.7)	6.05 ± 5.50		6.25 ± 4.99		7.25 ± 5.52	
	Seventh	285 (24.3)	7.59 ± 6.09		7.32 ± 5.71		8.21 ± 5.59	
	Eighth	208 (17.7)	7.62 ± 5.84		6.52 ± 5.34		8.04 ± 5.26	
	Nineth	225 (19.2)	7.67 ± 5.97		6.72 ± 5.67		7.75 ± 5.62	
	Tenth	180 (15.3)	7.33 ± 5.82		6.70 ± 5.08		8.17 ± 5.42	
	Eleventh	65 (5.5)	7.94 ± 6.18		6.43 ± 5.15		7.94 ± 5.80	
	Twelveth	5 (0.4)	9.40 ± 5.12		9.20 ± 4.60		10.40 ± 4.39	
Having a cellphone	YES	1127 (96)	7.41 ± 5.987		6.77 ± 5.44		7.96 ± 5.51	
	NO	47 (4.0)	7.72 ± 6.07	−0.35	7.19 ± 4.71	−0.52	8.38 ± 5.56	−0.51
Separated parents	YES	424 (36.1)	7.96 ± 6.01	2.30*	6.99 ± 5.42	0.97	8.38 ± 5.63	1.91
	NO	750 (63.9)	7.12 ± 5.95		6.67 ± 5.41		7.74 ± 5.42	
Perception of family support	YES	1083 (92.2)	7.05 ± 5.74	6.35**	6.50 ± 5.21	−5.25**	7.72 ± 5.34	−4.79**
	NO	91 (7.8)	11.84 ± 6.98		10.20 ± 6.41		11.05 ± 6.46	
Sleep disorders	YES	600 (51.1)	9.46 ± 6.11	12.76**	8.55 ± 5.46	12.16**	9.62 ± 5.34	10.96**
	NO	574 (48.9)	5.29 ± 5.03		4.94 ± 4.696		6.26 ± 5.150	

(Continued)

TABLE 1 (Continued)

Characteristics	Categories	n (%)	Depression		Anxiety		Stress	
		M ± SD	M ± SD	t/F	M ± SD	t/F	M ± SD	t/F
Rumination	YES	931 (79.3)	8.32 ± 5.97	12.17**	7.61 ± 5.38	12.24**	8.91 ± 5.33	13.11**
	NO	243 (20.7)	3.98 ± 4.65		3.63 ± 4.24		4.38 ± 4.645	
Social networking addiction	YES	487 (41.5)	8.66 ± 5.96	6.06**	7.61 ± 5.31	4.41**	9.07 ± 5.33	5.79**
	NO	687 (58.5)	6.54 ± 5.85		6.20 ± 5.41		7.20 ± 5.50	
Concern for the opinion of others	YES	714 (60.8)	8.61 ± 6.02	8.88**	7.80 ± 5.405	8.33**	9.09 ± 5.30	8.92**
	NO	460 (39.2)	5.59 ± 5.44		5.21 ± 5.04		6.24 ± 5.38	
Low self-esteem	YES	493 (42)	11.15 ± 5.79	20.56**	9.52 ± 5.316	15.91**	10.82 ± 5.09	16.60**
	NO	681 (58)	4.72 ± 4.49		4.80 ± 4.556		5.92 ± 4.849	
Belief in god	YES	767 (65.3)	6.65 ± 5.73	−6.06**	6.03 ± 5.10	−6.46**	7.34 ± 5.34	−5.45**
	NO	407 (34.7)	8.89 ± 6.185		8.21 ± 5.685		9.16 ± 5.62	
Cell phone compulsion	YES	573 (48.8)	8.47 ± 6.07	5.90**	7.46 ± 5.48	4.23**	8.86 ± 5.61	5.45**
	NO	601 (51.2)	6.43 ± 5.73		6.13 ± 5.37		7.13 ± 5.27	
Too much time on social networks	YES	731 (62.3)	8.08 ± 5.99	4.86**	7.30 ± 5.39	4.25**	8.61 ± 5.41	5.14**
	NO	443 (37.7)	6.34 ± 5.82		5.93 ± 5.33		6.92 ± 5.51	

M, mean; SD, standard deviation; t = values of t-test; F = values of ANOVA; * $p < 0.05$; ** $p < 0.00$; yrs = years.

TABLE 2 Descriptive statistics of research variables.

Variables	Range	M ± SD	Skewness	Kurtosis
Depression	0–21	7.42 ± 5.988	0.628	−0.665
Anxiety	0–21	6.78 ± 5.414	0.646	−0.516
Stress	0–21	7.97 ± 5.511	0.360	−0.799

M, mean; SD, standard deviation.

TABLE 3 Levels of depression, anxiety, and Stress among children and adolescents in the ChES.

LEVEL	Depression		Anxiety		Stress	
	n	%	n	%	n	%
Absent	469	39.9	427	36.4	585	49.8
Mild	150	12.8	77	6.6	134	11.4
Moderate	219	18.7	208	17.7	193	16.4
Severe	118	10.1	109	9.3	165	14.1
Extremely Severe	218	18.6	353	30.1	97	8.3

no statistically significant disparities were identified between the frequencies observed and those predicted by the model.

3.5 Binary logistic regression for anxiety

Table 5 represents the logistic regression analysis results. The model's constant was determined to be −0.056 (standard error = 0.399, Wald = 0.020, p = 0.888). The Hosmer and Lemeshow test was used to assess the logistic regression model adequacy for anxiety. The study's findings revealed no statistically

significant disparity between the observed frequencies and the models' projected frequencies ($\gamma^2(8) = 13.279$, $p = 0.103$).

3.6 Binary logistic regression for stress

Table 6 displays the logistic regression analysis for stress. The model constant was determined to be −1.062 (standard error = 0.374, Wald = 8.068, p = 0.005). The Hosmer and Lemeshow test evaluated the logistic regression model's goodness of fit. The results indicated no statistically significant difference between the observed values and those predicted by the model ($\gamma^2(8) = 3.105$,

TABLE 4 Binary logistic regression results for depression.

Variables	B	Standard error	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Inferior	Superior
Girl	0.715	0.152	22.017	1	0.000	2.045	1.517	2.757
Coquimbo	−1.765	0.312	32.060	1	0.000	0.171	0.093	0.315
Middle school	−0.493	0.153	10.422	1	0.001	0.611	0.453	0.824
Having cell phone	−0.975	0.368	7.002	1	0.008	0.377	0.183	0.777
Separated parents	0.486	0.153	10.017	1	0.002	1.625	1.203	2.195
Trouble sleeping	0.868	0.147	35.062	1	0.000	2.382	1.787	3.174
Rumination	1.009	0.180	31.415	1	0.000	2.742	1.927	3.902
Low self-esteem	1.799	0.165	118.338	1	0.000	6.043	4.370	8.356
Constant	−0.559	0.395	2.000	1	0.157	0.572		

TABLE 5 Binary logistic regression for anxiety.

Variables	B	Standard error	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Inferior	Superior
Girl	0.851	0.153	31.151	1	0.000	2.343	1.738	3.160
12 years old	0.697	0.228	9.338	1	0,002	2.008	1.284	3.140
Coquimbo	−0.976	0.284	11.846	1	0.001	0.377	0.216	0.657
Having cell phone	−1.238	0.380	10.602	1	0.001	0.290	0.138	0.611
Trouble sleeping	0.771	0.147	27.412	1	0.000	2.162	1.620	2.885
Ruminations	1.231	0.177	48.350	1	0.000	3.426	2.421	4.848
Low self-esteem	1.422	0.165	74.730	1	0.000	4.146	3.003	5.724
Belief in God	−0.547	0.157	12.138	1	0.000	0.579	0.425	0.787
Constant	−0.056	0.399	0.020	1	0.888	0.945		

TABLE 6 Binary logistic regression for stress.

Variables	B	Standard error	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Inferior	Superior
Girl	0.650	0.146	19.814	1	0.000	1.916	1.439	2.551
Coquimbo	−0.839	0.281	8.890	1	0.003	0.432	0.249	0.750
Viña del Mar	−0.567	0.221	6.606	1	0.010	0.567	0.368	0.874
Having cell phone	−0.818	0.345	5.619	1	0.018	0.441	0.224	0.868
Trouble sleeping	0.548	0.138	15.750	1	0.000	1.730	1.320	2.268
Ruminations	1.176	0.188	39.063	1	0.000	3.242	2.242	4.689
Low self-esteem	1.186	0.143	68.842	1	0.000	3.275	2.475	4.334
Belief in god	−0.441	0.144	9.446	1	0.002	0.643	0.485	0.852
Too much time on social networks	0.396	0.144	7.571	1	0.006	1.486	1.121	1.969
Constant	−1.062	0.374	8.068	1	0.005	0.346		

$p = 0.928$). The obtained outcome indicates a strong alignment with the logistic regression model.

3.7 Prevalence comparison

Our comprehensive review of statistical data reveals a marked increase in mental health problems among the Chilean child and adolescent population after the pandemic. Before the pandemic, the prevalence of depression and anxiety was recorded at 5.4% and 9%, respectively (Vicente et al., 2012). Recent measurements during the pandemic period show a substantial increase, with depression rates skyrocketing to 36% (Moya-Vergara et al., 2023) and anxiety levels escalating significantly between 2018 and 2021 (Caqueo-Urízar et al., 2023). Our research further underscores this trend, documenting a dramatic increase in symptomatology,

TABLE 7 Transversal risk factors of depression, anxiety, and stress among children and adolescents in the ChES.

Risk factors	Depression	Anxiety	Stress
Gender	Higher risk in girls	Higher risk in girls	Higher risk in girls
Age	Not mentioned	Increased at 12 years	Not mentioned
Cell phone	Increased likelyhood	Increased likelyhood	Increased likelyhood
Family structure	Higher risk with separated parents	Not mentioned	Not mentioned
Sleep disturbances	Strongly related	Related	Related
Intrusive or obsessive ideas	Related	Related	Related
Low self-esteem	Related	Related	Related
Religious beliefs	Not mentioned	Protective factor	Protective factor

with 60.2% for depression, 63.6% for anxiety, and 50.2% for stress.

To quantify these changes, we meticulously compared prevalence percentages from our study with historical data. We ensure the statistical robustness of our results by maintaining 95% confidence intervals. This rigorous approach allows us to state with statistical significance that there has been a substantial escalation of depression, anxiety, and stress among post-pandemic children compared to pre-pandemic levels. Our results highlight the urgent need to address these mental health issues in the affected population.

4 Discussion

The objective of this research was to determine the prevalence of depression, anxiety, and stress after the pandemic among children and adolescents in the Chilean Educational System as well as identify associated risk factors.

As already mentioned, several variables have been evidenced as an influence on the mental health of children and adolescents: (1) Mobile phone ownership, (2) Family variables, (3) Cognitive aspects, and (4) the belief in God. This set of variables was chosen to comprehensively analyze factors influencing child and adolescent mental health.

4.1 Prevalence of depression, anxiety, and stress in ChES children and adolescents

Our research findings indicate a high incidence of mental health issues among the sample of children and adolescents in the ChES after the pandemic was declared over. Specifically, depression was observed in 60.2% of the participants, followed by anxiety in 63.6% and stress in 50.2%.

The occurrence of depression in children and adolescents from ChES can be elucidated from many viewpoints that consider the three-year impact of the pandemic on the physical and mental growth of these groups. Regarding the high prevalence of depression in a Post-Pandemic Era, social isolation and decreased interaction played a critical role (Beattie et al., 2015), along with social isolation and decreased interactions, digital technologies as a double-edged sword (Orben et al., 2020), disruption of daily routines (Mesa, 2021), bereavement and pathological grief (Murata et al., 2021; Chen and Tang, 2021; Rancour and Zeno, 2021), and uncertainty and the future outlook (Cohrdes et al., 2021).

Regarding the high prevalence of anxiety in a post-pandemic era, fear of contagion and health concerns were critical (Rania and Coppola, 2022), besides information overload and media consumption (Sandín et al., 2020), and the disruption of the educational process and uncertainty.

Regarding the high prevalence of stress in a post-pandemic era, disruptions to the educational process and accelerated changes in digital technology were crucial (Yeomans and Silva, 2020; Ahmed and Opoku, 2022), along with family dynamics and economic hardship (Ayuso et al., 2020; Rees et al., 2023), reduction in physical and recreational activities (de Araújo et al., 2021; O'sullivan et al., 2021; McNamara, 2021), and academic pressure and future uncertainty (Shahbaz et al., 2021; Williams et al., 2024).

4.2 Risk factors with depression, anxiety, and stress among children and adolescents in the ChES

4.2.1 Risk factors associated with depression among children and adolescents in the ChES

This research endeavors to delineate the constellation of risk factors contributing to depression among children and adolescents within the Chilean Educational System (ChES), offering insights crucial for the development of nuanced prevention and treatment methodologies tailored to this demographic. Our findings underscore the multifaceted nature of these risk factors, spanning biological, psychological, environmental, and social domains.

4.2.1.1 Gender differences and vulnerability

A salient finding of our study is the pronounced gender disparity in depression risk, with females exhibiting a notably higher susceptibility than males. Considering that in Chile, most females (gender) are women (biological sex), specifically 99,99% (Claramunt Carrasco, 2023; Datosmacro.com, 2024), this increased risk among them can be connected to biological changes in this population, such as hormonal fluctuations during puberty (Rosenblum and Lewis, 2006; Goddings et al., 2012). Besides, sociocultural pressures include heightened expectations around self-image and behavior (Olenik-Shemesh et al., 2018). Early development of cognitive and emotional competencies in females

may amplify their sensitivity to emotional and interpersonal stressors, potentially predisposing them to depression (Hyde and Mezulis, 2020; Rapee et al., 2019).

4.2.1.2 Geographical variability in depression prevalence

Our analysis also reveals geographical variability in depression prevalence, with specific locales such as Coquimbo demonstrating a lower incidence. This phenomenon suggests that regional cultural, environmental, and socioeconomic differences may significantly influence mental health outcomes, positing a more favorable mental health milieu in certain areas (Sameroff and Seifer, 2021).

4.2.1.3 Educational level as a risk factor

The transition through educational levels emerges as a critical period for mental health, with students in higher educational tiers reporting increased depression risk. This pattern likely reflects the cumulative academic stress and evolving social pressures, underscoring the need for targeted mental health support within educational settings (Barker et al., 2018; Pitt et al., 2018).

4.2.1.4 Technological influences on mental health

Technological engagement, particularly cell phone usage, is identified as a risk factor associated with an increased likelihood of depression. The mechanisms underlying this relationship may include information overload, reduced face-to-face interaction, and the psychosocial impacts of social media use (Matthes et al., 2020), which can foster isolation and unfavorable social comparison, especially among adolescents (Clark et al., 2018; Reer et al., 2019).

4.2.1.5 Family structure and emotional well-being

Family dynamics, specifically the experience of parental separation, significantly affect the mental health of children and adolescents, with those from separated families showing a heightened depression risk. This association highlights the profound impact of familial stability and changes in family structure on children's emotional well-being (Garriga and Pennoni, 2022; Xerxa et al., 2020).

4.2.1.6 Sleep disturbances and cognitive patterns

Sleep disturbances and problematic cognitive patterns, such as obsessive or intrusive thoughts, are closely linked with depression. Insufficient sleep can adversely affect cognitive function, academic performance, and mood (Hershner, 2020), while maladaptive thought patterns, characterized by worry, fear, or negative rumination (Lawrence et al., 2021), perpetuate a cycle of sadness and hopelessness (Park and Kim, 2020; Wrosch and Scheier, 2020). Furthermore, low self-esteem and self-critical views may exacerbate vulnerability to depression (Rimes et al., 2023; Shokrpour et al., 2021), underscoring the interrelation between self-perception and mental health.

In synthesizing these findings, it becomes evident that addressing depression in children and adolescents within the ChES demands an integrated approach that considers the broad spectrum of individual, familial, educational, and socio-environmental risk factors. Enhancing our understanding of these determinants is fundamental to crafting effective interventions and support mechanisms that can mitigate the incidence and severity of depression in this population, fostering a more supportive and resilient developmental milieu.

4.2.2 Risk factors associated with anxiety among children and adolescents in the ChES

In the context of identifying risk factors for anxiety among children and adolescents within the Chilean Educational System (ChES), this paper delineates a comprehensive analysis, underscoring the multifactorial nature of anxiety disorders in this demographic. Several key determinants have been identified, spanning biological, developmental, environmental, technological, and psychological domains, alongside the protective role of religious beliefs.

4.2.2.1 Gender and biological factors

A pivotal finding of our research is the pronounced gender disparity in anxiety prevalence, with females exhibiting a significantly higher likelihood (134% more) of encountering anxiety disorders compared to males. This discrepancy is attributed to physiological differences, including elevated levels of anxiety-associated hormones such as cortisol and adrenaline among females (Lundberg, 2005; Lovallo et al., 2006). Additionally, hormonal fluctuations during puberty and adolescence are posited to influence emotional regulation and mood, potentially heightening females' susceptibility to anxiety (Holder and Blaustein, 2014).

4.2.2.2 Developmental and age-related factors

Age emerges as a critical risk factor, particularly at the onset of adolescence, around 12 years old, a phase characterized by profound physical, emotional, and social transformations. The confluence of these developmental changes, coupled with escalating academic and social pressures, can precipitate or exacerbate anxiety symptoms in this transitional period (Worthman and Trang, 2018; Simmons, 2017).

4.2.2.3 Environmental and regional influences

Our analysis reveals regional disparities in anxiety prevalence, with individuals residing in Coquimbo displaying a lower incidence of anxiety compared to other areas. This variation may be attributable to environmental and lifestyle factors inherent to Coquimbo, such as its relatively tranquil setting and potentially more supportive community structures (Generaal et al., 2019).

4.2.2.4 Technological factors and lifestyle

The possession and use of cell phones have been linked to increased anxiety, underscoring the role of technology in contributing to mental health challenges. Excessive engagement with mobile devices and social media can lead to information overload, unfavorable social comparisons, and sleep disturbances, all of which are known to exacerbate anxiety (Matthes et al., 2020).

4.2.2.5 Sleep disturbances

Sleep quality is intimately connected to anxiety, with sleep difficulties amplifying the risk of developing anxiety disorders. Insufficient or disrupted sleep can impair stress management capabilities, mood regulation, and academic performance, further intensifying anxiety levels (Maajida Aafreen et al., 2018).

4.2.2.6 Psychological factors

Intrusive or obsessive thought patterns and low self-esteem are identified as significant psychological risk factors for anxiety. These elements reflect a propensity towards negative thinking

and excessive worry, hallmark features of anxiety disorders. Low self-esteem may render individuals more susceptible to feelings of inadequacy and an inability to navigate challenges effectively, thereby elevating anxiety risk (Murad, 2020).

4.2.2.7 Protective role of religious beliefs

Contrastingly, our study indicates that religious beliefs may confer a protective effect against anxiety. Faith and religious engagement can give individuals hope, purpose, and belonging, offering solace during stressful times. Spiritual practices are also associated with structured support networks and coping mechanisms that can mitigate anxiety (Butler et al., 2019).

In conclusion, our comprehensive analysis elucidates the intricate interplay of multiple factors that contribute to anxiety among children and adolescents in the ChES, underscoring the necessity for intervention strategies that exhibit a wide range of approaches. The findings of this study provide evidence in favor of adopting targeted approaches that consider various elements, including biological, developmental, environmental, technological, and psychological influences. Moreover, it is critical to recognize the potential advantageous influence of religious and community engagement in mitigating anxiety.

4.2.3 Risk factors associated with stress among children and adolescents in the ChES

The analysis of stress variables among children and adolescents in the Chilean Educational System (ChES) reveals various risk factors, underscoring the intricate interplay of biological, psychological, environmental, and social influences.

4.2.3.1 Biological and gender-specific factors

A noteworthy finding is the increased vulnerability of females to stress, with a 91.6% higher likelihood when compared to males. The observed disparity can be ascribed to gender-specific pressures and cultural expectations, which place a significant burden on females, often requiring them to balance multiple roles as caregivers, homemakers, and professionals (Nielson et al., 2020), alongside hormonal fluctuations during puberty, which may intensify emotional and psychological responses to stress (Hodes and Epperson, 2019).

4.2.3.2 Environmental influences

Geographical location within Chile also plays a pivotal role, with Coquimbo and Viña del Mar residents exhibiting a lower stress incidence. These regions' reduced population density and more serene settings suggest an environmental buffer against stressors, highlighting the importance of physical and social environments in stress mitigation (Akpınar, 2021).

4.2.3.3 Technological and lifestyle factors

Ownership and cell phone usage contribute to increased stress levels. The pressures of constant connectivity, exposure to disturbing content, and sleep disruption are underscored as primary concerns (Beyens et al., 2016; Soriano Sánchez, 2022; Martínez-Líbano et al., 2023a), alongside the negative impact of social media on relaxation and sleep quality (Beyens et al., 2016; Soriano Sánchez, 2022; Martínez-Líbano et al., 2023a; Woods and Scott, 2016).

4.2.3.4 Sleep and psychological well-being

Sleep's critical role is evident, with sleep difficulties directly linked to heightened stress levels. Sufficient sleep is indispensable for effective stress management, mood regulation, and academic performance, indicating a bidirectional relationship between stress and sleep (Martínez-Líbano and Yeomans-Cabrera, 2023).

4.2.3.5 Psychological vulnerabilities

Obsessive or intrusive thoughts and low self-esteem are highlighted as significant psychological risk factors. These elements foster a cycle of worry and self-doubt, exacerbating stress sensitivity and impeding effective coping mechanisms (Nielson et al., 2020).

4.2.3.6 Protective role of religious beliefs

Conversely, religious beliefs and practices emerge as protective factors, offering emotional support, community, and coping strategies that bolster resilience against stress (King, 2019).

4.2.3.7 Implications for Intervention

This analysis underlines the necessity for a collaborative approach among schools, health professionals, and families in identifying and supporting students at risk of stress. Proposed strategies encompass emotional and psychological support programs, educational initiatives to enhance mental health literacy, responsible technology use, and bolstering family support systems. Moreover, the accessibility of mental health services, irrespective of geographical or socioeconomic status, is paramount.

The confluence of biological, psychological, environmental, and social factors delineates a complex landscape of risk factors for stress among children and adolescents in the ChES. Understanding these factors is decisive for developing comprehensive preventive and therapeutic interventions. By fostering a supportive educational environment, promoting mental health education, and ensuring a collaborative effort among key stakeholders, it is feasible to mitigate the adverse effects of stress, thereby enhancing students' well-being and academic success within the ChES.

Table 7 represents the comprehensive analysis of the various risk factors and their correlation with depression, anxiety, and stress in children and adolescents within the ChES. The table categorizes risk factors such as Gender, Age, Cell Phone Use, Family Structure, and Sleep Disturbances. Each factor is then associated with its impact on depression, anxiety, and stress: (i). Gender, identified as an increased risk for depression and stress in females and anxiety in males; (ii). Age, specifically, anxiety increases at age 12, but no specific age-related risk is mentioned for depression or stress; (iii) Mobile phone use, associated with an increased likelihood of all three conditions: depression, anxiety, and stress; (iv) Family structure, risk of depression increases in cases of separated parents, but no significant correlation is mentioned for anxiety and stress; (v) Sleep disturbances, strongly related to depression and also to anxiety and stress.

The risk factors identified suggest a multifactorial nature of mental health problems in children and adolescents. Gender-specific trends highlight possible biological and sociocultural influences. The impact of technology (cell phone use) and family dynamics (family structure) highlight environmental and social factors. Sleep disorders, as a common risk factor, underscore the function of physical health in mental well-being.

These findings are consistent with global research highlighting gender differences in mental health vulnerability, the impact of technology on youth mental health, and the critical role of the family environment (Centers for Disease Control and Prevention, 2023; Selph and McDonagh, 2019). For example, studies often report higher rates of depression and anxiety in females during adolescence (Racine et al., 2021). The association between cell phone use and sleep disturbances has been a growing concern in contemporary research (Kowalchuk et al., 2022).

A comprehensive understanding of these risk variables is essential for formulating precise preventative and intervention measures within the school system. This underscores the necessity of implementing gender-sensitive strategies, closely monitoring the utilization of technology, providing assistance to youngsters from diverse familial backgrounds, and advocating for the cultivation of appropriate sleep patterns.

This study provides a thorough examination of the mental health difficulties experienced by children and adolescents in the Chilean Educational System (ChES), highlighting the need for a comprehensive and multifaceted strategy to tackle the complex nature of depression, anxiety, and stress within this specific population. Comprehending the diverse individual, familial, educational, and socio-environmental factors is essential in formulating and executing efficacious interventions and support structures. The implementation of these treatments is crucial for mitigating the frequency and severity of various mental health issues, hence fostering a supportive and flexible environment.

4.3 Limitations of the present study

When analyzing the findings of this study, it is crucial to consider certain constraints. Establishing a causal association between the detected risk factors and mental health issues is not possible due to the cross-sectional character of the study. Conducting longitudinal research would be advantageous in gaining a deeper understanding of the interplay between these characteristics among children and adolescents in the ChES. Furthermore, it should be noted that the purposive sample's constraint restricts the generalizability of the findings to the broader community. Even though the students originated from five distinct regions within the country, it is possible that their representation may not fully encompass the nation's geographic, cultural, and socioeconomic diversity. Subsequent investigations may derive advantages from a more heterogeneous sample. Another significant disadvantage is the dependence on self-reports for data collection. While the scales employed in this study have been validated, it is essential to acknowledge that self-perception can be influenced by subjective factors and biases, potentially compromising the accuracy of the obtained data. These findings could be enhanced by doing clinical exams and making behavioral observations. Furthermore, despite identifying multiple significant risk variables, other factors, such as the influence of social networks, the quality of family connections, and the availability of mental health treatments, were not thoroughly examined. To obtain a more comprehensive understanding of the factors that influence mental health in this group, future investigations could delve into these and additional potential determinants. As a final limitation,

it is necessary to state that the participation of schools in this type of study is voluntary and depends on the willingness and agenda of each school, which may affect the sample's representativeness.

4.4 Projections and practical implications of the study

This study opens several future research and practical applications. First, it would be helpful to investigate specific interventions to address the identified risk factors. These include emotional and psychological support programs in schools, training for parents and teachers, and methods to encourage healthy use of social networks and technology. To evaluate their effectiveness in decreasing the prevalence of mental disorders among children and adolescents in the ChES, long-term studies could be conducted. In addition, future research could focus on developing more accurate and less invasive assessment and diagnostic tools that could be used frequently in the school setting to identify at-risk students early. This would facilitate more timely and targeted interventions. Another area of interest is the study of resilience and protective factors in this population. Understanding how some students manage stress and anxiety could provide vital information for creating prevention and support programs. Research could include a more comprehensive assessment of how Chile's cultural, socioeconomic, and regional variations influence student mental health. This would facilitate the development of more culturally specific intervention strategies. Finally, it would be advantageous to combine this area of research with government policies and educational practices. This study could be used to inform policymakers and educators around the mental health needs of students, which could lead to changes in school curriculum, staff training, and resource allocation for support services. Future research should focus on quantitatively assessing these risk factors, examining their interaction, and exploring additional factors such as socioeconomic status or educational environment. Longitudinal studies could provide information on the evolution of these risk factors over time.

5 Conclusion

The objective of this study was to determine the prevalence of depression, anxiety, and stress in the population of Chile after the pandemic, as well as identify associated risk factors. The findings of the study revealed a significant occurrence of sadness (60.2%), anxiety (63.6%), and stress (50.2%). Depression risk factors encompass female gender, parental separation, high school age, cell phone ownership, sleep disturbances, rumination, and diminished self-worth. The factors contributing to anxiety were female gender, age of 12, cell phone ownership, sleep disturbances, rumination, low self-esteem, and being an atheist. Finally, several characteristics were discovered as contributing to stress, including being female, possessing a cell phone, experiencing sleep problems, engaging in rumination, having low self-esteem, identifying as an atheist, and extensively using social networks.

Concerning our hypothesis, there has been a notable rise in the occurrence of disorders such as depression, anxiety, and stress

among children and adolescents in the ChES after the COVID-19 pandemic, as compared to levels observed before the pandemic. In addition, the prevalence of depression, anxiety, and stress exhibited notable disparities across all age and gender cohorts within the ChES population, indicating the unequal impact of the pandemic on different segments.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found in the article/supplementary material.

Ethics statement

The studies involving humans were approved by the Bioethics Committee of the Faculty of Education and Social Sciences of Universidad Andrés Bello. The studies were conducted in accordance with the local legislation and institutional requirements. The researchers did not request any compromising information that may potentially identify the students who took part in the study. Ultimately, informed consent was granted by all participants' parents and/or tutors at the outset of the questionnaire, and all participants provided their signature as their agreement. No compensation was provided for participation.

Author contributions

JM-L: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources,

Software, Visualization, Writing – original draft. M-MY-C: Conceptualization, Funding acquisition, Investigation, Methodology, Resources, Supervision, Visualization, Writing – original draft, Writing – review and editing.

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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