Community series in mental illness, culture, and society: Dealing with the COVID-19 pandemic- volume II

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Community series in mental illness, culture, and society: Dealing with the COVID-19 pandemic - volume II

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Editorial: Community series in mental illness, culture, and society: Dealing with the COVID-19 pandemic—Volume II

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Editorial on the Research Topic
Community series in mental illness, culture, and society: Dealing with the COVID-19 pandemic—Volume II

The COVID-19 pandemic has tremendously impacted our mental health (1, 2). Sociocultural factors, including norms, values, and religion, and individual factors have played an important role in shaping COVID-19-related psychiatric symptoms and disorders (3–6). These factors have also molded how mental health interventions are provided (7). As a continuation to Volume I of our Research Topic "*Mental Illness, Culture, and Society: Dealing with the COVID-19 Pandemic*" (8), in Volume II, we further investigate the intricate relationship between the pandemic and mental health. This volume particularly encompasses eight original articles, one brief report, and one systematic review, all highlighting this sophisticated association and how it can be moderated by sociocultural and individual variables.

Five studies directly looked at the differential impact of demographic, sociocultural, and other variables on COVID-19-related mental health symptoms. Using a cross-sectional design, Brooks et al. explored the relationship between demographic variables (i.e., ethnicity, sexual orientation, and disability status), mental health (i.e., distress, depression, anxiety, and somatic complaints), and vulnerability factors for COVID-19 (i.e., personal, community-related, and environmental) among 594 adults residing in the United States (US). Disparities were found for marginalized identities by gender, sexual orientation, and disability status. Younger individuals and those of lower economic status, across all identities, suffered more distress, depression, and anxiety (Brooks et al.). Pineros-Leano et al. looked at the impact of the pandemic on the mental

health needs of Lantix families in the US. The authors conducted 21 semi-structured interviews with direct service providers working with Latinx communities. Five key themes were identified: worsening of mental health symptoms, economic stressors, preoccupation regarding transnational lives, secondary needs becoming more salient, and immigration status as a central driver of inequality. The authors raised the need to ensure access of Latinx immigrants to mental health services and the potential role of telehealth in achieving this (Pineros-Leano et al.). Shalaby et al. conducted a randomized controlled trial assessing the impact of Text4Hope services ($n = 214$; received once-daily supportive text messages for 6 weeks) vs. no intervention ($n = 72$; enrolled but did not receive messages) on mental health symptoms among males in Canada. Compared to controls, participants in the intervention group had significantly lower mean scores on the Perceived Stress Scale, Generalized Anxiety Disorder 7-item (GAD-7), Patient Health Questionnaire-9, and Composite Mental Health score. They also had a significantly lower prevalence of likely major depressive disorder (58.15 vs. 37.4%) and likely generalized anxiety disorder (50 vs. 30.8%) (Shalaby et al.). Alternatively, in their brief report, Razali et al. looked at factors associated with suicidal behaviors among 963 Malaysians during the first wave of the pandemic. Suicidal behavior was associated with gender, marital status, education, type of employment, residential area, number of people living together, number of children, and family dynamics. The authors concluded with recommendations for strategies to reduce and manage suicidality among vulnerable groups during the pandemic (Razali et al.). Lastly, using an online survey, Hu et al. compared stress levels during the first wave of the pandemic ($n = 430$) and one year later ($n = 512$) in China. They particularly looked at COVID-19-related stress, social support, and perceptions of the pandemic (perceived threat, perceived protection, and perceived controllability). Results indicated that Chinese people had lower COVID-19-related stress as the pandemic progressed. At both time points, more social support was associated with less stress. This was mediated by perceived protection and controllability of COVID-19 at both time points, and by perceived threat of COVID-19 during the first wave only (Hu et al.).

Four studies looked at the mental health of medical staff during the pandemic. Jing et al. investigated the incidence of post-traumatic stress disorder (PTSD), turnover intention, and psychological resilience of frontline medical staff ($n = 443$) in a public hospital in China. The total turnover intention and psychological resilience scores were 13.38 ± 4.08 and 87.16 ± 18.42, respectively. PTSD (incidence of 14.4%) was more prevalent among medical staff who were married, had children, and were worried about being infected. The PTSD group also had a higher level of education, higher turnover intention, and lower psychological resilience than the non-PTSD group. Lastly, higher scores on turnover intention and fear of

being infected were significant risk factors for PTSD, whereas a higher education level and psychological resilience scores were significant protective factors (Jing et al.). In another original study, Kowalski et al. distributed a questionnaire to healthcare workers ($n = 1,243$) in Poland during four different waves of the pandemic. The Beck Depression Inventory (BDI-II), GAD-7, and Manchester Brief Assessment of Quality of Life (MANSA) scales were used. A gradual increase in moderate and severe anxiety and a decrease in fear due to the disease was observed as the pandemic progressed. No statistically significant differences were observed in comparing the mean values of the BDI-II, GAD-7, and MANSA scales across waves. Women, single people, and those with a psychiatric history were more likely to be affected (Kowalski et al.). Using a semi-structured interview, Arefin et al. analyzed the lived experiences of ten Bangladeshi frontline workers who were isolated after testing positive for COVID-19. Four primary themes and severe supporting themes emerged, including experience in a new working environment (e.g., maintaining social distance, misinformation, and fear of infection), diagnosis (e.g., experiences at the diagnosis center), recovery days (e.g., experiences in isolation and coping mechanisms), and post-COVID-19 (e.g., excitement, fear, and confusion, social stigma, and changes in philosophy) (Arefin et al.). Finally, in their meta-analysis of 23 studies ($n = 27,325$), Cheung et al. analyzed the psychological impact of the severe acute respiratory syndrome and COVID-19 epidemics in Asia on healthcare workers, as well as affected individuals and the general population. Findings showed high levels of mental health symptoms secondary to the outbreaks. In terms of the COVID-19 pandemic (12 studies), the overall prevalence rates of anxiety, depression, and stress were 34.8, 32.4, and 54.1%, respectively (Cheung et al.).

Shifting gears, in their cross-sectional study, Ghuloum et al. compared knowledge, attitudes, and practice related to COVID-19 infection between the public ($n = 345$), individuals attending outpatient psychiatry clinics ($n = 165$), and individuals admitted to psychiatry wards ($n = 100$). Results showed that, compared to the public, individuals with mental illness (inpatients and outpatients) had inadequate knowledge, more positive attitudes and confidence regarding COVID-19 outcomes, and fewer safe practices. Findings highlighted the need for a targeted approach among vulnerable individuals, particularly those with mental health problems (Ghuloum et al.).

In conclusion, Volume II of our Research Topic highlights, yet again, how the COVID-19 pandemic has worsened mental health symptoms throughout the globe; this has been mediated by a multitude of factors, including sociocultural, economic, and individual ones. Mental health experts should collaborate to provide timely, adequately tailored mental health treatment to those in need, particularly vulnerable groups.

Author contributions

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

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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An investigation of the incidence of post-traumatic stress disorder, turnover intention and psychological resilience among medical staff in a public hospital in China during the outbreak of the omicron variant in the COVID-19 pandemic in 2022

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Objective: To investigate the incidence of post-traumatic stress disorder (PTSD), turnover intention and psychological resilience of medical staff during the Outbreak of the Omicron Variant in the COVID-19 pandemic in 2022 and to provide a basis for adopting relevant psychological interventions to reduce medical staff turnover.

Methods: Using the PTSD Checklist-Civilian Version (PCL-C) and a total score ranging from 17 to 85 points, a total score $\geq$ 38 indicates significant PTSD symptoms and a diagnosis of PTSD. The Chinese version of the Turnover Intention Scale (TIS) has a total score of 6 to 24 points; the higher the score, the stronger the turnover intention. The Chinese version of the Connor-Davidson Resilience Scale (CD-RISC) has a total score of 0 to 100 points, with higher scores indicating a better level of psychological resilience. A total of 443 front-line medical staff working in Chinese public hospitals and still treating all patients normally during COVID-19 were invited *via* the internet to complete a survey from 15 May to 30 May 2022 in China.

Results: The incidence of PTSD was 14.4%, the total turnover intention score was 13.38 ± 4.08, and the total psychological resilience score was 87.16 ± 18.42. The prevalence of PTSD was higher among medical staff who were married, had children, and were worried about being infected; in addition, the PTSD group had a higher level of education, higher turnover intention, and lower psychological resilience than the non-PTSD group. The total scores for turnover intention and fear of being infected were risk factors for PTSD, while a high total psychological resilience score and high education

level were protective factors for PTSD; the differences were statistically significant (all $P < 0.05$).

Conclusion: Post-traumatic stress disorder among Chinese medical personnel was associated with the marital status, childbirth, education level, turnover intention, and psychological resilience. Among these factors, psychological resilience might be exploited as a protective factor.

KEYWORDS

COVID-19, incidence, post-traumatic stress disorder, turnover intention, psychological resilience

Introduction

Post-traumatic stress disorder (PTSD) is conceptualized as the "overconsolidation of memories" of prolonged or repeated traumatic events and is defined as a debilitating memory disorder, especially during an outbreak of illness or disaster (1). Its development can affect neuroendocrine disorders and psychiatric symptoms such as immune deficiency, absenteeism, insomnia and nightmares, depression, and even suicide (2, 3). The detection and treatment of PTSD in people after a disaster has become a major concern in medical psychology (4). During the SARS epidemic, medical staff were more susceptible to stress disorders than executives due to the need to cope with the potential risk of infection to themselves and their families (5) and the threat of a shortage of personal protective equipment (6), and some medical staff were afraid to go home after work or even considered quitting (7). COVID-19 has been spreading worldwide over the past 2 years, and the global impact is now growing rapidly with the discovery of the SARS-CoV-2 Omicron variant (B.1.1.529) (8). The Omicron variant has a mutation rate that exceeds other variants by approximately 5–11 times, and preliminary studies suggest that this variant causes an increased risk of human reinfection with the virus compared to other strains of concern (9). Fear of COVID-19 is associated with job dissatisfaction and an increased propensity to leave among healthcare workers (10). The high turnover rate of healthcare workers might have disastrous consequences for international efforts to contain the COVID-19 pandemic, but the possible role of PTSD in increasing the propensity to leave has not been examined.

Psychological resilience is the ability to mobilize one's own or surrounding protective resources when faced with difficulty or adversity and thus to recover quickly and achieve good adaptation, protecting against negative mental health during challenging times (11). Participation in psychological resilience workshops potentially promotes engagement in

positive health behaviors and reduces the incidence of mental health symptoms, especially when implemented prior to repeated trauma exposure (12). In this critical situation, this questionnaire study was performed to understand the incidence of PTSD, turnover intention and psychological resilience among medical personnel in China in the context of the Omicron epidemic, to develop appropriate psychological interventions for the mental health of frontline medical personnel fighting the epidemic and to provide a basis for reducing medical personnel attrition.

Materials and methods

Participants

The study was conducted anonymously at the Second People's Hospital of Gansu Province from 15 May to 30 May 2022 and was approved by the Ethics Committee of the Second People's Hospital of Gansu Province. The approval number was GSSEY2022-KY014-01. An online questionnaire, including a demographic profile questionnaire, the PTSD Checklist-Civilian Version (PCL-C), the Connor-Davidson Resilience Scale (CD-RISC), and Turnover Intention Scale (TIS), was distributed *via* WeChat, one of the most commonly used chat tools in China. Inclusion criteria were an age > 18 years, understanding and consent to participate in the study, voluntary signing the informed consent form, ability to answer the questionnaire using WeChat, and employed as a staff member in a formally designated position who are working in Chinese public hospitals and still treating all patients normally during COVID-19.

Measurement

Demographic information questionnaire

This portion of the question assessed the participants' gender, age, marital status, fertility status, education level, job title, nature of work, annual household income, experience in the treatment or care of COVID-19, and fear of being infected.

Abbreviations: PTSD, post-traumatic stress disorder; PCL-C, PTSD Checklist-Civilian Version; TIS, Turnover Intention Scale; CD-RISC, Connor-Davidson Resilience Scale.

Post-traumatic stress disorder Checklist-Civilian Version

The PCL-C, a 17-item self-report PTSD scale, is an internationally accepted screening questionnaire for PTSD. It is divided into 3 dimensions, namely, trauma re-experiencing (5 items), numbness and avoidance (7 items), and increased alertness (5 items). The responses are scored on a 5-point Likert scale, with each entry being scored from 1 to 5 points ranging from (1 = no to 5 = very severe), and the total score ranges from 17 to 85. The higher the score, the more likely PTSD is to occur; a total score of $\geq$38 indicates significant PTSD symptoms and a diagnosis of PTSD. The Cronbach α for the scale in this study was 0.957.

Turnover Intention Scale

The Turnover Intention Scale (TIS) was developed by Michael and Spector [13] in 1982 and was subsequently translated and revised by Li and Li [14], with a Cronbach's alpha of 0.773 and content validity of 0.677. The TIS main content scale contains three dimensions and six items: the possibility of quitting the current job, finding another job, and getting a different job. Items 1 and 6 constitute the intention to leave, indicating the possibility of quitting the current job; items 2 and 3 constitute the intention to leave I, indicating the motivation to find another job; and items 4 and 5 constitute the intention to leave II, indicating the possibility of obtaining a different job. A 4-point Likert scale is used, with each entry scored on a reverse scale of 1 to 4 points (4 = often to 1 = never), with a total score of 6 to 24 points; the higher the score, the stronger the turnover intention. The Cronbach α for the scale in this study was 0.848.

The Chinese version of the Connor-Davidson Resilience Scale

The Chinese version of the CD-RISC, which was developed by Connor-Davidson et al. [15] and contains 25 items in 5 dimensions, was used. The Chinese version was translated and revised in 2007 by Yu et al. [16]; this version also has 25 items, but the original 5 dimensions are modified into 3 dimensions, namely, optimism (4 items), self-improvement (8 items), and resilience (13 items). A 5-point Likert scale is used, with each entry scored from 0 to 4 points (0 = never to 4 = always), and a total score of 0 to 100 points, with higher scores indicating a better level of psychological resilience. The Cronbach α for the scale in this study was 0.964.

Statistical methods

Statistical analyses were conducted using SPSS 25.0 software. Count data are reported as rates (%), and measurement data met the normality test and are presented as M ± SD. Two independent sample t-tests and 2 tests were used for comparisons between two groups, and factors with $P < 0.05$

were entered into binary logistic regression model for the multifactor analysis.

Results

Demographic information

The demographic information of all subjects is shown in Table 1. A total of 443 front-line medical staff participated in this study, and 64 (14.4%) had PTSD.

Single-factor analysis of post-traumatic stress disorder

Table 2 shows that the total turnover intention score was 15.69 ± 3.84 for the PTSD group and 13.99 ± 4.00 for the non-PTSD group, and the total psychological resilience score was

TABLE 1 General information on the study population (n = 443).

Projects	Number of people (n)	Composition ratio (%)
PTSD		
Yes	64	14.4
No	379	85.6
Gender		
Male	62	14.0
Female	381	86.0
Age (years)		
$\leq$35	335	75.6
>35	108	24.4
Marital status		
Unmarried	123	27.8
Married	320	72.2
Fertility status		
No children	165	37.2
Children	278	62.8
Education level		
Specialized	135	30.5
Bachelor's degree and above	308	69.5
Title		
Junior	284	64.1
Senior Intermediate	159	35.9
Nature of work		
Employed by the hospital	138	31.2
Employed by an agency	305	68.8
Any experience of COVID-19 treatment or care		
Yes	158	35.7
No	285	64.3
Fear of being infected		
Yes	253	57.1
No	190	42.9

TABLE 2   Correlation analysis of psychological resilience scores with insomnia severity and general information (M ± SD, *n* = 443).

Projects	PTSD		c2/*t* value	*P*-value
	Yes, *n* = 64 (%)	**No, *n* = 379 (%)**		
Turnover intention (M ± SD)	15.69 ± 3.84	13.99 ± 4.00	5.015	<0.001
Mental toughness (M ± SD)	79.33 ± 14.07	88.49 ± 18.75	−3.732	<0.001
Gender				
Male	5 (8.1)	57 (91.9)	2.376	0.123
Female	59 (15.5)	322 (84.5)		
Age (years)				
≤35	43 (12.8)	292 (87.2)	2.886	0.089
>35	21 (19.4)	87 (80.6)		
Marital status				
Unmarried	10 (8.1)	113 (91.9)	5.497	0.019
Married	54 (16.9)	266 (83.1)		
Fertility status				
No children	14 (8.5)	154 (91.5)	7.938	0.005
Children	50 (18.0)	228 (82.0)		
Education level				
Specialized	8 (5.9)	127 (94.1)	11.407	0.001
Bachelor's degree and above	56 (18.2)	252 (81.8)		
Title				
Junior	36 (12.7)	248 (87.3)	2.008	0.157
Senior Intermediate	28 (17.6)	131 (82.4)		
Nature of work				
Employed by the hospital	24 (17.4)	114 (82.6)	1.406	0.236
Employed by an agency	40 (13.1)	265 (86.9)		
Any experience of COVID-19 treatment or care				
Yes	23 (14.6)	135 (85.4)	0.002	0.961
No	41 (14.4)	244 (85.6)		
Fear of being infected				
Yes	47 (18.6)	206 (81.4)	8.141	0.004
No	17 (8.9)	173 (91.1)		

79.33 ± 14.07 for the PTSD group and 88.49 ± 18.75 in the non-PTSD group among the 443 medical staff. Compared to the non-PTSD group, the PTSD group had a higher turnover intention and lower psychological resilience (both *P* < 0.05). In addition, the PTSD prevalence was higher among female, married, and childbearing medical staff, and the PTSD prevalence was also higher among medical staff who were highly educated and worried about being infected (all *P* < 0.05).

TABLE 3   Table of independent variable assignments.

Variable	Variable name	Assignment
Y	Presence of PTSD	No = 0; Yes = 1
X1	Marital status	Unmarried = 0; Married = 1
X2	Fertility status	No children = 0; Children = 1
X3	Education level	Specialized = 0; Bachelor and above = 1
X4	Fear of being infected	No = 0; Yes = 1

Multifactor analysis of post-traumatic stress disorder

Using the PTSD status as the dependent variable and a significant factor in the univariate analysis as the independent variable, a binary logistic regression analysis was conducted, and the dichotomous variables were assigned the values shown in Table 3: PTSD status: no = 0, yes = 1; marital status:

TABLE 4   Multifactorial analysis of post-traumatic stress disorder (*n* = 443).

Independent variables	*B*	SE	Beta	*P*-value	OR	95% CI
Willingness to leave	0.125	0.040	9.912	0.002	1.134	1.048–1.226
Mental toughness	−0.022	0.009	6.594	0.010	0.978	0.962–0.995
Education level	−0.977	0.425	5.287	0.021	0.376	0.164–0.866
Fear of being infected	0.691	0.317	4.751	0.029	1.996	1.072–3.716

unmarried = 0, married = 1; fertility status: no children = 0, children = 1; education level: specialist = 0, undergraduate and above = 1. As shown in Table 4, the binary logistic regression results indicated that the total turnover intention and fear of being infected were risk factors for PTSD, and high total psychological resilience score and a high education level were protective factors for PTSD, all with statistically significant differences (all $P < 0.05$).

Discussion

In the present study, the prevalence of PTSD among health care workers was 14.4%, which was higher than the prevalence of PTSD among the general population in China (9.28%) (17). This difference may be because the general public is not directly fighting on the front line of the epidemic and perhaps is not fully aware of the dangers of the new variant of COVID-19 due to a lack of medical knowledge. The results were supported by the findings reported by Petrie et al. (18) and Salehi et al. (19). Although COVID-19 has been endemic worldwide for 2 years, the incidence of PTSD among Chinese medical staff in this study is still high. A probable explanation for this finding is that although many countries have protected against the virus, including through vaccination; the lethality of COVID-19 has been reduced. However, the direction of virus development is difficult to predict because many variables and uncontrollable aspects exist, and the effectiveness of available diagnostic methods, vaccines, and treatments has been reduced (20). The Chinese government has taken a strict and unrelenting approach to the epidemic and has implemented a series of measures to prevent the epidemic for the whole population (e.g., implementing regular nucleic acid testing and criminal liability for obstruction of epidemic prevention) (21). Therefore, as long as this epidemic is present, all people should be aware of it. On the other hand, PTSD is not immediately apparent in medical personnel during disasters. A study of 7,393 health care workers showed that between 2 and 19% reported symptoms of PTSD within 1–3 years after the outbreak (22), supporting the conclusion that PTSD is not always immediately apparent. Therefore, the increasing number of confirmed and suspected cases, heavy workload, depletion of personal protective equipment, and extensive media coverage may have all contributed to these health care workers' mental burden, although COVID-19 has been a global pandemic for 2 years.

The prevalence of PTSD in women in this study was twice that of men, consistent with a large number of studies that have shown a higher prevalence of PTSD in women (23, 24). Among the sex –related factors, sex hormone levels, such as testosterone, estradiol, and progesterone, are postulated to be associated with the development of PTSD, and these factors may directly influence the risk of PTSD through epigenetic mechanisms, putting women at a particularly high risk of developing PTSD

(25). On the one hand, although the proportion of women in this study was greater than the proportion of men, the China Health and Health Statistical Yearbook (2021) reported that 72.4% of health technicians nationwide were women at the end of 2020 (26). Furthermore, according to the National Health and Wellness Commission of China, 67% of the 42,600 medical personnel assisting in Wuhan at the time of the COVID-19 outbreak were female medical personnel (27) showing that women are gradually becoming the mainstay of China's medical profession. Therefore, the gender distribution of the subjects in this study is consistent with the current gender distribution of Chinese medical personnel and may reflect the incidence of PTSD and psychological resilience of Chinese medical personnel in the face of epidemics to a certain extent. On the other hand, in a developing country, such as China, socioeconomic factors and gender roles must be considered to understand this association. In China, traditional thinking holds that men earn money outside the home while women take care of the family, but as society changes and women become more involved in social work, women tend to experience more work and family conflicts than men. Women are more likely to feel the tension between their careers and the demands of their families. Because they often have more responsibility for their families, children, and patients, this dilemma of trying to achieve an ideal work-life balance may make women feel like failures, potentially increasing their vulnerability to PTSD. In China, therefore, female medical professionals are not only biologically and genetically influenced but are also at higher risk of PTSD due to their specific cultural environment and gender roles.

The higher incidence of PTSD in married medical personnel is not entirely consistent with a meta-study (28) that reported a higher incidence of psychological stress in unmarried medical personnel than in married personnel during the COVID-19 epidemic, possibly due to cultural constraints on the incidence of PTSD that vary between countries (29–31). A study by Li et al. (32) assessing Chinese medical team members during the COVID-19 epidemic supports our hypothesis.

Similar to the results from the study by Yasmin et al. (33), the present study concluded that the incidence of PTSD was higher among medical personnel with children. Numerous studies have reported increased mental health risks associated with the presence of children in the family during COVID-19 (34–36), and concerns about children's health potentially contribute to higher rates of PTSD among medical staff in families with children because children have relatively less immunity than adults.

A higher education level and fear of infection were risk factors for PTSD in health workers ($P < 0.05$) Giorgi et al. (37) reported that PTSD was more likely to affect health workers during COVID-19, especially frontline workers with higher educational backgrounds. This result may be due to the increased speed of transmission and infectiousness of the virus in the face of ongoing mutations of the new coronavirus and the

fact that more educated health workers are more likely to have access to information about COVID-19 and to feel more afraid of the virus. Fear of disease is a risk factor for psychological stress during a pandemic (38), consistent with the findings of the present study. In contrast, less educated individuals may not be aware of the potential hazards of a pandemic and therefore may exhibit a lower PTSD incidence (39).

In addition, the PTSD group had a higher total score for turnover intention and a lower total score for psychological resilience than the non-PTSD group. The differences between COVID-19 illness and turnover intention and psychological resilience were significant (both $P < 0.05$). In this case, turnover intention was a risk factor, while psychological resilience was a protective factor. Previous studies of the SARS outbreak have shown that health care workers often experienced isolation after being involved in treating infected patients, and studies of Chinese hospital staff reported higher levels of stress among isolated health care workers who expressed reluctance to work or considered quitting (7). Since the outbreak, different occupations have been hit differently, with health care workers facing a greater occupational risk than others, increasing their likelihood of infection. In the COVID-19 context, we used the O*Net (40) definition of occupational risk that is divided into two components: (i) the level of physical contact with other individuals and (ii) the frequency of exposure to possible diseases or infections. Several researchers have found that healthcare workers are among those at the highest risk of infection (41, 42). In addition to extrinsic environmental factors, researchers have found that individual factors such as workability and perceived threat to work potentially influence employees' decisions to continue working (43, 44). The results of a Korean study showed that in a pandemic context, where viruses are constantly mutating, healthcare workers still face uncertainty in terms of competence and risk, as well as threats to their safety, generating burnout and a lower willingness to retain their jobs (41). In addition, the study showed that a decrease in career retention intentions implies a shrinking healthcare workforce, which would be a major obstacle to overcoming COVID-19.

The findings of the present study on psychological resilience as a protective factor for PTSD are consistent with the findings reported by Liu et al. (45) for Chinese medical personnel during COVID-19. Resilient individuals tend to be optimistic and adaptive, with high resilience positively correlated with well-being and negatively correlated with perceived stress (46); resilient individuals are able to maintain perspective and daily functioning in the face of problems, representing the strength to overcome obstacles with competence and hope (47). Some studies have shown that resilience predicts secondary traumatic stress in medical personnel and that psychological resilience is protective against traumatic stress (48), while psychological resilience also mediated the relationship between COVID-19 stress experiences and acute stress disorder in a

study of 7,800 university students (49). Furthermore, studies on psychological resilience have reported a protective effect on turnover intentions, with psychological resilience reducing burnout and turnover rates (50). We should identify risk and protective factors that are important to reduce the occurrence of PTSD. A review of guidelines and recommendations issued during the COVID-19 pandemic by Halms et al. (51) also showed that structural social support and improvements in the work environment were important for health workers in the fight against the epidemic. We therefore also recommend that the mental health of medical staff be carefully monitored and that health care organizations provide support to medical staff with sufficient flexibility to prevent health care system breakdown in response to a pandemic.

However, several limitations of this study must be acknowledged. First, we used a snowball sampling method to recruit medical staff online, which may have resulted in a sampling bias, as some older medical staff do not use social networks; this limitation was evident in our sample, as a larger proportion of participants were under 35 years of age. This recruitment method may also have resulted in a skewed gender demographic distribution, with a larger proportion of women in the current sample and little data available from men, which also limits the generalizability of the findings. Second, as this study recruited subjects working in only one public hospital, some bias in the proportion of medical staff with or without experience in COVID-19 treatment or care was also present, and the findings should be validated in future studies in multiple centers. Furthermore, the cross-sectional design of the current survey did not allow for a causal relationship to be established, and the short duration of the survey did not allow for the effective validation of whether a dynamic change in PTSD prevalence occurs with the development of COVID-19.

Conclusion

In summary, this study revealed a high prevalence of PTSD among health care workers during COVID-19. Emphasis on the screening and treatment of PTSD is important for maintaining the physical and mental health of healthcare workers during the epidemic and to reduce staff turnover. The findings also revealed that being married with children and a fear of being infected were associated with a higher prevalence of PTSD among healthcare workers and that the PTSD group had a higher level of education and turnover intention in the workforce and lower psychological resilience than the non-PTSD group. Associated risk factors included a high turnover intention in the profession and fear of infection. In addition, tolerance of psychological resilience and a high level of literacy were protective factors for PTSD. Focusing on gender differences, culture and other aspects of the lives of staff enable a better understanding and perception of their psychological experiences (52). Hospital

administrators should actively improve the psychological resilience of volunteers, cultivate optimism and resilience, and use psychological resilience as a positive psychological resource to play an active role in reducing the incidence of PTSD and turnover intention among front-line medical staff, which is important for responding to and providing relief during major disasters. In addition, government disaster preparedness plans should include provisions and interventions to address mental health issues among medical staff.

Data availability statement

The original contributions presented in this 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 Medical Ethics Committee, and Second People's Hospital of Gansu Province. The patients/participants provided their written informed consent to participate in this study.

Author contributions

CJ and ZF-H: conceptualization, methodology, investigation, data collection, statistical analysis, manuscript preparation, writing – review and editing, supervision, and revision. WY-Y: conceptualization, methodology, investigation, data collection, and manuscript preparation. 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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The differential impact of COVID-19 on mental health: Implications of ethnicity, sexual orientation, and disability status in the United States

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The COVID-19 pandemic's effects on mental health interact with preexisting health risks and disparities to impact varying populations differently. This study explored the relationship between demographic variables (e.g., ethnicity, sexual orientation, and disability status), distress and mental health (e.g., depression, anxiety, somatic complaints, and pandemic distress), and vulnerability factors for COVID-19 (e.g., personal health vulnerabilities, community members' health vulnerabilities, and environmental exposure risks at work or home). An online cross-sectional study was conducted from 18 June to 17 July 2020, reflecting the impact of early phase COVID-19 pandemic and related shelter-in-place measures in the United States. Participants were adults residing in the United States (N = 594), with substantial subsamples ($N \geq 70$) of American Indian, Asian American, African-American, and Hispanic and/or Latinx participants, as well as people with disabilities and sexual minorities. Outcomes measured were depression, hopelessness, somatic complaints, anxiety-related disorders, locus of control (LOC), and a novel measure of pandemic-related distress. Data were analyzed using analyses of covariance (ANCOVA), chi-square test, and correlation coefficients. Generally, younger individuals, and those with less financial power—across all identities—suffered more distress. When controlling for age, lower financial power was associated with higher scores on the Center for Epidemiologic Studies Depression Scale-Revised (CESD-R; r = −0.21, p = < 0.001), Beck Hopelessness Scale (BHS; r = −0.17, p < 0.001), Patient Health Questionnaire-15 (PHQ-15; r = −0.09, p = 0.01), Screen for Child Anxiety Related Emotional Disorders for Adults Panic Disorder (SCARED-A PD; r = −0.14, p < 0.001), SCARED-A generalized anxiety disorder (GAD; r = −0.13, p = 0.002), SCARED-A obsessive−compulsive disorder (OCD; r = −0.08, p = 0.04), and the COVID-19 Pandemic Distress restriction/disconnection scale (C19PDS; r = −0.10, p = 0.009). In addition, disparities were found, in general, for marginalized identities by gender, sexual orientation, and disability status. Importantly, each ethnicity subsample showed a unique

pattern of relationships between COVID-19 risk variables and mental health symptoms. The results support the hypothesis that any pandemic may amplify preexisting social and financial disparities. Overall, interventions at the clinical, governmental, or health equity level should take into consideration the needs of vulnerable groups.

Introduction

At the end of 2019 and early months of 2020, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) spread throughout China and subsequently throughout the world. The SARS-CoV-2 infection—causing the coronavirus disease 19 (COVID-19)—spread rapidly, compelling countries and global governing bodies to enact preventative efforts such as shelter-in-place or quarantine mandates, that disrupted normal ways of life. Early on, healthcare and other essential workers were identified as particularly at risk for not only infection by SARS-CoV-2, but also for mental health distress (Lai et al., 2020). In early 2020, China identified mental health concerns in the general population as well, citing panic, anxiety, and depression as major concerns (Qiu et al., 2020). Actual illness, income and job inequality, governmental preparation and communication, and stigma toward those infected have been cited as concerns for mental health (Graham et al., 2020; Hossain et al., 2021; Piltch-Loeb et al., 2021). In the United States, of particular concern were loneliness, low distress tolerance, and COVID-19 worry, which are associated with clinical symptoms of depression, anxiety, and post-traumatic stress disorder (PTSD; Liu et al., 2020). A metareview of quarantine or shelter-in-place measures in historical pandemics and epidemics identified negative psychological effects including post-traumatic stress, confusion, and anger (Brooks et al., 2020).

Individuals with marginalized identities experienced disparities in health and other life outcomes prior to the COVID-19 pandemic, many of which are exacerbated in the face of pandemic or other disasters, especially in the realm of healthcare, and particularly for those with multiple minority identities (Gray et al., 2020). Kline (2020) notes that health inequity should be at the forefront of conversations surrounding global responses to the COVID-19 pandemic, specifically higher risk populations, such as elderly adults and people who have marginalized identities, but it is unclear whether those are the greatest risk for infection and mortality are also at greatest risk for psychological distress.

Research continues to emphasize racial and ethnic disparities in COVID-19 cases, where people of racial minority groups are overrepresented (for review, see Pan et al., 2020;

Sze et al., 2020). Furthermore, a review of COVID-19 literature found that over half of the manuscripts from the first wave of COVID-19 did not report racial distribution (Raghav et al., 2021). While minority groups make up small percentages of the overall population in the United States, recent studies show that within their individual racial and ethnic categories, Hispanic/Latinx, American Indian/Alaskan Native, Native Hawaiian/Pacific Islanders, and Black individuals are disproportionately infected with SARS-CoV-2 (Raine et al., 2020). Black and African-American people, for example, are contracting the disease and dying from it at higher rates than other ethnic groups (Raine et al., 2020; Thebault et al., 2020). Both race and socioeconomic status (SES) have been identified as long-standing factors of poorer health outcomes and early mortality (Chu et al., 2007). Gelaye et al. (2020) proposed that stress-associated neurobiological activity is much higher for Black, Indigenous, and People of Color (BIPOC), and this chronic elevation predisposes these individuals to chronic stress, under-activated antiviral pathway genes, and therefore higher likelihood of contracting and experiencing worse outcomes with diseases such as COVID-19.

African-American and Latinx people experienced significant spikes in unemployment as a result of the pandemic (Couch et al., 2020), followed by Asian Americans, even when holding equivalent education to their counterparts of any other race, likely a factor of the growing racism and xenophobia associated with the virus (Kim et al., 2021). While this trend of economic shock for ethnic minorities dates back to the Great Depression, Asian Americans have also experienced an increased prevalence of hate crimes related to the pandemic (Stop AAPI Hate, 2021).

The primary concern during COVID-19 for lesbian, gay, bisexual, and queer (LGBQ) sexual minorities, and their gender minority constituents, is an exacerbated effect of already immense struggles related to mental health, such as suicidal ideation and family rejection (Salerno et al., 2020a). Although most of the general population reported mental health or physical health struggles related to the COVID-19 pandemic, gender and sexual minority (GSM) individuals are affected in unique ways, including reporting higher rates of substance use, domestic abuse, discrimination, COVID-19 worry, grief,

disconnection/isolation, depression, and anxiety compared to their sexual majority counterparts (e.g., LGBT Foundation, 2020; Peterson et al., 2020; Kamal et al., 2021).

Gender and sexual minority populations already experience systemic oppression that limits access to necessary resources such as lodging, education, and healthcare, as well as socially supportive networks that would otherwise buffer negative mental health outcomes (Gibb et al., 2020). The social distancing and stay-at-home restrictions exacerbate this limitation greatly. The GSM community already has disproportionate rates of poverty (Badgett et al., 2020) and twice the average rate of service-industry employment, unemployment, or employment requiring high traffic social contact, which is each of particular concern during the pandemic (Salerno et al., 2020b). Loss of or lack of healthcare is a related concern for GSM individuals, especially for the transgender and gender expansive (TGE) community, who face immense financial disparity and discrimination in healthcare (Safer et al., 2016). All in all, the available literature on GSM considerations during the COVID-19 pandemic advocates for accessible and effective resources and supports to bolster equity for the GSM community (Signorelli et al., 2020).

The COVID-19 pandemic has also profoundly affected people with disabilities, a population that makes up about 26% of adults in the United States based on definitions by the Americans with Disabilities Act (ADA). Reviews of safety measures and accessibility services from educational systems, news, or governmental reports noted a dearth of disaster planning or considerations for individuals with disabilities, as well as a lack of sufficient information and resources or aid (Jesus et al., 2021). People with disabilities have been impacted by the COVID-19 pandemic in three main areas: higher risk of infections, loss of services and accessibility, and deficit or denial of care through measures such as medical rationing (Lund et al., 2020).

While only some ADA disabilities increase risk of infection by SARS-CoV-2 (e.g., *via* cardiovascular risk; Kamalakannan et al., 2021), many carry risk factors for greater repercussions from infection (Boyle et al., 2020). Abedi et al. (2020) noted a connection between higher disability rates, higher poverty rates, and higher COVID-19 mortality rates by county, proposing that decreased mobility and access to healthcare might explain the higher mortality rate.

National and global measures to prevent the spread of SARS-CoV-2 themselves impacted disabled individuals and their families' ways of life, requiring significant changes in services or routines, including loss of educational, behavioral, or healthcare supports (Jesus et al., 2021). Individuals receiving assistance from caregivers, aides, or providers may be forced to choose between receiving aid and following shelter-in-place protocols or have physical limitations that make certain precautions difficult (World Health Organization, 2020). As school or work endeavors have shifted toward online platforms,

many disabled individuals' typical resources have been rendered obsolete or unavailable, especially for those in rural or low-income areas (Lund et al., 2020).

One of the largest issues impacting the disabled community and the current COVID-19 pandemic is the implementation of medical rationing of medical supplies across the world. Although medical rationing has been used historically, the current societal context warrants concerns about ethical implementation and has caused many disability activists to speak out against the discriminatory practice due to its ableist mentality that those with disabilities and older age are more disposable than younger, non-disabled individuals which, in some instances, may prevent individuals with disabilities the proper or even life-sustaining care needed (Boyle et al., 2020; Lund and Ayers, 2020). Andrews et al. (2020, p. 7) emphasize the American Psychological Association's stance that "a disabled person's ability to achieve their goals depends less on the nature of disability and individual coping skills than on personal, familial, and systemic interactions with schools, employers, healthcare providers, and communities."

Well-documented historical disparities for marginalized groups in the United States highlight the importance of studying the relationship between COVID-19 risk factors, mental health outcomes, and demographic factors including sexual orientation, disability status, and a range of ethnicities. This study examines a broad set of mental health-related outcomes including depression, anxiety, hopelessness, somatic symptoms, LOC, and pandemic distress. This study addresses gaps in the literature by examining these outcomes comprehensively across multiple marginalized identities to identify their unique experiences and health inequity.

Materials and methods

Participants

The study included a nationally representative sample ($N = 594$; with missing data minimum $N = 490$) of adult participants (ages 18–78, $M = 35.00$; $SD = 15.42$). Inclusion criteria included those who were at least 18 years old, currently living in the United States, and who had the ability and access to complete an online survey in the English language. Of the 50 states, Hawaii, Maine, and North Dakota did not have participants, as well as no one from the District of Colombia or Puerto Rico. A power analysis was conducted based on the most rigorous planned analysis for the data (MANOVA), with a minimum of 98 participants; the sample goal was inflated to a minimum of 120 to account for any invalid or missing data. The majority of participants were female (65%), resided in dense urban areas (36%), and reported ongoing but loosening shelter-in-place orders in their county at the time of data collection (50%). Economic status was calculated by where participants

fell in relation to the poverty line, based on their reported income and the number of people supported by that income. Table 1 provides descriptive statistics for the overall sample's demographic variables, along with those of our sexual minority and ADA-disability subsamples. Of our ADA-disability sample, 56% had physical disabilities, 14% had vision-related disabilities, and 11% were hard of hearing.

Procedure

Quota convenience sampling, a type of stratified sampling, was utilized to recruit participants until adequate statistical representation (at least 70 participants) was attained across a number of demographic categories: ethnicity (American Indians, African Americans, Asian Americans, European

TABLE 1 Participant demographics and key variables.

Characteristic	Overall sample N = 594 n (%)	Sexual minority subsample N = 95 n (%)	ADA disability subsample N = 88 n (%)
Age			
18 to 29	201 (34)	43 (45)	15 (17)
30 to 39	163 (28)	28 (30)	20 (23)
40 to 49	88 (15)	7 (7)	17 (19)
50 and above	142 (24)	17 (18)	36 (41)
Gender			
Male	203 (34)	26 (27)	29 (33)
Female	385 (65)	64 (67)	59 (67)
Non-binary or transgender	6 (1)	5 (5)	0 (0)
Ethnicity			
American Indian or Alaskan Native	70 (12)	12 (13)	12 (14)
Asian or Asian American	111 (19)	8 (8)	10 (11)
African American	88 (15)	12 (13)	22 (25)
European American	208 (35)	41 (43)	29 (33)
Hispanic or Latinx	81 (14)	13 (14)	11 (13)
Other/Multiethnic/Did not answer	36 (6)	9 (10)	4 (5)
Population Density			
Rural	119 (20)	17 (18)	15 (17)
Suburban	199 (34)	29 (31)	24 (27)
Urban	213 (36)	35 (37)	40 (46)
Did not answer	63 (11)	14 (15)	9 (10)
Education			
Less than a bachelor's degree	303 (51)	53 (56)	56 (64)
Bachelor's degree	175 (30)	24 (25)	19 (22)
Graduate degree	116 (20)	18 (19)	13 (15)
Local Shelter-in-Place Status			
Ongoing	121 (20)	27 (28)	21 (24)
Ongoing but loosened	299 (50)	13 (14)	16 (18)
Has ended	108 (18)	7 (7)	5 (6)
Never	66 (11)	48 (51)	46 (52)
Sexual Orientation			
Heterosexual	499 (84)	0 (0)	71 (81)
Lesbian	11 (2)	11 (12)	2 (2)
Gay	18 (3)	18 (19)	4 (5)
Bisexual	41 (7)	41 (43)	7 (8)
Queer	13 (2)	13 (14)	3 (3)
Prefer not to say	12 (2)	12 (13)	1 (1)
Disability Status			
No	506 (85)	78 (82)	0 (0)
Yes	88 (15)	17 (18)	88 (100)
Economic Status			
Below poverty line	110 (19)	15 (16)	30 (34)
At poverty line (1x)	121 (20)	31 (33)	23 (26)
Above poverty line	117 (20)	23 (25)	13 (15)
At Living Wage (2x)	132 (22)	20 (21)	12 (14)
Middle or high class (3x+)	107 (18)	5 (5)	10 (11)

Americans, and Hispanic/Latinx individuals); gender (cisgender men and women); sexual orientation (sexual minorities and heterosexual individuals), and urbanicity (rural, suburban, and urban). This study does not claim to have an exhaustive sample for these groups nor is it meant to represent the present prevalence rates of the U.S. population across demographic categories. The survey was hosted by Qualtrics, using a combination of researcher-initiated advertisement, and Qualtrics' own online recruitment, with up to $3.00 compensation for completed surveys. Through Qualtrics, simple logic quota was used to meet the identified minimum 70 participants for each of the demographic groups above; this minimum was determined adequate utilizing power analysis for planned analyses. Participant data were collected from 18 June to 17 July 2020.

Participants provided informed consent electronically, were given a list of mental health and COVID-19 resources, then took 20–27 min to complete the online survey. The full survey gathered information on demographics, coping skills and their efficacy, psychological and physiological distress, and pandemic-specific experiences and risks, with question formats including Likert's scale, multiple choice, and free response (measures utilized for the present analyses discussed in detail below). This study was approved by the Alliant International University Institutional Review Board (IRB; protocol #2004176143, approved 10 June 2020).

Measures

Demographics

Demographic items queried ethnicity, gender, sexual orientation, disability status, education, employment, income, and living situation, among other factors. For vulnerabilities to COVID-19, participants identified whether they had (1) personal chronic health issues related to COVID-19 risk, such as being immunocompromised or having lung or heart trouble; (2) family, community members, or clients through work had chronic health issues related to COVID-19 risk; or (3) home or work environments that place them at increased risk for exposure to COVID-19 (i.e., due to flow of customers, work in a healthcare setting, or housemates who neglect safety protocols).

Depression

The Center for Epidemiologic Studies Depression Scale-Revised Short Form (CES-D-R 10; α > 0.86; Miller et al., 2008) is a 10-item version of the full CESD-R and a well-validated measure of depression (Van Dam and Earleywine, 2011), with higher scores indicating more frequent symptoms of depression. Participants rate how often they experience depressive symptoms on a four-point scale between "Rarely or None of the Time" (less than 1 day) and "All of the Time" (5–7 days).

Hopelessness

The Beck Hopelessness Scale (BHS; Beck et al., 1974) is a 20-item true–false questionnaire, with higher scores representing higher levels of hopelessness. Prior research has deemed the BHS as both reliable (α = 0.88) and valid in undergraduate college populations (Steed, 2001). This study utilized the most predictive four items out of the original 20, as recommended by Aish et al. (2001) and further confirmed by Yip and Cheung (2006).

Anxiety

The Screen for Child Anxiety Related Emotional Disorders for Adults (SCARED-A; van Steensel and Bögels, 2014) is a 71-item measure evaluating anxiety in adults and has nine subscales that correspond with anxiety-related diagnoses in the DSM-IV, four of which are utilized in the present analyses: generalized anxiety disorder (GAD; 9 items; α = 0.84, –0.89), social anxiety disorder (SAD; 9 items; α = 0.83, –0.90), panic disorder (PD; 13 items; α = 0.80, –0.86), and obsessive–compulsive disorder (OCD; 9 items; α = 0.62, –0.76). The GAD subscale focuses on various sources of worry, while the PD subscale focuses on situations that may cause fear and panic. The SAD subscale includes items such as "I feel nervous when I go to a party." The OCD subscale includes items on ruminations and behaviors, such as "I want things to be in a fixed order." Higher scores indicate greater frequency of symptoms described on a three-point scale (0 = Almost Never, 1 = Sometimes, and 2 = Often), to which a clinical cutoff score can be applied.

Somatization

The Patient Health Questionnaire-15 (PHQ-15; α = 0.80; Kroenke et al., 2002) is a 15-item questionnaire evaluating the severity of somatic symptoms, with higher scores indicating greater severity in more areas of discomfort. Participants rate the degree to which they have been bothered by each symptom (e.g., "stomach pain" and "dizziness") during the past 7 days on a three-point scale from "Not Bothered at All" to "Bothered a Lot." The PHQ-15 demonstrated good reliability and validity in adult primary care and other samples (Kroenke et al., 2002).

Distress

The COVID-19 Pandemic Distress Scale (C19PDS; Chang et al., 2021) is a novel, self-authored, self-report measure of distress regarding a variety of facets of the pandemic with shelter-in-place protocols. The C19PDS has 19 items (Full Scale a = 0.93), twelve measuring distress due to disconnection and restriction of freedom (Disconnection/Restriction, a = 0.92; e.g., "Loneliness," "Missing my typical hobbies and exercise") and six measuring distress due to fears around sickness and uncertainty (Fear/Uncertainty, a = 0.88; e.g., "The uncertainty of it all," "The idea of being contaminated and getting sick"), on a five-point Likert Scale of 0 (Not at All Bothered) to 4 (Incredibly Bothered). The full C19PDS and the

disconnection/restriction scale have excellent internal reliability, while the fear/uncertainty scales have good internal reliability. The total scale demonstrated strong convergent validity *via* correlation with the Perceived Stress Scale (PSS-10; Cohen et al., 1983).

Locus of control

Locus of control was measured by a single item seven-point scale that asked subjects, "How much control do you feel you have over your own life?" from 1 (No Control) to 7 (Complete Control), with higher scores indicating greater internal LOC and lower scores indicating more external LOC. There is evidence that a single item measure is a valid alternative brief measure of LOC as evidenced by Bugaighis and Schumm (1983) and Kovaleva (2012).

Statistical approach

All data were analyzed using IBM SPSS Version 27. All assumptions for analyses were examined and met. Correlations examined relationships between demographic, COVID-19 risk variables, and mental health outcomes. One-tailed correlations were considered to evaluate statistical significance due to our directional hypotheses that marginalized identities would be positively correlated with measures of psychological distress. Five additional sets of partial correlations were conducted to examine relationship between COVID-19 risk and mental health outcomes within ethnicity subsamples.

Chi-square analyses examined rates of COVID-19 risk for the demographic variables of ethnicity, sexual orientation, and disability. One-way ANCOVAs compared ethnicity, disability status, and sexual orientation, controlling for the effect of age, with Bonferroni *post hoc* tests conducted as needed, due to the variability in sample sizes. Exploratory ANCOVA was conducted for gender.

Results

Partial correlations controlling for the effect of age were run between all suitable study variables (see Table 2), because bivariate correlations revealed age as a significant correlate to many variables, including every mental health variable (see Figure 1 and Table 2, Column 1).

Ethnicity

Ethnicity and COVID-19 risk

Chi-square analyses revealed that rates of personal health-related vulnerabilities to COVID-19 significantly differed by ethnicity (see Table 3). One highlight of *post hoc* analyses

revealed significant differences with the American Indian sample endorsing higher personal health-related vulnerabilities to COVID-19 compared with all other ethnicity categories. The rate of health-related vulnerabilities to COVID-19 in one's home, family, or work community also significantly differed by ethnicity (Table 3). *Post hoc* analyses revealed the European American sample endorsed higher community health-related vulnerabilities than the American Indian, African-American, and Asian American samples. Environment-related vulnerabilities to COVID-19 at home and/or work did not significantly vary by ethnicity, despite a trend in the current literature for a higher percentage of the Hispanic/Latinx participants to endorse environmental exposure risks to SARS-CoV-2 during the pandemic (McNicholas and Poydock, 2020; Rogers et al., 2020).

Ethnicity and mental health outcomes

Analyses of covariance controlling for the effect of age found significant differences by ethnicity on the CESD-R [$F(4,552) = 2.70$, $p = 0.03$], SCARED-A GAD subscale [$F(4,550) = 5.01$, $p = 0.001$], and LOC [$F(4,492) = 2.79$, $p = 0.03$]. The CESD-R and LOC Scales showed no significant differences when evaluated pairwise. However, the European American sample exhibited a greater average depression score ($M = 12.89$; $SE = 0.46$) than other ethnicities by about two points. Similarly, European Americans exhibited the greatest mean GAD score ($M = 8.39$, $SE = 0.32$), significantly greater in pairwise comparisons to both the African-American ($M = 6.07$, $SE = 0.48$, $p = 0.001$) and Hispanic/Latinx samples ($M = 6.61$, $SE = 0.51$, $p = 0.04$). For the LOC scale, African Americans ($M = 5.50$, $SE = 0.16$) exhibited the most internal LOC, closely followed by American Indians ($M = 5.34$, $SE = 0.15$), then Asian Americans ($M = 5.08$, $SE = 0.16$) in the middle, and with the European American ($M = 4.95$, $SE = 0.12$) and Hispanic/Latinx ($M = 4.89$, $SE = 0.17$) samples with the lowest. Finally, each ethnicity subsample demonstrated unique patterns between COVID-19 risk variables and mental health outcomes (Table 4).

Sexual orientation

Sexual orientation and COVID-19 risk

Significantly more LGBQ individuals reported health-related vulnerabilities among their own community members, as compared to the heterosexual sample. Personal health-related vulnerabilities or environment-related vulnerabilities to COVID-19 did not vary by sexual orientation (Table 3).

Sexual orientation and mental health outcomes

Analyses of covariance examined differences across sexual orientation for ten mental health outcomes, controlling for the effect of age. Scores on the BHS [$F(1,594) = 9.32$, $p = 0.002$], the

TABLE 2 Partial correlation matrix controlling for age.

Variable	1§	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. Age	1.00																								
2. Cismale Gender	0.13**	1.00																							
3. Sexual Minority	−0.10*	−0.05	1.00																						
4. ADA Disability	0.17†	−0.02	0.02	1.00																					
5. Financial Power	0.08	0.14†	−0.13**	−0.10**	1.00																				
6. African American	−0.06	0.05	−0.01	0.15†	−0.07	1.00																			
7. American Indian	0.01	−0.01	0.05	0.04	−0.12**	−0.13†	1.00																		
8. Asian American	−0.17†	−0.02	−0.13†	−0.09*	0.09*	−0.22†	−0.20†	1.00																	
9. European American	0.28†	0.03	0.12**	−0.07*	0.11**	−0.32†	−0.26†	−0.32†	1.00																
10. Hispanic/Latinx	−0.17†	−0.05	0.01	0.01	−0.08*	−0.15†	−0.16†	−0.23†	−0.25†	1.00															
11. CV Risk: Self	0.31†	−0.04	0.08*	0.21†	−0.11**	−0.04	0.12**	0.04	−0.03	−0.04	1.00														
12. CV Risk: Community	−0.07	−0.06	0.10**	0.05	0.03	−0.03	−0.01	−0.12**	0.17†	−0.02	0.00	1.00													
13. CV Risk: Environmental	−0.24†	0.12**	−0.02	0.03	−0.01	0.02	−0.01	−0.05	0.04	0.02	0.06	0.05	1.00												
14. Sheltering-in-Place	0.01	0.14†	0.90*	0.07	0.08*	0.02	0.00	0.02	0.03	−0.07	0.05	−0.14†	0.06	1.00											
15. Urbanicity	−0.01	0.20†	0.03	0.09*	0.08*	0.06	−0.08*	−0.01	0.01	0.07	−0.01	0.03	−0.02	0.17†	1.00										
16. Depression (CESD)	−0.28†	−0.12**	0.08*	0.10**	−0.21†	−0.03	−0.03	−0.05	0.14†	−0.04	0.11**	0.17†	0.07*	−0.06	−0.01	1.00									
17. Hopelessness (BHS)	−0.10*	−0.07	0.13**	0.09*	−0.17†	−0.03	−0.01	−0.03	0.08*	0.04	0.06	0.10*	0.05	−0.06	−0.02	0.47†	1.00								
18. Somatic Symptoms (PHQ)	−0.17†	−0.13**	0.06	0.22†	−0.09*	−0.01	0.03	−0.05	0.04	−0.02	0.12**	0.12**	0.12**	0.03	0.00	0.50†	0.24†	1.00							
19. PD Scale (SCARED-A)	−0.35†	−0.02	−0.01	0.12**	−0.14†	−0.01	−0.04	0.02	0.03	0.01	0.11**	0.03	0.16†	0.04	0.04	0.58†	0.32†	0.56†	1.00						
20. GAD Scale (SCARED-A)	−0.36†	−0.11**	0.08*	0.09*	−0.13**	−0.10**	−0.02	−0.01	0.18†	−0.05	0.09*	0.11**	0.03	0.00	−0.01	0.60†	0.35†	0.48†	0.65†	1.00					
21. SAD Scale (SCARED-A)	−0.32†	−0.07	0.06	0.10*	−0.06	−0.10**	0.01	0.04	0.04	0.00	0.09*	0.04	0.01	0.03	−0.01	0.47†	0.34†	0.43†	0.64†	0.71†	1.00				
22. OCD Scale (SCARED-A)	−0.31†	0.03	0.02	0.11**	−0.08*	0.04	0.02	0.03	−0.02	−0.03	0.06	0.03	0.09*	0.01	0.05	0.46†	0.24†	0.44†	0.72†	0.66†	0.63†	1.00			
23. Pandemic Distress (R/D)	−0.42†	0.04	−0.01	0.07	−0.10**	0.01	−0.03	0.01	0.04	0.01	0.04	0.04	0.05	0.15†	0.15†	0.38†	0.19†	0.30†	0.43†	0.32†	0.24†	0.40†	1.00		
24. Pandemic Distress (HF/U)	−0.17†	−0.13†	0.04	0.09*	−0.07	−0.02	0.00	0.01	0.05	0.03	0.13†	0.13**	0.00	0.02	0.02	0.44†	0.22†	0.33†	0.33†	0.46†	0.35†	0.37†	0.52†	1.00	
25. LOC	0.14†	0.18†	−0.10*	−0.02	0.25†	0.09*	0.04	−0.03	−0.09*	−0.08*	−0.07	−0.12**	0.05	0.08*	0.02	−0.44†	−0.43†	−0.19†	−0.23†	−0.34†	−0.30†	−0.12**	−0.14†	−0.18†	1.00

*$p < 0.05$; **$p < 0.01$; †$p < 0.001$.

§ Bivariate correlations between age and other variables, demonstrating why it was controlled for in the overall partial correlation matrix.

One-tailed; $N = 490–592$; positive correlations with gender mean scores are higher for cisgender men than combined cisgender female and TGE sample; finance is an ordinal variable based on household income per household/family size; positive correlations with urbanicity mean scores are higher for city dwellers than suburban or rural dwellers. R/D and HF/U are subscales of the CV19PDS (see section Materials and Methods).

LOC, locus of control.
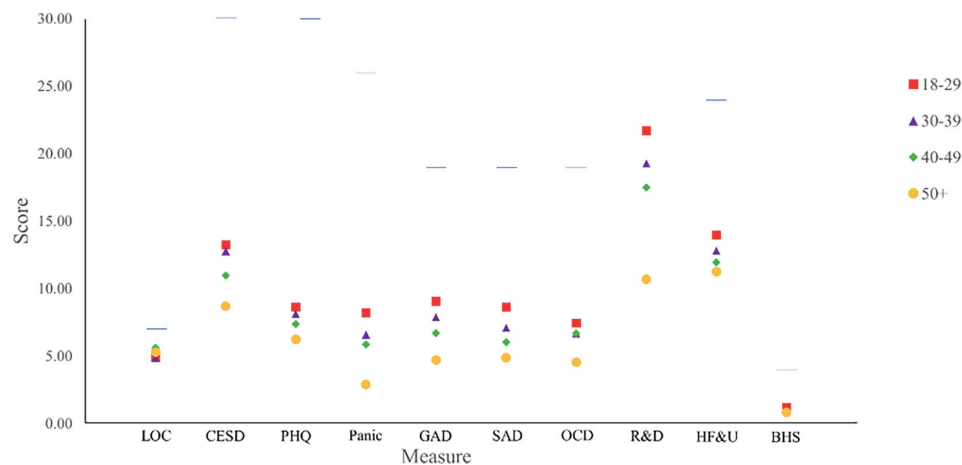
FIGURE 1
Average scores on mental health measures by age group. Figure displays maximum score for each measure with horizontal line. The maximum score for the R&D subscale is 44 and is not shown due to space. LOC, Locus of Control scale; CESD, The Center for Epidemiologic Studies Depression Scale-Revised Short Form; PHQ, Patient HealthQ uestionnaire-15; Panic, Panic subscale of the SCARED-A; GAD, Generalized Anxiety subscale of the SCARED-A; SAD, Social Anxiety subscale of the SCARED-A; OCD, Obsessive Compulsive subscale of the SCARED-A; R&D, Restriction and Disconnection subscale of the C19PDS; HF&U, Health Fears and Uncertainty subscale of the C19PDS; BHS, Beck Hopelessness Scale.

TABLE 3 Chi-square of ethnicity, gender, sexual orientation, disability status, and COVID-19 risk.

	N	Personal health vulnerability %(n)	Community: Health vulnerability %(n)	Environmental vulnerability %(n)
Ethnicity χ^2, *df* = 4		15.02**	13.87**	2.50
African American	87	8(7)[ae]	23(20)[b]	41(36)
American Indian	69	25(17)[abcd]	23(16)[a]	36(25)
Asian American	109	12(13)[b]	18(20)[c]	37(41)
European American	208	17(35)[cef]	36(75)[abc]	37(77)
Hispanic/Latinx	81	6(5)[df]	26(21)	46(37)
Gender χ^2, *df* = 1		0.000	2.96	4.31*
Cismale	201	13(27)	23(47)	45(91)
Cisfemale/TGE	389	13(52)	30(117)	36(141)
Sexual χ^2, *df* = 1 *Orientation*		1.27	6.14*	0.04
Heterosexual	496	13(63)	26(128)	39(194)
LGBQ	94	17(16)	38(36)	40(38)
Disability χ^2, *df* = 1		26.67***	2.85	0.003
Yes	88	31(27)	35(31)	39(34)
No	502	10(52)	27(133)	39(197)

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
[a,b,c,d,e]Within each column, pairs of values marked with the same letter are significantly different at the 0.05 level (df = 1); numbers reflect the percentage and total number of individuals in each ethnic group that endorsed each type of risk.
Due to variability in missing data, N represents minimum for each analysis set.

SCARED-A GAD Scale [$F_{(1,589)} = 4.00$, $p = 0.046$], and LOC scale [$F_{(1,552)} = 5.10$, $p = 0.021$] significantly differed by sexual orientation. The LGBQ sample had the greatest mean BHS score ($M = 1.36$, $SE = 0.13$), in comparison with the heterosexual sample ($M = 0.93$, $SE = 0.06$, $p = 0.002$). Similarly, the LGBQ sample had a higher mean GAD score ($M = 8.20$, $SE = 0.46$) in comparison with the heterosexual sample ($M = 7.19$, $SE = 0.20$, $p = 0.05$). Finally, the heterosexual sample ($M = 5.17$, $SE = 0.07$) exhibited more internal LOC than the LGBQ sample ($M = 4.76$, $SE = 0.17$, $p = 0.02$).

TABLE 4 Interitem correlations of mental health outcomes and risk by ethnicity group, controlling for age.

Variable	CESD	BHS	PHQ-15	Panic	GAD	SAD	OCD	R&D	HF&U	LoC
African American (N = 88)										
Personal vulnerability	0.02	0.00	0.21*	0.16	0.07	−0.03	0.14	0.00	0.01	−0.05
Community vulnerability	0.24**	0.05	0.10	0.06	0.23*	0.15	0.22*	0.04	0.22*	−0.11
Environmental exposure	0.04	−0.05	0.09	0.20*	0.06	0.10	0.00	−0.06	−0.10	0.12
Ongoing Shelter-in Place	−0.07	−0.02	0.16	0.06	0.07	0.06	0.01	0.18*	0.01	0.05
Urbanicity	0.14	−0.01	−0.10	−0.04	−0.01	−0.10	0.08	−0.01	0.07	−0.11
American Indian (N = 70)										
Personal vulnerability	0.16	−0.12	0.30**	0.33**	0.16	0.21*	0.26*	0.08	0.22*	−0.03
Community vulnerability	0.15	0.02	0.30**	0.19	0.27**	0.08	0.15	0.11	0.12	−0.14
Environmental exposure	0.03	0.17	0.17	0.15	0.10	0.19*	0.13	−0.05	−0.06	−0.13
Ongoing Shelter-in Place	−0.15	−0.17	0.03	0.08	−0.05	0.11	0.11	0.13	0.06	0.01
Urbanicity	0.06	0.11	0.20*	0.05	0.06	0.17	0.16	0.25*	0.17	−0.17
Asian American (N = 111)										
Personal vulnerability	0.02	0.09	0.01	0.04	0.03	0.07	0.07	0.03	0.00	−0.08
Community vulnerability	0.06	0.10	0.12	0.02	0.05	0.01	0.07	0.01	0.06	0.04
Environmental exposure	0.29**	0.20*	0.12	0.24**	0.13	0.03	0.16*	0.25**	0.03	−0.07
Ongoing Shelter-in Place	−0.04	0.03	−0.11	−0.03	−0.03	0.09	0.00	−0.04	0.00	−0.02
Urbanicity	−0.05	−0.11	−0.10	−0.10	−0.12	−0.05	−0.13	0.13	−0.05	−0.02
European American (N = 208)										
Personal vulnerability	0.15*	0.14*	0.10	0.08	0.14*	0.10	0.02	0.04	0.20**	−0.16**
Community vulnerability	0.17**	0.10	0.11*	−0.02	0.05	−0.05	−0.04	0.02	0.17**	−0.06
Environmental exposure	0.01	−0.03	0.17**	0.21**	0.04	0.04	0.18**	0.03	0.07	0.08
Ongoing Shelter-in Place	−0.11	−0.14*	0.02	0.00	−0.04	−0.05	0.02	0.26†	0.05	0.21**
Urbanicity	−0.08	−0.04	0.04	0.07	−0.02	0.00	0.08	0.21**	−0.06	0.20**
Hispanic/Latinx (N = 81)										
Personal vulnerability	0.20*	0.05	0.02	0.04	0.00	−0.02	−0.13	−0.02	0.04	0.11
Community vulnerability	0.08	0.10	0.08	−0.06	0.01	0.07	−0.02	0.10	0.12	−0.17
Environmental exposure	−0.02	−0.01	0.11	0.04	−0.16	−0.18	−0.05	−0.01	−0.13	0.18
Ongoing Shelter-in Place	0.18	0.09	0.17	0.15	−0.01	−0.03	−0.11	0.05	−0.12	−0.07
Urbanicity	−0.03	0.06	0.08	0.15	0.08	0.05	0.15	0.17	0.11	0.07

*$p < 0.05$; **$p < 0.01$; †$p < 0.001$.

$N = 558$; CESD, The Center for Epidemiologic Studies Depression Scale-Revised Short Form; BHS, Beck Hopelessness Scale; PHQ, Patient Health Questionnaire-15; Panic, Panic subscale of the SCARED-A; GAD, generalized anxiety subscale of the SCARED-A; SAD, social anxiety subscale of the SCARED-A; OCD, obsessive–compulsive subscale of the SCARED-A; R&D, Restriction and Disconnection subscale of the C19PDS; HF&U, Health Fears and Uncertainty subscale of the C19PDS; LOC, Locus of Control Scale.

Disability status

Disability status and COVID-19

Participants with disabilities had a significantly higher rate of personal health-related vulnerabilities to COVID-19 than those without (Table 3). Participants did not differ in community or environment-related COVID-19 vulnerabilities by disability status.

Disability status and mental health outcomes

Analyses of covariance examined differences between participants with and without disabilities for ten mental

health outcomes, controlling for the effect of age. Psychiatric disabilities were excluded to prevent confounds with the mental health outcomes. Participants with physical disabilities had statistically significantly greater scores than non-disabled participants on the CESD-R [$F(1,578) = 5.74$, $p = 0.017$; ($M = 13.18$, $SE = 0.74$; $M = 11.28$, $SE = 0.28$)] and BHS [$F(1,578) = 4.57$, $p = 0.033$; ($M = 1.26$, $SE = 0.14$; $M = 0.93$, $SE = 0.06$)], indicating marginally more frequent symptoms of depression and hopelessness for the disabled population. The only measure in which participants with physical disabilities had both statistically and clinically significant elevations as compared to non-disabled participants was the PHQ-15 [$F(1,577) = 26.91$, $p < 0.001$; ($M = 10.94$, $SE = 0.66$; $M = 7.18$, $SE = 0.25$)]. Participants with physical disabilities also had statistically significantly greater scores than non-disabled participants on the C19PDS Health Fears/Uncertainty Scale [$F(1,573) = 5.12$, $p = 0.024$], and three SCARED-A subscales: GAD [$F(1,576) = 5.05$, $p = 0.025$], Panic Disorder [$F(1,576) = 7.95$, $p = 0.005$], and OCD, [$F(1,576) = 6.65$, $p = 0.010$]. Of these measures, the mean scores between people with and without disabilities differed by one or fewer points on each aforementioned scale.

Discussion

This study aimed to identify disparities in mental health outcomes related to COVID-19 health risks, ethnicity, sexual orientation, and disability status. This study's single greatest correlate for distress during early phase COVID-19 was age. The younger the participants, the greater their distress, on average, across all 10 mental health outcomes analyzed, without considering other identities and risk factors, as evidenced by **Figure 1**. Understanding younger adults' psychological vulnerability during a pandemic could be useful to the policymakers, physicians, professors, and mental health professionals guiding our population in times such as this, particularly when the natural focus is on protecting older adults with greater COVID-19 risks to physical health.

In terms of interpretation, young people may experience greater suffering around their freedom being restricted, having a smaller community of support to rely on, thwarted desires to date new people, or a lack of resilience derived from surviving previous large-scale national or global crises such as wars, depressions, and epidemics, as compared to their older counterparts. A robust literature on developmental needs and generational influences suggests that young adults, particularly in newer generations, rely more on friendship than familial relations (Levitt et al., 1993) and are less likely to live with their main social supports or consider a partner to be the center of

their social universe (Jamieson et al., 2006), while shelter-in-place policies discourage multi-household interactions or the expanding of networks from social media to in-person contexts. Other studies before and after this study's time frame also found worsening outcomes for young people, including stress and emotional distress (Robillard et al., 2020; Shanahan et al., 2022).

The second most impactful correlate in the data emerged when controlling for age: financial power. Intuitively, the lesser one's financial power, the greater the depression, hopelessness, anxiety, and sense of control over one's own life during the pandemic. Participants with personal health vulnerabilities to COVID-19 (e.g., at cardiovascular risk, 65 + years old, immunocompromised) tended to have lesser financial power. This was particularly true for participants endorsing American Indian ethnicity, which was significantly associated with both low financial power and personal health vulnerabilities to COVID-19, but—in a representation of resilience—not distress. American Indian ethnicity was not in itself associated with worse mental health overall, but American Indian participants with personal or community health risks during COVID-19 endorsed significantly greater anxiety and somatic distress than those without. LGBQ-identified participants as well as people with ADA disabilities also had significantly lower financial power than their respective comparison groups and likely related elevations in hopelessness and worry during the pandemic. Disproportionate distribution of resources across groups appears to be connected to the amount of mental health distress experienced (Gibb et al., 2020). Taken together, these data support the role of financial resources in maintaining classic lines of marginalization in the United States, in which future analyses should evaluate as a mediator of the impact of pandemics on mental health and distress.

Who is most vulnerable to COVID-19?

One-quarter of American Indian participants and nearly one-third of participants with an ADA disability endorsed personal health vulnerabilities that put them at double and triple the risk for COVID-19, compared to the study average overall. In terms of ethnicity, this result may be indicative of the health inequity for American Indians related to historical trauma and oppression (Hatcher et al., 2020). In terms of disability, this result was anticipated due to the literature on health- and immune-related disabilities, as well as the significant loss of services or accommodations for this community during the pandemic (e.g., Jesus et al., 2021). Given their increased need for safety and services during the COVID-19 pandemic, it is unconscionable that 22% of people with disabilities in this study also reported loss of assistance-based services due to COVID-19 pandemic restrictions.

Over one-third of the disabled, LGBQ, and European American subsamples reported having at least one community or family members with health-related vulnerabilities to COVID-19, compared to about one-quarter for all other groups. This may illustrate differences in social network and risk disclosure patterns as well as community risk (Badgett et al., 2020; Salerno et al., 2020a; Signorelli et al., 2020).

Taken together, these data position cismale gender, heterosexual orientation, and non-disabled status as protective factors amidst the COVID-19 pandemic. These results highlight the importance of resource distribution across marginalized populations, particularly as regards the availability or loss of healthcare, employment, and housing in the event of national crises, especially for disabled and GSM populations (Gibb et al., 2020; Salerno et al., 2020b).

In general, about 40% of the entire sample reported living with environmental vulnerabilities to COVID-19 at work and/or home, seen across all ethnic groups in the study. Trend-level findings demonstrating slightly greater rates of environmental vulnerability to COVID-19 among Hispanic/Latinx participants, followed closely by African-American participants, as compared to the other ethnicities in the study. McNicholas and Poydock (2020) suggest it is actually the type of jobs individuals hold that determines their environmental susceptibility to COVID-19 and the literature shows that those who hold minority identities are generally more likely to hold essential positions (Hawkins, 2020).

Who is most distressed during the COVID-19 pandemic?

Demographics and mental health outcomes

Gender was related to the greatest breadth of distress, across all demographic variables explored. Specifically, ciswomen and TGE participants demonstrated greater and more frequent symptoms of depression, worry, somatic complaints, and distress around health fears and uncertainty during the pandemic. This reflects well-established mental health disparities for women and for GSM populations (LGBT Foundation, 2020; Peterson et al., 2020).

Women and gender minorities also reported feeling less in control of their lives. This effect on LOC could reflect the relative privilege cismen experience in the world. In addition, this relative privilege can be connected to better access to resources for healthcare and stability in employment and financials during the pandemic (Landivar et al., 2020), which may help to explain the gender differences in mental health outcomes. When considered dispositionally, preexisting internal LOC may have a significant, positive influence on a person's ability to cope with stressors as demonstrated in recent COVID-19 pandemic literature (Bachem et al., 2020; Sigurvinsdottir et al., 2020). However, it could be that one mechanism of pandemics'

impact on mental health is a decrease in internal LOC due to situational powerlessness. It may be that during a pandemic, LOC becomes more fluid, incorporating fiscal power, and acting as a moderator of the impact of the pandemic on mental health (Bachem et al., 2020).

Consistent with previous literature (Kamal et al., 2021), the sexual minority participants in this study reported greater levels of hopelessness, worry, and external LOC, in comparison with the heterosexual sample. Exploratory *post hoc* analyses replicated pre-pandemic findings that queer and bisexual individuals often suffer even more than their sexual minority peers (Ross et al., 2018). Our LGBQ sample, like many others (e.g., Gibb et al., 2020), did demonstrate greater rates of poverty than the heterosexual sample. However, findings did not indicate elevated psychological distress for sexual minorities across the board, mirroring theories on unexpectedly strong mental health and resilience among some of the more oppressed ethnicities in the United States (Paul, 2018).

Participants with physical disabilities reported significant but shallow elevations in scores for depression, hopelessness, worry, obsessions/compulsions, and panic, as well as both clinically and statistically significant elevations in pain/somatic symptoms, compared to non-disabled participants. First, these vulnerabilities and distress within the disabled sample may be related to its greater rate of income at or below the poverty line, as compared to the non-disabled sample. Financial resources may serve to insulate some, but not all, people with disabilities from the impact of the COVID-19 pandemic. Furthermore, this high percentage of people who are disabled below or at the poverty line (60%) indicates that they are likely to have government-based health insurance or assistance. Finally, the disruption of disability assistance and services by shelter-in-place policies paired with the use of medical rationing illustrates how regulations by governing bodies to combat COVID-19 may introduce or compound health risks, pain, uncertainty, and fear for the disabled community (Boyle et al., 2020; Lund and Ayers, 2020). Previous literature corroborates that loss of services across disabled populations is commonly associated with increases in injury, pain, and psychological distress (Jesus et al., 2021), as was the case for half of our sample with ADA disabilities. Overall, these results highlight both the deleterious consequences of the loss or lack of essential provisions, as well as the importance of ensuring sustained, unbiased, and consistent accommodations, medical supplies, and services for all disabled populations.

Although our data indicate that many people with disabilities have statistically significant mental health distress, in five areas it is indistinguishable from distress levels of non-disabled participants. One possible interpretation is a ceiling effect, in which the amount of pre-pandemic distress for oppressed populations is already so great that the impact of COVID-19 caused milder elevations for them than for others (e.g., Llera and Newman, 2010). Another compelling

theory is the resiliency interpretation, in which a history of life experiences leads to a greater resilience even in the face of greater stress, resulting in score averages similar to more privileged populations, who may nonetheless be experiencing fewer stressors overall (e.g., Fishback et al., 2020).

In terms of ethnicity, it was the European American group that endorsed significantly greater scores in depression and worry than all other ethnicity samples, particularly the African-American and Hispanic/Latinx samples. No other mental health score means were found to differ significantly by ethnicity. While this disproves our original hypothesis, it is in line with recent COVID-19 research (Graham et al., 2020; Liu et al., 2020), again explained by some sociologists as a feature of resilience against long-standing oppression, in which low levels of omnipresent stress protect some people against the spikes in stress that the COVID-19 pandemic caused for others (Llera and Newman, 2010; Fishback et al., 2020). This theory is supported by the positive correlation between African-American ethnicity and internal LOC, particularly as it relates to resilience in mental health (Bachem et al., 2020). Alternately, the present data could reflect some underreporting of distress by researchers or ethnic minority groups seen in both pandemic and non-pandemic-related contexts (Rochon et al., 2004; Raghav et al., 2021). However, even commensurate rates of distress among all ethnicities would suggest great resilience among the African-American community, given the proven medical disparities and disproportionate impact of COVID-19 on the African-American community (Raine et al., 2020).

Each ethnicity had slightly different COVID-19 risk factors associated, on average, greater with depression, anxiety, or pandemic-related distress: Among African Americans, it was having family and/or community members vulnerable to COVID-19, for American Indians, it was endorsing personal health-related vulnerabilities to COVID-19, or living in urban areas, among Asian Americans, it was being in a home or work with greater environmental COVID-19 risk, and among Hispanic/Latinx participants, personal health-related vulnerabilities to COVID-19 were related only to depressive symptomology. This result may be explained by underreporting in mental health (Rochon et al., 2004), or else because factors beyond the scope of these analyses are determining the mental health of Hispanic/Latinx people during COVID-19. European Americans living in urban areas or under strict shelter-in-place policies reported, on average, greater distress around feeling restricted and disconnected, greater internal LOC, and increased hope. Interestingly, the variability in scores among the European American sample limited its usefulness as a cohesive category, perhaps due to intersectionality with other identities.

There are limitations to this study. First, the data collected are cross-sectional in nature and represent a short 2-month period of time during the COVID-19 pandemic in the United States, which limits the ability to generalize further and also to justify causal relationships. Although quota convenience sampling was utilized to obtain a diverse sample, there were still limitations in the ability to examine intersectional identities and very limited ability to examine sexual orientation and gender outside of exploratory analysis. It is important to consider the limitations of this study with reference to the impact of COVID-19 on participants' finances as this difference is not fully captured within the present study; other researchers have found that anticipation of financial struggles was associated with greater anticipated mental health struggles (Piltch-Loeb et al., 2021). Future work in these areas could use larger samples with nested stratification to further explore intersectionality effects between ethnicity, gender, disability, and sexual orientation. Although our TGE was quite small, exploratory analyses revealed their rates of vulnerability were high comparatively to their cisgender peers; research conducted during a similar time frame to this study with a large TGE population indicated pandemic exacerbation of existing mental health struggles (Kidd et al., 2021). Further research is needed to examine the experiences of the TGE population as differentiated from cisgender women and other sexual orientations as differentiated from the monolith of LGBQ.

Conclusion

Data from this study were collected during the COVID-19 pandemic and in the midst of the significant nationwide protests for racial justice and the continued growth of the Black Lives Matter movement. The present data are a snapshot of that specific time frame, in which various stages of shelter-in-place were in effect in many places, a pattern which may again become relevant during the emergence of future COVID-19 variants or pandemics with restrictive protective measures. Furthermore, this study highlights differential impact of COVID-19 across marginalized identities. Our study did not aim to examine the influences of privilege and intersectional identities, but reaped results that suggest the influence of these phenomena and the intention was to examine results within the context of sociopolitical oppression experienced by marginalized groups. Age was an extremely influential factor throughout our analyses and should be considered or controlled for in all pandemic-related research. In some instances, relative privilege appeared to be a protective factor against psychological distress. As with our Hispanic/Latinx, African-American, ADA disability, and LGBQ samples, the potential of ceiling effects and resilience to stress may render lower rates of mental health disorder in response to equivalent stressors as socially and financially privileged communities and hence understate the impact of the COVID-19 pandemic on marginalized populations.

Taken together, our study has many implications within clinical work and beyond. Disparities in mental health outcomes and COVID-19 risks exist among marginalized communities, with unique experiences across demographic factors, and it is

our hope that these data may be utilized by governing bodies and clinicians as the repercussions of the COVID-19 pandemic continue to develop, and as global planning efforts evolve for future pandemics. Evidence is in line with the theory that most mental health disparities during the pandemic are amplifications of preexisting social disparities, impacting far more people than those at greatest risk of mortality to COVID-19. Government and other organizations must take into consideration the unique needs of populations regarding regulations in the face of the COVID-19 pandemic and other national or global crises and inquire directly with these populations in regard to their needs instead of prescribing interventions from a top–down approach. Our findings show the importance of acknowledging resiliency in marginalized populations, instead of seeing the disparity in distress as an assumed experience. Ultimately, not everyone is impacted equally by the COVID-19 pandemic, and it is critical to examine these unique differences.

Data availability statement

The datasets presented in this article are not readily available because the authors have future planned publications at this time. Requests to access the datasets should be directed to the JB, jbrooks4@alliant.edu.

Ethics statement

This study was approved by the Alliant International University Institutional Review Board (IRB). Participants provided informed consent electronically.

Author contributions

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

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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Naturalistic randomized controlled trial demonstrating effectiveness of Text4Hope in supporting male population mental health during the COVID-19 pandemic

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Background: Mental illness is not uncommon among males. It is estimated that males are more likely to die by suicide, become dependent on alcohol, report frequent drug use, and be dissatisfied with their life, compared to women. In this study, we assessed the potential to offer support to this population using Text4Hope, a texting mental health service.

Methods: The study was a naturalistic randomized controlled trial comparing two populations of Text4Hope male subscribers; an intervention group (IG, Text4Hope subscribers who received once-daily supportive text messages for 6 weeks) and a control group (CG, Text4Hope subscribers who joined the program in the same time frame but were yet to receive text messages). Inferential statistics were used to compare the severity and the prevalence of the likely stress, anxiety, and depression, between the two groups, using the Perceived Stress Scale (PSS-10), the Generalized Anxiety Disorder 7-item (GAD-7), and the Patient Health Questionnaire-9 (PHQ-9), and defined the Composite Mental Health (CMH) score as the sum of these three. T-test, Chi-squared association, and binary logistic regression analyses were applied.

Results: There were 286 male subscribers to Text4Hope. The majority were above 40 years, white, employed, had postsecondary education, were in a relationship, and owned a home. Mean scores of PSS-10, GAD-7, and PHQ-9 scales and the CMH were significantly higher for the CG compared to the IG, 11.4, 28.8, 25.8, and 18.7%, respectively. Similarly, a statistically significantly lower prevalence in IG, compared to the CG, on likely MDD (58.15 vs. 37.4%) and likely GAD (50 vs. 30.8%), with a small effect size. The IG was a significant predictor for lower odds of both likely MDD and likely GAD while controlling for sociodemographic characteristics.

Conclusions: The Text4Hope service is an effective tool for mental health support for male subscribers during the COVID-19 pandemic. Compared to the males who didn't receive the service, those who received it were in better mental health conditions. Further effort is still needed to encourage males to participate in such online services that can help them receive adequate support, particularly during crisis times.

Introduction

While mental illnesses affect both men and women, the latest studies report an increasing trend of mental illness among men (1, 2). It is estimated that three times as many men as women die by suicide, become dependent on alcohol, and report frequent drug use (3). Further, males are more likely to be less satisfied with their lives (3). The literature suggests that males tend to deny mental health concerns and do not seek professional support for their psychological problems. According to Ketterer et al. (4) more females often report depression and anxiety than males. However, anger and denial are usually greater in males. Contributing to the problem, the high levels of emotional stress experienced by men can be a risk factor for the predisposition to physical health adversities, including heart problems (4, 5).

Mental illness is common among males as much as females. According to the Canadian Mental Health Association, one in five people in Canada will personally experience a mental health problem or illness in any given year (6). The StatsCan Canadian Community Health Survey on Mental health and wellbeing found a comparable survey of mental health disorders and substance dependencies among men and women (10% of men compared to 11% of women) (1). According to the Centre for Disease Control and Prevention, men are often less likely to have received mental health treatment than women in the past year (7). This includes medications, counseling, or therapy. The same trend was also noted among the men who endure a severe mental illness (7).

The gender difference in mental illness represents a health disparity that cannot be overlooked. Men are less likely to get the appropriate mental health diagnosis when compared with females who experience the same symptoms or scores on diagnostic scales (8, 9). Such disparity is often reported among males, particularly young adolescents with depressive symptoms (10). Furthermore, the quite different framework of symptomatology of mental illness in males compared to females has added to the problem. From the literature, it was suggested that men might experience mental illness differently than females. For example, depression among males could manifest as irritability, aggression, violence, substance abuse, risky behavior, or somatic complaints (9, 11). Such symptoms are typically not included in the diagnostic criteria of the condition; therefore, they could be easily overlooked without obtaining a formal diagnosis (9, 11).

Several variables may contribute to experiencing mental illnesses among males. This includes genetics, social, and psychological factors. Unemployment, along with the sense of competition with the other gender, can adversely affect the feeling of power (1). Men are often less likely to seek help. Thus, the severe life-threatening conditions can distort their sense of strength and power, aggravating their depressed feeling (1).

In another context, the COVID-19 pandemic has impacted individuals' physical as well as mental health. According to the World health organization, in 2019, nearly a billion people were living with a mental disorder. In the first year of the pandemic alone, depression and anxiety went up by more than 25% (12). The detrimental impacts of the pandemic reflected in morbidity and mortality rates, changes in ways of living and other usual daily activities, along with the uncertainties associated with the pandemic, have mounted up to the experience of mental health adversities (13, 14). Physical and mental long-term sequelae among COVID-19 survivors are high among males (15). Whereas, depression and anxiety were more common among women, men were more likely to endure PTSD during the pandemic (16).

Additionally, male mental health is not highlighted enough in the literature, particularly during the pandemic. This is partly attributed to the nature of data which is often gathered *via* self-reported questionnaire surveys that typically attract more females than males. Previous publications often report more female service subscribers are more likely to receive the online service and report on their mental health using validated scales compared to their male counterparts (17–19). Uneven gender sampling may skew results or limit the ability to generalize to the broader population.

Text4Hope is a remotely delivered service stimulated by the pandemic to integrate technology-based mental health supports provided to the general population in Alberta, Canada, during

the COVID-19 pandemic ([20], [21]). To solicit the mental illness and the potential support among the male population, this study was designed to focus on the assessment of the Text4Hope service outcome among only male subscribers who have received the service for 6 consecutive weeks, compared to the male subscribers who have not received the service, during the COVID-19 pandemic.

Methodology

Study design

This study focused on male subscribers of the Text4Hope service. The design represented a naturalistic randomized controlled trial, comparing two study populations of Text4Hope subscribers who identified as male. The first group was an intervention group (IG) who were subscribers that received once daily supportive text messages for 6 weeks and completed 6 week evaluation measures between April 26 and July 12, 2020. The second group was a control group (CG), who were subscribers who joined the program in the same time frame and completed baseline evaluation measures and did not receive any text messages yet.

The Research and Ethics Board approved the study protocol ([21]) of the University of Alberta (Pro00086163).

Text4Hope

In the Text4Hope program ([22]), individuals self-subscribe to receive daily supportive SMS text messages for 3 months by texting the word "COVID19HOPE" to a short code number. Detailed information about the service was described in previous publications ([23], [24]). In brief, the messages were crafted within a cognitive behavioral framework, with content written by mental health professionals. The first message welcomed subscribers to the service and invited them to complete a baseline survey. At 6 weeks, subscribers were invited again *via* a text message link to complete another web-based follow-up survey.

Data collection

Participation in the Text4Hope service was voluntary, and the completion of the associated online surveys was not pertinent to receiving supportive SMS text messages. Subscribers could opt out of the service at any time. The surveys captured various sociodemographic data provided as categorical factors, including age (<=40 y, >40 y), ethnicity (White, non-white), educational level (postsecondary education, high school diploma or less), employment status (employment, not employed), relationship status (in a relationship, not in a relationship), and housing status (own home, other). Clinical information was also collected, including various mental health self-reported symptoms, which represented the study outcome measures.

Outcome measures

At baseline and 6 weeks, we collected clinical information on stress, anxiety, and depression based on validated screening scales for self-reported symptoms, including the Perceived Stress Scale (PSS; PSS score $\geq$ 14 indicates moderate or high stress) ([25]), the Generalized Anxiety Disorder 7-item (GAD-7) Scale [GAD-7 score $\geq$ 10 indicates likely generalized anxiety disorder (GAD)] ([26]), the Patient Health Questionnaire-9 [PHQ-9; a score $\geq$ 10 indicates possible major depressive disorder (MDD)] ([27]), and defined the Composite Mental Health (CMH) score as the sum of these three. These measures have been shown to have strong reliability and validity.

Hypothesis

We hypothesized that male participants who have received the daily supportive text messages for 6 weeks (IG), when compared to Text4Hope subscribers who were yet to receive the intervention (CG), would have at least 25% lower scores on CMH score, PSS-10, PHQ-9, and GAD-7 scales, in addition to the respective prevalence for each of moderate/high stress, likely GAD, and likely MDD.

Sample size considerations

To detect a 25% difference in mean CMH score between the IG and the CG, given a two-sided significance level $\alpha = 0.05$ and a power of 80% ($\beta = 0.2$), we estimated a sample size of 62 per group would be sufficient.

Statistical analysis

Data analysis was undertaken using SPSS for Windows version 25 (IBM Corporation) ([28]). We examined the difference between the mean scores of PSS-10, GAD-7, PHQ-9 scales, and CMH scores between the IC and CG using independent *t*-tests. In addition, we examined the prevalence of moderate to high stress, likely GAD, and likely MDD in both the IG and CG. Results were summarized by numbers and percentages and compared by chi-squared analysis with a two-tailed criterion ($\alpha < 0.05$), using the identical cut-off scores for PSS-10, GAD-7, and PHQ-9 scales, respectively.

TABLE 1 Distribution of demographic characteristics and isolation conditions of the participants.

Variables	CG $n = 72$	IG $n = 214$	Total $n = 286$	Chi^2	P-value
Age group					
<=40 y	34 (47.9)	68 (31.8)	102 (35.8)	6.02	0.01
>40 y	37 (52.1)	146 (68.2)	183 (64.2)		
Ethnicity					
White	64 (90.1)	173 (81.2)	237 (83.5)	3.07	0.08
Non-white	7 (9.9)	40 (18.8)	47 (16.5)		
Education level					
Postsecondary education	56 (77.8)	152 (88.4)	208 (85.2)	4.53	0.03
High school diploma or less	16 (22.2)	20 (11.6)	36 (14.8)		
Employment status					
Employed	45 (62.5)	118 (69.0)	163 (67.1)	0.97	0.32
Unemployed	27 (37.5)	53 (31.0)	80 (32.9)		
Relationship status					
In a relationship	45 (62.5)	109 (63.0)	154 (62.9)		
Not in a relationship	27 (37.5)	64 (37.0)	91 (37.1)	0.01	0.94
Housing status					
Own a home	45 (64.3)	119 (69.6)	164 (68.0)	0.64	0.42
Other	25 (35.7)	52 (30.4)	77 (32.0)		

To assess the impact of the supportive text message intervention on the clinical measures while controlling for sociodemographic characteristics, we entered all demographic predictors along with the "intervention arm" into three different binary logistic regression models. We examined the odds ratios from the regression models to determine the respective associations between the "intervention arm" and the likelihood of respondents to self-report symptoms of moderate to high stress, likely GAD, and likely MDD, controlling for the other sociodemographic variables in the respective model. Correlation analyses were performed before the regression analysis to rule out very strong correlations ($r_s \geq 0.7$) among predictor variables.

There was no imputation for missing data, and the total numbers reported represent the total responses recorded for each variable.

Results

Table 1 demonstrates the distribution of the sociodemographic characteristics against the two study groups (CG and IG). There were 286 male subscribers to the Text4Hope service during the timeframe of the study, with 72 (25.2%) in the CG and 214 (74.8%) in the IG. From the table, the majority of the participants were above 40 years (183, 64.2%), white (237, 83.5%), had postsecondary education (208, 85.2%), employed (163, 67.1%), or in a relationship (154, 62.9%), and owning home (164, 68%). IG subscribers were significantly older and had higher education levels compared to CG.

Severity analysis

Table 2 summarizes the results of the difference between the three primary outcome variables, along with the CMH score, between the IG and CG. From the table, the intervention group consistently reported a significantly lower mean score across all outcome variables ($p < 0.05$). The mean scores on the PSS-10, GAD-7, and PHQ-9 scales and the CMH score were higher for the CG compared to the IG, 11.4, 28.8, 25.8, and 18.7%, respectively.

Prevalence analysis

Table 3 demonstrates the difference in the prevalence of moderate to high stress, likely depression, and likely anxiety between the IG and the CG of male subscribers. The IG had significantly lower likely MDD (58.2 vs. 37.4%) and likely GAD (50.0 vs. 30.8%) compared to the CG, with a small effect size.

Regression analysis

Table 4 shows the binary logistic regression models examining the effect of the provided intervention on the likelihood of the respondents presenting with moderate to high stress, likely depression, and likely anxiety. There was no high correlation ($r_s < 0.7$) between the suggested factors

TABLE 2 Independent sample t-test comparing the mean scores for IG and CG on PSS, the GAD-7 and PHQ-9 scales and the Composite Mental Health (CMH) score.

Measure	Scores				Mean difference (95% CI)	P-value	t-value (df)	Effect size (Hedge's g)
	n	CG, mean (SD)	n	IG, mean (SD)				
PSS-10 total score	67	20.81 (8.25)	200	18.68 (7.33)	2.13 (0.03–4.24)	**0.047**	1.99	0.3
PHQ-9 total score	62	10.95 (6.89)	187	8.5 (6.55)	2.45 (0.54–4.37)	**0.01**	2.52	0.4
GAD-7 total score	60	9.32 (6.09)	185	7.41 (5.36)	1.91 (0.28–3.53)	**0.02**	2.31	0.3
CMH Score	60	41.00 (19.24)	185	34.53 (17.71)	6.47 (1.18–11.77)	**0.02**	2.41	0.4

CI, confidence interval; CMH, Composite Mental Health Score. Bold values are p-values that are $p < 0.05$.

TABLE 3 Chi-square test of association between prevalence of clinical parameters and study arm.

Clinical Condition	Prevalence n/N (%)		$\chi 2$ (df)	p-value	Effect size
	CG	IG			
Moderate-to-High Stress	55/67 (82.1)	148/200 (74.0)	1.80 (1)	0.18	0.08
Likely MDD	36/62 (58.1)	70/187 (37.4)	8.11	**<0.01**	0.18
Likely GAD	30/60 (50)	57/185 (30.8)	7.29	**<0.01**	0.17

Bold values are p-values that are $p < 0.05$.

(sociodemographic and intervention type); thus, all variables were entered into the models.

From Table 4, the results show that the intervention group was a significant predictor for lower odds of both likely MDD and likely GAD while controlling for the sociodemographic variables (including age and educational status, which showed a significant difference between the CG and IG on chi-square analysis) in the two models.

Regarding the likely MDD, the full model was significant, x^2 (df = 7, n = 218) = 19.46, $p < 0.01$, explaining between 8.5% (Cox and Snell R^2) and 11.4% (Nagelkerke R^2) of the variance and correctly classified 63.8% of all cases. Controlling for all demographic characteristics, the "intervention arm" contributed significantly to the model (Wald = 5.36). The IG was 0.47 times less likely to meet the cut-off threshold for likely MDD during the study period compared to CG (OR = 0.47; 95% CI = 0.25–0.89). This suggests that participants in the CG were 2.13 times more likely to meet the cut-off threshold for likely MDD compared to participants in the IG, controlling for other variables in the regression model.

In terms of likely GAD, the model was significant, x^2 (df = 7, n = 214) = 17.77, p = 0.01, explaining between 8% (Cox and Snell R2) and 10.9% (Nagelkerke R2) of the variance and correctly classified 71% of all cases. Controlling for all demographic characteristics, the "intervention arm" contributed significantly to the model (Wald = 5.12). The IG was 0.47 times less likely to present with likely GAD during the study period compared to CG (OR = 0.47; 95% CI = 0.24–0.90). This suggests that participants in the CG were 2.13 times more likely to meet the cut-off threshold for likely GAD compared

to participants in the IG, controlling for other variables in the regression model.

Regarding stress symptoms, the full model was significant, x^2 (df = 7, n = 228) = 26.32, $p < 0.001$, explaining between 10.9% (Cox and Snell R2) and 16.3% (Nagelkerke R2) of the variance and correctly classified 75.4% of all cases. Controlling for all demographic characteristics, the "intervention arm" failed to predict the likelihood of reporting stress symptoms among the respondents. i.e., respondents in the IG were not significantly more or less likely to experience stress symptoms during the study period compared to the CG (OR = 0.6; 95% CI = 0.28–1.29).

Discussion

This study was a naturalistic randomized controlled trial that examined the effectiveness of Text4Hope among two groups of male subscribers. Our results suggest that Text4Hope helped to support the mental health wellbeing of male participants who received the texts compared to those who did not. Significant differences were observed in favor of the subscribers who received the text messages for 6 weeks. A significant difference was noted in the severity and the prevalence of GAD and MDD scores; however, regarding stress symptoms, the improvement was reported only for the prevalence but not for the severity of the condition. Furthermore, the intervention group was a significant predictor of lower odds for both likely MDD and likely GAD.

TABLE 4 Odds for subscribers in the IG to have various clinical characteristics compared to the CG.

Clinical variables of interest	p-value	Odds ratio	95% CI for OR	
			Lower	Upper
Moderate/High stress[a]	0.19	0.60	0.28	1.29
MDD likely[b]	**0.02**	0.47	0.25	0.89
GAD likely[c]	**0.02**	0.47	0.24	0.90

[a]Moderate or High Stress defined as PSS $\geq$ 14, [b]Likely GAD defined as GAD-7 $\geq$ 10, [c]Likely MDD defined as PHQ-9 $\geq$ 10. Bold values are p-values that are $p < 0.05$.

The study results have partially met the predetermined hypothesis, where symptom severity of both anxiety and depression have reached and exceeded the study target of a 25% difference between the two study groups. Similarly, the prevalence of the two conditions (likely GAD and likely MDD) was significantly lower in the IG compared to the CG, albeit the difference was only 20%.

Texting services generally have several advantages; they do not compromise physical distancing requirements while allowing users to receive essential mental health support (18). Moreover, the service is scalable, convenient, and economically reliable, with growing evidence of its applicability in mental health (29). This study's findings, therefore, are consistent with the recently reported results from the Text4Hope service (23, 30). More than 30,000 subscribers joined the service in the first week of its launch (20). After 6 weeks of receiving the daily text message, the service's subscribers reported remarkable satisfaction and acceptability of the service, with a general agreement that the service improved their quality of life and to cope with stress, anxiety and depression (30). Furthermore, more than 4 in five subscribers felt that they are connected to a support system during the pandemic (30). In clinical terms, Text4Hope has significantly improved the baseline mental health symptoms among service subscribers, represented in stress symptoms, likely anxiety, and likely depression; where the positive impact was reported on the short and long-term of the service, i.e., after receiving the daily text messages for 6 weeks (mid-point) and 3 months (end of the service) (22, 23).

Being in the IG had a significant effect on predicting future mental health status. It was a protective factor against the symptoms of depression and symptoms of anxiety, regardless of the baseline sociodemographic characteristics of the participants. Again, this highlights the value of the provided service, where after 6 weeks, it could protect the mental wellbeing of male subscribers. In consideration of the fact that supportive text messages are perceived as add-on services and not meant in any way to replace the conventional lines of therapy, the effect of most psychiatric interventions is mainly achieved within or after the first 6 weeks of treatment (31–34). Further, the assessment of the change in the symptoms is often recommended after the lapse of this time period (34, 35). Considering this, texting service is not outside the scope of other helplines and may be comparable with the effect of these interventions in terms of their effectiveness and timeline benefits.

The present study pointed out the effect of Text4Hope among male subscribers of the service, contradicting the widely accepted notion that any detected effectiveness of such online services is invariably linked to most female participants and not likely to be generalized to the male minority. This follows the fact that most subscribers of such services are typically females, while males represent one in five at most (17–19). Such effectiveness could highlight the need for similar help channels and public health support for the male equal to the female population.

Finally, it is important to mention that in contrast to the anxiety and depression symptoms, stress symptoms seemed quite resistant to handle with Text4Hope among the male participants. As mentioned earlier, emotional stress is a prominent problem in men that could manifest in diverse ways, even different from women's presenting symptoms. This may explain why the texting services are well-accepted, though the male subscribers seemed less satisfied than their female counterparts (30). Collectively, this may raise the urgent need to carefully address such symptoms among men, particularly during crisis times, such as the current pandemic, aiming to guarantee satisfaction and the good uptake of the service.

This study has several limitations. The small sample size of male subscribers might limit the power of the produced results, which may necessitate further research on a larger study sample of the male population. Additionally, the study followed a naturalistic design that lacked the classic randomization of the participants into the two study groups. An effort was made, however, to control for potential differences based on sociodemographic factors using the logistic regression analysis. Finally, the Text4Hope service couldn't manage the stress symptoms as effectively as it did with the depression and anxiety symptoms, which may necessitate further work to address stress, particularly the emotional stress among males if aiming to support this vulnerable population.

To conclude, Text4Hope is an effective service for mental health support for the male population. Males who received the service for 6 weeks were in better mental health status

compared to those who didn't, particularly regarding depression and anxiety symptoms. Further effort is still needed to encourage males to participate in such services that can help them receive effective support, particularly during crisis times. More importantly, it is imperative to establish effective lines of help and support tailored to the male population through a collaborative effort of community partners and stakeholders. The online support services, such as Text4Hope, would therefore need extra work to acknowledge the male population while designing the service. Such efforts should prioritize the involvement of male representatives who can effectively contribute while building supportive programs, thus guaranteeing that the peculiar mental health needs related to this neglected population are met.

Data availability statement

The raw, de-identified 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 University of Alberta Health Research Ethics Board (protocol code Pro00086163 approved on March 18, 2020). Written informed consent for participation was not required for this study as approved by the University of Alberta Health Research Ethics Board.

Author contributions

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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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Mental health disparities in Latinx immigrant communities residing in the United States during COVID-19: Implications for policy and practice

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Objectives: Studies have demonstrated that Latinx populations face significant health disparities in access to mental health care. The objective of this study was to describe the impact of the COVID-19 pandemic on the mental health needs of Latinx families, from the perspectives of direct service providers working with Latinx communities.

Methods: Twenty-one semi-structured interviews were conducted virtually with direct service providers to the Latinx community from August to October 2020. Interviews were transcribed verbatim and analyzed using thematic analysis.

Results: Two-thirds of providers were female, with a median age of 33 years, and provided direct services to Latinx clients and had extensive experience working with immigrant families, particularly in Massachusetts. Key themes identified describing the impact of COVID-19 on the mental health needs of Latinx families included: (1) exacerbation of mental health symptoms, (2) financial stressors, (3) preoccupation regarding transnational lives, (4) secondary needs becoming more salient, and (5) immigration status as a main driver of inequality.

Conclusions: Our findings highlight the importance of focusing on the mental health needs of Latinx immigrants and ensuring their access to mental health services. Telehealth seems to be a potential tool that promotes mental health access among Latinx clients. Future research needs to continue investigating the role of telehealth in decreasing mental health access disparities.

KEYWORDS

COVID-19 pandemic, Latinx immigrant families, mental health, providers, qualitative research and analysis

Introduction

The Latinx population has a substantial presence throughout much of the U.S. (1). They constitute 60 million individuals, or 18.7% of the total U.S. population (2), and 50% of the foreign-born population in the U.S. (3, 4). Latinxs remain one of the country's largest ethnic minority groups, and their numbers are expected to grow due to continued immigration and higher fertility rates than Black and White populations (3).

Despite the growth of the Latinx population, the health and mental health infrastructure to address their needs is still lacking (5). Salsberg et al. found that Latinx providers are the most underrepresented ethnoracial group in healthcare (5). This lack of representation has direct implications on the care provided to the Latinx populations, which has been evidenced throughout the coronavirus disease 2019 (COVID-19) pandemic. The COVID-19 pandemic has disproportionately impacted Indigenous, Black, and Latinx individuals' physical health and mental health (6–8). The circumstances brought about by the pandemic have also resulted in additional barriers to health and mental health care, primarily due to, but not limited to, widespread loss of employment (9), the inadequate practice of social distancing due to living situations—multigenerational families or low-income and public housing-and high exposure to the virus as essential workers (9). Compared to other racial and ethnic groups in the US, the COVID-19 pandemic has negatively impacted the wellbeing of Latinx communities (6, 7). Latinx individuals in the US were 1.7 times more likely to contract COVID-19, 4.1 times more likely to be hospitalized, and 2.8 times more likely to die from COVID-19 complications in comparison to White individuals (10). In Massachusetts specifically, where this study was conducted, the Latinx population accounts for 12% of the total state population. At the beginning of the COVID-19 pandemic, Massachusetts was the state with one of the highest COVID-19 incidence rates (11). Similar to national findings, a study from Massachusetts indicated that majority-minority neighborhoods were highly impacted with Black and Latinx populations having the highest incidence rates of COVID-19 (11). Importantly, the study also found that the strongest predictor of COVID-19 cases was nativity; foreign-born populations had the highest incidence (11).

COVID-19 has also exacerbated disparities in mental health care access and utilization among Latinx communities, a disparity well-documented in the US even before the onset of the pandemic (12–16). These disparities are worsened by several barriers, including inadequate health insurance coverage and avoidance of government assistance programs, such as food and housing, due to a fear of deportation or legal ramifications (16–19).

Research describing the impact of the COVID-19 pandemic on the US-based Latinx population has been limited. Behbahani et al. (20) described Latinx individuals' difficulty accessing COVID-19 testing sites and treatment services. Previous to the pandemic, there were several reports of barriers to health and social services for Latinx individuals including lack of accessibility, availability, and affordability (21–23) in addition to institutional barriers such as lack of Spanish speaking healthcare team members that prevented Spanish-speaking Latinx clients from accessing services (22). However, these previous findings around barriers to health and social services for the Latinx communities in the US have not been examined during the COVID-19 pandemic. To date, there is a lack of research investigating how the mental health needs and barriers changed during the COVID-19 pandemic among Latinx immigrant families.

Given that providers are in constant communication with their clients, they can offer a unique perspective of clients' needs and how they changed throughout the COVID-19 pandemic. Furthermore, providers can offer essential information about the institutional practices and how these may have been affected during the unprecedented time of the pandemic (22). Despite the literature available on this topic, there is a lack of research investigating whether the mental health needs and barriers changed during the COVID-19 pandemic, particularly among Latinx immigrant families.

To address the gaps in the literature, this study was designed to better understand the mental health barriers that Latinx immigrants faced during the COVID-19 pandemic through the perspectives of direct service providers who work with the Latinx population. We interviewed predominantly mental health providers since they have direct experience with the Latinx population and understand their mental health needs. Specifically, the question that guided this study was: *What are the providers' perspectives on the mental health needs of Latinx immigrant families during the COVID-19 pandemic?*

Materials and methods

This study utilized qualitative descriptive methodology to conduct semi-structured individual interviews with direct service providers to the Latinx community.

Sample

Prospective study participants were recruited from 14 Latinx-serving community organizations, ranging from community health centers to middle schools, predominantly located in Massachusetts, United States. These community organizations were selected based on established relationships that the principal investigator and other collaborators already had with them. The research team met with representatives of several of these organizations and invited them to help in the recruitment process. The community organizations sent

recruitment materials and study information to their teams. Prospective study participants were encouraged to contact the research team *via* email or phone. Inclusion criteria for participation included: (1) being a provider (e.g., health, mental health), (2) working primarily with the Latinx community, and (3) agreeing to engage in a 90-min interview. Exclusion criteria included providers who declined to be audio-recorded. Each prospective study participant was screened for eligibility before proceeding. Participants were given the option of completing the interview in English or Spanish.

Data collection

Data collection was completed remotely from the privacy of participants' homes. All interviews were held *via* distance utilizing computer-based audio call services or telephone. Interviews were conducted by KR and KD, research assistants trained by the study principal investigator, MPL. Following formal data collection, team debriefing meetings were held to address any questions or issues that arose during the interview process. Before initiating the formal interview protocol, the research team member read the information sheet verbatim and obtained verbal consent from the participant. The audio-recorded interview began with a demographic questionnaire, followed by an in-depth interview that lasted an average of 77 min, with a minimum of 38 min and a maximum of 129 min. Twenty of the interviews were conducted in English. One interview was conducted in Spanish. The interview included questions related to the type of work the provider conducted with Latinx immigrants, the wellbeing of Latinx immigrant families, and how these families' needs were altered during the pandemic. Sample questions include: *"How do you feel the pandemic has affected Latinx immigrants?"* and *"Has your organization continued to provide all services since the pandemic began?"* (see Supplementary material for the full interview guide). Once the interviewers noticed that there were no new topics being described by the participants, we identified that data saturation had been reached and data collection was stopped once any remaining participants who had been scheduled were interviewed. The participants were compensated with a $40 gift card for their time. The Boston College Institutional Review Board authorized all procedures under protocol number 21.040.01e. All participants provided informed consent prior to beginning any research activities.

Data analysis

Data were collected from direct service providers to the Latinx community utilizing semi-structured, in-depth interviews. Audio-recordings of the completed interviews were transcribed verbatim using a transcription provider. Each transcript was verified for accuracy by KD. Using thematic

network analysis, the researchers used a grounded theory approach to allow the themes to emerge from the data (24). First, two coders went through all the interviews and assigned generic codes. The interview in Spanish was coded in Spanish to avoid losing any meaning in translation. Second, a codebook was developed based upon these generic codes. After creating the codebook, two coders (KD & KR) recoded all the interviews and identified illustrative quotes for each code. Each code had at least an 80% intercoder agreement. When there was <80% agreement, the coders discussed their coding decisions until general consensus was formed. Overall, the average intercoder reliability agreement among final codes was 93.1%. These final codes were grouped into key themes with coinciding illustrative quotes. Any quotes in Spanish were then translated to English.

Results

Twenty-one in-depth interviews were conducted from August through October 2020. All participants had either a master's degree ($n = 18$; 87.5%) or a doctoral degree ($n = 3$; 12.5%). Most participants provided mental health services ($n = 16$; 76%), three were case managers and two worked at schools. Two-thirds of providers were female, with a median age of 33 years. Fourteen providers (66.7%) identified as Latinx. Most participants (57%) had been practicing for 5 years or more. Providers worked predominantly with Latinx immigrant families from the Dominican Republic, El Salvador, and Guatemala.

Themes

Five themes that impacted the mental health of US-based Latinx families during the COVID-19 pandemic were identified: (1) exacerbation of mental health symptoms, (2) financial stressors, (3) preoccupation regarding transnational lives, (4) secondary needs becoming more salient, (5) immigration status as a primary driver of inequality (see Table 1).

Exacerbation of mental health symptoms

Most providers ($n = 19$; 90%) agreed that they noticed an exacerbation of mental health symptoms among Latinx parents and youth during the pandemic. Many of these mental health symptoms previously existed, such as depression, anxiety, post-traumatic stress disorder, domestic violence, alcohol misuse, panic attacks, and general feelings of stress; however, they were all exacerbated to higher levels of symptoms or experienced in a higher frequency. Providers mentioned that their clients were very concerned about working under risky conditions without the proper protection, contracting COVID-19, and losing their jobs or having their hours cut. Also, providers mentioned that, particularly among undocumented Latinx immigrants, there

TABLE 1 Key themes and illustrative quotes.

Exacerbation of mental health symptoms (*n* = 19; 90%)

"… I just think that it's exacerbated symptoms of depression and anxiety… [COVID-19 has] made it worse for some people, and then they're not accessing services. And it's also true that we have a lot of families and individuals that have undiagnosed mental illness, and so those behaviors are exacerbated, absolutely." *Carla, behavioral health clinician

"I've seen rates of domestic violence go extremely up, and depression, and just overall anxiety… And so I think that has been affecting everyone" Sarah, behavioral health clinician

"Like many immigrant communities, they thrive on community, right? And the socialization and sharing of meals is so much a part of who they are, and what supports them, that the fact that they're being asked to socially isolate and wear masks where you can't see affect is a huge, huge kick […] for this population" Karen, behavioral health clinician

"….that would mean that just not having access to the information means that like, in addition to being like, physically isolated often, there is this like, emotional isolation as well, where people are like, 'I'm here alone, and nobody can help me. And I don't necessarily know, in this new country how to help myself.' And that's not true, but I think a lot of people are put into a situation where they might feel that way." William, case manager

Financial stressors

"I think that it's impacted them not only because of their health, but I think I said this before… they have lost jobs because if they were, for example, in the service industry, the restaurants are closed, or industrial services, cleaning services, any kind of service, that is again, frontline is more susceptible perhaps to not even being in existence anymore. So they don't have jobs or their hours have been cut. Or they have children that need to be taken care of and they don't have childcare" Zulma, behavioral health clinician

"That's […] aside, but the financial, so they lose their jobs that they're already working in under the table. And they don't have, they don't have one of these two, they can't access money… They're not, they can't get unemployment, they can't get any kind of benefits, right. Any kind of assistance" Claudia, behavioral health clinician

Preoccupation regarding transnational lives (*n* = 3; 14%)

"I know, especially for folks who are living here and have family in Central America or have family in places where medical access is just – I mean, we maxed out our medical system in Guatemala in March. So, I know folks here [US] with family that are extremely fearful and scared of what will happen if someone gets COVID there [country of origin]. So yeah, I think those are the main challenges I've seen." Sarah, behavioral health clinician

"And a lot of these families are also thinking about their families back home and sending money back home. So not only can you not provide for yourself and your immediate family that's with you, but you also can't provide for your family that are, you know, in whatever country […] you're originally from" Carla, behavioral health clinician

"There were families that they work here in the US and send money back home, right… They're not.. they're not making money, right? So, when we talk about a challenge to one's identity, that's the big one, you're not able to provide, not just for your immediate family, you're not able to provide for the family that's back home." Mateo, behavioral health clinician

(Continued)

TABLE 1 (Continued)

Secondary needs becoming more salient (*n* = 9; 43%)

"In fact, with some of the parents, I can't talk about everything, because even if you ask someone: is this a privacy issue and they consent, right, like you asked me, […] well I'm not gonna bring that in, because it's irrelevant, but I asked a mother […] 'how are things going?' She ended up emailing me later and saying, 'even though I said that I had privacy to talk, I was unable to talk because my aunt was in earshot and we're staying with her, and my answers would have upset her.'" Karen, behavioral health clinician

"There just wasn't any support whatsoever. Again, access is the big one to technology. Again, right? Oh, you know, these internet companies were giving internet […] free for three months, but then you were a customer after that, right? Well, caregivers who couldn't afford it before, can't afford it now. Technology again, it's a big one. How do you do remote work? If you have, you know, four or five other kids in the home, it's a single bedroom in a shared apartment. Internet is running slow." Mateo, behavioral health clinician

Immigration status as a main driver of inequality (*n* = 17; 81%)

"Yeah, exactly, […] this whole, like work from home thing really sticks out to me, because it's always been this place, this place of privilege. And I think even as a social worker, I never experienced, I never thought I would have a job where I could work from home. But I just know, in all of my clients' experience, that's just not possible. And if they don't work, they don't eat, and their kids don't eat. And so, I just don't think it was taken in consideration, especially in terms of, like stimulus packages, and how that affects undocumented folks." Sarah, behavioral health clinician

"Now, these families are struggling 10 times more than the, you know, regular US population, who are documented and who can seek these services without feeling the fear of deportation" Camila, behavioral health clinician

*All the names provided are pseudonyms that have been created to protect the identity of participants.

was much fear around contracting COVID-19 because then they would have to go to the hospital which could lead to deportation. Several providers (*n* = 8; 38%) reported that community support and ties were a vital support system and method of resilience among the Latinx community. However, during the pandemic, social distancing and other COVID-19 restrictions resulted in isolation from family and friends, negatively affecting their mental health. This included being unable to attend church, see family members, or attend community or social events. One of the providers mentioned the importance and sense of community that stems from socialization stating "being asked to socially isolate and wear masks where you can't see affect is a huge, huge kick […] for this population."

Financial stressors

Providers (*n* = 18; 86%) indicated that one of the main stressors experienced by the Latinx community during the pandemic was related to finances. Providers indicated that most Latinx individuals experienced the loss of employment,

cut hours at work, became essential workers, but obtained no extra pay to work in dangerous and often unhealthy conditions. Providers mentioned that finances were a huge stress, particularly because their clients were usually living pay check to pay check; therefore, losing hours or losing a job meant that several of their clients could no longer afford to pay rent or food. This lack of ability to provide was, in turn, generating a lot of anxiety in the Latinx immigrant clients who had migrated to the U.S. in search of better opportunities, but they were finding themselves in situations they might have experienced prior to migration. Providers also mentioned that some of their clients were afraid of receiving financial help or services they qualified for, such as food from their children's schools, because of fear stating, "they're already working in under the table...they can't access money...they can't get any kind of... assistance."

Preoccupation regarding transnational lives

The providers interviewed indicated that the financial stressors were also tied to the transnational lives of their clients. A few providers ($n = 3$; 14%) indicated that their clients' mental health was also being impacted by their transnational ties in two main ways. On the one hand, providers felt that many of their Latinx clients were highly worried about the health and wellbeing of their family members and relatives back in their country of origin. On the other hand, providers expressed that some of their Latinx clients were worried about not being able to send remittances back home, which compounded the financial stressors they were already facing. Providers discussed this topic in-depth sharing that "a lot of these families are also thinking about their families back home and sending money back home."

Secondary needs becoming more salient

Several providers ($n = 9$; 43%) identified that beyond basic necessities like food and water, the pandemic generated a situation in which prior secondary needs became basic, everyday necessities, particularly when trying to ensure that Latinx communities had access to services including a school for children and telehealth therapy. These secondary needs included reliable access to the internet and privacy in the home. Without these needs being covered, Latinx families were having a more difficult time accessing services, such as basic "internet" for "telehealth," for their children and themselves.

Immigration status as a main driver of inequality

Most providers ($n = 17$; 81%) asserted that immigration status played a crucial role in how the Latinx community was able to deal with the consequences of the pandemic. Providers mentioned that undocumented immigrants were even more susceptible to the effects of the pandemic because they could not access government support like stimulus checks

and/or unemployment assistance. Even when there was financial help available from private donors, making undocumented immigrants eligible for it, the funds usually ran out within the first hour, leaving several people unable to obtain any relief. Providers also mentioned that some of their undocumented clients could not provide proof of income, or did not have an official lease agreement, making them ineligible for emergency financial assistance or rent relief.

Providers mentioned that for their Latinx undocumented clients, not accessing any safety net during this time made them feel excluded, forgotten, and it made them question their belonging in the country. Providers also noted that the hostile rhetoric used by the administration in charge during the pandemic further exacerbated feelings of stress and hopelessness. One provider shared how "these families are struggling 10 times more than the, you know, regular US population, who are documented and who can seek these services without feeling the fear of deportation."

Discussion

Qualitative interviews with direct service providers to Latinx communities around mental health needs during COVID-19 identified five themes that summarized the difficulties faced by Latinx immigrant families faced during these unprecedented times in contemporary history.

Study findings reinforce literature on the intersectional issues faced by Latinx individuals related to their marginalized identities, including poverty, language barriers, lack of health insurance, and immigration status (25). During the pandemic, the Latinx immigrant population was further marginalized by the lack of policies that focused on their specific needs. According to providers, the COVID-19 pandemic exacerbated mental health symptoms among the Latinx immigrant population, and the mental health consequences of the pandemic will likely linger for many years (26). Therefore, it is important for health and mental health providers to monitor and screen patients using validated screenings coupled with culturally grounded conversations around mental health and wellbeing (27).

The exacerbation of mental health symptoms described by study participants is consistent with the COVID-19 Latinx mental health disparities literature (26). While the research on Latinx children is limited, Blanco et al. (28) found that social distancing for Latinx children living in California (e.g., social distance learning) was another source of stress. These findings suggest that it is critical for mental health providers to focus on the Latinx immigrant community and address mental health symptoms through increased mental health access and an increased number of mental health practitioners who are culturally and linguistically competent to meet their

mental health needs. It is important for health and mental health providers to pay particular attention to signs of distress among the Latinx immigrant population and try to establish conversations around the stressors the pandemic brought about and how they have been coping with them. Now that pre-pandemic activities are resuming, providers need to reach out to Latinx families and other families who had a particularly difficult time during the pandemic to ensure their mental health needs are being covered.

The study findings around financial stressors align with previous studies indicating lost income (28, 29) and financial hardships, with greater increases among families with undocumented immigrants (30). Under these circumstances, mental health providers often address basic needs, rather than focusing on treating mental health symptoms. Given the changing world that we live in, it is necessary to understand that what used to be considered "basic necessities" have fluctuated as the world has adapted to the pandemic to include internet and privacy. This indicates that changes need to occur at the policy and institutional levels to ensure the holistic wellbeing of Latinx immigrant families, regardless of legal status. Also, providers need know about resources that immigrant families can apply for without fear of being considered a public charge their fears around applying for resources. At the institutional level, health centers need to offer integrated care, where the clients' basic needs including housing, food, and utilities, can be addressed in conjunction with their physical and mental health needs.

This study also describes how Latinx families were worried about the lives of their families in their country of origin with our findings differing from what previous studies have shown. Several studies have found that remittance decrease the likelihood of psychological distress (31) and depression (32). However, our results need to be considered within COVID-19, where 69% of Latinxs with a foreign-born family member lost jobs, worked fewer hours, or lost income, and 54% indicated substantial material hardship due to the pandemic (33). Given the economic impact of COVID-19, it is possible that the role of remittances changed while people worked toward economic stability. This finding highlights the importance for providers to explore the nature of transnational relationships when working with Latinx immigrants to identify stressors and their impact on mental health. Transnational relationships present an essential opportunity for providers to discuss with their clients during therapeutic encounters to ensure that these relationships remain a positive source of support and strength for Latinx immigrants, rather than an additional stressor to their daily lives.

Finally, according to our participants, immigration status was the main driver of inequity during the COVID-19 pandemic. Legal status became a determining factor in whether Latinx immigrants had access to necessary aid. For instance, families without documentation were ineligible for unemployment benefits and stimulus checks, leaving those who lost their jobs without aid (20). At the same time, those who could maintain their jobs and were deemed essential workers were at a higher risk of contracting COVID-19 and putting their families at risk while still not experiencing the same employment or health protections as Latinxs with legal status (20). The intersectional identities of Latinx immigrants, particularly of undocumented immigrants, exacerbated the needs they faced during the COVID-19 pandemic. Providers can play a key role in identifying and discussing how these intersectional identities impact clients differently. As the pandemic continues to uncover and exacerbate disparities, more resources are needed to support the Latinx population, particularly immigrants who lack documentation.

Limitations

The generalizability of study findings is limited by the sample of providers working with low-income Latinx immigrant families. We acknowledge that the Latinx diaspora is quite diverse, and Latinx immigrants come from different countries and socio-economic backgrounds. Second, responses from different types of providers (e.g., mental health, health) were analyzed together; however, it is possible that other themes would have arisen if analysis had been stratified by provider type. Despite its limitations, the study is novel in its qualitative examination of mental health needs of Latinx immigrant communities from the perspectives of providers during an ongoing pandemic.

Conclusion

Our findings from direct service providers highlight the detrimental mental health effect of COVID-19 in Latinx immigrant communities. It is essential to address the mental health needs of this population and ensure their equitable access to mental health services. Telehealth holds promise for Latinx clients and should be offered to meet the crucial mental health needs of this community and reduce systemic barriers to access and care.

Data availability statement

Data will be made available upon request to the corresponding author.

Ethics statement

Boston College Institutional Review Board authorized all procedures under Protocol Number 21.040.01e. The

patients/participants provided their written informed consent to participate in this study.

Author contributions

MP-L: conceptualization, methodology, formal analysis, investigation, writing—original draft, and visualization. NJP-F, KD, and KR: methodology, formal analysis, investigation, writing—original draft, and writing—review and editing. GO: writing—review and editing. SS: conceptualization, writing, visualization, senior review, 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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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2022.1000233/full#supplementary-material

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Suicidal behaviour amid first wave of COVID-19 pandemic in Malaysia: Data from the COVID-19 mental health international (COMET-G) study

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During the COVID-19 pandemic, numerous social and life changes were implemented to curb the spread of the disease. The effect of lockdown and isolation predisposes the general population to various psychological health concerns. The existing determinants of suicidal behaviour were further added with social isolation, financial stress, depression, and other pandemic-related stressors. Hence, our study aimed to investigate suicidal behaviour and the associated factors among Malaysians during the COVID-19 pandemic. It is a cross-sectional online questionnaire survey that used convenient sampling, where the survey was disseminated to the public *via* Google Forms through social media during the first wave of the COVID-19 pandemic in Malaysia. This study is also part of a large international COVID-19 mental health international study for the general population (COMET-G). This research revealed concerns about issues related to suicidal behaviours during the beginning of the COVID-19 pandemic. Suicidal behaviours were associated with depression, sex, marital status, educational level, employment type, residential area, number of people living together, number of children, and family dynamics. The pandemic effects from psychological, social, and economic perspectives will definitely take more time for recovery. Future prevention and protection are needed especially for the highly at-risk group on top of the general population in any future unforeseen circumstances of the pandemic.

KEYWORDS

suicidal behaviour, COVID-19, Malaysia, mental health, pandemic

Introduction

The COVID-19 infection leaves long-term neuropsychiatric symptoms, including sleep problems, anxiety, depressed mood, and irritability, making them more vulnerable to mental health disturbances. Furthermore, the effects of lockdown, isolation, and quarantine predisposed the general population to psychological and emotional burdens, putting them at risk of mental health disorders (1). Although COVID-19 had its outbreak in China in December 2019, Malaysia only had the first COVID-19 case in February 2020. Due to this threat, Malaysia had its first movement control order (MCO) on 18 March 2020 (2). During this time, travelling across districts and states was to be avoided, and mass gatherings were postponed, especially in religious houses. These continued in a few separate episodes until the end of 2021 (3).

There was heterogeneous nomenclature for definitions of suicidal behaviour according to literature. Suicidal behaviour is defined as suicide attempts, which are self-directed injurious acts with at least some intent to end one's own life, which range from completed suicide to highly lethal and failed suicide attempts to low-lethality, usually impulsive attempts due to social crisis (4). Factors affecting suicidal behaviour are complex and variable. These factors can generally be divided into sociodemographic, socioeconomic, socio-political, geographical, cultural, lifestyle, and health- or clinical-related factors (5). Personality and individual differences, cognitive factors, social aspects, and adverse life events are the main psychological factors contributing to the suicidal behaviour (6). The Malaysian data collected before the COVID-19 pandemic showed that the determinants of suicidal behaviour were income, age, gender, ethnicity, education, marital status, self-rated health, and being diagnosed with diabetes and hypercholesterolemia (7).

During the COVID-19 pandemic, the existing determinants of suicidal behaviour were added to social isolation, financial stress, depression, limited or variable access to healthcare services, and other pandemic-related stressors (8). Studies done during the COVID-19 pandemic found that suicidal ideation was associated with loneliness, anxiety, depression, insomnia, impaired family functioning, a history of mental health issues, alcohol misuse, COVID-19-related stress symptoms, concerns over COVID-19, having tested positive for COVID-19, a younger age, an unmarried or divorced marital status, living alone, being a military veteran, previous homelessness, financial strain, housing instability, unemployment, poor perceived quality of physical health, disability, and living with an individual with frail health (9–12). A study in Italy showed that 14% of respondents were at higher risk of having suicidal ideation after being unemployed due to the pandemic (13). While another study among healthcare workers (HCW) in Malaysia during the COVID-19 pandemic discovered that suicidal ideation was linked to

depression and early career status of less than 10 years in service (14).

Our study investigated suicidal behaviour and the associated factors among Malaysians during the COVID-19 pandemic. This study is part of a large international COVID-19 mental health international study for the general population (COMET-G).

Methodology

Study design

This study is part of the global joint project of more than 40 countries worldwide initiated by the Aristotle University of Thessaloniki and the Mental Health Sector of the Scientific Research Institute of the Pan-Hellenic Medical Association, Greece. It is a cross-sectional online questionnaire survey that used convenient sampling.

Data collection

In Malaysia, the survey was disseminated to the public using Google Forms through social media (e.g., Facebook and Twitter) during the first wave of the COVID-19 pandemic. The distribution of the survey was done from 1 July 2020 (average of six cases per week) to 6 October 2020 (average of 338 cases per week) during the initial wave of the COVID-19 pandemic in Malaysia.

The selection criteria were participants aged 18 years and above, who could read Malay or English, and who had access to the internet to receive the online form. All potential participants were provided with an explanation regarding the risk and benefits of the study on the introductory page of the online questionnaire. Participants who agreed to participate were invited to answer the questionnaires. Implied consent was gathered when the participant proceeded to the next page, where the actual survey began. This study was approved by the local institutional research ethics committee, REC/06/2020 (MR/109).

Measurement tools

Embedded in the survey was Pro Forma questionnaire for sociodemographic data, including sex, age, marital status, residential areas, educational status, employment, and status of being a HCW status, living condition (including the number of people living together, number of children, and status of living with a vulnerable family member), and their background medical disease. The detailed categorisation of independent variables followed the main COMET-G study, which include

sex statuses (female, male, and other/do not want to declare), age (years old) (≤ 21, 22–45, 46–60, and ≥ 61), marital status [single or married (or in a civil partnership), divorced (or estranged), co-habitant, widower, or other], educational level (elementary school or less, high school degree or equivalent, bachelor's degree, master's degree, and doctorate), residential area [capital city, city > 1 million population, city (100,000–1 million population), town (20,000–100,000 inhabitants), town (< 20,000 inhabitants), rural area to village and other], number of people living together (one, two, three, four, and five or more), number of children (zero, one, two, three, and four or more), living with vulnerable people (No or Yes), employment status (working at the public sector, working at private sector, self-employed, retired, unemployed, housekeeper, college or university students, not working by choice, and other), status as HCW (doctor, nurse, other HCW with direct contacts to clinical work, administrative employee at a hospital, other hospital staff, and do not work in the health sector), and status of the chronic medical illness (No or Yes).

For mental health status, the presence of depression and anxiety were assessed with the Center for Epidemiologic Studies Depression Scale (CES-D) and the State-Trait Anxiety Inventory (STAI-Y). The English version of these questionnaires was prepared by the lead collaborating centre, while the Malay version was prepared after translation and discussion between local researchers with reference to the Malay version of the questionnaires (15). The total scores of those questionnaires were used to indicate depression when the CES-D score was above the cut-off score of 23/24 and the algorithm score was above 9.03 as per the categorisation in COMET-G (16) and anxiety, respectively. Furthermore, statements assessing the emotional changes (joy and melancholy) were also included in the survey. Spirituality was also assessed using a Likert score ranging from 0 to 3.

Participants were also asked about the family dynamics during the lockdown due to the pandemic. Using Likert scores ranging from "−2 = much less," "−1 = less," "0 = same," "1 = more," and "2 = much more," the participants were asked about their needs to communicate with other members of their family, receive emotional support from other members of the family, and the presence of any conflicts with the rest of your family members during the period of lockdown due to the pandemic. They were also asked about changes in the overall quality of relationships with the other members of their family compared to the one before the quarantine by choosing the score: "−2 = much worse," "−1 = worse," "0 = it has not changed," "1 = a little bit better," and "2 = much better." Similar scoring was used for the status of the participant's financial status. Furthermore, a question was also given about managing to maintain a basic daily routine (such as waking up in the morning, regular meals, sleeping hours, and routine activities) both for participants and their families, the scores ranged from "0 = not at all," "1 = a little," "2 = most of the times," and

"3 = always." Finally, the level of difficulty managing their children's daily life and behaviour was also asked, and the scores ranged from "−2 = much more difficult than before," "−1 = somehow more difficult but not always," "0 = same as always (also if the participant does not have children)," "1 = somehow easier but not always," and "2 = much easier than before." The overall family dynamics are represented by the total scores of all domains of the family dynamic scores.

Suicidal behaviour was measured with the Risk Assessment Suicidality Scale (RASS) (17). The English version of the survey was prepared by the lead collaborating centre, while the Malay version was prepared after translation and discussion between local researchers. The overall suicidal behaviour was indicated by the total score of RASS, while the suicidal intention, lifetime suicidal behaviour, and history of suicidal behaviour were assessed using the RASS subscales of "intention," "life," and "history," respectively (17). The full protocol can be found elsewhere (16).

Statistical analyses

Descriptive statistics were calculated for the independent variables: key sociodemographic variables (including sex, age, marital status, educational level, residential area, number of people living together, number of children, employment, status as HCW, and the status of living with vulnerable people), health status (status of chronic medical illness, depression, and anxiety), family dynamics, and spirituality. All independent variables that are significant ($p < 0.05$) in bivariate analyses were included in the model. Multiple forward stepwise linear regression analyses were performed to investigate variables that could be the contributing factors for overall suicidal behaviour. Two-tailed p-value and 95% confidence intervals (95% CI) were provided. Statistical analyses were performed using IBM SPSS version 26.

Results

The study sample included 963 participants; the majority were women (578; 60.0%) and a small proportion refused to declare their sex identity or chose "other" (74; 7.7%). The mean age of the participants was 40.1 ± 12.0 years, and about two-thirds (662; 68.7%) were between 22 and 45 years old. The majority (725; 75.3%) had tertiary education such as bachelor, master, or doctoral degree. Participants came from all types of residential areas, from rural areas (156; 16.2%) to towns (265; 27.5%) and city centres (517; 53.7%). Most of the participants were living with at least someone (916; 95.1%), less than one-third had no children (298; 30.9%), and about one-third were living with someone vulnerable (311; 32.3%). In terms of employment, about one-third were working in the public

TABLE 1   Background sociodemography of the participants.

Sociodemographic factors		N (%)
Sex	Female	578 (60.0)
	Male	311 (32.3)
	Other/do not want to declare	74 (7.7)
Age (years old)	≤ 21	27 (2.8)
	22–45	662 (68.7)
	46–60	200 (20.8)
	≥ 61	74 (7.7)
Marital status	Single	232 (24.1)
	Married (or in a civil partnership)	618 (64.2)
	Divorced (or estranged)	51 (5.3)
	Co-habitant	48 (5.0)
	Widower	12 (1.2)
	Other	2 (0.2)
Educational level	Elementary school or less	35 (3.6)
	High school degree or equivalent	176 (18.3)
	Bachelor's degree	419 (43.5)
	Master's degree	247 (25.6)
	Doctorate (Ph.D.)	59 (6.1)
Residential area	Capital city	279 (29.0)
	City > 1 million population	147 (15.3)
	City (100,000–1 million population)	91 (9.4)
	Town (20,000–100,000 inhabitants)	108 (11.2)
	Town (< 20,000 inhabitants)	157 (16.3)
	Rural area – village	156 (16.2)
	Other	25 (2.6)
Number of people living together	1	47 (4.9)
	2	140 (14.5)
	3	265 (27.5)
	4	231 (24.0)
	5 and more	280 (29.1)
Number of children	0	298 (30.9)
	1	128 (13.3)
	2	239 (24.8)
	3	147 (15.3)
	4 or more	151 (15.7)
Living with vulnerable people	No	652 (67.7)
	Yes	311 (32.3)
Employment	Working at the public sector	357 (37.1)
	Working at private sector	192 (19.9)
	Self-employed	127 (13.2)
	Retired	64 (6.6)
	Unemployed	16 (1.7)
	Housekeeper	34 (3.5)
	College or university students	129 (13.4)
	Not working by choice	9 (0.9)
	Other	35 (3.6)
Status as healthcare workers (HCW)	Doctor	55 (5.7)

(Continued)

Sociodemographic factors	N (%)
Nurse	25 (2.6)
Other HCW with direct contact to clinical work	31 (3.2)
Administrative employee at a hospital	27 (2.8)
Other hospital staff	8 (0.8)
Do not work in the health sector	817 (84.8)

sector (357; 37.1%), and 129 (13.4%) of the participants were college or university students. The majority (817; 84.8%) did not work in the health sector. Table 1 shows further details of the sociodemographic background of the participants.

Of the total participants, 180 (18.7%) had chronic medical diseases as tabulated in Table 1. For depression, the mean ± SD of CESD scores was 21 ± 10.51 and the scores ranged from 3 to 56. For anxiety, the mean ± SD of STAI scores was 45.92 ± 9.60 and the scores ranged from 20 to 78. The mean ± SD for the total score of family dynamic parameters was −0.59 ± 3.70 and the scores ranged from −12.00 to 11.00. The spirituality score ranged from 0 to 3, with a mean ± SD of 1.74 ± 1.05.

Bivariate analyses of the associations between suicidal behaviours and the possible contributing factors

Table 2 summarises the bivariate analyses of the associations between suicidal behaviours and the possible contributing factors. The tests showed that overall suicidal behaviours were associated with sex ($F = 10.278$, $p < 0.001$), marital status ($F = 8.074$, $p < 0.001$), educational level ($F = 3.567$, $p = 0.003$), employment type ($F = 8.747$, $p < 0.001$), residential area ($F = 5.481$, $p < 0.001$), number of people living together ($F = 4.048$, $p = 0.003$), number of children ($F = 2.556$, $p = 0.038$), depression ($r = 0.440$, $p < 0.001$), anxiety ($r = 0.311$, $p < 0.001$), and family dynamic ($r = -0.088$, $p = 0.009$). Overall suicidal behaviours and each domain of RASS (intention, lifetime, and history) were associated with sex, employment type, educational level, number of people living together, number of children, anxiety, and depression. On the contrary, none of the suicidal behaviour domains was associated with the existence of chronic medical diseases.

Factors contributing to suicidal behaviour

Table 3 summarises the multivariate forward linear regressions of three proposed models. All three models are statistically significant with low adjusted R^2 and low collinearity scores. The first model includes depression, sex, family dynamic,

and the number of people living together as the significant contributing factors to suicidal behaviours. The second model includes the number of children as another additional factor (a protective factor). The third model shows that depression, sex, family dynamics, number of people living together, the number of children, and marital status changes are significant contributing factors to suicidal behaviours.

Discussion

Due to MCO during the COVID-19 pandemic, psychological effects were evident among the general population. Suicidal behaviour was one of the main outcomes of this study. We found that suicidal behaviour was highly associated with sex, marital status, educational level, employment type, residential area, number of people living together, number of children, and family dynamics. Most participants in this study were educated; therefore, they had better access to the internet and participated in this study. WHO found women to have a higher risk of suicidal behaviour, although they have lower rates of suicide compared to men. Knowledge of the importance of gender factors shows the importance of paying attention to each gender when suicidal behaviour is identified.

A straightforward explanation may be that women expressed suicidal behaviour more than men, probably due to higher emotional sensitivity toward stress, especially during adverse life events [18]. A few other local studies found a higher prevalence of depression and anxiety among Malaysian women [19] and a higher rate of suicidal ideation among female HCW during the MCO [14].

According to a systematic review by Mamun [1], loneliness and social isolation caused by MCO during COVID-19 affected more those who are alone, such as those divorced, separated, widows, or those with no children or staying alone. These findings matched our findings that these sociodemographic factors had a higher risk of suicidal behaviour during the pandemic. Our study found that higher educational status was linked to suicidal behaviour during the pandemic. This could be explained by the fact that high educational attainment leads to stability in employment, and the pandemic causes a sudden loss of jobs, hence causing high frustration and distress. This

TABLE 2 The bivariate analyses of associations between suicidal behaviours and the possible contributing factors.

Possible contributing factors	Overall suicidal behaviour		Suicidal intention		Lifetime suicidal behaviour		History of suicidal behaviour	
	RASS total	P-value	RASS intention	P-value	RASS life	P-value	RASS history	P-value
Sex	10.278	0.000*	3.020	0.049*	17.108	0.000*	18.235	0.000*
Age	0.779	0.506	2.382	0.068	2.236	0.083	3.140	0.025*
Marital status	8.074	0.000*	9.864	0.000*	0.991	0.422	3.888	0.002*
Educational level	3.567	0.003*	5.268	0.000*	7.678	0.000*	6.048	0.000*
Job								
Employment type	8.747	0.000*	8.522	0.000*	8.380	0.000*	6.714	0.000*
Status as healthcare workers (HCW)	2.107	0.062	3.951	0.001*	2.248	0.048*	4.619	0.000*
Living arrangement:								
Residential area	5.481	0.000*	11.202	0.000*	1.269	0.269	4.625	0.000*
Number of people living together	4.048	0.003*	15.221	0.000*	13.251	0.000*	2.632	0.033*
Number of children	2.556	0.038*	5.983	0.000*	8.285	0.000*	4.938	0.001*
Living with vulnerable people[a]	0.884	0.990	2.489	0.077	−3.187	0.000*	2.197	0.867
Health status								
Chronic medical illness[a]	−0.799	0.425	−0.751	0.453	−0.886	0.376	0.330	0.741
Depression[b]	0.440	0.000*	0.615	0.000*	−0.123	0.000*	0.297	0.000*
Anxiety[b]	0.311	0.000*	0.353	0.000*	−0.070	0.000*	0.382	0.000*
Family dynamic[b]	−0.088	0.009*	−0.298	0.000*	0.242	0.000*	0.011	0.736
Spirituality[b]	−0.020	0.526	−0.115	0.000*	0.106	0.001*	0.038	0.235

*$p < 0.05$.
[a]Independent T-test was used for analyses between suicidal behaviour and sociodemographic factors with two categories; status of living with vulnerable people and status of having a chronic medical disease. [b]Pearson's correlation was used to test the association between total scores of each suicidal behaviour parameters and total score of CESD for depression, total score of STAI for anxiety, total score of family dynamic and total score of spirituality. One-way ANOVA test was used for other inferential analyses between each suicidal behaviour parameters and independent variables with three or more categories. P-value is the test which is significant with $p < 0.05$.

TABLE 3 Proposed models of factors contributing to suicidal behaviour.

Model		Adjusted R^2	Adjusted beta	T	P-value	95.0% confidence interval for B		Collinearity statistics	
						Lower bound	Upper bound	Tolerance	VIF
1	(Constant)	0.192		4.954	0.000	1.960	4.532		
	Depression		0.456	13.286	0.000	0.176	0.237	0.801	1.249
	Sex		0.118	3.822	0.000	0.413	1.284	0.991	1.009
	Family dynamic		0.078	2.273	0.023	0.013	0.183	0.800	1.250
	Number of people living together		0.070	2.170	0.030	0.028	0.551	0.897	1.115
2	(Constant)	0.201		4.929	0.000	1.932	4.489		
	Depression		0.459	13.446	0.000	0.177	0.238	0.800	1.250
	Sex		0.109	3.542	0.000	0.350	1.219	0.984	1.016
	Family dynamic		0.071	2.074	0.038	0.005	0.174	0.797	1.255
	Number of people living together		0.120	3.387	0.001	0.208	0.781	0.739	1.353
	Number of Children		−0.113	−3.350	0.001	−0.602	−0.157	0.814	1.228
3	(Constant)	0.205		2.896	0.004	0.729	3.793		
	Depression		0.458	13.443	0.000	0.177	0.237	0.800	1.250
	Sex		0.099	3.205	0.001	0.277	1.153	0.965	1.037
	Family dynamic		0.070	2.044	0.041	0.003	0.172	0.797	1.255
	Number of people living together		0.140	3.824	0.000	0.279	0.869	0.696	1.436
	Number of children		−0.140	−3.908	0.000	−0.706	−0.234	0.719	1.391
	Marital status		0.072	2.198	0.028	0.046	0.821	0.861	1.161

is in line with other studies that found that a high educational level was associated with a higher risk of suicidal behaviours (20, 21). Those with unemployment were found to be associated with suicidal behaviours, and financial constraints may precipitate economic stunting during the pandemic (22).

This study found that suicidal behaviour during the COVID-19 pandemic was associated with depression and anxiety. This finding was similar to other studies done during the same time (1, 8, 10, 11). This finding was expected, as suicidal behaviour could be a manifestation of depression and anxiety and also the consequence of these psychological problems. Depression and anxiety are known risk factors for suicidal behaviour, and during the COVID-19 pandemic, people may develop depressive symptoms and anxiety following reports of deaths, increased media communications, and an escalating number of new cases (23). Another study found an association between depressive symptoms, COVID-19 preventive practice measures, daily activities in home quarantine, and suicidal behaviours (24). Another review of sociocultural risk and predisposing factors for suicidal behaviour in developing countries revealed that the fear of being infected with COVID-19, growing economic pressure, and lack of resources due to lockdown were significant (25).

Surprisingly, in our study, having a chronic medical illness was not a significant contributing factor to suicidal behaviour. This is contrary to findings by other studies, which demonstrated that the presence of comorbid medical illnesses like diabetes, cerebrovascular diseases, heart diseases, and other chronic conditions would increase the risk of developing mental health problems, including suicidal behaviour (9–11, 26, 27). We were unable to demonstrate the association between suicidal behaviour and having chronic medical illness because this study did not take into account the severity and types of the chronic medical illness. Another explanation was that a previous study showed the effect that medical illness has on a person's life in terms of disruption to daily activity rather than the number of medical conditions that predict suicide risk (28), which could explain the lack of association in our study.

However, from an ethnocultural point of view, illness perception differs between different religions in Malaysia. Malay Muslims believed suffering and diseases were trials from God for a better life in the everlasting world, while Chinese Taoists perceived illnesses to be an imbalance of forces in the body system. On the contrary, Christians may believe illnesses are due to personal sins and are a form of cleansing (29).

There were some practical strategies for reducing and managing suicidal behaviours during the COVID-19 pandemic. The government needs to address COVID-19-related unemployment and financial insecurity through financial provisions like tax deferral, wage subsidy, and investment in the labour market programme, as well as support for employers,

to help them retain their workers (30). In Malaysia, the government used fiscal policy to allocate a huge budget from the lowest income individuals to the highest international trade to reduce the economic implications caused by the outbreak of COVID-19 (31). Other suicide prevention strategies include improving access to mental healthcare; responsible media reporting with information about available support; preventing increased alcohol intake; and limiting access to lethal means of suicide (32).

Limitations and recommendations

Since this was a cross-sectional study, we were unable to demonstrate a causal-effect relationship. The data collection was fully online and distributed *via* social media, therefore this study was limited to participants with internet access and social media. There was also selection bias due to the convenience sampling method, which may affect the generalizability of the results to the general population. There were also other confounding factors not studied, like the history of suicidal attempts, life events, and family history of suicide. We would like to recommend a future prospective study to investigate this topic in more detail, to include other factors that could influence suicidal behaviours using randomised sampling and both online and physical data collection.

Conclusion

This study revealed that depression, sex, family dynamics, the number of people living together, the number of children, and marital status are significant contributing factors to suicidal behaviours. With an understanding of the related variables associated with suicidal behaviours among the general population, which is supported by data, future mental health support can be provided for intervention, prioritising the at-risk group. This will also help in future preparedness for an unforeseen pandemic.

Data availability statement

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

Ethics statement

The studies involving human participants were reviewed and approved by the Research Ethics Committee Research Management Centre Universiti Teknologi MARA.

The patients/participants provided their written informed consent to participate in this study.

Author contributions

SR, JS, NH, and NR were the primary authors in analyzing and writing the manuscript. DT, DS, and KF were involved in the design and conceptualization of the whole research project. 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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Knowledge, attitude, and practice related to COVID-19: A comparison between patients with mental illness and the general population in Qatar

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Background: In 2020, the World Health Organization (WHO) declared COVID-19 a global health pandemic. The rapid spread and high fatalities associated with COVID-19 have increased interest in assessing Knowledge, Attitude, and Practice (KAP) toward this illness among the general population in comparison to specific subgroups. Most publications to date have explored KAP among the general public, healthcare providers, and people with chronic conditions, but not amongst those with mental illness. Yet, research has shown patients with mental illness are at higher risk of poor outcomes related to infectious diseases such as COVID-19. The objective of this study is to compare KAP toward COVID-19 between people with mental illness and the general public.

Materials and methods: This is a cross-sectional study, done over 3 months in 2020, to compare KAP during the COVID-19 pandemic in three groups: outpatients from outpatient Psychiatry clinics ($N = 165$), inpatients admitted to a Psychiatry ward ($N = 100$), and the general public ($N = 345$). KAP parameters were assessed through online surveys.

Results: The proportion of subjects in the public group (84.8%) giving the correct responses to most Knowledge questions was significantly higher than those in the inpatient and outpatient groups. Compared to the public and inpatient groups, subjects in the outpatient group (92.7%) were significantly more optimistic and confident that COVID-19 would be brought under control. A higher proportion of subjects from the general public (82.9%) indicated that they attended crowded places and were more compliant in wearing masks. Multiple linear regression analyses showed that poorer COVID-19 knowledge was associated with being single and having a young age (18–29), with both inpatients and outpatients and with primary-or secondary-level education.

Conclusion: Patient populations, both inpatients and outpatients, had inadequate Knowledge, more positive attitudes and confidence regarding the outcome of COVID-19, and less safe practices than the public. This highlights the need for targeted approaches around COVID-19 and pandemics in general in this vulnerable population.

KEYWORDS

KAP, COVID-19, mental health, patients, public

Introduction

On March 11, 2020, the World Health Organization (WHO) declared a global health emergency due to the COVID-19 pandemic. Although COVID-19 is considered to be less fatal than other virally-transmitted diseases, such as the Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS), it is highly infectious, which explains its rapid spread internationally. As of August 2, 2022, the WHO has reported a total of 575,887,049 confirmed cases of COVID-19 infections globally, including 6,398,412 deaths [1].

The rapid spread and the high number of fatalities caused by the disease have prompted most countries to implement several precautionary measures to contain it. Such measures ranged from practicing hand and respiratory hygiene and social distancing to total national lockdowns. The success of such governmental efforts and whether people adhere to them and adopt the required behavioral changes depends largely on the public's Knowledge, Attitude, and Practice (KAP) toward COVID-19 [2, 3]. This has given rise to increased interest in assessing KAP among the general population in comparison to specific subgroups, with varying outcomes of such assessments from one population to another. For instance, at the early stages of the pandemic, Zhong et al. [2] explored KAP among the population of Wuhan. They concluded that their sample demonstrated a high rate of Knowledge about the virus, an optimistic Attitude, and a high level of adherence to safety Practices [2]. The authors, recognizing the association of higher Knowledge with more positive Attitudes and preventive methods, acknowledge that these results may not be generalized to a population of different demographics. On the other hand, other research assessing KAP concluded that their samples had lower levels of Knowledge and poor practices regarding COVID-19, urging local authorities to establish awareness programs to improve KAP among the general population [4–6].

Research has noted the urgency of identifying vulnerable populations, highlighting the importance of targeting these groups with awareness and preventive efforts. People with mental illness (PWMI) are more vulnerable during pandemics

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Abbreviations: KAP, knowledge, attitude, and practice; HMC, Hamad Medical Corporation.

and have a higher risk of becoming infected [7]. Causes may include cognitive impairment, lack of awareness of risks associated with infections and of protective measures, and a lower ability to adhere to protective measures due to the nature of their illness or living circumstances [8]. People with severe mental illness often have lower educational attainment and health literacy and may have lesser social support [9]. Those who are admitted to hospital or residential care are often in shared spaces that may be overcrowded. Recent data has indicated that people with mental illness who contract the COVID-19 virus have poorer outcomes [10]. Smoking, poor sleep quality, psychotropic medication side effects and the sedentary lifestyle often associated with PWMI result in a higher prevalence of obesity, cardiovascular disease and chronic obstructive pulmonar disease; all contributing factors to the higher risk of COVID-19 [11, 12]. Despite these trends, most publications to date have explored KAP among the general public, healthcare providers, and vulnerable groups such as people with chronic conditions, but not in the mental health population [13–18]. We found one paper that used the Knowledge, Attitude and Practices questionnaire on a convenient sample of 200 patients with mental illness attending a psychiatry hospital. Their results show 51.5% of their participants had poor knowledge, 75% moderate attitude, and 61% low to moderate practices toward the pandemic [19]. This group is considered highly vulnerable due to many factors that might impede their adherence to preventive measures for COVID-19, putting them at higher risk of infection and poorer outcomes [9].

Qatar, like other countries, has been impacted by COVID-19, with a total of 3,758,024 confirmed cases and 681 deaths as of August 2, 2022 [20]. The government has taken many steps to ensure that knowledge is disseminated to all residents of Qatar in different languages, targeting the large multi-ethnic population. Health agencies have dedicated their social media accounts to sharing information about the virus with the public and providing better education on safety measures. The objective of this study was to explore the efficacy of these efforts in raising public KAP toward COVID-19 and to compare it to the KAP among people with mental illness, with the expectation that PWMI would show significant deficits in their knowledge of the COVID-19 pandemic and its prevention compared to the general population. Despite their established

vulnerability, barely any publication exploring KAP of the COVID-19 pandemic in PWMI was identified.

Materials and methods

Study design, setting, and participants

This is a cross-sectional study comparing the Knowledge, attitude, and safe practice (KAP) during the COVID-19 pandemic in three groups: Psychiatry outpatients, Psychiatric ward inpatients, and the general population. Using online surveys, the study was conducted between May and August 2020 with the approval of the Research Office and Ethical Committee of Hamad Medical Corporation (HMC) (Reference number: MRC-05-050). Participants signed an online or manual informed consent form. Psychiatry patients were recruited from two facilities: Mental Health Hospital (MHH) in Doha, Qatar, and Al-Khor Hospital (AKH) in Al-Khor, Qatar. The general population was invited through messages sent by the telecommunications company Ooredoo which contained a link to an online survey.

The inclusion criteria for patients were (i) having a mental illness, (ii) attending the outpatient clinics or being admitted to the inpatient services during the study period, (iii) ages 18–65 years inclusive, and (iv) having the capacity to sign the consent form. The exclusion criteria included having the diagnosis of a learning disability and patients admitted from prison. The inclusion and exclusion criteria for the general population were (i) adults aged 18–65 and (iii) Arabic or English speaking.

Sample size was estimated based on the proportion of correct answers for each of the three groups using Chi-Square tests, utilizing three pairwise comparisons. Limits were set to a difference of 33% for each comparison, with a confidence interval of 90%, a power of 80%, and a type one error of 5% (significance level). A minimal sample size of 85 subjects in each group was needed to reach significance. Factoring a potential 20% dropout rate, 100 subjects were targeted for each subgroup.

Study procedure and measures

The inpatient group was recruited from the inpatient units of the Mental Health Services in Doha. These units are the only available inpatient psychiatric facility in Doha. The researchers invited all inpatients who fulfilled the eligibility criteria. Participants signed an informed consent form and answered a questionnaire. Outpatients attending the service within the same period (May-August 2020) who met the criteria were randomized by the lead PI and distributed among the team members. In this subgroup, consent was obtained by phone, the standard method of contacting patients

during the pandemic. The research members read a script (approved by the ethical committee) explaining the research on a phone calls and then obtained verbal consent to participate. For the general population, the telecommunications company randomly sent a text message to Arabic and English speakers in their records, linked to an online questionnaire (available on SurveyMonkey, San Mateo, CA, USA), inviting them to participate in the study.

Participants answered both a sociodemographic questionnaire and the KAP instrument. The latter was published in English based on a sample from the general public in Wuhan, China (2).

The KAP instrument was translated for an Arab-speaking population, utilizing the back-translation method, whereby three bilingual (English and Arabic) team members independently translated the instrument from English to Arabic. A final Arabic version was agreed upon by all three translators. This version was piloted in ten patients and staff to ensure that the items were clear and understandable. The three translators reviewed the input from the pilot participants and agreed on the proper modifications accordingly. The Arabic version was back-translated to English and independently reviewed by another team member to ensure the contents were consistent with the original instrument and with the Ministry of Public Health information in Qatar on the COVID-19 pandemic and its prevention.

The English and Arabic versions of the KAP instrument include 16 items divided into three sections: (1) Twelve items covering Knowledge about COVID-19, where participants can answer each question with "True," "False," or "I do not know." (2) Two questions related to Attitude: the first question asking whether the respondent agrees that the pandemic will be controlled with the optional answers: "Yes," "No," and "I do not know," and the second question asking whether they trust Qatar to control the spread of COVID-19, with binary answers Yes vs. No. (3) Two items covering the subjects' practice during the pandemic: going to crowded places (Yes vs. No) and wearing a mask when going out (Yes vs. No).

Data analysis

Data were analyzed using IBM Statistical Package for Social Sciences (IBM SPSS® Version 24; IBM Corp, USA). The significance level was set at 0.05. The categorical data on sociodemographics and the correct answers on each instrument's item are presented as percentages. The Chi-Square test compared the proportions between the three groups of participants with Bonferroni corrections for multiple comparisons.

The total score on COVID-19 Knowledge was calculated from the sum of correct responses on the first 12 questions.

TABLE 1   Sociodemographic characteristics of the sample by group.

	Public $N = 345$	Outpatient $N = 165$	Inpatient $N = 100$
Gender			
Female	176 (51.0%)[c]	72 (43.6%)[c]	18 (18.0%)
Male	169 (49.0%)	93 (56.4%)	82 (82.0%)[a,b]
Age-group (years)			
18–29	53 (15.4%)	41 (24.8%)[a]	40 (40.0%)[a,b]
30–49	205 (59.4%)	84 (50.9%)	50 (50.0%)
50–65+	87 (25.2%)[c]	40 (24.2%)[c]	10 (10.0%)
Marital status			
Married	246 (71.3%)[c]	112 (67.9%)[c]	40 (40.0%)
Others	15 (4.3%)	4 (2.4%)	12 (12.0%)[a,b]
Single	84 (24.3%)	49 (29.7%)	48b (48.0%)[a,b]
Education			
Primary school	7 (2.0%)	15 (9.1%)[a]	25 (25.0%)[a,b]
Secondary school	54 (15.7%)	55 (33.3%)[a]	35 (35.0%)[a]
College degree	201 (58.3%)[b,c]	77 (46.7%)[c]	30 (30.0%)
Masters or PhD	83 (24.1%)[b,c]	18 (10.9%)	10 (10.0%)
Occupation			
Employed	251 (72.8%)[b]	93 (56.4%)	61 (61.0%)
Retired	9 (2.6%)	10 (6.1%)	8 (8.0%)[a]
Student	24 (7.0%)	8 (4.8%)	1 (1.0%)
Unemployed	61 (17.7%)	54 (32.7%)[a]	30 (30.0%)[a]
Place of current residence			
Doha	285 (82.6%)[c]	129 (78.2%)	7 (70.0%)
Other parts of Qatar	60 (17.4%)	36 (21.8%)	30 (30.0%)[a]

[a]Significantly higher than the Public group, [b]significantly higher than the Outpatient group, [c]significantly higher than the Inpatient group.
Tests were adjusted for all pairwise comparisons within a row using the Bonferroni correction.

A correct answer received a score of 1, an incorrect answer or "I do not know" received a 0. The total knowledge score (0–12) (continuous variable) between the three groups was analyzed with the Analysis of Variance test (ANOVA). Each of the two questions on Attitude was dichotomized (Yes vs. No) to the questions.

Multiple linear regression analysis checked if the differences in the total Knowledge score (dependent variable) between the three groups were still valid even after controlling for all the sociodemographic factors (the independent variables entered as dummy variables in SPSS) listed in Table 1. Multivariable logistic regression to assessed whether the variations in the three groups' COVID-19 attitudes and practices were still valid after controlling for all the independent sociodemographic factors. Four analyses were conducted, utilizing the backward method for each of the questions on the attitudes and practices as the dependent variable and the sociodemographic categorical factors as the independent variables. A Nagelkerke Pseudo R2 test to was added to assess the goodness of fit of the regression models.

Results

The total number of eligible inpatients approached was 120, of whom 100 participated. Of 211 eligible outpatients, 165 finished the survey. Ooredoo, a Qatari-based telecommunications company sent 10,000 phone messages to the general population, of whom 345 completed the survey.

Sociodemographic characteristics of the sample by group

The majority in the sample were males (56.4%), aged 30–49 years (55.6%), were married (65.2%), had a university or college degree (68.7%), were employed (66.4%), and resided in Doha (79.3%). There were significant sociodemographic differences between the three groups: Gender ($\chi^2 = 34.36$, df = 2, $p < 0.001$), Age-group: ($\chi^2 = 32.72$, df = 4, $p < 0.001$), Marital status ($\chi^2 = 38.58$, df = 4, $p < 0.001$), Education ($\chi^2 = 102.96$, df = 6, $p < 0.001$), Occupation ($\chi^2 = 29.30$, df = 6, $p < 0.001$), and Place of residence ($\chi^2 = 7.71$, df = 2, $p = 0.02$). *Post hoc* comparisons (Table 1) showed that the proportion of males in the inpatient group was significantly higher than those in the other two groups. The percentage of young subjects (aged 18–29) was significantly higher in the patients' groups than in the public group. The proportion of subjects with university or college degrees was significantly higher in the public group than the two patients' groups. The latter showed a significantly higher percentage of unemployed subjects than the ones participating from the general public.

Knowledge, attitude, and practice survey responses by group

Of the 12 questions on Knowledge, only two of the answers (on questions 7 and 8) showed no significant differences in Knowledge (spread through respiratory droplets and prevention by wearing masks) among the three groups. In general, the number of subjects in the public group giving the correct responses to all the other ten Knowledge questions was significantly higher than those in the inpatient group (Table 2). The percentage of subjects with correct answers to Knowledge questions 2, 6, and 9 were significantly higher in public than in the outpatient group only. The percentage of subjects giving correct answers to questions 1, 5, 10, and 12 in the outpatient group was significantly higher than in the inpatient group only. The proportion of subjects in the outpatient group giving the correct answers to questions 3, 4, and 11 was not statistically significant from the public and inpatient groups (Table 2). ANOVA showed that the total knowledge score differed significantly between the three groups, $F(2, 609) = 41.57$, $p < 0.001$. *Post hoc* comparisons showed the

score was statistically higher in the public group than the other two groups ($p < 0.001$), and the one in the outpatient group was higher than the one for the inpatient group ($p < 0.001$) (Table 2).

The outpatient group was significantly more optimistic about possible control of COVID-19 (item 13) than the public and inpatient groups. Likewise, outpatients responded with more confidence than the other two groups in Qatar, agreeing that Qatar would be able to win against COVID-19 (item 14) (Table 2). The majority of the public group participants indicated that they had not attended crowded places in recent days (article 15). This percentage was significantly higher than those of the two patients' groups. The subjects in the public and outpatient groups were significantly more compliant in wearing masks when leaving the house than those in the inpatient group (item 16) (Table 2).

Predictors of the total score on COVID-19 knowledge

The multiple linear regression analysis (Table 3) showed that both the inpatient and outpatient groups were associated with lower total Knowledge in Qatar even after controlling for the various sociodemographic factors. The model tested was a good fit as the R2 was 0.18, and the F change (9.56) was significant ($p < 0.001$). Further, the analysis showed that being single and young (ages 18–29 years) were also independently associated with poor performance on COVID-19 Knowledge. After controlling for the other independent factors, primary or secondary education also remained an independent predictor of a lower total knowledge score (Table 3).

Predictors of COVID-19 attitude: Multiple logistic regression

The regression model used the dichotomized answers to survey question 13 (Agree vs. Not) as the outcome variable and the group factor with the sociodemographic variables as the predictors; the Nagelkerke R2 showed that the model explained only 6.1% of the variance predicted by these independent factors. This best-fit model was ascertained by the Hosmer and Lemeshow test ($\chi^2 = 12.01$, df = 8, $p = 0.15$). The whole model gave an overall 74.9% correct rate of the outcome (Agree vs. Not). The only predictor that remained significant after controlling for the other ones was the group where the outpatient group showed 2.22 more odds of showing a positive attitude toward controlling the COVID pandemic than the general public group (Table 4).

We obtained the same results when using the survey item 14 on the attitude regarding the trust in Qatar to control the pandemic. This best-fit model was confirmed by the Hosmer and Lemeshow test ($\chi^2 = 5.15$, df = 8, $p = 0.74$). The Nagelkerke

R2 showed that the model explained only 7.9% of the variance predicted by these independent factors. The whole model gave an overall 84.6% correct rate of the outcome (Yes vs. No). The only predictor that remained significant after controlling for the other ones was the group where the outpatient group showed 3.25 more odds of showing a positive attitude toward control of COVID-19 pandemic than the general public group (Table 4).

Predictors of COVID-19 practice: Multiple logistic regression

The multiple logistic regression models assessing the outcome on the practice of avoiding crowds during the pandemic (item 15, going to crowded places) showed that both patient groups were at increased odds of answering Yes compared to the general public after controlling for all factors (Table 5). Middle age (30–49 years compared to being above 50) was associated with answering No to this question. "Being employed" (compared to not employed) was also associated with a Yes answer (Table 5). This best-fit model was confirmed by the Hosmer and Lemeshow test ($\chi^2 = 7.92$, df = 8, $p = 0.44$). The Nagelkerke R2 showed that the model explained only 7.1% of the variance predicted by all the independent factors. The whole model gave an overall 77.5% rate of the outcome (answering Yes to question 15).

The regression analysis with the outcome on answer 16 (wearing masks in crowds) showed that being in the inpatient group is an independent predictor of answering No after controlling all variables. The only other factor that remained significant was having a primary education level (compared to college), which was also significantly associated with not wearing a mask in crowds (Table 5). This best-fit model was confirmed by the Hosmer and Lemeshow test ($\chi^2 = 4.32$, df = 8, $p = 0.83$). The Nagelkerke R2 showed that the model explained only 21.5% of the variance predicted by all the independent factors. The model gave an overall 95.1% correct rate of the outcome (correctly answering Yes to question 16).

Discussion

This paper explores the Knowledge, Attitude, and safe practices related to COVID-19 in Qatar, comparing three groups: the general public, people with mental illness admitted to the psychiatry hospital, and mental health outpatients. This is the first paper that addresses KAP among all these groups.

The significantly higher number of male respondents from the inpatient group reflects the population of Qatar, where the male to female ratio is around 3:1. In September 2020, Qatar's population was estimated to be 2 723 624 million, of which 1 969 032 million were males (~72%)

TABLE 2 COVID-19 knowledge, attitude, and practice by group.

	Public N = 345	Outpatients N = 165	Inpatients N = 100
Knowledge	Correct answers n (%)		
1. The main clinical symptoms of COVID-19 are fever, fatigue, dry cough, and myalgia.	317 (91.9%)[c]	150 (90.9%)[c]	76 (76.0%)
2. Unlike the common cold, stuffy nose, runny nose, and sneezing are less common in persons infected with the COVID-19 virus.	219 (63.5%)[b,c]	75 (45.5%)	47 (47.0%)
3. Currently, there is no effective cure for COVID-19, but early symptomatic and supportive treatment can help most patients recover from the infection.	323 (93.6%)[c]	150 (90.9%)	81 (81.0%)
4. Not all persons with COVID-19 will develop severe cases. Only those who are elderly, obese, and have chronic illnesses are more likely to be in severe cases.	251 (72.8%)[c]	112 (67.9%)	57 (57.0%)
5. Eating or contacting wild animals would result in infection by the COVID-19 virus.	213 (61.7%)[c]	91 (55.2%)[c]	31 (31.0%)
6. Persons with COVID-19 cannot infect others with the virus when a fever is not present.	283 (82.0%)[b,c]	100 (60.6%)	51 (51.0%)
7. The COVID-19 virus spreads *via* respiratory droplets of infected individuals.	314 (91.0%)	139 (84.2%)	85 (85.0%)
8. Ordinary residents can wear general medical masks to prevent infection by the COVID-19 virus.	295 (85.5%)	146 (88.5%)	94 (94.0%)
9. Children and young adults do not need to take measures to prevent the infection by the COVID-19 virus.	327 (94.8%)[b,c]	141 (85.5%)	74 (74.0%)
10. To prevent the infection by COVID-19, individuals should avoid going to crowded places such as train stations and avoid taking public transportations.	334 (96.8%)	163a (98.8%)[c]	93 (93.0%)
11. Isolation and treatment of people who are infected with the COVID-19 virus are effective ways to reduce the spread of the virus.	338 (98.0%)[c]	159 (96.4%)	93 (93.0%)
12. People who have contact with someone infected with the COVID-19 virus should be immediately isolated in a proper place. In general, the observation period is 14 days.	337 (97.7%)[c]	157 (95.2%)[c]	82 (82.0%)
Knowledge Total score (mean ± standard deviation)	10.29 ± 1.49[b,c]	9.59 ± 1.65[c]	8.6 ± 2.07
Attitude	Positive attitude		
13. Do you agree that COVID-19 will finally be successfully controlled? Yes	247 (71.6%)	140 (84.8%)[a,c]	70 (70.0%)
14. Do you have confidence that Qatar can win the battle against the COVID-19 virus? Yes	275 (79.7%)	153 (92.7%)[a]	88 (88.0%)
Practice	Correct practice		
15. In recent days, have you gone to any crowded place? No	286 (82.9%)[b,c]	118 (71.5%)	69 (69.0%)
16. In recent days, have you worn a mask when leaving home? Yes	338 (98.0%)[c]	158 (95.8%)[c]	84 (84.0%)

[a]Significantly higher than the Public group, [b]significantly higher than the Outpatient group, [c]significantly higher than the Inpatient group.
Tests were adjusted for all pairwise comparisons within a row using the Bonferroni correction.

while 754 592 thousand were females (∼28%) (21). Male expatriates are more than threefold the female ones, while Qataris have no significant difference in sex ratio (22). Other demographics, such as age, marital status, education, and employment, can all be explained by the sociodemographic norms in Qatar. A significant majority of the population

TABLE 3 Multiple linear regression: Predictors of total score knowledge.

	B	SE	t	P-value	95.0% CI for B	
(Constant)	10.714	0.354	30.257	0.000	10.019	11.410
Outpatient	−0.507	0.161	−3.150	0.002	−0.823	−0.191
Inpatient	−1.132	0.222	−5.088	0.000	−1.569	−0.695
Gender (males vs. females)	−0.143	0.148	−0.968	0.334	−0.434	0.147
Marital status = Others	−0.092	0.315	−0.292	0.771	−0.711	0.527
Marital status = Single	−0.408	0.170	−2.399	0.017	−0.742	−0.074
Age: 18–29 (vs. 50–65+)	−0.484	0.237	−2.040	0.042	−0.949	−0.018
Age: 30–49 (vs. 50–65+)	−0.272	0.170	−1.602	0.110	−0.605	0.061
Masters or PhD	0.368	0.183	2.014	0.044	0.009	0.728
Primary school	−0.793	0.274	−2.897	0.004	−1.331	−0.255
Secondary school	−0.378	0.171	−2.205	0.028	−0.714	−0.041
Retired	−0.312	0.335	−0.931	0.352	−0.970	0.346
Student	−0.107	0.337	−0.318	0.750	−0.768	0.554
Not employed	0.253	0.173	1.460	0.145	−0.087	0.593
Place of current residence (Doha vs. outside Doha)	0.075	0.164	0.457	0.648	−0.248	0.398

B, unstandardized coefficient; SE, standard error; CI, confidence interval.

TABLE 4 Multiple logistic regression: Predictors of positive attitude.

	B	SE	Wald	df	P-value	OR	95% CI	
							Upper	Lower
Positive attitude on control of COVID-19:								
Outpatient vs. public	0.798	0.248	10.381	1	0.001	2.222	1.367	3.611
Inpatient vs. public	−0.077	0.249	0.096	1	0.757	0.926	0.569	1.507
Positive attitude on trust in Qatar to control the pandemic:								
Outpatient vs. public	1.777	0.328	12.858	1	0.000	3.245	1.705	6.176
Inpatient vs. public	0.624	0.336	3.459	1	0.063	1.867	0.967	3.603

B, unstandardized coefficient; SE, standard error; OR, odds ratio; CI, confidence interval.

comprises male laborers in the construction industry on short-term contracts to help build the country's infrastructure. They are often younger than 30 years of age, single, or live in Qatar without their spouses, and have lower educational attainments. Previous studies are in concurrence with the demographic findings of this study (23–26). Furthermore, mental health disorders were also found to significantly impact academic achievement and successful completion of schooling (27–30). Emerging evidence supports the correlation between mental health disorders and higher unemployment rates, which parallels the findings of unemployment rates among our patient groups compared with participants from the general public (31, 32).

Knowledge

This study demonstrated that patient groups had inadequate Knowledge about COVID-19 compared to the public group.

These findings indicate that knowledge level decreased as the acuity of mental illness increased, as those admitted to inpatient service who tend to have more acute illness had the lowest Knowledge score among the three groups. Recent studies on patients with severe mental illness (SMI) revealed poor Knowledge on COVID-19, supporting the study findings (10, 18). Among the 12 questions assessing the Knowledge of COVID-19, all three groups showed good knowledge with no significant difference regarding the two questions: using general medical masks to prevent the infection and the spread of the virus *via* respiratory droplets. However, significant differences in Knowledge were apparent among these three groups regarding the remaining ten questions. Most participants were more knowledgeable in answering those two questions due to how information was delivered regarding COVID-19 and the importance given to certain precautionary measures compared to other items in the questionnaire. Another factor that could have impacted all participants' Knowledge might be the law mandating masks in all public places. On the

TABLE 5 Multiple logistic regression: Predictors of positive practice.

	B	SE	Wald	df	P-value	OR	95% CI	
							Upper	Lower
COVID-19 practice: Going to crowded places (correct answer No)								
Outpatient vs. public	0.706	0.233	9.187	1	0.002	2.025	1.283	3.197
Inpatient vs. public	0.663	0.280	5.603	1	0.018	1.941	1.121	3.363
Age: 18–29 vs. 50–65+	−0.273	0.260	1.100	1	0.294	0.761	0.457	1.268
Age: 30–49 vs. 50–65+	−0.902	0.347	6.745	1	0.009	0.406	0.205	0.802
Employed vs. not employed	0.604	0.256	5.584	1	0.018	1.830	1.109	3.021
Retired vs. not employed	0.528	0.534	0.979	1	0.322	1.696	0.596	4.829
Student vs. not employed	−0.040	0.552	0.005	1	0.943	0.961	0.326	2.835
COVID-19 practice: Wearing a mask outside home (correct answer Yes)								
Outpatient vs. public	−0.667	0.562	1.412	1	0.235	0.513	0.171	1.543
Inpatient vs. public	−1.950	0.575	11.503	1	0.001	0.142	0.046	0.439
Age: 18–29 vs. 50–65+	0.860	0.452	3.617	1	0.057	2.362	0.974	5.730
Age: 30–49 vs. 50–65+	−0.439	0.665	0.436	1	0.509	0.645	0.175	2.374
College vs. college	−1.587	1.064	2.223	1	0.136	0.205	0.025	1.648
Primary vs. college	−2.397	1.149	4.351	1	0.037	0.091	0.010	0.865
Secondary vs. college	−1.464	1.089	1.805	1	0.179	0.231	0.027	1.957

B, unstandardized coefficient; SE, standard error; OR, odds ratio; CI, confidence interval.

other hand, other studies suggested that sedentary life and the stress of watching COVID-19 news during the pandemic might worsen the anxiety and mood symptoms in patients with mental illness and thus indirectly affect their Knowledge responses (33, 34).

Those who are single, young, and patients with lower educational levels had low COVID-19 Knowledge. These results confirm previous findings which demonstrated that people with higher educational levels showed an increase in COVID-19 awareness (2, 35, 36). Knowledge of the general public about COVID-19 symptoms, mode of transmission, and safety measures were generally very high. In China's Hubei province, the rate of correct answers to the 12 Knowledge questions in the COVID-19 questionnaire among the general public was 90%. Their results showed significantly lower Knowledge scores among males, younger, single, lower education, and the unemployed (2). In comparison, earlier in the pandemic, a publication from China showed a considerable number of their population was not familiar with the common symptoms (37).

Findings published from Saudi Arabia, a neighboring Arabian Gulf country, were similar to the results of this study. A cross-sectional survey on Knowledge and Attitudes toward COVID-19 among their general public also showed that men and the younger people were less knowledgeable about the infection, calling for a more targeted health education program. About 44% of their population had little Knowledge about when and where to wear a mask (38). However, in the Qatari general population, 85.5% were aware that wearing a

medical mask can help prevent the spread of the infection. Interestingly, this awareness was higher among patients with mental illness (88.5% of outpatients and 94% of inpatients). This might be explained by the restrictions introduced in hospitals, whereby clinic visits were stopped in favor of tele-mental health and the limitation of visits in the inpatient settings; patients were informed of these policy changes and their rationale. In another regional study in Jordan, 60.9% were considered to have adequate Knowledge, and 88.7% believed that following protective advice from health authorities effectively prevents infection (39).

Attitude

Regarding optimism about the pandemic's future, the outpatient group was significantly more positive than the other two groups that COVID-19 will be controlled, with 84.8% of them agreeing to the statement compared to the general public or the inpatient group. The regular contact of the outpatient with the healthcare team may have contributed to their optimism. Similarly, a significantly higher number of outpatients had confidence that Qatar would win the battle against the virus. Overall, patients with mental illness had a more positive attitude and confidence in the outcome than the general public. In the Saudi study, 94% of the general public were optimistic that the pandemic would be controlled, and 97% were confident that their government would control it (38). However, more than

50% of Jordanians did not trust the information given by their Ministry of Health or its ability to control the pandemic (39).

Practice

The better attitude among patients with mental illness was not reciprocated with safer practice. Their adherence to avoiding crowded places was significantly lower than the general public, though still with higher adherence than not. The vast majority of all three sample populations wore a mask when leaving the house. Such a level of compliance may be attributed to the legal requirement to wear masks in public places and the fines imposed on non-adherence. The expectation is that better Knowledge results in better practices. However, applying such practices is not easy for many (40). In a Malaysian sample, those with higher Knowledge did not wear face masks or avoid crowds (3). In the Jordanian study, the majority did not wear face masks and, in fact, those with higher levels of education had lesser safe practices (39).

Strengths and limitations

The main strength of the study is in the targeted group of participants. This is the first study to assess KAP toward COVID-19 among patients with mental illness. The study had a large multidisciplinary team that facilitated completing it within the time approved by IRB. Recruitment *via* phone was advantageous since most of those contacted had agreed to participate because they were anonymous.

Several limitations might limit the generalizability of the results. First, the sample has unequal distribution in gender. This is mainly due to the representation of the male to female ratio among the Qatar population (male to female ratio is around 3:1). Second, only the English and Arabic versions of the questionnaire were used; thus, it is not possible to generalize the results to the entire population of Qatar. Third, the majority of participants are from the labor sector who have comparatively lower levels of education. The latter might confound the responses on the KAP questionnaire. Fourth, although the study had enough power in the sample size, there is the possibility that prior knowledge about COVID-19, using text messages, and online surveys, might have affected the decision of participants to accept enrolments. Fifth, our research targeted all patients who met the inclusion criteria; we did not further assess the impact of diagnosis or symptom severity on KAP. Finally, this is a cross-sectional study covering a limited period of time, limiting the inferential conclusions about the impact of the sociodemographic variables on being in the mental health group. As the COVID-19 situation changes rapidly, changes in KAP are expected.

Conclusion

This study demonstrated that patient groups had poorer Knowledge yet more positive Attitudes and confidence regarding the outcome of COVID-19 than the public group. Also, it was noted that Knowledge levels decreased as the acuity of mental illness increased. In addition, a more positive attitude among patient groups was evident but was not countered with greater safe practices. However, a majority of the three groups still adhered to some protective measures, such as wearing face masks. This highlights the need for targeted approaches to the awareness efforts ensuring vulnerable groups such as patients with acute mental illness receive awareness activities tailored to their needs and understandings. Rather than the currently used broader awareness targeted the whole population, there is a need for information that is specific to different age groups, and language and cognitive abilities. Non-verbal education such as using picture presentations and videos may contribute to better understanding. Engaging the family or care giver can encourage PWMI to better adhere to preventive practices. Mental healthcare professionals may incorporate KAP education in their communication with PWMI. Such interventions are likely to enhance knowledge and ensure this is reflected in better attitudes and safer practices.

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 IRB at Hamad Medical Corporation. The patients/participants provided their written informed consent to participate in this study.

Author contributions

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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 impact on healthcare workers, general population and affected individuals of SARS and COVID-19: A systematic review and meta-analysis

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Background: Any infectious disease outbreak may lead to a negative detrimental psychological impact on individuals and the community at large, however; there was no systematic review nor meta-analysis that examined the relationship between the psychological/mental health impact of SARS and COVID-19 outbreak in Asia.

Methods and design: A systematic search was conducted using PubMed, EMBASE, Medline, PsycINFO, and CINAHL databases from 1/1/2000 to 1/6/2020. In this systematic review and meta-analysis, we analyzed the psychological impact on confirmed/suspected cases, healthcare workers and the general public during the Severe Acute Respiratory Syndrome (SARS) outbreak and Coronavirus disease (COVID-19) epidemics. Primary outcomes included prevalence of depression, anxiety, stress, post-traumatic stress disorder, aggression, sleeping problems and psychological symptoms.

Result: Twenty-three eligible studies ($N = 27,325$) were included. Random effect model was used to analyze the data using STATA. Of these studies, 11 were related to the SARS outbreak and 12 related to COVID-19 outbreaks. The overall prevalence rate of anxiety during SARS and COVID-19 was 37.8% (95% CI: 21.1–54.5, $P < 0.001$, $I2 = 96.9$%) and 34.8% (95% CI: 29.1–40.4), respectively. For depression, the overall prevalence rate during SARS and COVID-19 was 30.9% (95% CI: 18.6–43.1, $P < 0.001$, $I2 = 97.3$%) and 32.4% (95% CI: 19.8–45.0, $P < 0.001$, $I2 = 99.8$%), respectively. The overall prevalence rate of stress was 9.4% (95% CI: −0.4 –19.2, $P = 0.015$, $I2 = 83.3$%) and 54.1% (95% CI: 35.7–72.6, $P < 0.001$, $I2 = 98.8$%) during SARS and COVID-19, respectively. The overall prevalence of PTSD was 15.1% (95% CI: 8.2–22.0, $P < 0.001$) during

SARS epidemic, calculated by random-effects model ($P < 0.05$), with significant between-study heterogeneity (I2 = 93.5%).

Conclusion: The SARS and COVID-19 epidemics have brought about high levels of psychological distress to individuals. Psychological interventions and contingent digital mental health platform should be promptly established nationwide for continuous surveillance of the increasing prevalence of negative psychological symptoms. Health policymakers and mental health experts should jointly collaborate to provide timely, contingent mental health treatment and psychological support to those in need to reduce the global disease burden.

Systematic review registration: CRD42020182787, identifier PROSPER.

Introduction

It is somewhat unsurprising that respiratory infectious diseases epidemics such as Severe Acute Respiratory Syndrome (SARS), Middle-Eastern Respiratory Syndrome (MERS), Ebola and COVID-19 have led to unprecedented global hazards jeopardizing individuals' physical and psychological wellbeing (1). Respiratory infectious diseases refer to virus spreading from person to person directly via aerosols/droplet nuclei, small droplets or virus laden secretions from larger droplets; or indirectly by contact with contaminated surfaces transmitted by airborne and droplet through our daily activities of living (2). The rapid transmission of these respiratory infectious diseases has inevitably triggered public fear of being infected, partly attributed to insufficient supply of personal protective gears and contact with confirmed/suspected cases (3). Without effective vaccine to curb the disease, contingent public health preventive measures including social distancing, quarantines, lockdown (4) may indirectly reinforce perceived social isolation, loneliness, anxiety and depression (5). Precisely, we selected SARS and COVID-19 as the primary research focus in this paper.

SARS is a viral respiratory disease caused by SARS-associated coronavirus. It was first identified in November 2002 in Guangdong province of southern China and soon after, SARS was also transmitted to Toronto, Hong Kong, Taipei, Singapore, Hanoi and Vietnam. The case fatality for suspected cases of SARS was ∼3%. There were 8,098 confirmed cases in total, with 774 deaths during the 2003 SARS epidemic (6).

Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus which has been declared a pandemic by the World Health Organization in March 2020 (7). Since October 2020, there have been over 40 million confirmed COVID-19 confirmed cases and 1.1 million deaths across the world (8). The case fatality of COVID-19 was ∼2.8%. Notwithstanding the soaring number of infected cases, COVID-19 has also triggered great economic recession across different countries. A cross-sectional study conducted during the COVID-19 pandemic in China ($n = 1,599$) showed that nearly 50% of the respondents rated their psychological beings as "moderately poor" to "severely poor" (9). Other studies also showed that natural disasters and social unrest may induce different levels of psychological distress (10).

Respiratory infectious diseases have detrimental negative impact on the psychological wellbeing of the general public, healthcare workers and confirmed/suspected patients, especially at the initial stage of unprecedented outbreak. For instance, prevalence of depression among the general public was 37.4% (11), whilst 38.6 and 51.1% of healthcare workers and confirmed cases, respectively reported anxiety during the COVID-19 pandemic (12, 13). Existing systematic reviews on respiratory infectious disease primarily focused on a specific population, for example, healthcare workers (3); general public (14) during the COVID-19 pandemic or disease patients (15, 16) during the SARS epidemic. Nonetheless, there is no systematic review examining the relationship between respiratory infectious disease epidemics outbreaks and mental health in different populations. Thus, this research gap gives us the impetus to conduct this systematic review and meta-analysis.

The aims of this systematic review were threefold: first, to provide an integrated picture on how the SARS epidemics and COVID-19 pandemic affect mental wellbeing of confirmed/suspected patients, healthcare workers and the general public; second, to identify psychological impact and psychiatric symptoms on different populations in relation to the SARS and COVID-19 outbreak; third, to provide insights on the mental health needs of those affected individuals during the outbreak.

Methods

Search strategy

The search process and methods adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (17). A systematic search was conducted on 5 databases (i.e., CINAHL Complete, Embase, MEDLINE, PubMed & PsycINFO), from 1 January 2000 to 1 June 2020. (Please refer to Appendix 1). Our review was registered with The PROSPER (International Prospective Register of Systematic Reviews was published) (Registration #: CRD42020182787).

Search terms included "psychological impact" OR "mental health" OR "mental disorder" OR depress* OR anxiety* OR "post-traumatic stress disorder" OR "suicide" OR "emotional disturbance" OR "stress" OR "trauma and stressor-related disorder" OR "psychopathology" OR "psychological distress" OR "psychological symptoms" OR "panic") AND ("epidemic" OR "pandemic" OR "outbreak" OR "MERS" OR "middle east respiratory syndrome" OR "SARS" OR "Severe Acute Respiratory Syndrome" OR "H7N9" OR "Avian influenza" OR "Influenza" OR "H5N1" OR "respiratory infectious disease" OR "airborne disease" OR "COVID-19" OR "coronavirus" OR "swine flu" OR "H1N1."

Eligibility criteria

The inclusion criteria for this systematic review included English full text observational studies which investigated the psychological impact of respiratory infectious disease outbreak (e.g., COVID-19, SARS). Sampling included confirmed/suspected patients with respiratory infectious diseases, general population, and healthcare workers, who experienced psychological symptoms during and after respiratory infectious diseases outbreak. Studies that included samples with other co-morbidity other than respiratory diseases were excluded.

Outcomes measurements

Outcome measurements for this systematic review included prevalence of depression, anxiety, stress and post-traumatic stress.

Study selection

The initial search yielded a primary pool of articles. Records were excluded if they did not meet the inclusion criteria. All records were saved in the Endnote software for removal of duplicates and blinded screening. Title and abstract screening were manually conducted by two independent reviewers to identify potentially eligible studies before full-text screening to check for their eligibility. Should there be any disagreement in the selection of articles, consensus was reached by the involvement of a senior researcher in the project team.

Data extraction process

Data were extracted from qualified studies after screening. In each study, the following information was retrieved and saved in an excel file which included: (1) authors and publication year; (2) study site; (3) study design; (4) sample size; (5) type of infectious disease; (6) target population; (7) demographic characteristics of the participants; (8) data analysis method; (9) measurement tools and cut off value; (10) prevalence of psychological symptoms and associated factors.

Quality appraisal

Quality appraisal of the selected studies was performed by using the Joanna Briggs Institute (JBI) Critical Appraisal tools for observational studies, including cohort studies and cross-sectional studies from the Faculty of Health Sciences at the University of Adelaide (18). JBI assessed the study design, recruitment strategy, confounding factor identification, reliability of outcome measurement and statistical analysis. The quality appraisal of each study would be calculated by number of "Yes" options/ total number of applicable questions) × 100%. Extracted paper was considered "low quality" if JBI results was <49%, "moderate quality" if fell between 50 and 69%. Paper(s) received >70% would be considered as "high quality" (19).

Data synthesis/analysis

Data obtained from the included articles were stratified into several groups according to the types of respiratory infectious disease. Data of each group were used for the pooled prevalence calculation and the 95% confidence interval (95% CI) by using STATA statistical software version 11.0. Forest plots were used to demonstrate the pooled prevalence and 95% CI for different groups.

Prevalence of psychological symptoms were presented in frequency (%), with 95% confidence interval (CI). A generic inverse variance method with a random effect model was used to estimate pooled prevalence rates. Random effect models were deemed appropriate when the number of studies included in the meta-analysis was low (<10). The I^2 statistic was also used to quantify the percentage of total variation in the study estimated due to heterogeneity. I^2 values between 25 and 50% were considered as "low" heterogeneity, "moderate" heterogeneity if I^2 fell between 50 and 75%; and 75% as "high" heterogeneity. A p-value of <0.05 was considered as heterogeneity (20). We

FIGURE 1
PRISMA flow diagram.
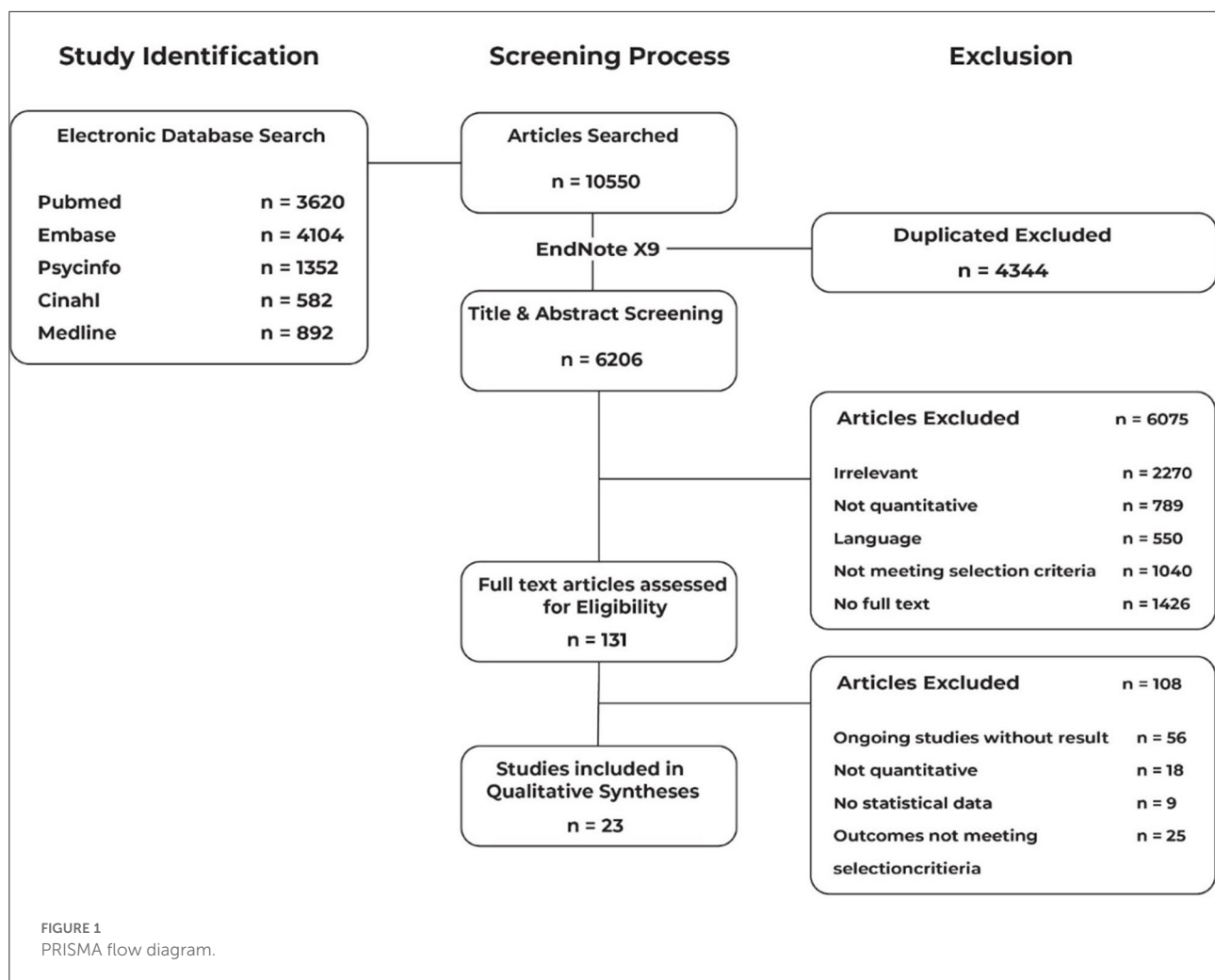
further performed subgroup analyses to synthesis our data. Tables were synthesized for each category according to different respiratory infectious disease, including the study population, psychopathological symptoms and associated factors, and measurement tools. Statistical analyses were conducted with STATA software version 11.0. Additionally, meta-regression was done to investigate the source of heterogeneity.

Visual assessment of publication bias was analyzed using funnel plot. Egger's test was also conducted to minimize the risk of statistically significant publication bias due to asymmetric funnel plot. A p-value of <0.05 was considered as statistically significant publication bias (21).

Results

Search result

A total of 10,550 publications were identified, of which, 4,344 duplicates were removed. Another 6,075 studies were

further excluded as they did not meet our inclusion criteria after abstract and title screening. It left down to 131 full-text studies assessed for eligibility. We excluded another 108 articles which ended up with 23 articles eligible for this systematic review and meta-analysis (Figure 1).

Study Characteristics

Study characteristics and key study findings were summarized in Tables 1, 2. The sample size of these 23 studies ($N = 27,325$, 59.3% female) ranged from 65 to 8,079 participants. Of these studies, 11 studies (47.8%) were related to the SARS outbreak and 12 studies (52.2%) COVID-19 outbreak. All study participants were 18 years old or more. Only two studies used a cohort study design. All the remaining studies adopted cross-sectional design. With the exception of one study from Canada, all other study sites originated from Asian countries [Asia ($n = 22$), China ($n = 9$), Hong Kong ($n = 5$),

TABLE 1 Summary of study characteristics.

Study characteristics	Number of study (%)	
	n =	(%)
Study design		
Cohort	2	8.7
Cross-sectional	21	91.3
Study population		
General public	10	43.4
Affected individuals	5	21.7
Healthcare workers	14	31.3
Sample size		
1–499	13	56.5
500–599	5	21.7
1,000–1,999	1	4.3
>2,000	4	17.4
Diseases		
COVID-19	11	47.8
SARS	12	52.2
Geographic location		
China	9	39.4
Hong Kong	5	21.7
Taiwan	3	13.0
Singapore	2	8.7
India	1	4.3
Vietnam	1	4.3
South Korea	1	4.3
Canada	1	4.3
Psychological impact		
Depression	19	N/A
Anxiety	16	N/A
Post-traumatic stress disorder	5	N/A
Stress	6	N/A
Aggression	1	N/A
Psychological symptoms	1	N/A
Sleep related problems	1	N/A
Others	1	N/A

Taiwan ($n = 3$), Singapore ($n = 2$), India ($n = 1$), Vietnam ($n =1$) and South-Korea ($n = 1$)]. Outcome measurement varied across studies; 19 studies measured depression, 16 studies on anxiety, 6 studies on stress, 5 studies measured PTSD and 1 study measured aggression, sleeping problem and psychological symptoms.

Quality appraisal results

The JBI Critical Appraisal Checklist for Cross-Sectional Studies was utilized to assess 20 cross-sectional studies. Of which 17 articles were ranked as "High Quality" and 3 "Low

Quality" (Table 3). Whereas, the JBI Critical Appraisal Checklist for Cohort Studies was used to assess 2 cohort studies. 1 study was ranked as "Moderate Quality" and another "Low Quality" (Table 4).

Overall pooled prevalence of anxiety, depression and stress during SARS epidemic and COVID-19 pandemic

Anxiety

A total of 16 studies indicated anxiety as a psychological impact for respiratory pandemics. Of which 8 studies were conducted on medical staff, 3 among the general public and 5 among affected individuals (survivors and individuals with suspected symptoms). These studies utilized different validated measurement scales including Beck Anxiety Inventory (BAI), Depression Anxiety Stress Scales (DASS-21), Generalized Anxiety Disorder Assessment (GAD-7), General Health Questionnaire-28 (GHQ-28), Hospital Anxiety and Depression Scale (HADS), The Zung Self-Rating Anxiety Scale (SAS), SCL-90 self-report inventory, Structured Clinical Interview for DSM-IV (SCID) and Spielberger Trait Anxiety Inventory (STAI) (Table 5).

Prevalence of anxiety during SARS epidemic

Seven studies (12, 15, 16, 23–26) reported the prevalence rate of anxiety on healthcare workers and affected individuals during the SARS epidemic and it ranged from 15.1 to 68.0%. The analytic pooling of these rates generated an overall prevalence of 37.8% (95% CI: 21.1–54.5), $P < 0.001$), calculated by random-effects model ($P < 0.05$), with significant between-study heterogeneity ($I^2 = 96.9\%$). The prevalence of anxiety was higher among affected individuals [46.2% (95% CI 24.8–67.7)] compared to healthcare workers [17.3% (95% CI 12.3–22.3)] (Figure 2).

Prevalence of anxiety during COVID-19 pandemic
Pooled prevalence

There were nine studies examined the prevalence of anxiety on healthcare workers (3, 5, 30, 33–35) and the general population (11, 14, 34) during the COVID-19 pandemic and it ranged from 14.0 to 54.1%. The analytic pooling of these rates generated an overall prevalence of 34.8% (95% CI 29.1–40.4), $P < 0.001$, which calculated by random-effects model ($P < 0.05$), with significant between-study heterogeneity ($I^2 = 98.1\%$). The subgroup analysis of prevalence of anxiety by population showed that high prevalence among healthcare workers (37.8% [95% CI 28.7–46.9]) compared to the general population [29.0% [95% CI 20.8–37.2]). Affected individuals was not comparable due to unavailability of studies in the meta-analysis (Figure 3).

TABLE 2 Summary of study findings.

References	Age (SD)	Male (n)	%	Female (n)	%
Bai et al. (22)	39.1 ± 9.4	163	49.0%	175	51.0%
Chen et al. (23)	25.7 ± 2.2	0	0	128	100%
Cheng et al. (15)	37.1 ± 12.09	34	34.0%	66	66.0%
Cheng et al. (24)	36.9 ± 11.1	60	33.0%	120	67.0%
Kwek et al. (25)	34.8 ± 10.49	13	20.6%	50	79.4%
Lancee et al. (26)	45.0 ± 9.6	18	13.0%	121	87.0%
Lee et al. (12)	N/A	35	36.5%	61	63.5%
Liu et al. (27)	N/A	129	23.5%	420	76.5%
Sim et al. (28)	N/A	N/A	N/A	N/A	N/A
Su et al. (13) Neurology;	25.4 ± 3.7	0	0	102	100%
SARS ICU;	31.5 ± 6.2				
SARS Regular;	29.8 ± 7.6				
CCU	32.7 ± 4.3				
Wu et al. (16)	N/A	84	43.0%	111	56.9%
Wu et al. (29)	39.8 ± 10.6	129	23.5%	419	76.5%
Chatterjee et al. (30)	42.05 ± 12.19	119	78.3%	33	21.7%
Choi et al. (14)	47.26 ± 15.82	226	45.0%	274	55.0%
Huang and Zhao (31)	35.3 ± 5.6	3,284	45.0%	3,952	55.0%
Nguyen et al. (32)	44.4 ± 17.0	1,747	44.3%	2,200	55.7%
Wang et al. (9)	33.9 ± 12.3	531	33.2%	1,068	66.8%
Xiao et al. (3)	N/A	314	32.8%	644	67.2%
Xing et al. (5)	35.5 ± 9.6	153	27.9%	359	72.8%
Yang et al. (33)	36.2 ± 10.2	34	52.3%	31	47.7%
Zhang et al. (34)	33.7 ± 9.6	270	17.2%	1,293	82.7%
Zhou et al. (11)	16.0	3,753	46.5%	4,326	53.5%
Zhu et al. (35)	34.16 ± 8.06	18	17.0%	137	83.0%

TABLE 3 JBI critical appraisal checklist for analytical cross-sectional studies.

References	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Quality
Bai et al. (22)	●	●	●	●	●	●	●	●	High (71.4%)
Chatterjee et al. (30)	●	●	●	●	●	●	●	●	High (71.4%)
Chen et al. (23)	●	●	●	●	●	●	●	●	Low (28.6%)
Cheng et al. (15)	●	●	●	●	●	●	●	●	Low (42.9%)
Cheng et al. (24)	●	●	●	●	●	●	●	●	High (71.4%)
Choi et al. (14)	●	●	●	●	●	●	●	●	High (85.7%)
Huang and Zhao (31)	●	●	●	●	●	●	●	●	Low (28.6%)
Lancee et al. (26)	●	●	●	●	●	●	●	●	High (71.4%)
Lee et al. (12)	●	●	●	●	●	●	●	●	High (71.4%)
Liu et al. (27)	●	●	●	●	●	●	●	●●	High (71.4%)
Nguyen et al. (32)	●	●	●	●	●	●	●	●	High (85.7%)
Sim et al. (28)	●	●	●	●	●	●	●	●	Low (25.0%)
Wang et al. (9)	●	●	●	●	●	●	●	●	High (85.7%)
Wu et al. (16)	●	●	●	●	●	●	●	●	High (85.7%)
Wu et al. (29)	●	●	●	●	●	●	●	●	High (85.7%)
Xiao et al. (3)	●	●	●	●	●	●	●	●	High (85.7%)
Xing et al. (5)	●	●	●	●	●	●	●	●	High (85.7%)
Yang et al. (33)	●	●	●	●	●	●	●	●	High (85.7%)
Zhang et al. (34)	●	●	●	●	●	●	●	●	High (85.7%)
Zhou et al. (11)	●	●	●	●	●	●	●	●	High (85.7%)
Zhu et al. (35)	●	●	●	●	●	●	●	●	High (85.7%)

● Yes; ● No; ● Unclear; ● Not Applicable.

TABLE 4   JBI critical appraisal checklist for cohort studies.

References	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Quality
Kwek et al. (25)	•	•	•	•	•	•	•	•	•	•	•	Moderate (54.5%)
Su et al. (13)	•	•	•	•	•	•	•	•	•	•	•	Low (36.0%)

● Yes; ● No; ● Unclear; ● Not Applicable.

TABLE 5   Assessment tools used for measurement of depression, anxiety, stress, PTSD, and psychological symptoms.

Assessment tools

Depression

Depression Anxiety Stress Scale (DASS-21)[a]

The Zung Self-Rating Depression Scale (SDS)

General Health Questionnaire (GHQ-12, GHQ-28)

Patient Health Questionnaire (PHQ-9)

Beck Depression Inventory (BDI)

Anxiety

Beck Anxiety Inventory (BAI)

Generalized Anxiety Disorder Assessment (GAD-7)

Hospital Anxiety and Depression Scale (HADS)[b]

The Zung Self-Rating Anxiety Scale (SAS)

Stress and post-traumatic stress

Kessler Psychological Distress Scale (K6, K10)

The Perceived Stress Scale (PSS-10, PSS-14)

Impact of Event Scale—Revised (IES-R)

Symptom Checklist—Revised (SCL-90-R)

Psychological symptoms

Self-administered questionnaire

Sleep related measurement tools (ISI, CESR-10)

Others

Health, quality of life related (SF-36, IPAQ)

[a]May use for assessing anxiety.
[b]May use for assessing depression.

Heterogeneity investigation

The level of significance was high after subgroup analysis ($I^2 = 98.1$). We did not perform meta-regression to investigate the source of heterogeneity due to collinearity of the studies.

Publication bias

Funnel plot and egger's test were computed to examine publication bias. Each study's effect size was plotted against the standard error. Visual inspection reviewed symmetrical funnel plot and no significant evidence of publication bias was detected (P-value = 0.80).

Depression

A total of 19 studies indicated depression as a psychological impact during SARS epidemic and COVID-19 pandemics. Of which 10 studies were conducted among the medical staff, 4 among the general public and 5 among affected individuals (patients, survivors, suspected cases). These studies utilized different validated measurement scales such as Beck Depression inventory (BDI), Center for Epidemiologic Studies Depression Scale (CES-D), Depression Anxiety Stress Scales (DASS-21), General Health Questionnaire-28 (GHQ-28), Hospital Anxiety and Depression Scale (HADS), the Kessler Psychological Distress Scale (K10) and SCL-90 self-report inventory.

Prevalence of depression during the SARS epidemic

The prevalence rate of depression was reported in 9 studies (12, 13, 15, 16, 23–27) and it ranged from 4 to 68%. The overall prevalence was 30.9% (95% CI: 18.6–43.1, $P = {<}0.001$), with significant substantial heterogeneity ($I^2 = 97.3\%$) by random-effects model ($P < 0.05$). The prevalence of depression was higher among affected individuals [40% [95% CI 19.1–60.8]] compared to healthcare workers [19.4% (95% CI 6.5–32.3)]. Prevalence of depression in the general population was not comparable due to unavailability of data in this meta-analysis (Figure 4).

Publication bias

Funnel plot and egger's test were computed to examine publication bias. Each study's effect size was plotted against the standard error. Asymmetrical funnel plot was observed on visual inspection, as one study laid on the left side whilst eight studies laid on the right side of the line representing the pooled prevalence (Figure 5).

Additionally, we performed egger's test to investigate publication bias which resulted significant evidence of publication bias (P-value = 0.04). Lastly, we performed trim and feel analysis to estimate the number of missing studies that might exist, which helped reducing and adjusting publication bias (Figure 6).

Prevalence of depression during the COVID-19 pandemic

Ten studies reported the prevalence rate of depression in the general population (11, 14, 32) and among healthcare
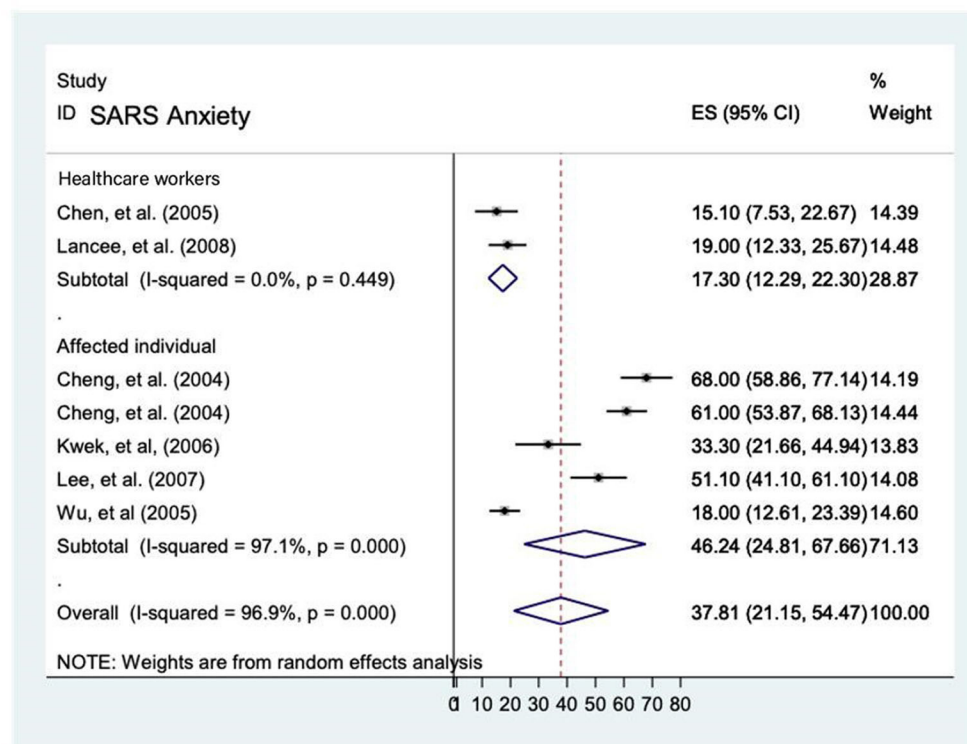
Prevalence rate of anxiety among healthcare workers and affected individuals during the SARS epidemic.

workers (3, 5, 30, 33–35). Due to unavailability of data from confirmed/suspected patients in these ten studies, meta-analytic comparison with the other two populations cannot be executed. Overall, the prevalence rate of depression during COVID-19 reported in these 10 studies ranged from 4.1 to 58%. The analytic pooling of these rates generated an overall prevalence of 32.4% (95% CI: 19.8–45.0, $P = <0.001$, $I^2 = 99.8\%$), calculated by random-effects model ($P < 0.05$), with significant between-study heterogeneity ($I^2 = 99.8\%$). The prevalence of depression was higher among healthcare workers was 39.8% [95% CI 29.0–50.5] than that of the general population [21.9% (95% CI 3.4–40.5)] (Figure 7).

Publication bias

Funnel plot and egger's test were computed to examine publication bias. Each study's effect size was plotted against the standard error. Asymmetrical funnel plot was observed on visual inspection, as one study laid on the left side and nine studies on the right side of the line representing the pooled prevalence (Figure 8).

We performed trim and feel analysis to estimate the number of missing studies that might exist, which helped reducing and adjusting publication bias (Figure 9).

Stress

A total of 5 studies indicated stress as a psychological impact for respiratory pandemics. All of them were conducted among the medical staff, 2 of them were under SARS and 3 of them were under COVID-19. Studies utilized different validated scales as measurement of depression including Depression Anxiety and Stress Scales (DASS-21), Impact of Event Scale- Revised (IES-R), Perceived Stress Scale (PSS-14) and Symptom Checklist-90-Revised (SCL90-R).

Prevalence of stress during the SARS epidemic

The prevalence rate of stress was reported in two studies conducted on healthcare workers (22, 23) and it ranged from 5% (95% CI 2.1–7.9) to 15.1% (95% CI 7.53–22.7). The overall prevalence was 9.4% (95% CI: −0.4–19.2, $P = 0.015$), with heterogeneity ($I^2 = 83.3\%$) by random-effects model ($P < 0.05$) (Figure 10). Due to unavailability of studies on the general population and affected individuals, comparison between these groups cannot be conducted.

Prevalence of stress during the COVID-19 pandemic

The prevalence rate of stress was reported in three studies and it ranged from 32.9% (95% CI 25.4–40.4) to 73.4% (95%
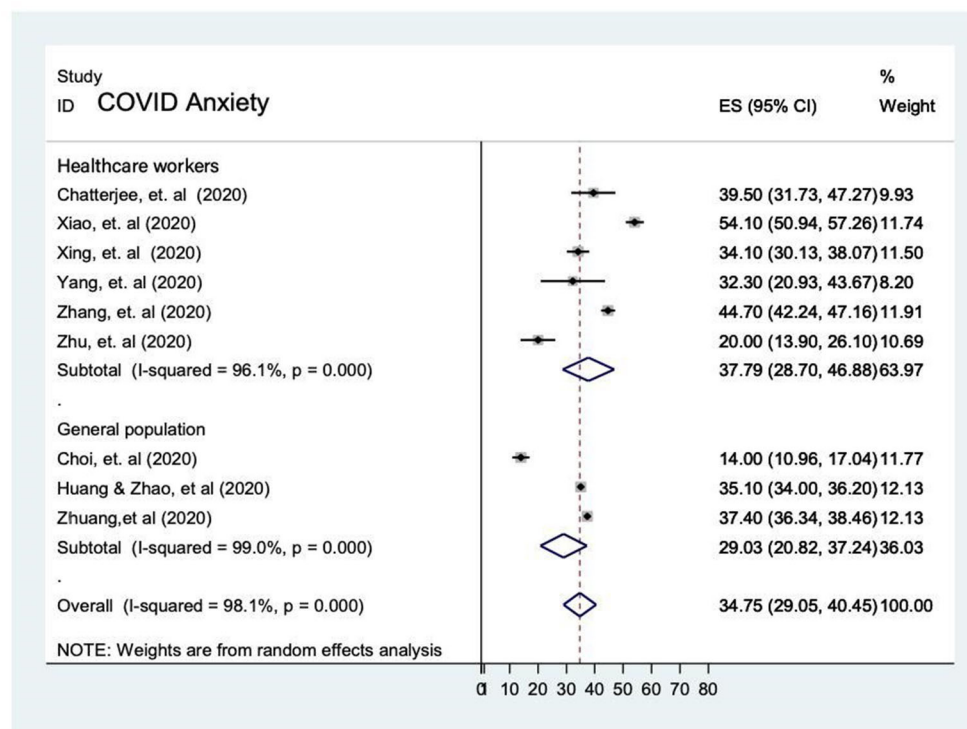
FIGURE 3
Prevalence of anxiety the general population and among healthcare workers during the COVID-19 pandemic.
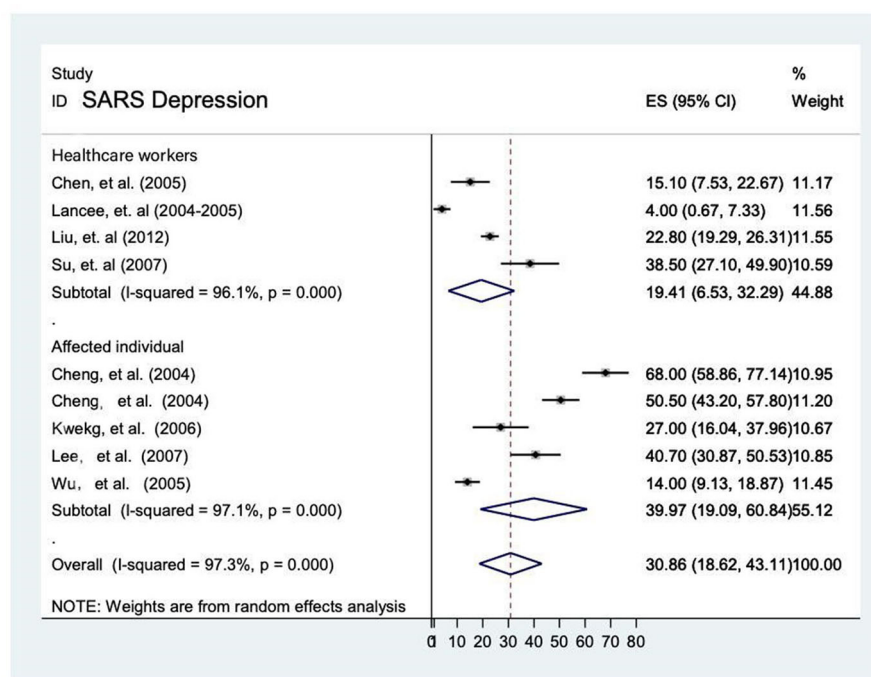

FIGURE 4
Prevalence of depression among healthcare workers and affected individuals during SARS epidemic.

CI 71.2–75.6). The overall prevalence was 54.1% (95% CI: 35.7–72.6, $P < 0.001$, with heterogeneity ($I^2 = 98.8\%$) by random-effects model ($P < 0.05$) (3, 30, 34) (Figure 11).

Prevalence of PTSD, distress and sleep problems during SARS epidemic and COVID-19 pandemic

Apart from anxiety, depression and stress, PTSD and other psychological impacts such as distress and sleeping problems were reported in 8 studies. Of which, 6 studies investigated the prevalence of PTSD in healthcare workers (13, 16, 26, 28) during the SARS epidemic and it ranged from 2.0 to 41.7%. The analytic pooling of these rates generated an overall prevalence of 15.1% (95% CI: 8.2–22.0), $P < 0.001$, calculated by random-effects model ($P < 0.05$), with significant between-study heterogeneity ($I^2 = 93.5\%$). Another 2 studies investigated

FIGURE 5
The funnel plot to test publication bias of nine studies of pooled prevalence of depression during SARS pandemic, 2021.

FIGURE 6
The result of trim and fell analysis for pooled prevalence of depression during SARS pandemic, 2021.

PTSD on affected individuals (16, 25). The prevalence of PTSD was higher among affected individuals [23.4% (95% CI −11.6–58.3)] compared to healthcare workers [12.7% (95% CI 4.6–20.7)]. Nevertheless, affected individual was not comparable with the general population due to unavailability of data in the meta-analysis. Moreover, the prevalence of distress among affected individuals was 68%, which was higher than healthcare workers (23.4%) during SARS period. In contrast, prevalence of sleeping problems among healthcare workers was 36.1% during COVID-19 pandemic and this figure was higher than that of SARS (28.4%) (Figure 12).

Discussion

In this systematic review and meta-analysis, we aimed to critically examine on how the SARS and COVID-19 outbreak affect the mental wellbeing of different population (i.e., general public, healthcare workers, and affected individuals) during the initial stage of unprecedented outbreak. In our study, the pooled prevalence of anxiety during SARS and COVID-19 were 37.8 and 34.8%, respectively. The pooled prevalence of depression during SARS and COVID-19 were 30.9 and 32.4 %, respectively. According to a recent report published by the World Health Organization (36), the global prevalence of anxiety and depression in 2015 was 3.6 and 4.4%, respectively, which were lower than our findings. It was evident that infectious diseases outbreaks had caused negative detrimental impacts on different populations.

The severity of the psychological impact between SARS and COVID-19 was somewhat similar in a way that the prevalence of anxiety in both outbreaks were slightly higher than depression. Our findings, however, contradicted with those findings by (36) as their global prevalence of anxiety was lower than depression. Nonetheless, our findings were in line with a recent research conducted by (37) that the prevalence of anxiety and depression were 12.1 and 5.3%, respectively, despite our prevalence of anxiety during SARS and COVID-19 was more than 3-fold than that of (37).

Regarding the healthcare workers, the psychological impact of COVID-19 was greater than SARS. For example, the pooled prevalence of stress during COVID-19 was higher compared to SARS. It was somewhat unsurprising as the state government and institutional support were protective factors to maintain good team spirit and resilience to combat any infectious disease outbreak (26). The sudden surge of COVID-19 pandemic with its rapid rate of transmission and high contagion in the globe, coupled with insufficient personal protective equipment and shortage of manpower were significant risk factors jeopardizing the mental health of frontline healthcare workers (38). As a matter of fact, the infection rates of COVID-19 among healthcare workers were three times more than that of SARS in China. By March 2020, there were more than 3,000 healthcare
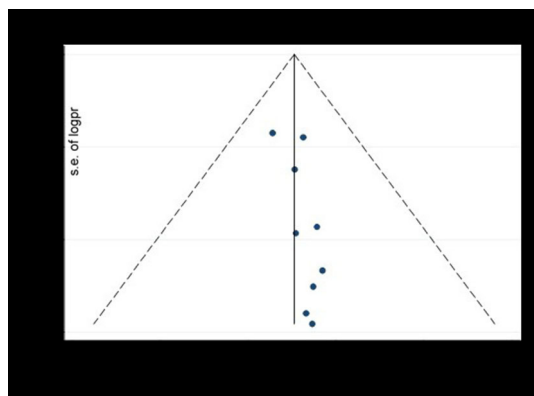
FIGURE 7
The prevalence of depression in the general population and among healthcare workers during COVID-19 pandemic.
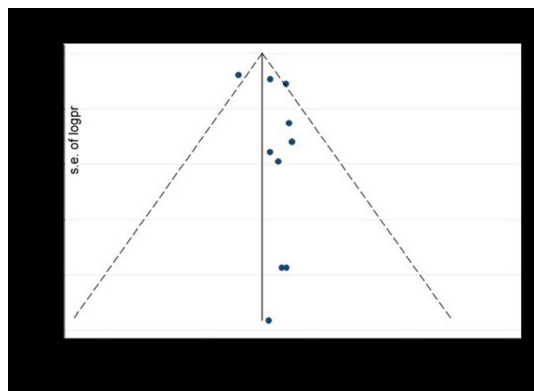
FIGURE 8
The funnel plot to test publication bias of ten studies of pooled prevalence of depression during COVID-19 pandemic, 2021.
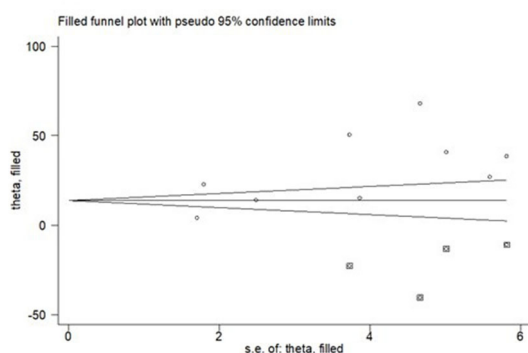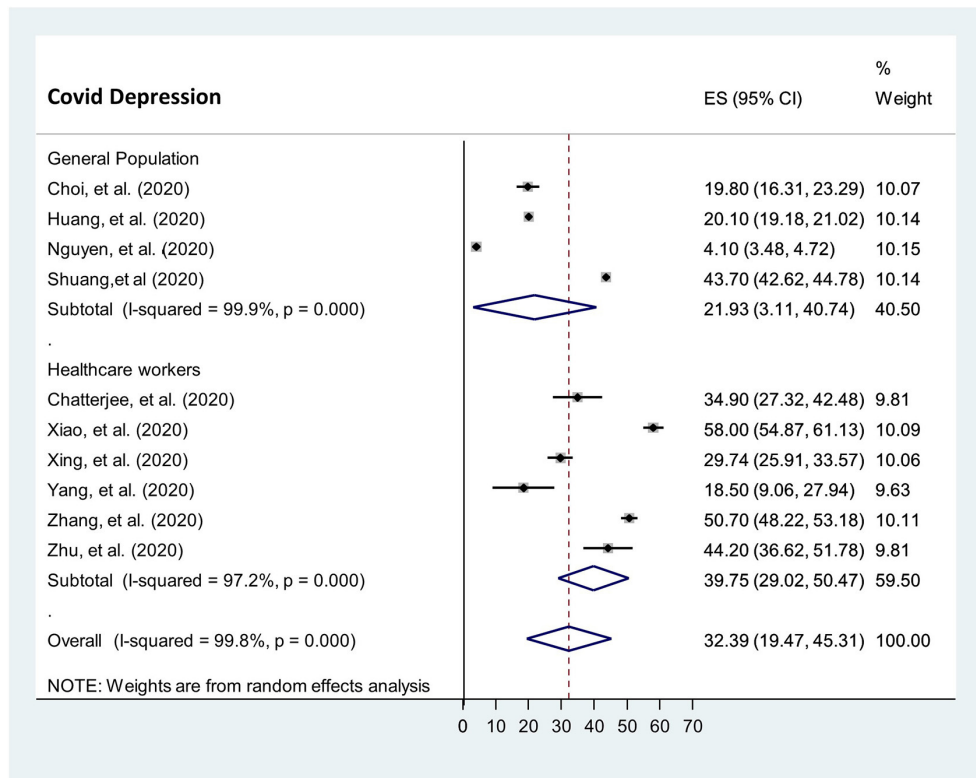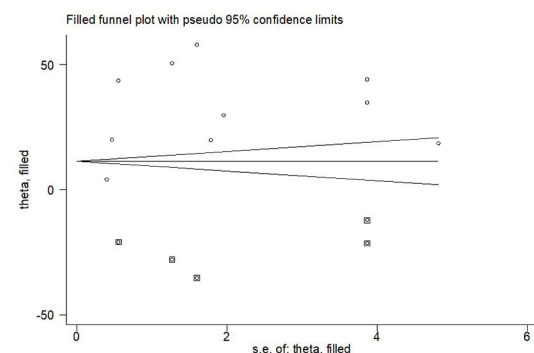

FIGURE 9
The result of trim and fell analysis for pooled prevalence of depression during COVID-19 pandemic, 2021.

workers infected with COVID-19 in China (11) compared to only 1,000 infected healthcare workers infected with SARS in China (39).

Besides, the psychological impact on affected individuals was more severe than that of healthcare workers. It was evident that the mortality and morbidity rate was high in SARS and that increased the perceived risk of different populations during COVID-19 pandemic (5). Perceived risk may also vary depending on job nature and educational attainment. Healthcare workers presumably had lower perceived risk as they were professionally trained in the management of public
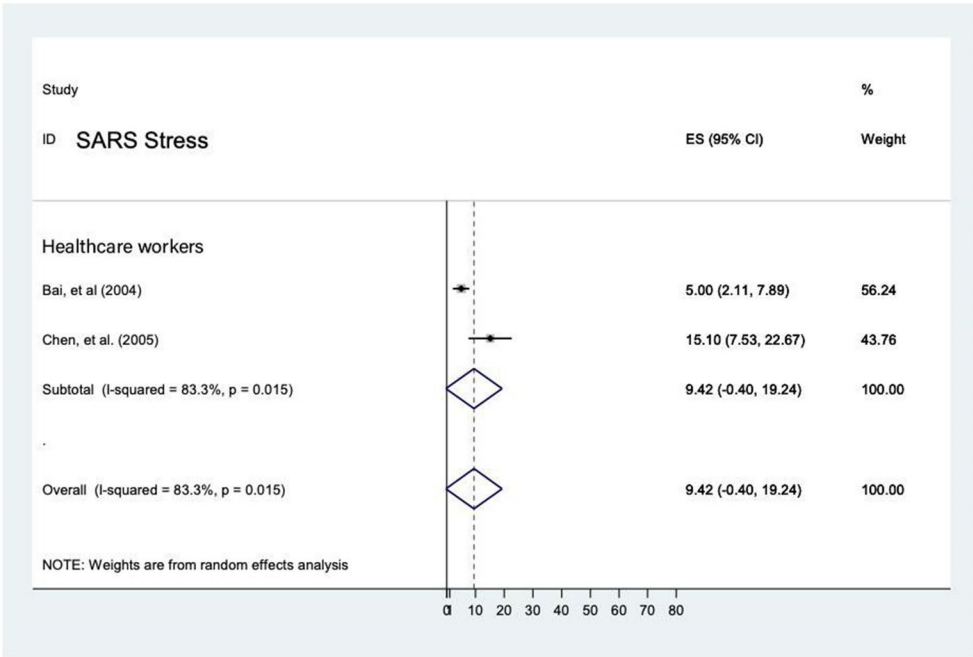
FIGURE 10
Prevalence of stress among healthcare workers during SARS epidemic.

FIGURE 11
The prevalence of stress in the general population during COVID-19 pandemic.

FIGURE 12
Prevalence of PTSD among healthcare workers and affected individuals during SARS epidemic.

health crisis (40). According to past research that investigated the impact of SARS on SARS survivors, over 60% rated their perceived life threat as "moderately to extremely serious" (16). The traumatic experience of those SARS survivors may put them in a more vulnerable position when they were confronted with another public health crisis.
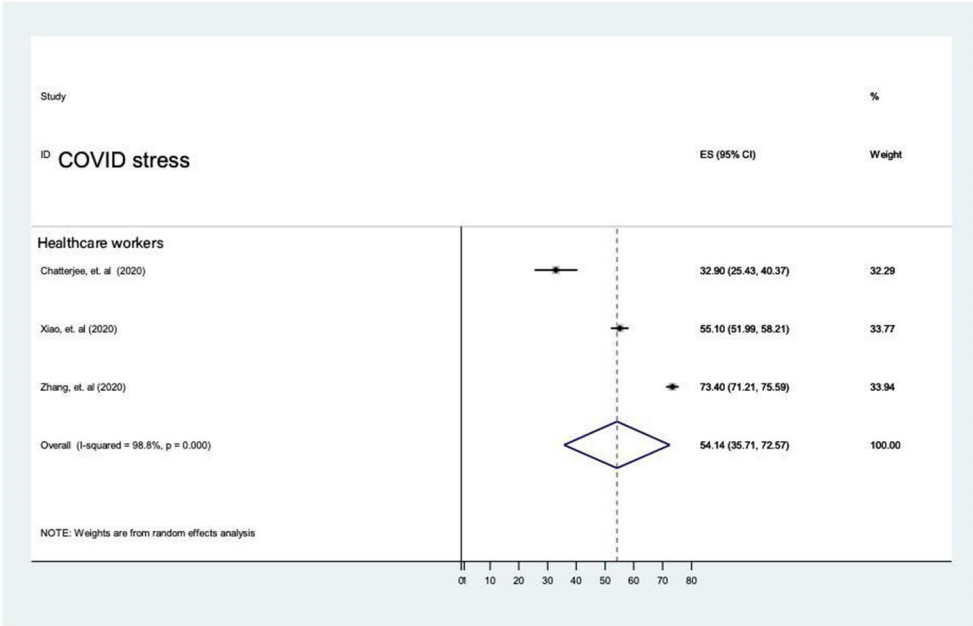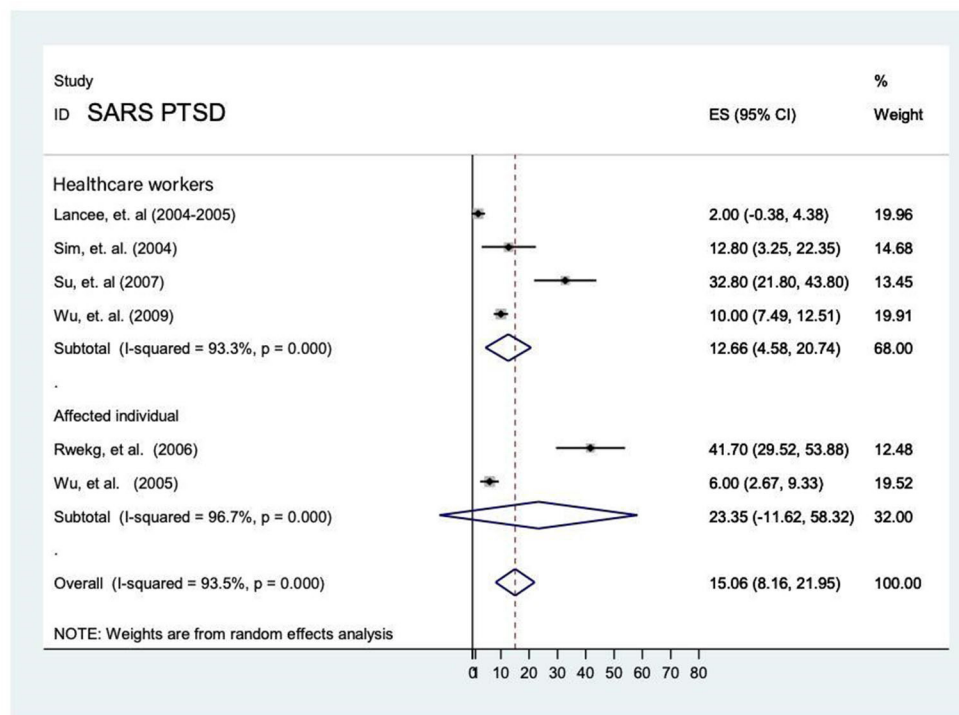
Lastly, the psychological impact on healthcare workers was more severe than the general public in COVID-19. Healthcare workers had a much higher chance of exposure and susceptibility to this new virus compared to the general public as the former had direct patient care to confirmed/suspected COVID-19 patients (41). Due to shortage of manpower, some frontline healthcare workers had to work long hours shifts without decent supply of personal protective equipment in the clinical settings. As such, the risk of infection and perceived stress level was higher among healthcare workers. Due to high contagion nature of COVID-19, healthcare workers may have persistent fear of transmitting the virus to their families and friends and thus, they tended to self-isolate themselves or in quarantines when they were off work. Prolonged self-isolation without social support may worsen their mental wellbeing leading to increased level of stress and depression during the COVID-19 pandemic (42).

Implications

The psychological impact brought by infectious disease outbreaks should not be under-estimated. Public health policymakers may consider developing a surveillance and monitoring system worldwide to continuously monitor the situation of an infectious disease outbreak (43). With the development of surveillance systems, stakeholders are more capable to detect and tackle public health emergency globally. Insufficient knowledge and unclear information of any disease epidemic may exacerbate anxiety and depression in the general public (44, 45). Thus, the general public should be well-informed about the etiology, symptoms of the respiratory infectious disease, preventive measures (e.g., social distancing, face masks wearing, proper handwashing) and treatment of any infectious diseases outbreaks to reduce their level of anxiety, stress and depression (46). Myths and misconceptions should be promptly clarified by the health authority to reduce the anxiety level of the public. Psychological intervention such as remote counseling, telecare and effective online stress-reduction strategies should be promoted during the pandemic era to maintain the mental wellbeing of different populations (14). Health authority should increase the transparency of professional mental health seeking online platform *via* digital

media so that the lay public is better equipped with higher mental health literacy. A 24-h mental health helpline should also be in place for immediate mental health advice from those in need. Health authority should establish a team of mental health experts including psychiatrists, clinical psychologists, counselors and mental health nurses to deliver timely mental health interventions and treatment to those at risk subgroups including those reporting depressive symptoms, anxiety, PTSD and sleep problems so as to reduce the psychiatric morbidity and global disease burden.

Limitations

There were several limitations needed to be addressed. At the time of reporting, COVID-19 pandemic still exists and thus, we cannot include the latest publications in our systematic review and meta-analysis beyond June 2020 (our cut-off period registered in PROSPER). Nevertheless, we used PubMed and the same search terms to identify the latest publication from 1 June 2020 and 30 July 2021. A total of 14 articles were identified (N = 9,706). Of which, 4 papers were on affected individuals (47–50) (n = 811) and another 4 [(51–54)] on healthcare workers (n = 2,298); 6 on general public (55–60) (n = 6,597) across Asia (Taiwan & Australia), Europe (Italy, Poland & Turkey) and other countries (USA, Brazil, & Saudi Arabia). Prevalence of anxiety ranged from 8.1 to 92.1% while prevalence of depression ranged from 2.1 to 50%. Prevalence of stress ranged from 6.84 to 48.3%. Prevalence of PTSD ranged from 11.0 to 40.3% across these extracted studies (please refer to Supplementary Tables 1–3). There seems to be a huge variation regarding the prevalence of depression, anxiety, stress and PTSD, this phenomenon is likely to be attributed by the number of infected suspected COVID-19 cases during the study period. Of particular note is that there is only 1 cross-sectional study conducted on healthcare workers in Taiwan (51) which compared perceived stress between COVID-19 and SARS. All the other 13 selected studies were all focused on COVID-19. It is noteworthy that these recent studies utilized various psychological measurement tools which makes meta-analysis impossible.

Second, we encountered difficulty in comparing affected individuals and general population between COVID-19 and SARS due to unavailability of data. Third, there was a high heterogeneity of results attributed to the use of different measurement tools and variables in selected articles. Fourth, almost all selected studies in this review used cross-sectional design and thus, the long-term psychological impact on different populations cannot be examined. Lastly, there was only one study originated from Canada, and the remaining 22 papers were sourced from Asia. Results from our systematic review and meta-analysis could be biased and thus, needed to be interpreted with caution. Majority of studies were Asian oriented, where

the quarantine measures adopted were somewhat similar, such as compulsory facemask wearing, social distancing, and stay home advice. All these measures, collectively, influenced the negative mental wellbeing of studied population. As a result, independent effect of individual countries' precautionary measure were unable to be totally reflected in the selected studies and hence, the variation in psychological wellbeing among individuals residing in different countries was not compared.

Conclusion

The epidemics of SARS and COVID-19 has brought about high levels of negative detrimental impact to individuals and the community at large. Psychological interventions and contingent digital mental health platform should be promptly established nationally for continuous surveillance of the increasing prevalence of negative psychological symptoms. Health policymakers and mental health experts should jointly collaborate to provide timely, contingent psychiatric and psychological support to those in need to reduce the global disease burden.

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Data availability statement

The datasets generated and/or analyzed during the current study are available in the figshare repository, https://figshare.com/s/2304e48e86481aa589ca.

Author contributions

SL conceived and guided the study. TC and SR Nursing Working Group carried out the literature searches. CC, TF, and SL extracted the data. SL and TC assessed the study quality. NS performed the statistical analysis. TC and SL wrote the manuscript. RA and Y-TX critical reviewed and revised the manuscript. All authors contributed equally to this work.

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. 2022.1004558/full#supplementary-material

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"The whole sky has broken down on me. I might die alone": A qualitative study on the lived experiences of COVID-19 positive frontline workers in Bangladesh

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Many countries, including Bangladesh, have conducted research on the mental health of frontline workers and their challenges in adjusting to their new workplaces. However, the authors are unaware of any studies on their real-life experiences as COVID-19-positive patients in Bangladesh. This study intends to investigate the lived experiences of Bangladeshi frontline workers who were isolated as a result of the COVID-19 infection and tested positive for the virus. We used a qualitative methodology and a semi-structured interview guide to conduct ten interviews between July 26 and August 12, 2020. The participants were recruited *via* a social media campaign and purposive sampling. All interviews were conducted *via* telephone and online and were transcribed and analyzed using Colaizzi's phenomenological method. The study does, however, identify four primary themes and 13 supporting themes, including (1) experience in a new working environment (subthemes: workload and adaptation, maintaining health protocol and social distance, and the fear of infection), (2) diagnosis (subthemes: the origin of infection, physiological problems, experiences at the diagnosis center), (3) recovery days (subthemes: earlier reactions, experiences in isolation, coping mechanisms), and (4) post-COVID-19 (subthemes: excitement, fear, and confusion; physiological problems; increased religiosity; and changes in philosophy). This study is important for healthcare policymakers because it helps them design healthcare management systems that take Bangladeshi society's social context into account. This study also recommends that long-term behavioral change programs be implemented by national policymakers to lessen societal stigma.

At the same time, it suggests that the government should help lessen the barriers to health care services that persons with lower socioeconomic status confront.

Introduction

The SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2) virus, which causes COVID-19, is highly contagious and pathogenic. It has sparked a global pandemic that has resulted in a large number of deaths around the world. Although there is debate about the exact origin and source of the virus, Wuhan- an emerging economic and commercial hub in China initially saw an outbreak of a new coronavirus by the end of 2019 that killed over 1,800 people and infected over 70,000 individuals in the first 50 days of the COVID-19 epidemic. In 2003 a viral infection caused by the SARS coronavirus broke out in southern China's Guangdong province (Shereen et al., 2020), which created a pandemic that affected 26 countries worldwide and claimed more than 8,000 infections and 776 deaths (World Health Organizaition, 2003). However, SRAS-CoV (2003) had a fatality rate of 9 percent (Shereen et al., 2020), whereas SRAS-CoV-2 (2019) has infected 619,836,103 people in 228 countries and territories with 6,539,363 deaths (Worldometer, September 24, 2022), indicating that SARS-CoV-2 has an even greater transmission rate than SRAS-CoV.

Bangladesh officially declared its first identified COVID-19 case on March 8, 2020, and confirmed the first death on March 18, 2020, which puts us at 2,020,768 confirmed cases and 29,347 deaths until January 2022 (Worldometer, September 24, 2022). According to the Bangladesh Medical Association, about 8,890 frontline healthcare workers tested positive among the infected, and 87 died (Rosenvald, 2022). Besides the healthcare workers, frontline workers, including 833 journalists, 8,331 police officers, and 150 administrative workers, were identified as COVID-19 positive; around 60 died among them (New Age, June 19, 2020; Rosenvald, 2022). The countless frontline workers who continue to work despite the adversities and health hazards associated with the COVID-19 outbreak are the true heroes of our time. They work very hard amidst the severity of the pandemic to keep people safe and healthy. Global evidence also reports that the number of infections among frontline workers, especially healthcare providers, is higher than in general people (Liu Y., et al., 2020). In addition, due to the nature of work frontline workers worldwide suffer from various psychological and physiological problems (Lai et al., 2020; Shahbaz et al., 2021). Several studies have shown a high prevalence of mental health symptoms, such as anxiety, insomnia, distress, and psychological burden among frontline healthcare workers while treating patients with COVID-19 (Muller et al., 2020; Upadhyaya et al., 2020; Wang et al., 2020; Sun et al., 2021; Zhang et al., 2021). Studies also revealed that frontline workers faced various professional and psycho-social challenges during this pandemic that included a harsh working environment, fear of contaminating family members and others, adaptation to continuously changing guidelines, and a lack of PPE (Lai et al., 2020; Hossain M. A, et al., 2021; Khatun et al., 2021; Shahbaz et al., 2021). Moreover, COVID-19-positive frontline workers have been seen to hide their symptoms from their loved ones because of the fear of stigmatization (Logie and Turan, 2020; Kwaghe et al., 2021).

Numerous studies are being undertaken throughout the world to examine the psycho-social experiences of frontline workers caring for COVID-19 patients during this pandemic (Lai et al., 2020; Aughterson et al., 2021; Dagyaran et al., 2021; De Kock et al., 2021; Deng and Naslund, 2021; Magner et al., 2021; Nguyen et al., 2021; Sun et al., 2021; van der Goot et al., 2021; Wang et al., 2021, 2022; Yin et al., 2022). Nevertheless, a few global studies describe COVID-19-positive frontline workers' lived experiences (Fawaz and Samaha, 2020; Siagian and Rantung, 2022; Simeone et al., 2022). For example, Siagian and Rantung (2022) explored the lived experiences of seven Indonesian healthcare nurses who tested positive for COVID-19 in a descriptive phenomenological study. They recognized the pre-isolation, isolation, and post-isolation lived experiences of survivors in their study, which included, among other things, fear, reaction, feelings in the isolation room, and post-COVID-19 condition. Similar to this, De Simone et al. (2022) examined the lived experiences of Italian frontline nurses and doctors who were affected by COVID-19. They looked at the strong emotional impact of COVID-19 on nurses and doctors who contracted it while performing their duties, including feelings of fear and loneliness on the one hand and impotence and guilt for not being able to help on the other. However, prior to this study, there was a dearth of literature in Bangladesh about the lived experiences of front-line healthcare workers who tested positive for COVID-19.The majority of COVID-19 studies in Bangladesh have concentrated on the work experiences of frontline workers, their mental health problems, and associated

stigma in healthcare settings and outside (Farhana, 2020; Akhter et al., 2021; Hossain M. A, et al., 2021; Hossain M. B, et al., 2021; Khan Rony et al., 2021; Khatun et al., 2021; Rahman et al., 2021; Rana and Islam, 2021; Razu et al., 2021; Sakib et al., 2021; Mehedi and Ismail Hossain, 2022; Miah et al., 2022; Pooja et al., 2022; Rahman, 2022; Tune et al., 2022; Uddin et al., 2022). In addition, a group of researchers in Bangladesh conducted a telephone-based survey of 322 healthcare professionals to examine their quality of life after being cured of coronavirus (Rashid et al., 2022).

Moreover, prior COVID-19 research did not examine the lived experiences of various infected frontline workers, including healthcare providers, law enforcement personnel, journalists, and bankers. The current study will address this knowledge gap by examining the experiences of Bangladeshi frontline workers who tested positive for COVID-19. Moreover, as individual viewpoints might vary depending on a person's culture and society, it is crucial to explain and comprehend frontline workers' experiences in a particular context. Additionally, their untold stories about their work, diagnosis, isolation, socio-psychological vulnerabilities, social support, and organizational support throughout and after their quarantine will help policymakers and stakeholders design efficient strategies to lessen their work-related burden and discrimination in Bangladesh.

Materials and methods

Research design

Using Colaizzi's phenomenological method we qualitatively analyzed the lived experiences of frontline workers in Bangladesh who were identified as COVID-19-positive patients. This approach seeks to comprehend people's daily experiences. It identifies common patterns of meaning rather than unique characteristics in the research subjects, ensuring the validity of the information gathered from the participants (Shosha, 1857; Sanders, 2003).

Participants

From July 26, 2020, to August 12, 2020, we selected ten COVID-19 positive frontline workers (three medical frontline workers and seven non-medical frontline workers) from various sources, including a social media campaign and personal contact. We adopted the required number of participants by interviewing those who met the following inclusion criteria until the data was saturated and no new themes were generated.

The inclusion criteria included:

1. Of those who had contracted COVID-19 after a diagnosis,

2. Those who had undergone at least a 2-week isolation independently or in a hospital, and

3. Those who had formally agreed to participate in the study after being informed of its goals.

Interview outline

We developed the interview outline after reviewing pertinent literature and getting feedback from group members at numerous meetings. The interview subjects were asked the following questions: (1) What was your earlier life before infection? (2) How did you come to know about your infection? (3) What were your initial responses after identifying yourself as a COVID-19 patient? (4) What were your experiences during the isolation days? (5) How did you cope with this situation? (6) What aspects of life changed after your recovery from COVID-19?

Data collection

An email including a consent form and an interview guide was sent to participants who indicated an interest in participating in this study. After the participants gave their consent, an interview was scheduled and held whenever it suited them. The five research team members (SA, TR, MB, MH, and MI) conducted each interview. Due to the pandemic, the interviews were carried out over the telephone and on online platforms (zoom, google meet). Each interview lasted 35–60 min and was conducted in Bangla. With the participants' consent, all interviews were audio recorded.

Data analysis

Within 24 h of each interview, the team translated the audio recording from Bangla to English. The first two authors (SA and TR) then read each transcript several times to identify significant statements. Next, they took the meaning units from these statements and provided codes. After creating a preliminary list of themes that emerged from the diversity of transcripts, the connections between themes (cluster meaning) were established. The research team then engaged in frequent online meetings to extrapolate themes and subthemes from the coding. Finally, divergent opinions on the content of the topics were addressed and resolved by a professor with experience in qualitative research. We also conducted another interview with the participants to share the study's findings for validation.

Ethics

This study followed the ethical agreement of the Helsinki declaration. The study participants had the right to withdraw from the research at any time. In gathering the data we maintained objectivity and built strong bonds with the individuals. Each participant's name was changed to a pseudonym to protect their identity. We kept all the information in a password-protected Google Drive storage system that was only available to us.

Results

Characteristics of the participants

Our study comprised three medical frontline workers and seven non-medical frontline workers who had been diagnosed as COVID-19 patients and were between the ages of 28 and 45. Their average age was 34 years. Three of them (30%) provided healthcare services, three (30%) worked in law-enforcement agencies and bureaucracy, and the remaining four (40%) worked in the financial sector and print media industries. Moreover, 30% of respondents were single, whereas 70% were married. In addition, seven respondents received treatment at home, while three others were admitted to COVID-19-dedicated hospitals. The duration of treatment lasted between 14 and 32 days. The participant's characteristics are outlined in Table 1.

However, we analyzed the lived experiences of COVID-19-positive frontline workers in Bangladesh using phenomenological techniques. Four significant themes and 13 subthemes emerged from Figure 1. The analysis of the participant's responses is outlined below.

Theme I: Experiences in a new working environment

Frontline workers in the COVID-19 situation encountered numerous challenges in a new work situation that impacted their physical, psychological, and social wellbeing. This theme consisted of three subthemes: workload and adaptations; maintaining health protocol and social distance, and the fear of being infected by others.

Workload and adaptations

None of the frontline workers in this study had worked in a pandemic environment like the current COVID-19 pandemic in Bangladesh. Therefore, they had to adapt to the new working situations and policies. Specially, medical frontline workers had to face dire conditions due to their direct involvement in treating COVID-19 patients in the corona unit. In addition, because of the increasing number of COVID-19 patients in Bangladesh, non-medical frontline workers were deployed and assigned to different places outside their routine work.

"*Since I am a government employee, I had to go to different places to perform official duties at the beginning of the corona infection in Bangladesh. I started working to ensure social distancing from the period when the government announced that no more than 10 or 15 people could gather in a place. Control of public gatherings at various institutions, wedding houses, religious and social functions, to ensure the home quarantine and isolation of expatriates and those who came from outside the district, etc., were my prime official duties during that time*" (R2).

"*I have been on the field since the beginning of Corona, highlighting the plight of patients in hospitals, including the mismanagement of sample collections, the neglect of unsuspected people, and the corporate propaganda called 'corona drug.' While other stations shut down their crime investigation programs, Searchlight did not shut down for a single episode*" (R7).

Maintaining health protocols and social distance

Most of the frontline workers in this study expressed that they always tried to follow the health rules of the Directorate General of Health Services (DGHS) and World Health Organization (WHO) properly. Initially, medical frontline healthcare workers in Bangladesh had shortages of personal protective equipments and they had to work long hours in COVID-19 dedicated isolation units with corona patients. So maintaining health protocols were challenging at the beginning. But gradually this situation improved. However, for non-medical frontline workers it was very difficult to work with complete personal equipment (PPE) and maintain a social distance because of their nature of work in diverse areas and people.

"*When I went to bury Corona suspicious person's body, I wore full PPE (Personal Protective Equipment). However, when I went to the work court or other work, I used a mask, gloves, and head cover. It is tough to ensure social distance in Bangladesh due to the people's indifference. I tried but could not always maintain it*" (R9).

TABLE 1 Characteristics of participants.

Code	Gender	Age	Occupation	Marital status	Isolation
R1	M	28	Sub-Inspector	Single	22
R2	F	31	Magistrate	Single	14
R3	M	45	Banker	Married	18
R4	M	38	Doctor	Married	14
R5	F	35	Banker	Married	14
R6	M	32	Doctor	Married	18
R7	M	35	Journalist	Married	32
R8	M	30	Banker	Married	21
R9	M	37	Doctor	Married	14
R10	M	28	Sub-Inspector	Single	16

The fear of being infected by others

Because of the severity of the virus, misinformation, data, nature, and workload, the survivors experienced fear of contracting the virus. In addition, most participants feared spreading the virus to their families and close ones.

"As I was the only earning member of my family, I always feared being affected by the virus." So, I tried to maintain necessary precautions like wearing a mask, washing my hands frequently, and trying to maintain distance as much as possible" (R4).

Another participant involved in financial services (bank) closely observed a patient with COVID-19 symptoms who were not granted leave by the authorities. As a result, she feared going to the office every day. According to her statement,

"I was afraid of going to the office regularly. One incident in my office that I want to mention here. One of our colleagues was suffering from a cold during the lockdown situation. Although she applied for leave, she was not granted it. As a result, she frequently met all of us, and we became horrified" (R5).

Theme II: Diagnosis

This theme centered on survivors' experiences of being infected and the diagnosis center. Three subthemes emerged from this, such as the origin of infection, physiological symptoms, and experiences in the diagnosis center.

Origin of infection

Those frontline workers whose duty was to provide public services and welfare amidst the severity of COVID-19 believed that they had been infected because of their frequent visits to public places and contacts.

"The way both of us (couple) have done our professional work in dealing with the Corona situation, we assumed today or tomorrow we would be infected because we did not have the opportunity to stay at home" (R7).

The same was true for another healthcare frontline worker who treated COVID-19 patients at a private hospital and experienced the tragic loss of three family members due to COVID-19.

"As I was taking care of my father, like taking him to the ICU when he developed severe respiratory problems, though I was doing everything with protection, of course, I thought that I should test myself. There was a likelihood that I may have transferred the germ to my other colleagues as I was working with them in the hospital" (R5).

Physiological symptoms

When the respondents were interviewed the most reported symptoms were fever, neck pain, headaches, coughs, body aches, and loss of taste and smell, as indicators of their general weakness. The comments here include examples of the earlier symptoms that the front-line workers reported.

"I had no such symptoms except some minor neck pain. However, gradually, I developed other symptoms, and my physical situation worsened" (R1).

"My wife and I tested a corona examination on May 11 at Bangabandhu Sheikh Mujib Medical University with symptoms of fever, headache, slight cough, and severe pain around the ears" (R7).

Major themes and sub-themes

1. **Experiences in a New Working Environment**
    a) Workload and adaptations
    b) Maintaining health protocol and social distance
    c) The fear of being infected by others
2. **Diagnosis**
    a) Origin of infection
    b) Physiological symptoms
    c) Experiences at the diagnosis center
3. **Recovery Days**
    a) **Earlier reactions**
        i.   Fear of death
        ii. Depression and emotion
        iii. Surprise
        iv. Anxiety about family
        v.   Prior mental preparation
    b) **Experiences in isolation**
        i.   Care vs. denial
        ii. Self-isolation
        iii. Fear, dilemma, mental struggle
        iv. Social stigma
    c) **Coping mechanism**
        i.   Changing in diet
        ii. Prayer and listening to Wazz
        iii. Music, movies, and reading books
        iv. Telemedicine
        v.   Self-motivation
        vi. Social support
4. **Post-COVID Days**
    a) Excitement, fear, and confusion
    b) Physiological problems
    c) Financial stress
    d) Changes in philosophy

FIGURE 1
Major themes and sub-themes.

However, two respondents stated that they did not display any physical symptoms in their bodies in the initial stages of the disease or even after it was diagnosed. Even though everything about them was fine, they were listed as COVID-19-positive patients after the test.

> "*Even in my case, I was certain that I was carrying the germ and infected my wife, though I had no such symptoms to be sure of my disease*" (R6).

Experiences in the diagnosis center

When they went to the diagnosis center for a diagnosis, those frontline employees involved in government services (such as police, magistrates, and doctors) received tremendous support. However, even though they were not required to keep queues for providing samples in the medical center, one of the respondents described his encounter with the testing facility as follows:

> "*I did not need to pay any fees for my test, as it was free for all government officials. I also did not face harassment while doing tests standing in a queue or others. Instead, I went to the hospital, filled out a form with some information, gave a sample, and returned*" (R1).

However, people from lower socio-economic backgrounds who worked in the private sector struggled in the diagnosis centers. Another one commented,

> "*When I went to the Upazilla health complex to do a blood test, the doctor left the hospital for having lunch*" (R3).

Theme III: Recovery days

This theme covers a significant area of the survivors' experiences after identifying themselves as COVID-19 positive. Their initial reactions after the test report, experiences in the isolation center/home isolation, and coping mechanisms are discussed here. This theme includes earlier reactions (fear of death, depression and emotion, surprise, anxiety about family, hiding disease from family, prior mental preparation); experiences in isolation center/home isolation (care vs. denial, fear, dilemma, mental struggle, social stigma, self-isolation); and coping mechanisms (changing in diet, prayer, entertainment, telemedicine, self-realization, social support).

Earlier reaction
Fear of death

Some frontline workers experienced fear of death and anxiety after identifying themselves as COVID-19 patients. However, they informed us throughout our conversation that they were fully aware of how Bangladeshi family members and relatives consider the corpse of a corona patient as something unpleasant and unexpected.

> "*When I heard it, I felt that the whole sky had broken down on me. I might die soon. Life is very short. We are just like guests on this earth*" (R1).

> "*After getting the report, my whole situation changed. I became anxious. Suddenly, my hands and feet were shaking. I started thinking about death and afterward*" (R2).

Depression and emotion

While being identified as COVID-19 patients after the test, most of the individuals in this study reported feeling depressed. In addition, some of them have started to experience emotional instability. Even one participant with no physical symptoms of illness developed psychological weakness. The reason for this is that after the disease was reported, they were worried about the severity of the virus and its burden.

> "*I was broken at first after hearing the news. Especially when Sayda hugged me and cried and said, We do not even have a baby*" (R7).

However, a 35-year-old female assistant commissioner of Kishorgonj Upazilla who initially experienced depression later revealed that she gradually turned her depression into strength.

> "*I became a little depressed. However, I convinced myself that if I remained frustrated, I would die. So I had to convert my depression into mental strength*" (R4).

Surprisement

At least two respondents who had no physical symptoms expressed surprise when they had identified themselves as COVID-19 positive. When we interviewed them they said that they had always kept a social distance, been extremely cautious from the beginning and adhered to health regulations (including PPE). They found it difficult to believe because they were certain they had followed the precautionary measure. One of the respondents said as "*I tested only to be sure of my situation but I was astonished seeing that I was also positive while I had no symptoms*" (R6).

Anxiety about family

Nearly all participants admitted to becoming extremely concerned for their families after receiving confirmation of their infection. This is because they were the primary breadwinners in their household. As a result, they started to worry about what would happen to their families if the virus harmed them.

> "*At that time, the first thing that came to my mind was my family, especially my younger sister*" (R2).

> "*I became anxious about my family, especially about my little children*" (R9).

Another respondent who was a non-medical frontline workers had to keep his sickness a secret from his family. He was far away from them and just did not want to upset them. According to him,

> "*I did not tell family members about my infection as I was far away from them. I did so because everyone was so afraid and anxious during that time of pandemic outbreak that if anyone was identified as a COVID-19 patient, people believed that that person would die soon or thought that he/she was very prone to death. So I decided not to inform my family and relatives because it could make them more sacred*" (R1).

Prior mental preparation

We also found a new situation after our interview. The majority of the frontline workers were panicked and became anxious, however, a 37-year-old frontline financial service provider kept her composure despite knowing she was sick. This is because, prior to becoming ill, her family had COVID-19 survivors. Therefore, she took mental preparation in advance of her infection as well as remained calm knowing the nature and severity of this virus. According to her,

> "*I was not afraid. You know, it is not a dangerous disease. I was conscious only of my smell problem. However, I got used to this situation because two more people had been infected in our house. I saw them closely*" (R5).

Experiences in isolation
Care vs. denial

Most of the frontline workers we have interviewed remained in isolation at home. Only three were admitted to hospitals designed explicitly for COVID-19, where they were isolated for a minimum of 14 days. They consequently experienced positive and negative interactions with the caregivers while in isolation. However, one of the respondents, a police officer, said that the hospitals provided adequate healthcare when we asked him about his hospital experiences.

> "*I was admitted to the district police hospital in Sylhet.*" Moreover, three of my colleagues, who were also positive, remained in the room. The hospital authorities provided us with good treatment and everything that we required. They sent every necessary accessory as soon as we informed them over the telephone or mobile phone* (R1).

On the other hand, another non-medical frontline workers shared his bitter experiences while receiving treatment at COVID-19 dedicated hospital. He was shocked that no one, not even physicians or nurses, had ever seen him physically during his 22 days of isolation in hospitals.

> "*During our 22 days of hospitalization, no doctors, nurses, or other medical staff ever visited us physically in the hospital, but only in some critical situations. Instead, they talked to us over the phone and provided only virtual advice. It frustrated me a lot to think that this is happening because we are COVID-19 patients*" (R9).

Self-isolation

At least two respondents described similar instances of self-isolation from family and friends. They internalized their condition and prioritized their family members' wellbeing. Even one of the responders could not go to his father's burial because he felt that other people would fall in danger of infection.

"I have grief for not attending my father's funeral, but I took the right step at the right moment because my presence could infect others in a way that I could never accept" (R6).

Fear, dilemma, and mental struggle

Almost all frontline workers experienced various forms of emotional distress in isolation, including dilemmas, insomnia, and fear of deaths. One of the frontline workers who was away from her house because of job obligations struggled to sleep and experienced death fears while alone in an isolation room at a government estate. She could not communicate with anyone because her home was kept in strict lockdown during her quarantine. She asserts,

"Since I had trouble breathing almost every night when I went to bed, I was afraid that I might not be able to get up in the morning. I was scared to death. I thought I had these psychological problems because I was living alone" (T2).

Another survivor, a well-known journalist, and author in Bangladesh experienced difficulty, uncertainty, and emotional stress during his mandatory home quarantine. According to him,

"The doctor advised us to avoid social media, especially Facebook, and suggested we be busy with housework and self-care. But unfortunately, I did not listen to the doctor but once or twice used Facebook. Later, I saw that it truly created anxiety and mental pressure on me. Especially when you see that everything in the world is running smoothly, nothing is stopped because of your illness" (R7).

Furthermore, a medical professional who cared for coronavirus patients in a private hospital in Dhaka shared similar worries with us.

"The doctor told us to follow the routine and to become worry-free." But nevertheless, is it possible to remain worry-free after all of this? I was shocked that even a little gastric pain was short of breath! "Corona was such a mental torture" (R8).

Social stigma

The COVID-19 infection had an impact not only on the patients but also on their interpersonal and societal interactions. People purposefully avoid COVID-19 patients due to an overarching fear of infection. During their solitude, survivors allegedly experienced rejection and ostracism from those who were closest to them. At least two of non-medical frontline workers shared similar stories of denial from their colleagues and close ones when they caught COVID-19.

"The building where I live was completely locked down. I faced some social stigma. After I got sick, I heard many officers who worked with me were terrified. Many of my colleagues around me wanted to escape. For example, after hearing the news of my infection, the naib of my office went to his village. He was afraid I might order him to work for me, but I think I have faced fewer social vulnerabilities due to my social status than other survivors" (R2).

Even families of patients who tested positive for COVID-19 had to deal with unfavorable behaviors from their kin and neighbors Due to this stigmatization, a 38-year-old doctor who treated Corona patients in a private hospital in Dhaka had to endure severe repercussions. In his opinion:

"As frontline workers, we had to give service directly to the COVID-19 patients. When I returned from the hospital, I understood that they feared me. However, when four other members of my family and I were infected with the COVID-19 virus, they completely avoided us" (R6).

Another participant, a non-medical frontline workers who lost his father due to COVID-19 infection shared similar stories of being stigmatization by his neighbors. He also claimed that owing to stigma, he could not even convince anyone to hold the corpse after his father's death. The same rejection events occurred when he got infected. According to him:

"When the villagers learned about my father's disease, they started to treat us like wild animals. Even when my father died, none of my neighbors visited our home, and there was no one to hold the corpse bed. After that, they stopped coming to our pond to take a bath when I got infected" (R4).

Coping mechanism
Change in diet

The majority of patients who received treatment at home altered their diet plans. They thought eating a lot would make them more prone to the illness. Some respondents stated that they also regularly engaged in breathing exercises, steamed hot baths, and sunbathing, all of which assisted their recovery from the infection.

"According to the doctor's advice, I ate nutritious foods like milk, eggs, fish, meat, lemons, and vitamin C daily. I also took hot water vapor and followed the hygiene rules" (R2).

Prayer and listening to Wazz

Bangladesh has a large Muslim population. During times of isolation, faith in God and practicing religion were very effective coping mechanisms for the survivors. Nearly everyone we had a conversation claimed that their faith in God helped

them find relief from their sufferings. According to one of the respondents,

> "*Most of the time of the day I prayed salah and recited dua. As I was free from all worldly activities, I concentrated more on religious activities that gave me relief*" (R4).

Another participant who received treatment at a COVID-19-dedicated hospital regularly listened to various religious lectures (Wazz) on YouTube, which provided him with moral support to recover.

Music, movies, and reading books

Most of the frontline workers admitted that they avoided social media sites while remaining in isolation because it created anxiety and mental pressure upon them. One of the non-medical frontline workers asserted that he became mentally more vulnerable when he found everything around him was okay except him while scrolling into Facebook. However, most of the frontline workers passed their isolation times by watching movies, reading books, and a few of them involved in gardening.

> "*I did not use social media. I read books, walked around the house, watched funny movies, and spent time gardening*" (R2).

> "*Netflix and Amazon Prime helped me overcome this challenge. In series like Breaking Bad, Picky Blinders, House of Cards, Walter-Jesse's Math Lab, Celian Murphy's outstanding performance, and the political intelligence of the Underwood family, I forgot I had a fatal illness*" (R7).

Telemedicine

Before this pandemic, the general people of Bangladesh were not comfortable with telemedicine services. But due to the shortage of COVID-19 designated beds in public and private hospitals telemedicine services became very popular among the patients who received care remaining at home. Three individuals in our study also regularly consulted with their doctors about their health related problems over the phone, which helped them recovering from this disease. According to one of the respondents:

> "*We decided to take treatment from home until the situation worsens.*" *In that case, we need to be under the supervision of a specialist doctor.* "*Doctor X provided us treatment via telemedicine regularly*" (R8).

Self-motivation

Due to the severity and concealed nature of COVID-19 at the initial stages of infection, Bangladeshi people, notably frontline workers, were more susceptible. In addition,

a couple of the individuals we interviewed said that their family was their source of mental strength, aiding their recovery from this illness. One of the frontline worker who was kept in isolation in her government estate describe this situation as:

> "*I have done self-counseling by convincing myself that many people depend on me. So I have to live for my siblings and my family's future. This mental strength has inspired me to recover*" (R2).

Social support

Almost all of the frontline workers received immense support from their family members and relatives, which helped them to recover quickly. Even if, in some instances, the family members were not physically present while they were in the hospital or home isolation, their support—such as food, comfort, and religious guidance—were tremendously helpful in enabling them to heal and cope.

> "*Although I was in a COVID-19 dedicated hospital in an isolation room, I received immense support from my family. Whenever I talked with my wife over the phone, she told me not to be afraid. She motivated me in such a way that I am going to recover very soon. Even she took care of my family, children, and business in my absence*" (R4).

Some survivors also received much help from their colleagues, office managers, and friends, which was a huge help in their recovery. One of the respondents, who was admitted into a COVID-19 dedicated hospital along with four other colleagues, stated that because of their shared experiences, they could help one another and manage the situation even while remaining in a segregated unit. As (R1) said;

> "*... As we were living together in a hospital room, it was great to support us all. When we felt upset, we gossiped with one another, had fun and joked, and shared our grief to maintain social distance. It worked great to recover from our psychological hardship and effectively overcome our trouble. It had a tremendous impact on us that would not have been possible if I had stayed alone in a room.*"

Although most frontline workers reported having their neighbors denied and rejected them, an author and journalist told us that his house owner offered adequate support and cooperation when the couple became infected. Due to their comparative higher social status and their connections with the power structure they were most privileged even in the age of COVID-19, but the general situation is completely different in Bangladesh. According to the respondents:

> "*We informed the homeowner at the outset so that no one got panicked.*" *He helped us a lot from the beginning. He provided us with food, fruits, and bottled water, in addition to the constant search. He also hired a doorman who would bring emergency supplies and take down the garbage can* (R7).

Theme IV: Post-COVID-19 days

Following their recovery, survivors also reported post-COVID-19 physiological and psychological issues, such as chest pain, sleep issues, anxiety, and shortness of breath, as well as specific social issues, such as financial loss. However, they also started to view life more optimistically. There are four subthemes under this main theme: excitement, fear and confusion, physiological problems, financial stress, and changes in philosophy.

Excitement, fear, and confusion

Survivors undoubtedly felt joy when they returned to normal life. Although, medical-frontline workers had to return to their previous job as there was scarcity of physicians and nurses in COVID-19 dedicated hospitals in Bangladesh. However, some participants concurred that they were afraid of spreading the virus to others after they were fully recovered. Therefore, they stayed away from places where the public congregates, like bazaars, tea shops, and playgrounds. When we questioned why they felt this way, they admitted that their test results had left them perplexed. During the pandemic, some private hospitals and clinics issued fake corona test results, which led to significant discrepancies. According to them:

> "*After recovery, I tried to avoid visiting public places like bazaars, tea stalls, or friends' houses because I was scared if someone would be infected by me again. So, I tried to maintain all medical rules when communicating with others*" (R1).

> "*When I fully recovered I could not believe in myself! I wanted to meet my friends and close ones. However, you know I was frightened of mixing with them. I have little trust in corona testing. So, I do not want to put anyone at risk*" (R5).

Some survivors also experienced negative attitudes from their neighbors even after their recovery from the COVID-19 virus. Despite being healed, their bodies were marked as something to be afraid of. As a result, neighbors tried to avoid them for fear of contracting an infection. According to one of the respondents:

> "*Even after the report came back negative, many people stayed far away from me. So I do not know if it was for awareness or if people were scared of me*"(R2).

Physiological problems

The survivors experienced various physiological problems following their recovery. For instance, among the survivors breathing difficulties, respiratory issues, weakness, etc., were frequent. In addition, one survivor informed us that for a month, he could not move from one place to another owing to physical sickness.

> "*Even after recovery, I often had shortness of breath. I still have some respiratory problems and have also reduced my 4 kg weight*" (R2).

Financial stress

Corona is a substantial financial burden on patients. Although, those frontline workers we interviewed were comparatively remained in a better socio-economic condition rather than the general population in Bangladesh, but they reported having some form of financial hardship to support their families after recuperation. One of the participants who was a doctor lost his job due to corona infection. To her surprise:

> "*There has been some economic loss. The prices of daily necessities, including masks, sanitizers, fish meat, and eggs, have increased significantly. As a result, family expenses have increased immensely*" (R2).

Changes in philosophy

The participants returned to their everyday lives when the swab test results were reported as negative. Corona improved most of the survivors' outlooks, but a few of them who were highly educated were still uncertain about their sources of infection and the importance of mask in preventing corona virus. This is against our general beliefs about those who are illiterate are more suspicious and superstitious about the severity of corona virus. One of the non-medical frontline workers assert as: "*I do not believe a mask can protect us from corona*" (R8).

However, participants also claimed that they developed a stronger spiritual bond with God due to their COVID-19 experience. They prayed to God frequently while in the hospital and formed regular prayer routines. For example, one of the respondents who was agnostic now became a devoted follower of religion. According to him:

"Although from the beginning I was conscientious, I was infected." It surprised me a lot, and "I realized it was Allah's will. Therefore, I have developed a firm belief in the almighty that led me to be involved in religious rituals during my hospital days" (R1).

Discussion

We analyzed the lived experiences of Bangladeshi COVID-19-positive frontline workers in this study. We have identified four major themes and 13 subthemes from this study. In summary, our study showed that frontline workers in Bangladesh faced significant physiological, psychological, and social challenges while working in a new COVID-19 environment. Thus, when they contracted the infection and were isolated at home or in a hospital unit, they experienced anxiety, fear, wrath, frustration, and stigma. However, they could quickly deal with this adverse situation by altering their eating habits, relying on telemedicine for assistance, being self-motivated, having social support, and enjoying movies. The research also revealed that frontline workers continued to experience physical, emotional, economical, and social sufferings after fully recovered. In addition, when experiencing financial crisis and stigma they emphasized more on religiosity which in turn helped them to overcome those hardships. Similar themes emerged from another study on Indonesian frontline nurses who were kept in quarantine because of their infection (Siagian and Rantung, 2022).

To begin with, our study reveals that since the beginning of the COVID-19 pandemic, Bangladeshi frontline workers have been facing immense physical, psychological, and social challenges because of the changing working environment, their fear of infection, and separation from family and close friends. Although, they tried to maintain health protocols and social distance from the beginning, however, non-medical frontline workers told us that it was quite possible for them to maintain appropriate social distance as they had to render direct services to the general public for various reasons. Even during the period of national lockdown (started on March 23 and extended to May 30, 2020), for example, non-medical frontline financial service workers had to regularly provide banking services to the general population (Rana and Islam, 2021). As a result, among Bangladesh's frontline workers, fear of infection, trauma, distress, worry, misinformation, and social stigma are more prevalent. We also found similar findings in previous research in Bangladesh and across the world (Ahsan et al., 2021; Akhter et al., 2021; Khan Rony et al., 2021; Rahman et al., 2021; Razu et al., 2021; Sun et al., 2021; Villar et al., 2021; Wang et al., 2021, 2022; Zhang et al., 2021; Mehedi and Ismail Hossain, 2022; Pooja et al., 2022; Simeone et al., 2022; Tune et al., 2022).

Secondly, it was evident from the findings that most of the non-medical frontline workers were infected by this virus because of their frequent visits to different public gatherings. On contrary, medical frontline workers were reported as infected while working with the Corona unit. However, almost all the frontline workers went to the associated test centers with the physiological symptoms of fever, neck pain, headaches, coughs, body aches, and loss of taste and smell which are in line with the clinical signs of SARS-CoV-2 infection (Ramanathan et al., 2020; Wu et al., 2020). Besides, some frontline workers became very surprised that even though they had no physical symptoms, they were found positive after the test. Researchers from the University of Illinois at Chicago found similar cases. In their study Patel et al., found that of thirty five (35) infected cases, thirteen (13) never posed any symptoms (Patel et al., 2020). Moreover, due to misinformation (Islam et al., 2020; Bakebillah et al., 2021), fake COVID-19-test reports of some private hospitals (Updates, 2022), and media, some frontline workers of this study expressed their concern and confusion about the diagnosis process. In addition, most of the medical and non-medical frontline workers received adequate treatment facilities from both the test centers as well as the COVID-19 dedicated hospitals due to their upper socio-economic profiles in Bangladesh.

Thirdly, our study participants also revealed that fear of death, anxiety, depression, and frustration—were their immediate reactions after identifying themselves as COVID-19-positive patients. These findings are also consistent with Taylor et al. and Liu Q. et al.'s studies (Liu Q., et al., 2020; Taylor et al., 2020). From Liu et al.'s study we came to know that in Hubei, China, more than 3,000 healthcare providers were infected by the coronavirus at the initial stage which caused trauma and fear among all the frontline workers across the world. Another UK based survey study revealed that compared to the general population, frontline health care providers experienced higher levels of anxiety and depression after being infected (Murphy et al., 2020). On contrary, our study revealed that some frontline workers in Bangladesh felt less stressed as they had prior mental preparation about the severity of this virus.

Again, this study showed that most of the frontline workers we interviewed remained in isolation at home during their recovery days. Only a few went to the government's dedicated COVID-19 hospitals where they stayed in complete isolation units along with other COVID-19 patients. As there is scarcity of COVID-19 dedicated beds and people are not comfortable with remaining in isolation, like the general populations frontline workers tended to receive treatment staying at home. Similarly, in Philippines, it was found that COVID-19 survivors are more reluctant to stay at home than at the isolation center (Romulo and Urbano, 2022). The data showed that Bangladeshi frontline workers had received good care at the COVID-19 dedicated hospitals because of their upper socio-economic status. On the other hand,, some of the non-medical frontline workers were denied face-to-face treatment by the healthcare providers because of the fear of infection and stigma which is pertinent to

studies conducted in India (Miah et al., 2022). Research in India also reported that some patients are stigmatized because they are COVID-19 patients (Gupta and Sahoo, 2020). As a result, some frontline workers in Bangladesh were also found to hide their disease from their friends, relatives, neighbors, and even family members when they stayed in isolation. Not only that those who received treatment at home experienced fear, anxiety, sleepiness, stress, depression, and stigmatization during their recovery days which are also consistent with a study conducted by Fawaz and Samaha (2020) over the quarantined frontline nurses in Lebanese (Fawaz and Samaha, 2020). Apart from this, some frontline workers believed that remaining in home isolation surrounded by the family members might positively impact on their recovery process. Some studies also showed that positive emotions and hope play an essential role in a patient's recovery (Carbone and Echols, 2017; Waugh, 2020).

Furthermore, frontline workers' various coping mechanisms during their recovery days are also evident in this study. Most frontline workers coped with this adverse situation by altering food habits, relying on telemedicine, religiosity, having social and organizational support, and engaging in recreational activities (e.g., music, movies, reading books). We also found that nurses in Saudi Arabia and Qatar considered changing their eating habits a solid coping mechanism against this virus (Alhusseini and Alqahtani, 2020; Villar et al., 2021). Again, like this study, studies conducted in Indonesia and the Philippines substantiated strong positive connections between religion and mental health (Romulo and Urbano, 2022; Siagian and Rantung, 2022). As most of the frontline workers in this study were Muslim, they felt a strong connection with God, which worked like a placebo effect on their healing process. Besides, some of the frontline workers mentioned that music, movies, and books were influential sources of coping strategies for stress management during isolation. The influence of music on reducing stress for quarantined COVID-19 patients is also evident in some studies (Ramesh, 2020; Carlson et al., 2021). In addition, support from family members, friends, colleagues, and neighbors were also mentioned as strong coping mechanism by the Bangladeshi frontline workers. The association between social support and healing is also consistent with previous studies (Awang et al., 2014; Siagian and Rantung, 2022; Uddin et al., 2022). Although, government of Bangladesh declared institutional supports for the COVID-19 infected frontline workers, none of the frontline workers received any organizational support of this study. Besides, no one in this study required any psychotherapy or counseling for their recovery which was evident in other countries. Even in Bangladesh, according to the survivors' experiences, strict isolation is not recommended for the survivors healing because it creates more anxiety, loneliness, and fear among the patients. Henceforth, social and organizational support could be the best coping strategies for the COVID-19 frontline workers in Bangladesh. Therefore, future researchers in Bangladesh might

investigate the impact of social and organizational support on the healing process of COVID-19 survivors.

Lastly, the study revealed that frontline workers in Bangladesh faced several psychological and physiological challenges (e.g., breathing difficulties, respiratory issues, weakness, fear, insomnia, and fatigue) even after being fully recovered from the virus. Likewise, Guo et al., in their study, also found that fatigue, shortness of breath, fear, trauma, and stigma are common to many medical frontline workers after their recovery (Guo et al., 2022). Similar results are also found in some studies conducted in the UK and Wuhan in China (Halpin et al., 2021; Huang et al., 2021). Meanwhile, our respondents also mentioned that they also faced various social and economic crisis in their post-COVID-19 days which is also consistent with some other studies across the world (Missel et al., 2022; Rashid et al., 2022; Uddin et al., 2022).

Strengths and limitations

This study has some limitations. Due to the spread of the virus across the nation, it was first and foremost impossible to conduct face-to-face interviews in all instances. So, again, we only conducted ten interviews, which do not represent the whole population. Earlier, we had disagreements about our study participants. Generally, healthcare providers, e.g., doctors, and nurses are considered frontline workers. However, we believe defining frontline workers is not specific but contextualized. Hence, after getting inspiration from the definition given by Rana and Islam (2021) in their recent study, we included law enforcement agencies, bureaucrats, bankers, and journalists, along with healthcare providers, as frontline workers in our study. Therefore, our study's conclusions cannot be applied to any specific group of Bangladeshi frontline workers. Despite all of these limitations, to the author's knowledge, the current study is one of the first to analyze the lived experiences of positive COVID-19 frontline workers in Bangladesh, providing in-depth detailed information on their particular experiences of suffering and coping mechanisms.

Implications

Despite all the limitations, this paper provides comprehensive insights for the policymakers. Firstly, healthcare policymakers should design health policies based on the social setting of Bangladeshi society. In Bangladesh, there is a practice to follow and copy policies from the developed countries blindly without considering their relevance. Lockdown without a social safety net program to combat COVID-19 was not fruitful in Bangladesh. Secondly, stigma can negatively affect the victims, leading to isolation, depression, anxiety, or public embarrassment. Stigmatized

individuals usually hide symptoms of their illness and restrict themselves from taking medical care. This behavior might create challenging situations to control the spread of any pandemic. Therefore, health policymakers should develop sustainable behavioral change programs to combat the social stigma associated with public health. Lastly, policymakers should develop a robust monitoring mechanism to eradicate discrimination regarding one's socio-economic status when getting medical services. This type of discrimination is a violation of constitutional rights.

Conclusion

In any epidemic or pandemic, frontline workers suffer psychologically and socially. The lived experience of this cohort depends on various interactions between demographics and socio-economic status. Therefore, they urgently need guidance for physical rehabilitation, psychological growth, social support, and protection from social stigma. Although across the world, including Bangladesh, frontline workers' mental health conditions are studied, their everyday lived experiences as COVID-19 survivors are merely studied. This study provides a comprehensive and in-depth insight into the lived experiences of frontline workers. This study thus has other policy implications for Bangladesh. This study is significant for healthcare policymakers in planning healthcare management systems based on the social settings of Bangladesh society. This paper also suggests that national policymakers implement long-term behavioral change programs to reduce social stigma. At the same time, it suggests the government end discrimination regarding an individual's socio-economic status to get medical assistance.

Data availability statement

Latest version of data will be available at doi: 10.17632/ymwydhvztj.2.

Ethics statement

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

Author contributions

SA developed and designed the study, drafted the article, revised, amended the manuscript, and assumes liability in his capacity as guarantor. SA, TR, MB, MH, and MI collected and analyzed the data and provided the interpretation of the findings. TR, MB, MH, MI, and MR reviewed the paper before the submission to this journal. The final version of the paper was reviewed and approved by all the authors.

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Conflict of interest

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

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Alterations in mental health and quality of life among healthcare workers in times of COVID-19: Four-stage cross-sectional study during first four pandemic waves in Poland

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Background: The COVID-19 pandemic has had many unexpected effects that have affected the mental health of healthcare workers. In response to the crisis, healthcare workers appear to be the most vulnerable to the psychological effects of the pandemic. The purpose of the study was to assess the prevalence of depressive and anxiety symptoms and healthcare workers' quality of life during the different stages of the COVID-19 pandemic.

Materials and methods: The questionnaire was distributed in four stages corresponding to the different waves of the pandemic in Poland. The last stage of the study covered the period from November 1, 2021 to November 31, 2021 which coincided with the fourth wave of COVID-19 in Poland. The Beck Depression Inventory II (BDI-II), Generalized Anxiety Disorderd-7 (GAD-7), and Manchester Brief Assessment of Quality of Life (MANSA) scales were used.

Results: A total of 1,243 respondents participated. A gradual increase in moderate and severe anxiety was observed as the pandemic continued, comparing waves I and IV of the pandemic. No statistically significant differences were observed in comparing the mean values of the BDI-II, GAD-7, and MANSA scales across waves. A decrease in fear due to the disease and neighbor's quarantine was found. Women, single people and those with a psychiatric history are more likely to be affected by the destructive impact of the pandemic.

Conclusion: The COVID-19 pandemic is significantly affecting the mental health and quality of life of healthcare workers, but trend is not uniform. It is necessary to continue monitoring the mental health of medical workers, who are the most important link in the fight against the pandemic.

KEYWORDS

COVID-19, anxiety, depression, mental health, pandemic

Introduction

The Coronavirus Disease-19 (COVID-19) pandemic has had many unexpected effects that have affected the mental health of the public, especially healthcare workers (1). In Poland, as in other European countries, its five waves have been distinguished until May 2022 (2). The variation in epidemiological characteristics in the different waves was due to the successive mutations of the virus that appeared. Wave four, which was dominated by the delta variant, was characterized by the greater transmission of the virus and more severe courses especially among the young and unvaccinated compared to the previous three (3).

In response to the ongoing crisis, healthcare workers appear to be the most vulnerable to the psychological effects of a pandemic. This has been confirmed in recent systematic reviews and meta-analyses, which confirm a significant escalation in the level of depression and anxiety associated with the pandemic among healthcare workers (4–8). The first such observations were conducted in China and showed that 50.7% of healthcare workers struggled with anxiety symptoms, while 44.7% struggled with depression (9). The possible reasons for the phenomenon were the rapid reorganization of the healthcare system, the increase in work intensity, and the increased likelihood of infecting oneself and loved ones (10, 11). In addition, the need to function under chronic stress has contributed to exacerbating the symptoms described above (12). There was also a positive correlation between anxiety and professional burnout and decreased quality of life (13). However, the impact was lessened over time, and some of the population adapted to the new reality. A retrospective study of nurses in China showed a declining trend in the incidence of the symptoms described above 1 month after the main peak of the disease (14). Similarly, observations from Belgium showed a reduction in depression and anxiety among frontline nurses, 2 months after the pandemic broke out (15). Convergent observations were made in Italy among healthcare workers, where a reduction in depressive and anxiety symptoms was confirmed 14 months after the start of the pandemic (16).

This declining trend on mean values of psychopathological scales among healthcare workers after some time after the outbreak of pandemic may be related to improved control of the pandemic situation and increased knowledge of the course of the infection and its prevention. In addition, the reduction in anxiety may be associated with greater awareness of SARS-CoV-2, increased availability of personal protective equipment, and adherence to preventive measures, including disinfection and social distancing (17).

On the other hand, the evolving course of the pandemic, the emergence of new coronavirus variants, and the lack of effective treatment exacerbated the sense of frustration and helplessness (18). There are numerous indications of the longevity of the health effects caused by the pandemic (19). Moreover,

fears of stigma and discrimination may hinder healthcare workers' willingness to use psychotherapeutic interventions (18). According to research, many prefer to seek support from family and friends rather than professional psychological help (20).

Previous studies on the population of Polish healthcare workers have not taken into account the temporal evolution of the course of the pandemic. Therefore, the purpose of the present study was to assess the prevalence of depressive and anxiety symptoms and to subjectively evaluate the quality of life of healthcare workers during the different stages of the COVID-19 pandemic.

Materials and methods

Methodology

This is a Computer-Assisted Web Interview (CAWI) survey using a questionnaire distributed through social media (medical facebook groups). The survey was targeted at healthcare workers who lived and worked in Poland during the pandemic period. Participation in the survey was fully anonymous, and voluntary, and at each stage of the survey, respondents had the opportunity to opt-out of the study, without providing a reason. Before participating in the survey, respondents were informed about the nature of the study, its objectives and methodology, after which they gave their informed consent to participate. The survey was designed in four stages, which corresponded to the different waves of infections in Poland.

- Stage I, from April 17, 2020 to April 26, 2020–the daily number of cases ranged from 263 to 460 COVID-19 cases and 18–40 deaths;
- Stage II, from December 1, 2020 to December 30, 2020–the daily number of cases ranged from 2,921 to 14,835 cases and 29–620 deaths;
- Stage III, from March 20, 2021 to April 30, 2021–the daily number of cases ranged from 6,802 to 35,246 and from 428–954 deaths;
- Stage IV, from November 1, 2021 to November 31, 2021–the daily number of cases ranged from 9,839 to 29,062 and 209–793 deaths (21).

The survey was based on a questionnaire that consisted of several parts. The first included sociodemographic questions, including age, gender, place of residence, relationship status, medical profession and reduction in earnings. It also asked about past psychiatric history (before COVID-19 pandemic), including psychological and psychiatric consultation and drug treatment. Moreover, questions regarding to seeking additional information about COVID-19 and tracking statistics on COVID-19 were asked. The next section contained questions

based on a 10-point Likert scale that asked about fear of contracting COVID-19, fear due to quarantine and neighbor isolation, and fear of infecting loved ones. The last part of the survey included three standardized psychometric tools to measure anxiety, depression and quality of life.

(1) Beck Depression Inventory II (BDI-II) a psychometric tool used to measure depression. It consists of 21 questions in which answers are classified from 0 to 3 points. Interpretation of the score depends on the number of points obtained. The following values were used as cutoff points: 0–11 points: no depression; 12–26: mild depression; 27–49: moderate depression; 50–63: severe depression (22–24). The polish version of scale was validated and revealed high reliability (25, 26).

(2) Generalized Anxiety Disorderd-7 (GAD-7)–is a seven-item tool for assessing generalized anxiety. Each question asks about the frequency of occurrence of certain psychological states in the past 14 days (0–not at all, 1–a few days, 2–more than half the time, 3–almost always). The analysis of the tool is based on the total score obtained, and the cutoff points were 5, 10, and 15 points, which correspond to mild, moderate and severe anxiety, respectively (27). Polish version of the scale was obtained from Patient Health Questionnaire Screeners (Pfizer–the owner of this questionnaires' translations base) (28).

(3) Manchester Brief Assessment of Quality of Life (MANSA)–is a tool for assessing quality of life by evaluating 16 aspects of life. The 14 questions are based on a 7-point Likert scale (1–could not be worse, 7–could not be better). Four questions involve affirmative answers (two points) or denial (one point) of the occurrence of certain situations. The higher the total score, the higher the quality of life is rated, and the maximum possible number of points to be scored is 92 (29). The MANSA scale was constructed on the basis of the existing Lancashire Quality of Life tool Profiles (LQLP), which enables a comprehensive assessment of the quality of life (29). The MANSA scale is a condensed and slightly modified alternative that maintains psychometric parameters of the prototype (30). It was validated with satisfactory reliability in terms of internal consistency on Swedish population (31). The Polish version of the tool was prepared in the Department and Clinic of Psychiatry, Wrocław Medical University, in 2000.

The study was conducted in accordance with the Declaration of Helsinki and approval was obtained from the Bioethics Committee of the Medical University of Wrocław (approval number: KB-471/2020).

Statistical analysis

The variables analyzed are qualitative, quantitative and ordinal. The Lilliefors test was used to assess normality of distribution, while the Brownian-Forsythe test was used to assess variance. Basic descriptive statistics were used to evaluate quantitative and ordinal variables. If the assumption of the equality of variance was not met, Welch's ANOVA was performed. Subsequently, *post-hoc* tests were performed using the Games-Howell test. For qualitative variables, Pearson's chi-square test with Bonferroni correction was used. Baseline linear models were used to assess the influence of sociodemographic variables on the results of the BDI-II, GAD-7, and MANSA scales.

A statistical significance level of <0.05 was assumed in each case. Statistical analysis was performed using Statistica 14.0 software from StatSoft.

Results

Materials

A detailed description of the study group is presented in **Table 1**. 1,243 healthcare workers participated in the survey during four waves of the pandemic in Poland. The largest number of respondents took part in the survey during wave 1 of the pandemic (632–50.9%). The vast majority were women (88.3%), people from large cities (47.8%) and those in a relationship (66.4%). The most common representatives of healthcare workers were medical doctors (37.6%). 13% of healthcare workers remarked that the pandemic had led to a reduction in their earning capacity, a percentage that decreased as the pandemic continued.

Interpretation of the Beck Depression Inventory II, Generalized Anxiety Disorderd-7, and Manchester Brief Assessment of Quality of Life scales over four waves among healthcare workers

A detailed comparison of the BDI-II, GAD-7, and MANSA scales is presented in **Table 2**. The ANOVA type II test of mean values between waves showed no significant statistical differences for each of the scales- the BDI-II ($p = 0.316$), GAD-7 ($p = 0.245$), and MANSA ($p = 0.413$). Analysis of the GAD-7 scale interpretation showed statistically significant differences ($p = 0.001$). As the pandemic continued, a gradual increase was observed in the percentage of healthcare workers whose scale scores indicated the presence of moderate anxiety and severe anxiety. In a *post hoc* analysis (Games-Howell test), significant changes were observed only between wave 1 and wave 2 of the pandemic ($p = 0.017$) as it is shown on **Figure 1**. Analysis of

TABLE 1 Characteristics of the study group.

		Variable N (%)						
		Wave 1	Wave 2	Wave 3	Wave 4	Size effect	p	The whole group
Age (M ± SD)		36.48 ± 10.31	28.37 ± 8.85	31.47 ± 10.04	34.01 ± 10.64	0.108[a]	**0.001**[c]	33.84 ± 10.53
Sex	Male	60 (9.2)	39 (19.2)	31 (12.7)	15 (9.2)	0.114[b]	**0.001**[d]	145 (11.7)
	Female	572 (90.8)	164 (80.8)	214 (87.3)	148 (90.8)			1098 (88.3)
Place of residence	City of over 250,000 inhabitants	297 (47.0)	108 (53.2)	112 (45.7)	77 (47.3)	0.037[b]	0.818[d]	594 (47.8)
	City of 50,000–250,000 inhabitants	127 (20.1)	32 (15.8)	51 (20.8)	38 (23.3)			248 (20.0)
	Town of up to 50,000 inhabitants	98 (15.5)	31 (15.2)	38 (15.5)	23 (14.1)			190 (15.2)
	Rural area	110 (17.4)	32 (15.8)	44 (18.0)	25 (15.3)			211 (17.0)
Marital status	Married	360 (57.0)	35 (17.3)	83 (33.9)	80 (49.1)	0.186[b]	**<0.001**[d]	558 (44.9)
	In an informal relationship	111 (17.6)	65 (32.0)	63 (25.7)	28 (17.2)			267 (21.5)
	Single	161 (25.4)	103 (50.7)	99 (40.4)	55 (33.7)			418 (33.6)
Healthcare profession	Medical doctor	335 (53.0)	47 (23.2)	41 (16.7)	44 (27.0)	0.279[b]	**<0.001**[d]	467 (37.6)
	Nurse	173 (27.4)	34 (16.8)	93 (38.0)	51 (31.3)			351 (28.2)
	Other	124 (19.6)	122 (60.0)	111 (45.3)	68 (41.7)			425 (34.2)
Prior psychiatric treatment (before COVID-19 pandemic)	Yes	115 (18.2)	37 (18.2)	42 (17.1)	22 (13.5)	0.041[b]	0.548[d]	216 (17.4)
	No	517 (81.8)	166 (81.8)	203 (82.9)	141 (86.5)			1027 (82.6)
Psychiatric drug treatment	Yes	103 (16.3)	31 (15.3)	39 (15.9)	20 (12.3)	0.036[b]	0.649[d]	193 (15.5)
	No	529 (83.7)	172 (84.7)	206 (84.1)	143 (87.7)			1050 (84.5)
Limitation of earning capacity	Yes	101 (16.0)	26 (12.8)	24 (9.8)	11 (6.8)	0.102[b]	0.061[d]	162 (13.0)
	No	531 (84.0)	177 (87.2)	221 (90.2)	152 (93.2)			1081 (87.0)
Seeking information about COVID-19	Yes	470 (74.4)	113 (55.7)	114 (46.5)	104 (63.8)	0.234[b]	**<0.001**[d]	801 (64.4)
	No	162 (25.6)	90 (44.3)	131 (53.5)	59 (36.2)			442 (35.6)
Tracking statistics on COVID-19	Yes	407 (64.4)	117 (57.6)	120 (49.0)	87 (53.4)	0.127[b]	**<0.001**[d]	731 (58.8)
	No	225 (35.6)	86 (42.4)	125 (51.0)	76 (46.6)			512 (41.2)
Pandemic wave	1	–	–	–	–	–		632 (50.9)
	2	–	–	–	–	–		203 (16.3)
	3	–	–	–	–	–		245 (19.7)
	4	–	–	–	–	–		163 (13.1)

[a]ε^2.
[b]Cramer's V.
[c]Kruskal–Wallis test.
[d]Chi-squared test. Significant differences ($p < 0.05$) were marked with bold characters.

the BDI-II scale interpretation showed no statistically significant differences ($p = 0.001$) (Figure 2). As the COVID-19 pandemic progressed, no significant changes were also observed in the healthcare workers' quality of life scores. Moreover, a detailed comparison of the BDI-II, GAD-7, and MANSA scales taking into account medical professions is presented in Table 3. No significant differences were found other than differences the mean BDI-II scale scores between waves for "other medical professions."

Anxiety due to quarantine, isolation of a neighbor, and from one's own illness

Questions based on a 10-point Likert scale were used to assess the fear of one's own, as well as a neighbor's disease and quarantine. Detailed data for this part of questionnaire are presented in Table 4. Significant differences were observed in ANOVA type II test between waves in each question, with the highest values achieved in wave 1 of the pandemic.

TABLE 2 Comparison of the BDI-II, GAD-7, and MANSA scales in relation to the different stages of the study.

| Variable		Wave 1 N (%)	Wave 2 N (%)	Wave 3 N (%)	Wave 4 N (%)	Power of a test	Size effects	p
BDI-II M ± SD		10.27 ± 8.48	10.52 ± 9.34	11.09 ± 8.54	11.72 ± 10.78	0.959	0.003[a]	0.316[c]
BDI-II interpretation	No depression	396 (62.7)	131 (64.5)	145 (59.2)	96 (58.9)		0.051[b]	0.392[d]
	Mild depression	151 (23.9)	38 (18.7)	59 (8.9)	34 (20.9)			
	Moderate depression	51 (8.0)	16 (7.9)	22 (9.1)	17 (10.4)			
	Severe depression	34 (5.4)	18 (8.9)	19 (7.8)	16 (9.8)			
GAD-7 M ± SD		9.10 ± 5.99	8.45 ± 6.06	8.86 ± 6.01	9.77 ± 6.55	0.998	0.004[a]	0.245[c]
GAD-7 interpretation	No anxiety	167 (26.4)	76 (37.4)	75 (30.6)	46 (28.2)		0.084[b]	**0.001[d]**
	Mild anxiety	199 (31.5)	41 (20.2)	56 (22.9)	31 (19.0)			
	Moderate anxiety	125 (19.8)	45 (22.2)	62 (25.3)	46 (28.2)			
	Severe anxiety	141 (22.3)	41 (20.2)	52 (21.2)	40 (24.6)			
MANSA M ± SD		62.10 ± 11.98	63.54 ± 12.12	63.11 ± 11.62	63.03 ± 14.47	0.704	0.002[a]	0.413[c]

[a]ε^2.
[b]Cramer's V.
[c]ANOVA type II.
[d]Chi-squared test.
M, mean; SD, standard deviation. Significant differences ($p < 0.05$) were marked with bold characters.
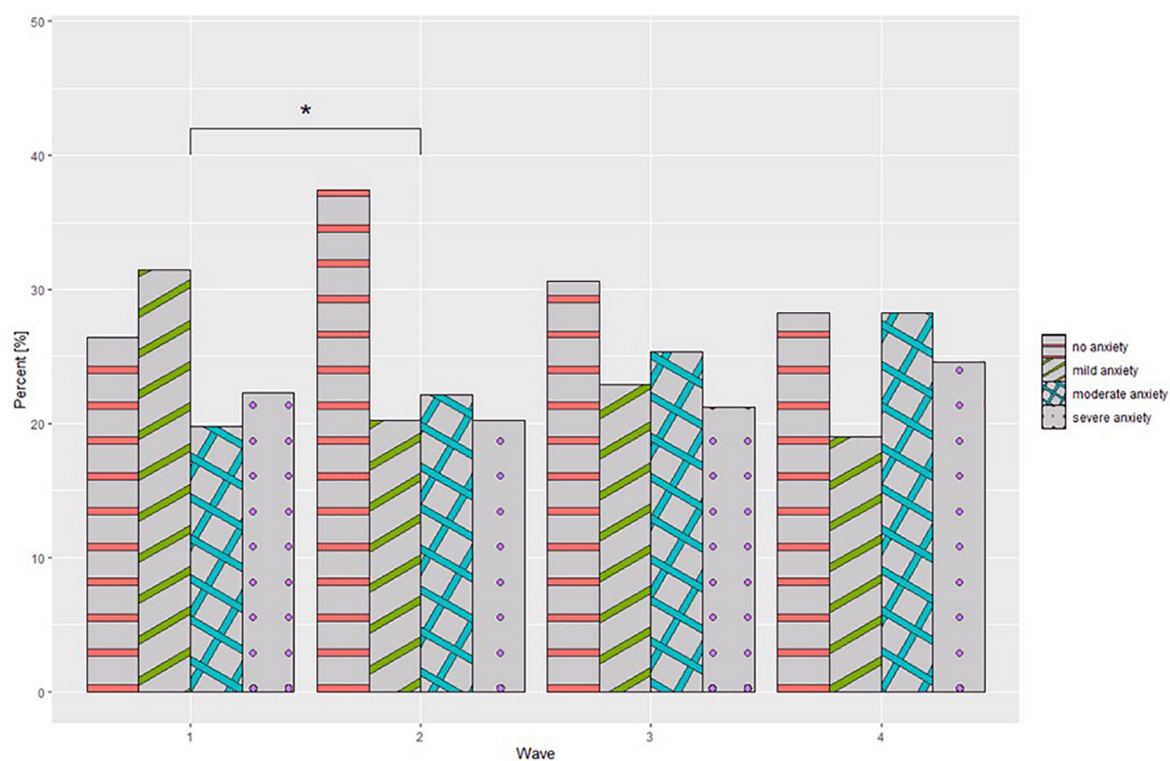
Generalized Anxiety Disorderd-7 (GAD-7) interpretation at different stages of the study. *$p < 0.05$.

Games-Howel *post-hoc* tests showed that there was a significant reduction ($p < 0.001$) in concern between waves 1 and 2 and 1 and 3 as the pandemic continued for each question. Furthermore, a significant increase ($p < 0.001$) was observed between wave 3 (mean value–3.09) and wave 4 (3.26) for

fear of one's disease and that of a neighbor's disease. An analogous relationship ($p = 0.048$) was observed for adherence to government recommendations to combat the pandemic with following mean values for waves 3 (7.87) and 4 (8.25). In addition, the Pearson correlation coefficient
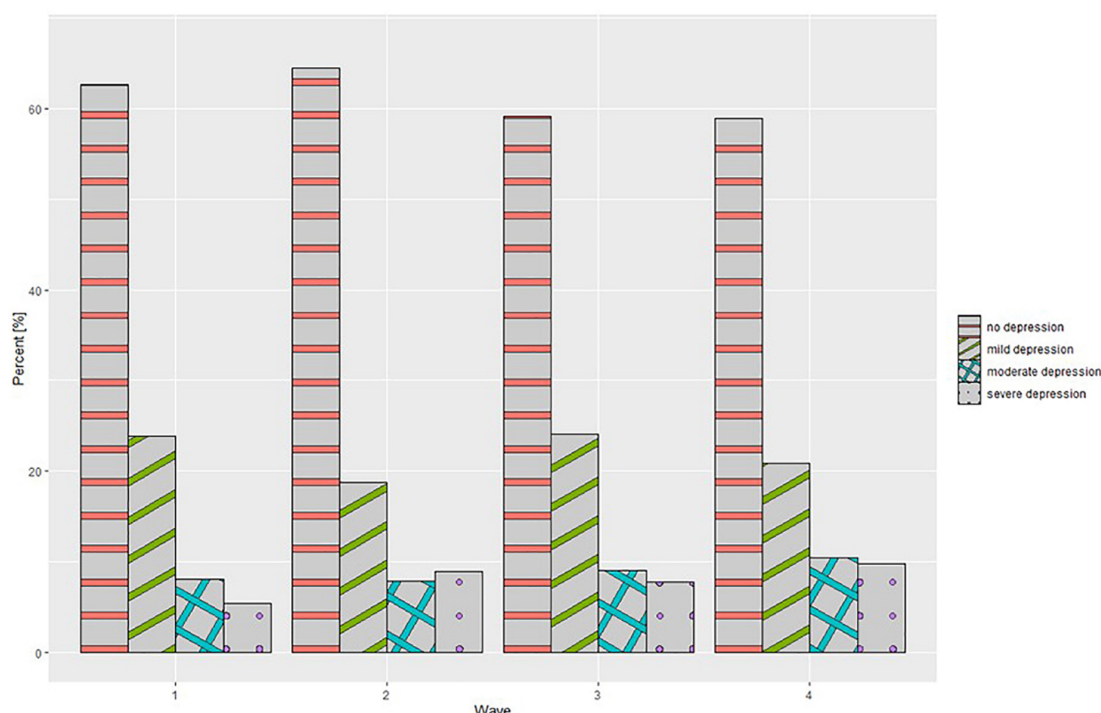
FIGURE 2
Beck Depression Inventory II (BDI-II) interpretation at different stages of the study.

revealed a relationship between adherence to government recommendations and fear of getting sick ($r = 0.34$; $p < 0.001$), fear of a neighbor's disease ($r = 0.263$; $p < 0.001$) and its quarantine ($r = 0.23$; $p < 0.001$). For the question assessing the level of concern for COVID-19 concerning individual diseases, it was shown that between waves 1 and 2 and waves 1 and 3 of the pandemic, there was an increase in those who were not concerned about COVID-19 and a significant decrease in those who were more concerned than other diseases (**Figure 3**).

Relationships between sociodemographic variables among healthcare workers and Beck Depression Inventory II, Generalized Anxiety Disorderd-7, and Manchester Brief Assessment of Quality of Life scales

A detailed summary of the relationships between sociodemographic variables and the mean values of the BDI-II, GAD-7, and MANSA scales based on linear models is presented in **Table 5**. In the analysis of healthcare workers, it was shown that the mean value of the BDI-II and GAD-7 scales statistically significantly ($p < 0.001$) decreases with increasing age. In addition, women score higher on both scales.

It was also shown that healthcare workers who are not in a relationship score higher on the BDI-II scale. Importantly, both the limitation of earning capacity, previous psychiatric treatment, and tracking COVID-19 statistics and seeking information significantly increases the mean scores of the BDI-II and GAD-7 scales.

Internal validity of the scales

Each scale used in the study revealed high internal validity. The following Cronbach's alpha values were obtained: 0.912 for BDI-II, 0.929 for GAD-7, and 0.852 for MANSA.

Discussion

The study found significant differences between the waves of the pandemic in terms of the mental condition of healthcare workers as the pandemic continued. Changes included an increase in the percentage of people suffering from anxiety disorders. Compared to a similar study among the general Polish population, there were significantly lower levels of depression (no depression: 63.7% vs. 50.1%) for the first wave of the pandemic, but slightly higher anxiety (no anxiety in: 26.4% vs. 28.9%). Additionally, healthcare workers rated their quality of

TABLE 3 Comparison of the BDI-II, GAD-7, and MANSA scales in relation to the different stages of the study for each medical profession.

Variable		Wave 1 N (%)	Wave 2 N (%)	Wave 3 N (%)	Wave 4 N (%)	Power of a test	Size effects	p
Medical doctors (N = 457)								
BDI-II M ± SD		10.79 ± 8.7	9.57 ± 7.8	11.6 ± 9.4	11.11 ± 9.8	0.871	0.007[a]	0.347[c]
BDI-II interpretation	No depression	74 (59.7)	85 (69.7)	65 (58.6)	40 (58.8)		0.439[b]	0.276[d]
	Mild depression	35 (28.2)	20 (16.4)	22 (19.8)	15 (22.1)			
	Moderate depression	8 (6.4)	12 (9.8)	14 (12.6)	7 (10.3)			
	Severe depression	7 (5.7)	5 (4.1)	10 (9.0)	6 (8.8)			
GAD-7 M ± SD		8.91 ± 6.26	8.23 ± 5.95	8.57 ± 6.01	9.22 ± 6.69	0.982	0.003[a]	0.715[c]
GAD-7 interpretation	No anxiety	38 (30.7)	47 (38.5)	37 (33.3)	21 (30.9)		0.054[b]	0.763[d]
	Mild anxiety	34 (27.3)	26 (21.3)	24 (21.6)	12 (17.7)			
	Moderate anxiety	25 (20.2)	26 (21.3)	28 (25.2)	20 (29.3)			
	Severe anxiety	27 (21.8)	23 (18.9)	22 (19.9)	15 (22.1)			
MANSA M ± SD		61.54 ± 12.33	64.20 ± 11.11	62.0 ± 11.72	64.28 ± 14.74	0.969	0.001[a]	0.226
Nurses (n = 351)								
BDI-II M ± SD		10.55 ± 8.95	11.71 ± 10.58	10.12 ± 7.79	11.84 ± 10.35	0.711	0.005[a]	0.163[c]
BDI-II interpretation	No depression	109 (63.0)	18 (52.9)	56 (60.2)	31 (60.8)		0.085[b]	0.567[d]
	Mild depression	37 (21.4)	10 (29.4)	27 (29.0)	10 (19.6)			
	Moderate depression	14 (8.1)	1 (2.9)	5 (5.4)	5 (9.8)			
	Severe depression	13 (7.5)	5 (14.8)	5 (5.4)	5 (9.8)			
GAD-7 M ± SD		9.55 ± 6.18	8.94 ± 6.15	8.94 ± 6.09	10.97 ± 5.88	0.998	0.012[a]	0.271[c]
GAD-7 interpretation	No anxiety	46 (26.7)	13 (38.2)	28 (30.1)	8 (15.7)		0.098[b]	0.267[d]
	Mild anxiety	49 (28.3)	4 (11.8)	22 (23.7)	14 (27.5)			
	Moderate anxiety	35 (20.1)	9 (26.5)	24 (25.8)	15 (29.3)			
	Severe anxiety	43 (24.9)	8 (23.5)	19 (20.4)	14 (27.5)			
MANSA M ± SD		61.22 ± 12.52	62.35 ± 12.82	63.62 ± 12.06	60.57 ± 13.69	0.841	0.008[a]	0.417[c]
Others medical professions (n = 467)								
BDI-II M ± SD		9.92 ± 8.15	12.14 ± 11.61	11.93 ± 7.79	12.52 ± 12.77	0.948	0.013[a]	**0.011**[c]
BDI-II interpretation	No depression	213 (63.6)	28 (59.8)	24 (58.5)	25 (58.6)		0.103[b]	0.174[d]
	Mild depression	79 (23.6)	8 (17.0)	10 (24.4)	9 (20.6)			
	Moderate depression	29 (8.7)	3 (6.4)	3 (7.3)	5 (11.4)			
	Severe depression	14 (4.1)	8 (17.0)	4 (9.8)	5 (11.4)			
GAD-7 M ± SD		8.93 ± 5.77	8.68 ± 6.38	9.41 ± 5.96	9.25 ± 6.98	0.358	0.001[a]	0.930[c]
GAD-7 interpretation	No anxiety	83 (24.8)	16 (34.0)	10 (24.4)	17 (38.6)		0.099[b]	0.085[d]
	Mild anxiety	116 (34.6)	11 (23.4)	10 (24.4)	5 (11.4)			
	Moderate anxiety	65 (19.4)	10 (21.3)	10 (24.4)	11 (25.0)			
	Severe anxiety	71 (21.2)	10 (21.3)	11 (26.8)	11 (25.0)			
MANSA M ± SD		62.76 ± 11.56	62.68 ± 14.48	64.91 ± 10.20	63.95 ± 14.88	0.798	0.003[a]	0.697[c]

[a]ε^2.

[b]Cramer's V.

[c]ANOVA type II.

[d]Chi-squared test. M, mean; SD, standard deviation. Significant differences ($p < 0.05$) were marked with bold characters.

life better than the rest of the population (mean value 62.1 vs. 60.65 on the MANSA scale–wave I) (32).

High exposure and direct contact with the pathogen may have influenced the heightened anxiety in healthcare workers. This situation increased the risk of infection, which is estimated to be up to three times higher than in the general population (33). In particular, at the beginning of the pandemic, when the level of knowledge about the disease was low, there was

no protective vaccination and no effective treatment available (34, 35). Although the proportion of moderate and severe anxiety increased with successive waves, in the first wave it was the smallest proportion of respondents who reported a lack of clinical anxiety. Significant shortages of personal protective equipment supplies were reported at the beginning of the pandemic. In addition, due to deficits in medical equipment such as ventilators, healthcare workers were unable to provide

TABLE 4 Comparison of the mean values of the assessment of fear of disease, fear due to neighbor's disease and neighbor's quarantine, and adherence to government recommendations for each wave of the pandemic.

	Wave 1	Wave 2	Wave 3	Wave 4	p
Anxiety about being infected with COVID-19 disease					
Mean	6.07	5.3	5.2	5.9	**<0.001**[a]
Comparison of individual COVID-19 pandemic waves			x	x	**<0.001**[b]
		x		x	**<0.001**[b]
		x	x		0.997[b]
	x			x	0.999[b]
	x		x		0.066[b]
	x	x			**0.019**[b]
Anxiety about neighbors being infected with SARS-CoV-2					
Mean	4.89	3.09	3.09	3.26	**<0.001**[a]
Comparison of individual COVID-19 pandemic waves			x	x	**<0.001**[b]
		x		x	**<0.001**[b]
		x	x		**<0.001**[b]
	x			x	0.934[b]
	x		x		0.389[b]
	x	x			**0.048**[b]
Anxiety about neighbors in quarantine					
Mean	3.84	2.57	2.62	2.62	**<0.001**[a]
Comparison of individual COVID-19 pandemic waves			x	x	**<0.001**[b]
		x		x	**<0.001**[b]
		x	x		**<0.001**[b]
	x			x	0.999[b]
	x		x		0.999[b]
	x	x			0.999[b]
Adherence to the Ministry of Health recommendations regarding SARS-CoV-2 prevention					
Mean	8.92	8.13	7.87	8.25	**<0.001**[a]
Comparison of individual COVID-19 pandemic waves			x	x	**<0.001**[b]
		x		x	**<0.001**[b]
		x	x		**<0.001**[b]
	x			x	0.934[b]
	x		x		0.389[b]
	x	x			**0.048**[b]

[a] ANOVA type II.
[b] Games-Howell *post-hoc* test. Significant differences ($p < 0.05$) were marked with bold characters.

adequate care to all patients, which resulted in frustration and anxiety (36, 37). At the same time healthcare workers were afraid of infecting their loved ones, there were also problems with a place to quarantine in case of infection (10, 38). Increasing anxiety in successive waves may also have been related to delayed psychiatric reactions to overwhelming clinical workloads (11). However, the increase in anxiety was not related to fear of getting sick themselves or those around them. On the contrary, these fears were rated lower in subsequent waves in our observations. A similar phenomenon occurred among staff working in an emergency department (ED) in Singapore (17). The decline may have been due to the increase in the availability of personal protective equipment, immunizations and effective treatment for the cause of the disease. In this point, it would be worth comparing the results to another study among Polish healthcare workers that also used the GAD-7 scale and the

same cut-offs. It showed a lower recognition of anxiety (45% vs. 62.6 to 73.6% depending on wave in this study), but the mean age of the respondents was much higher (mean 44.44 vs. 33.84 in this study), which is recognized as a protective factor in epidemiological studies (39).

Analogous to the results of this study changes in psychopathology, were shown in Argentina. In a longitudinal study among healthcare workers there, the prevalence of depressive or anxiety disorders increased (from 46 to 63%) on the Kessler Psychological Distress Scale a few months after the pandemic outbreak (40). In contrast, a study among ED workers in Singapore showed different trends. After 1 year of the pandemic, there was a decrease in anxiety and an increase in depressive symptoms. However, it should be mentioned, that the percentage of clinically significant depression among healthcare workers in Singapore was much lower at the beginning of the
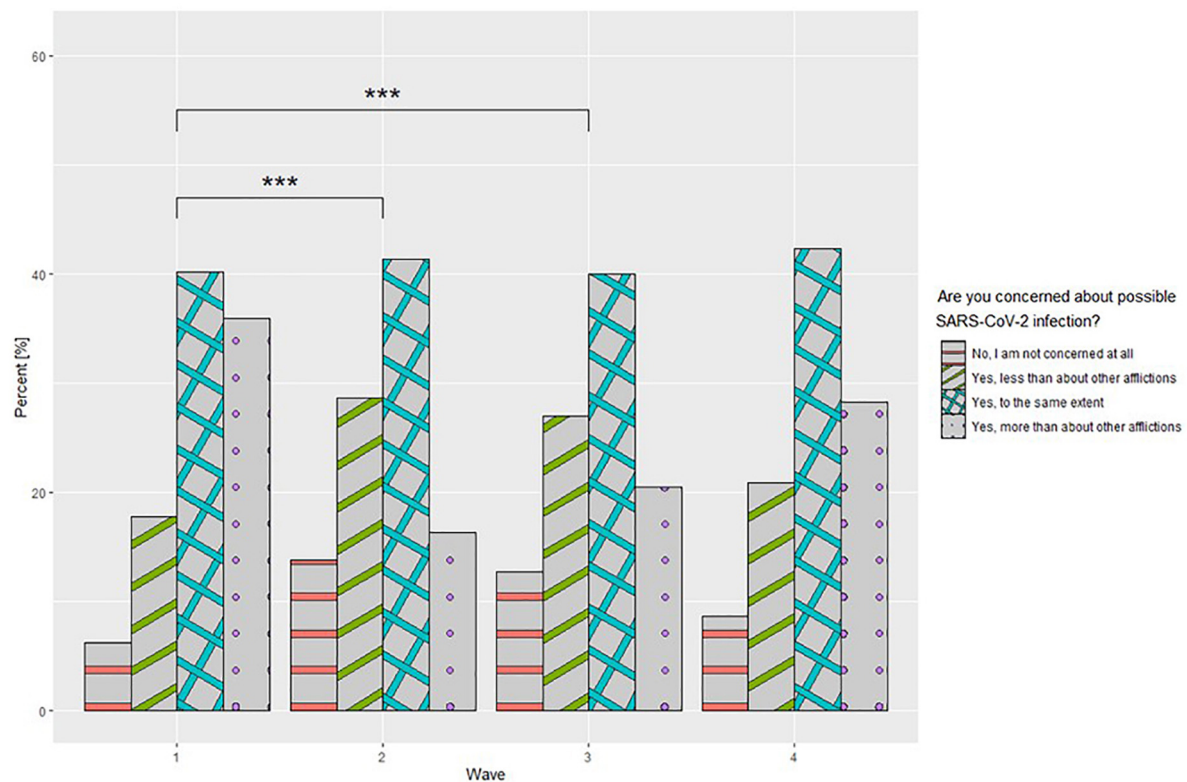
FIGURE 3

Fear of COVID-19 infection concerning other conditions at different stages of the study. ***$p < 0.001$.

TABLE 5 Summary of relationships between sociodemographic variables and the mean values of the BDI-II, GAD-7, and MANSA scales based on linear models.

		BDI-II				GAD-7				MANSA			
		Value	SD	t	p	Value	SD	t	p	Value	SD	t	p
Age		−0.100	0.025	−3.99	**<0.001**	−0.061	0.017	−3.60	**<0.001**	0.036	0.034	1.05	0.293
Sex	Male	−1.690	0.802	−2.11	**0.035**	−2.506	0.544	−4.65	**<0.001**	1.455	1.101	1.32	0.187
Place of residence	Rural	−1.131	0.717	−1.58	0.115	−0.338	0.487	−0.693	0.488	−0.196	1.373	−0.14	0.886
	Town of up to 50,000 inhabitants	−2.102	0.746	−2.82	**0.004**	−0.350	0.507	−0.691	0.489	0.548	1.438	0.38	0.702
	City of over 250,000 inhabitants	−0.599	0.677	−0.88	0.376	−0.026	0.461	−0.056	0.955	−1.937	1.30	−1.48	0.137
Marital status	Single	0.885	0.365	2.42	**0.016**	0.287	0.250	1.15	0.249	−1.464	0.501	−2.92	**0.003**
	In an informal relationship	0.512	0.411	1.24	0.213	0.156	0.280	0.56	0.576	0.09	0.565	0.17	0.861
Healthcare profession	Nurse	0.065	0.377	0.17	0.921	0.471	0.255	1.84	0.065	−0.723	0.517	−1.39	0.162
	Other	0.036	0.359	0.09	0.921	−0.384	0.243	−1.58	0.113	0.265	0.492	0.53	0.584
Limitation of earning capacity	Yes	3.391	0.754	4.50	**<0.001**	1.601	0.513	3.12	**0.001**	−5.337	1.03	−5.18	<0.001
Prior psychiatric treatment (before COVID-19 pandemic)	Yes	2.854	0.667	4.28	**<0.001**	1.888	0.452	4.17	**<0.001**	−3.401	0.917	−3.71	**<0.001**
Seeking information about COVID-19	Yes	0.795	0.265	3.01	**0.003**	0.826	0.178	4.63	**<0.001**	−0.068	0.364	−0.19	0.852
Tracking statistics on COVID-19	Yes	0.873	0.257	3.39	**<0.001**	0.934	0.73	5.39	**<0.001**	0.134	0.355	0.38	0.704

Significant differences ($p < 0.05$) were marked with bold characters.

pandemic than in our study (25.3% vs. 37.3%). Their increase in depressive symptoms could be contributed to staff shortages and extended work hours which additionally proved to be more exhausting than before. Concurrently, a reduction in anxiety was associated with the development of guidelines for managing patients, as well as the implementation of immunizations (17). In an Australian cross-sectional study, healthcare workers in the second wave of the pandemic scored higher than in the first wave on the Depression, Anxiety and Stress Scale (DASS-21). They revealed an increase in the level of workplace conflicts, as well as difficulties in taking leave, among the significant reasons for the deterioration (41). Interesting results were presented by a study that showed among acute care healthcare workers the impact of work-related sense of coherence (W-SoC) on psychopathology. The study concluded that during the first 3 months high W-SoC was associated with milder symptoms of depression and trauma, but after 1 year of the study, W-SoC among these respondents declined and ceased to be a protective factor (42).

It is worth noting that the average score on the quality of life scale did not change among healthcare workers in each wave. One factor contributing to this may be the relatively high financial bonuses for healthcare workers in Poland. In comparison, the subjective assessment of the quality of life of the Polish population with successive waves received lower scores which were related to their reduced financial satisfaction (32). It is vital to mention that quality of life as assessed by the MANSA scale takes into account many aspects such as physical and mental health, financial and sexual satisfaction, or the quality of social and family relationships, hence a potential increase in financial satisfaction may offset deficits in other issues (29). Another study using the Professional Quality of Life-5 scale found an imbalance between job satisfaction (compassion satisfaction) and work overload (compassion fatigue) as a contributing factor to reduced quality of life (43).

While analyzing the results, it should be considered that the Polish healthcare system is facing underfunding and staff shortages. According to Eurostat, in Poland, 4.8% of GDP was spent from public money to the healthcare system, which is one of the smallest amounts in the European Union (EU) (44). The number of medical doctors and nurses per 100,000 of months is also critical, at 2.4 and 5.1, respectively (45, 46). Significantly due to the nature of the survey, Poland is penultimate in the European Union in terms of the number of psychiatrists (9 per 10,000 population) (47). In the Organization for Economic Cooperation and Development's report "Health at glance: Europe 2020" Poland also ranked penultimate in the EU in terms of public satisfaction with the quality of health services provided (48). This had a demotivating effect on Polish healthcare workers during the pandemic in the form of conspiracy theories and lack of adherence to medical recommendations, which devalued their work (49).

The influence of socio-demographic variables on scale scores in this study reflects trends in other populations. Specifically, among studies of healthcare workers from other countries, women and younger people also showed more severe depressive and anxiety symptoms as measured by the same scale (GAD-7) (40, 50). It is consistent with the concept that people with more life experience show better mental resilience and emotional regulation (51). In contrast, the lower resilience of women than men to stress and the resulting psychiatric complications during the pandemic have been linked to environmental, psychodynamic, cognitive and physiological moderators (e.g., ovarian hormone fluctuations) (52). It is not surprising that healthcare workers with a prior history of psychiatric disorders have more severe psychopathological symptoms (40). However, contrary to intuition, being in a partnership relative to being single in many studies has not been a significant moderator of psychopathology scale scores, and in our study it was significant in the context of depression and quality of life, but not anxiety intensity (15, 53). An unfavorable relationship in the context of mental health was also found between the increased frequency of searching for information about the pandemic on the Internet and tracking statistics on the Internet, as confirmed by the results of another Polish study (53). Analyses of the quality of media coverage showed that audiences were particularly vulnerable to disinformation and conspiracy theories during the pandemic (54). More interestingly, searches for depression and suicide, but not for anxiety disorders, declined during the pandemic's peak in illnesses and deaths on search engines (55). Other studies have cited having children and maintaining good relationships with friends as protective factors against mental disorders during a pandemic (17). Attention should be paid to the fact that in the linear models no significant differences were found between the professions and the results of the scales used. At the same time, there is a large disproportion of the respondents' medical professions distribution between the study stages. To check whether the dominance of any of them biased the overall trends shown in the study, a wave-to-wave analysis was additionally performed for each profession that excluded such limitation. In studies from other countries according to depression, anxiety and insomnia scales, nursing profession appeared to be the most burdened among other medical professions (50, 56).

The survey has several limitations. First, due to the online method of distributing the surveys, the number of people reached is unknown. Second, we do not have access to the percentage of respondents withdrew from the survey during completion. The results of our scales may be underestimated because people with severe mental disorders are less likely to participate in surveys (57). There was also be a significant disproportion in the number of survey respondents between survey stages with a decreasing trend. Due to cross-sectional methodology of the study on disparate groups of respondents,

no direct conclusions can be drawn about the evolution of recorded changes in symptom intensity. Moreover, the survey sample is not representative in terms of gender and age, nor of the or the structure of employment in the polish healthcare system. The vast majority of women may lead to overdiagnosis in the epidemiological assessment of mental disorders in this population (58). Also, the various medical professions among the respondents were not distinguished, nor whether healthcare workers were required to work with patients with COVID-19, which significantly affects the results of the research (59). Due to the anonymous nature of the questionnaire and the way it was distributed, it was impossible to provide psychological care to those exposed, but the mere fact of participation could force self-reflection on one's own mental condition, which is a positive predictor of taking effective treatment (60). Another limitation is the lack of validation in the literature of the Polish translation of the GAD-7 and MANSA scales, which may undermine the reliability of the results.

Given the particular exposure to mental stress, healthcare workers should be provided with extensive access to psychological and psychiatric care. Public hospitals should provide such care as a compensation to their employees. It is also worth considering dedicated training in stress management for medical staff (61). Other countries have also proven successful methods, such as team support sessions, peer support programs, mental health and wellness programs, a palliative support team, philosophical services and clergy support. In summary, the most common coping styles were emotional support, planning, and active coping (15, 62). Given the high burden of stress, it would also be worthwhile to provide early intervention among healthcare workers for the prevention of post-traumatic stress disorder (63).

Conclusion

Based on the experience developed in previous pandemic waves, the healthcare system's crisis management model should be improved for new epidemiological threats in the future (64, 65). This is particularly important given that lack of mental health hygiene among healthcare workers promotes professional burnout and adversely affects the quality of healthcare delivery (66).

The COVID-19 pandemic is significantly affecting the mental health and quality of life of healthcare workers, a trend that is not uniform. Significant increases in anxiety symptoms, especially moderate and severe anxiety, were observed between the first waves of the study. Women, single people and those with a psychiatric history are more likely to be affected by the destructive impact of the pandemic. Given the ongoing situation, it is necessary to provide longitudinal studies on the mental health of medical workers, who are the most important link in the fight against the pandemic.

Data availability statement

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

Ethics statement

The studies involving human participants were reviewed and approved by the Bioethics Committee of the Medical University of Wrocław. The patients/participants provided their written informed consent to participate in this study.

Author contributions

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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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COVID-19 related stress during and one year after the first wave of the pandemic outbreak in China: The role of social support and perceptions of the pandemic

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Introduction: COVID-19 related stress might vary with the pandemic changes, as well as other associated factors. This study aimed to compare the stress level during the first wave of the pandemic outbreak and 1 year later in China, and to explore the differential roles of social support and perceptions of this disease in affecting pandemic-related stress over time.

Methods: COVID-19 related stress, social support, and perceptions of the pandemic (perceived threat, perceived protection, and perceived controllability) were measured using the Impact of Event Scale-Revised for COVID-19, the Multidimensional Scale of Perceived Social Support, and the Self-Compiled Scale of COVID-19 Related Perception, respectively. Using an online survey, two independent samples were collected during the first wave of the COVID-19 outbreak (Time 1: March 2020, $N = 430$) and 1 year later (Time 2: April 2021, $N = 512$).

Results: Levels of COVID-19 related stress and social support were lower at Time 2. Furthermore, at both Time 1 and Time 2, more social support was associated with less stress. Perceived protection and controllability of COVID-19 also mediated the relationship between social support and COVID-19 at both time points. However, the perceived threat of COVID-19 only served as a mediator at Time 1.

Conclusion: These results indicate that Chinese people might experience lower COVID-19 related stress as the pandemic progresses. The perceived threat of COVID-19 played a more critical role in stress experienced at Time 1.

These findings not only underscore the importance of social support under the context of Chinese society, but also have implications for developing specific interventions targeting different perceptions of COVID-19 to reduce pandemic-related stress during the different waves of this pandemic.

Introduction

In late December 2019, China was the first country to identify the coronavirus disease (COVID-19) as the cause of a spreading pandemic. While COVID-19 has pervaded the narrative of 2020–2022, the virus is still novel and highly transmissible. This disaster has an inevitably long-term and negative impact on the mental health of the general public in China (1–3).

Previous literature suggests stress response is one of the most common mental health outcomes of pandemics (e.g., severe acute respiratory syndrome [SARS] and Ebola) (4–6). At the beginning of the COVID-19 outbreak, a cross-sectional study in China indicated that approximately one-quarter of the sample experienced acute stress reactions (7). Other studies have reported that COVID-19 causes stress responses (e.g., COVID-19 related intrusive thoughts) and affects people's mental health and lifestyle habits (8–12). Although some studies have investigated the factors influencing COVID-19 related stress, such as coping strategies and chronic diseases (13, 14), only a few have compared levels of COVID-19 related stress across different time points. In addition, it remains unclear which factors and dynamics are associated with the stress responses induced by COVID-19.

Several studies have reported a negative relationship between social support and stress responses as an important factor that can buffer the latter (15, 16). However, little is known about the processes that underlie the links between social support and stress. Joseph et al. (17) proposed a model suggesting that social support relieves stress reactions by influencing people's perceptions and interpretations of traumatic stressors. Recent studies have further indicated that perceptions of traumatic stressors have affected mental health during the COVID-19 outbreak (8, 18–20). For example, the perceived risk of COVID-19 is positively correlated with preventive health behaviors (21) and stress responses (22). Nevertheless, few researchers investigate the roles of COVID-19 related perceptions in the relationship between social support and pandemic-related stress. This may be attributed to the lack of corresponding measurements on the different COVID-19 perceptions (e.g., perceived threat and perceived controllability). Therefore, novel measures need to be developed to better understand the influence of COVID-19 perceptions herein. In addition, considering pandemic-induced lifestyle changes (e.g., the closure of gyms and universities), social support and COVID-19 perceptions might have differed during the different waves of the outbreak (11, 23). More research should be conducted to explore the relationships between perceptions of COVID-19, social support, and stress responses at different time points during the pandemic.

This study aimed to compare levels of COVID-19 related stress in Chinese people during the first wave of the COVID-19 outbreak and 1 year later (Figure 1). In the current study, we tested three hypotheses: (1) compared to 1 year after the first wave of the COVID-19 outbreak, the level of COVID-19 related stress would be higher at Time 1, and social support would change between Times 1 and 2; (2) social support would negatively correlate with COVID-19 related stress in both periods; and (3) perceptions of COVID-19 mediate the association between social support and COVID-19 related stress in both periods.

Materials and methods

Study design

Data were collected using an anonymous cross-sectional online survey. Two time points were selected: March 2020 (Time 1: the first wave of the COVID-19 outbreak in China) and April 2021 (Time 2: 1 year later). A total of 942 participants were recruited ($N_{\text{Time 1}}$ = 430, $N_{\text{Time 2}}$ = 512). The study was approved by the institutional review board of Kangning Hospital. All participants provided informed consent prior to responding to the survey.

The survey was provided by the Chinese online platform www.wjx.cn and was anonymous to ensure data reliability and confidentiality. We also set up trap questions in the questionnaire to ensure answer quality. Participants included in the data analysis met the following criteria: (1) all questions were answered thoughtfully and (2) the trap question was answered correctly (e.g., What is the capital city of China?). Responses from participants who failed the trap question and who chose
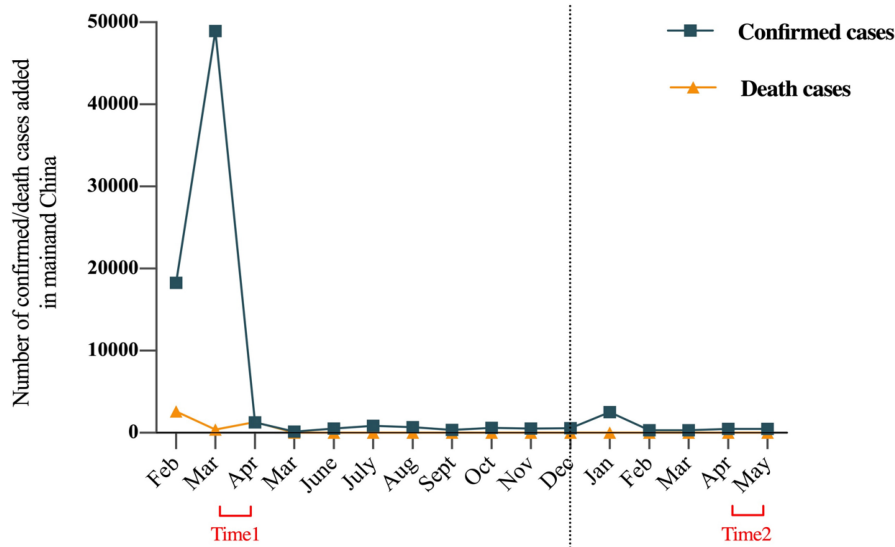
FIGURE 1
Trajectory of the COVID-19 in mainland China with the number of confirmed and deaths cases added each month from February 2020 to May 2021. The left side of the dotted line is 2020, and the right side is 2021.

the same answers across the entire scale were deleted. Qualifying participants were all offered the same compensation.

Instruments

The Impact of Event Scale-Revised Version

The Chinese version of the IES-R is a 22-item measure of stress reactions related to the COVID-19 pandemic (24). Each item describes the difficulty individuals sometimes have after experiencing a stressful COVID-19 event. Responses were rasted on a five-point Likert scale ranging from 0 ("not at all") to 4 ("extremely"), which indicate the level of distress caused by COVID-19 during the past 7 days (the total scores range from 0 to 88, with higher scores indicating greater distress). Example items included, *"I tried not to think about COVID-19,"* *"I tried to remove COVID-19 from my memory,"* and *"I had dreams about COVID-19"* (for details, see **Supplementary Table 1**). The three dimensions of the scale were: (1) COVID-19-related intrusion, (2) avoidance, and (3) hyperarousal. This study focused on the total score, which ranged from 0 to 88. Considering that: (1) the survey was based on the past 7 days, which did not match the DSM-5 diagnosis for posttraumatic stress disorder (PTSD), and (2) though the data collection included two time points, the pandemic is still ongoing and, therefore, not a post-traumatic event. Consequently, the IES-R was conceptualized as a measure to assess COVID-19 related stress rather than PTSD symptoms in the current study (25). For the first phase of testing, during the outbreak, the Cronbach's α coefficient for this scale was 0.85. After 1 year, at the second testing, the Cronbach's α was again 0.85. Both indicate adequate reliability.

Multidimensional Scale of Perceived Social Support

The Chinese version of the MSPSS is a 12-item self-reported measure used to assess levels of social support from three sources: family, friends, and significant others (26). Participants rated their agreement on a seven-point Likert scale from 1 ("very strongly disagree") to 7 ("very strongly agree"), with higher scores indicating higher perceived social support (total scores ranging from 12 to 84). Example items included, *"My family really tries to help me,"* *"I have a special person who is a real source of comfort to me,"* and *"I can count on my friends when things go wrong."* The three dimensions in this scale were: family support, friend support, and other support. The Cronbach's α coefficient was 0.89 for Time 1 and 0.90 for Time 2, indicating adequate reliability.

Self-Compiled Scale of COVID-19 Related Perception

The SSCP is a self-compiled and self-reported questionnaire containing ten items that is mainly used to assess individuals' COVID-19 perceptions. All items were rated on a 7-point Likert scale, ranging from 1 ("strongly disagree") to 7 ("strongly agree"). Exploratory and confirmatory factor analyses were used to determine the internal structure of the scale (total scores ranged from 10 to 70). Example items included, *"I think my life and health were threatened by COVID-19,"* *"I think wearing protective equipment (e.g., masks) can protect me from COVID-19,"* and *"I think the treatment for the virus is effective"* (for details, see **Supplementary Table 2**). The scale has three sub-dimensions: perceived threat, perceived protection, and perceived controllability. Cronbach's alpha for this scale was 0.60

TABLE 1 Demographic characteristics of participants of two periods.

Variables	Time 1 (N = 430)	Time 2 (N = 512)	Time 1 vs. Time 2
	No. (%)		P-value[a]
Sex			
Male	215 (50)	228 (44.5)	0.094
Female	215 (50)	284 (55.5)	
Whether in only-child family			
Yes	162 (37.7)	168 (32.8)	0.119
No	268 (62.3)	344 (67.2)	
Age, years			
<20	44 (10.2)	26 (5.1)	0.031
20–29	216 (50.2)	277 (54.1)	
30–39	130 (30.2)	163 (31.8)	
40–49	32 (7.4)	41(8.0)	
50–59	8 (1.9)	5 (1.0)	
Education			
≤Junior high school	7 (1.6)	4 (0.8)	0.733
Senior high school	36 (8.4)	40 (7.8)	
College	79 (18.4)	101 (19.7)	
Undergraduate	290 (67.4)	342 (66.8)	
≥Postgraduate	18 (4.2)	25 (4.9)	
Household income, yuan			
<50,000	51 (11.9)	42 (8.2)	0.130
50,000–100,000	133 (30.9)	137 (26.8)	
100,000–200,000	150 (34.9)	193 (37.7)	
200,000–500,000	85 (19.8)	123 (24.0)	
500,000–1,000,000	8 (1.9)	15 (2.9)	
>1,000,000	3 (0.7)	2 (0.4)	
Career			
Worker	25 (5.8)	49 (9.6)	0.122
Farmer	8 (1.9)	2 (0.4)	
Student	99 (23)	105 (20.5)	
Medical staff	10 (2.3)	13 (2.5)	
Educational, scientific and cultural personnel	25 (5.8)	26 (5.1)	
Enterprise manager	171 (39.8)	193 (37.7)	
Government institution personnel	36 (8.4)	54 (10.5)	
Retiree	1 (0.2)	0 (0)	
Migrant worker	22 (5.1)	21 (4.1)	
Other	33 (7.7)	49 (9.6)	

COVID-19, coronavirus disease 2019. [a]Two-tailed χ^2 analysis conducted for significance testing.

for both Time 1 and Time 2, indicating adequate reliability. The scale validity is further described in the Results section.
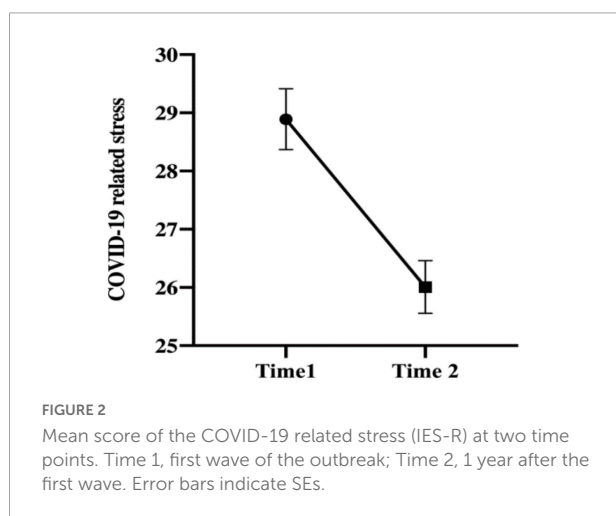
Statistical analyses

Data analysis was performed using IBM SPSS statistical software (version 23.0; IBM Corp.) and Mplus 8.3. Statistical significance was set at $p < 0.05$ and all tests were 2-tailed.

Only completed surveys were analyzed. To examine the reliability and validity of the SSCP, item analysis, exploratory factor analysis (EFA), and confirmatory factor analysis (CFA) were conducted using the sample from Time 1. Then, the demographic characteristics (e.g., age, gender, and income) were compared between the two samples from the two time points using the Pearson χ^2 test. The scores for COVID-19 perceptions, COVID-19-related

TABLE 2 Self-reported scores during the first wave of COVID-19 and 1 year later.

	Time 1	Time 2	Time 1 vs. Time 2
	Mean rank		P-value
Perceived threat of COVID-19	512.90	436.73	< 0.001
Perceived protection of COVID-19	515.26	434.75	< 0.001
Perceived controllability of COVID-19	449.18	490.25	0.02
COVID-19 related stress (IES-R)	514.38	435.48	< 0.001
Intrusion	514.87	435.08	< 0.001
Avoidance	504.07	444.15	0.001
Hyperarousal	490.14	455.85	0.053
MSPSS	485.22	459.98	0.156

COVID-19, coronavirus disease 2019; IES-R, 22-item Impact of Event Scale-Revised; MSPSS, Multidimensional Scale of Perceived Social Support.

FIGURE 2
Mean score of the COVID-19 related stress (IES-R) at two time points. Time 1, first wave of the outbreak; Time 2, 1 year after the first wave. Error bars indicate SEs.

stress, and perceived social support at Times 1 and 2 were not normally distributed, nor were the distributions similar. The non-parametric Mann–Whitney U test was applied, with the mean rank presented. Finally, an analysis was performed to identify correlations between the psychological factors. The mediation analysis was conducted using the PROCESS 3.0 procedure with SPSS to examine the associations and mechanisms, with all the covariates being controlled.

Results

The Self-Compiled Scale of COVID-19 Related Perception's internal structure and dimensionality

Item analysis was conducted with the participants from Time 1. The critical ratio method was used, with all participants being ranked according to their total scores from high to low.

The independent-sample t-test results indicate that all items could be significantly discriminated and had good psychometric properties ($p < 0.001$).

Next, all items were used to conduct an EFA with participants from Time 1. Bartlett's test of sphericity ($\chi^2 = 777.26$, $df = 45$, $p < 0.001$) and the KMO index = 0.718 indicate that the correlation matrix was suitable for factor analysis. The EFA of the scale produced three significant factors (Supplementary Table 3) with eigenvalues > 1 that explained 56.92% of the variance. The first and second factors contained three items each, whereas the third factor contained four items (the explained variances were 25.66, 20.09, and 11.18%, respectively). The three factors were labeled perceived threat perceived protection, and perceived controllability.

To substantiate the factor structure identified through the EFA, a CFA was conducted using Time 1 participants. The results indicate the structure of the SSCP with three factors, and 10 items had adequate good fit ($\chi^2 = 46.67$, $df = 32$, RMSEA = 0.03, CFI = 0.98, TLI = 0.97, SRMR = 0.03). Therefore, the SPSRC scale had good validity and was used in the subsequent analyses.

Demographic characteristics

A total of 942 eligible participants from the two time points were included in the final analysis. Pearson's χ^2 test showed that the two participant groups differed significantly in age ($p < 0.05$), but not in gender, only-child family status, education level, income, or occupation (Table 1) ($ps > 0.05$).

COVID-19 related stress, social support, and perceptions of the COVID-19

Mann–Whitney U test results indicate a significant difference in stress at Times 1 and 2 ($p < 0.001$). Considering

mean rank cannot be visually compared in the figure, both the mean rank (Table 2) and means suggested that stress levels were lower after 1 year. Figure 2 depicts this decreasing trend after 1 year with means and standard errors. The levels of intrusion ($p < 0.001$) and avoidance ($p = 0.001$) were significantly lower at Time 2 ($p < 0.05$). Although there was no significant change in perceived social support, participants reported a slightly higher level of perceived support during the pandemic period ($p = 0.156$). SSCP analysis indicated that perceived threat ($p < 0.001$) and perceived protection ($p < 0.001$) were lower after 1 year, whereas the sense of controllability ($p = 0.02$) was higher (Table 2).

Correlation and mediation analysis

Bivariate correlation analysis results indicated that social support was negatively correlated with COVID-19 related stress at Times 1 and 2 (Supplementary Table 4). Further, the three dimensions of COVID-19 related perceptions were also significantly correlated with social support and stress at Time 1 (Supplementary Table 4). One year later, perceived protection and perceived controllability remained significantly correlated with social support and COVID-19 related stress (Supplementary Table 4). However, perceived threat was not significantly correlated with social support (Supplementary Table 4). As a result, perceived threat was not analyzed for Time 2.

Mediation analyses were performed individually, with participants from Times 1 and 2. All continuous variables were standardized to a mean of 0 and a standard deviation of 1 before the analyses to facilitate interpretation of the main and mediation effects. In the analysis of data from Time 1, after controlling for demographic variables, three dimensions of perceptions of COVID-19 significantly mediated the association between social support and stress. First, perceived threat significantly mediated this association (95% CI, 0.01–0.10) (Figure 3A). Nevertheless, this indirect mediation effect was inconsistent with the direct effect, with perceived threat working as a suppressed mediator (11). Moreover, social support was negatively associated with COVID-19 related stress (β = −0.22; $p < 0.001$). However, perceived threat was positively associated with social support (β = 0.16; $p < 0.001$) and stress (β = 0.32; $p < 0.001$). Consequently, perceived threat partially explained the relationship between social support and COVID-19 related stress.

Next, perceived protection partially mediated the association between social support and COVID-19 related stress (95% CI, −0.07 to −0.003), with an estimated 21.05% (Figure 3B). Specifically, social support was positively associated with perceived protection (β = 0.28; $p < 0.001$). However, it was negatively associated with stress (β = −0.13; $p < 0.05$). Similarly, perceived protection was negatively associated with COVID-19

related stress (β = −0.14; $p < 0.05$). Moreover, perceived controllability partially mediated this association (95% CI, −0.08 to −0.02), with an estimated 27.18% (Figure 3C). Social support was positively associated with perceived controllability (β = 0.24; $p < 0.001$) but negatively associated with stress (β = −0.13; $p < 0.05$). Similarly, perceived controllability was negatively associated with COVID-19 related stress (β = −0.19; $p < 0.001$).

One year after the first wave of the pandemic (Time 2), only perceived protection and controllability had a mediating effect on the association between social support and COVID-19 related stress. Perceived threat did not correlate with social support and did not act as a mediator. After controlling for demographic variables, an estimated 10% of the association was mediated through perceived protection (95% CI, −0.04 to −0.001) (Figure 3B). Social support was positively associated with perceived protection (β = 0.18; $P < 0.001$) but negatively associated with stress (β = −0.16; $p < 0.001$). Perceived protection was also negatively associated with COVID-19 related stress (β = −0.10; $p < 0.05$). Similarly, perceived controllability partially mediated this association (95% CI, −0.08 to −0.02), with an estimated 26.82% (Figure 3C). Social support was found to be positively associated with perceived controllability (β = 0.27; $p < 0.001$) but negatively associated with stress (β = −0.13; $p < 0.01$). In addition, perceived controllability was negatively associated with COVID-19 related stress (β = −0.18; $p < 0.001$).

Discussion

This study investigated the relationships between COVID-19 related stress, social support, and perceptions of COVID-19 during different waves of the pandemic in China. The results found support for our hypotheses. Stress levels were lower 1 year after the first wave of the pandemic outbreak. Moreover, the relationship between social support and stress was mediated by perceived protection and perceived controllability in both Times 1 and 2. However, perceived threat was a mediator only at Time 1. These findings provide new evidence of the pandemic's temporal changes in China and improves current understandings of the psychological mechanisms underlying these trends.

Our results revealed a similar decrease in COVID-19 related stress to that of a United States longitudinal study, which supports our first hypothesis (27). These findings might be due to the age range (about 90% under 40 years old) and jobs (about 50% are enterprise managers or students) of our sample. Most of our participants were young and healthy. They usually received more social support and better adapted to stress (12–14). However, some researchers have found a contrary tendency (28, 29). One possibility for this is the relatively low number of positive COVID-19 cases at Time 2 in China, which
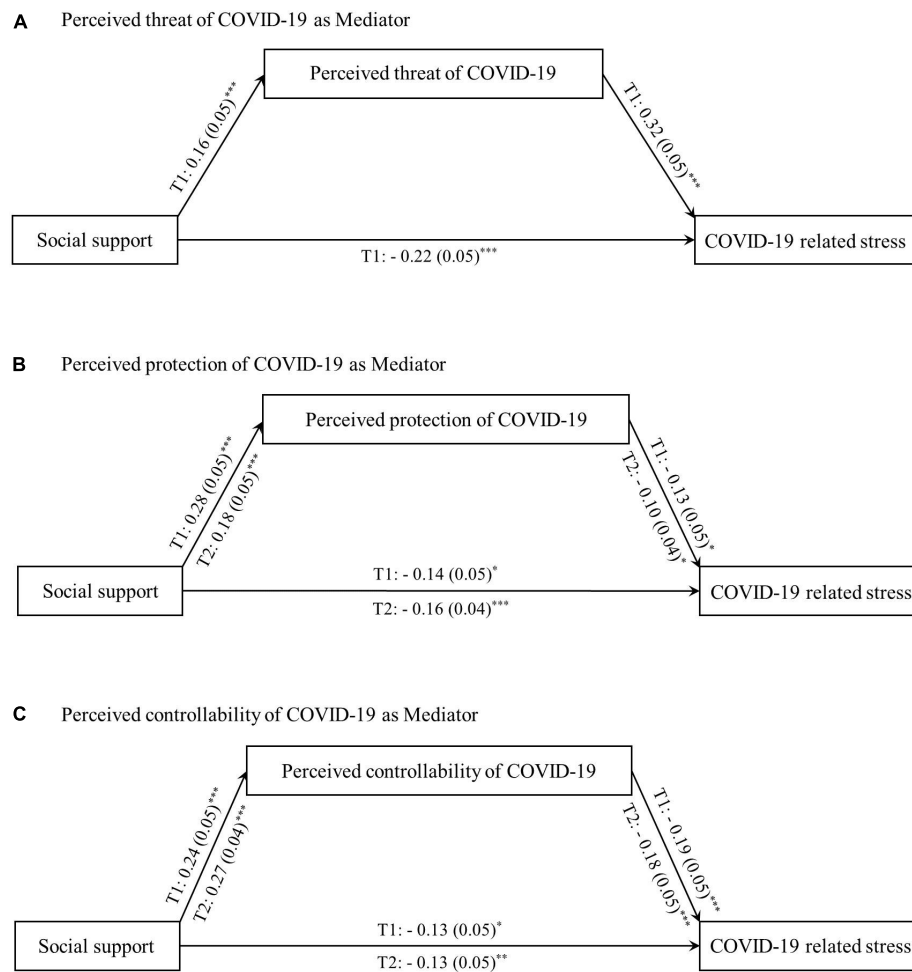
FIGURE 3
The mediation of perceived threat, perceived defense, and perceived controllability during the first wave of the COVID-19 outbreak and one year later. The link between social support and COVID-19 related stress is mediated. Path values are the path coefficients (standard errors). All covariates (whether in one-child family, education, age, gender, career, and income) were controlled in the analysis. T1 is the first wave of the outbreak; T2 is the second wave of 1 year after the first wave. **(A)** Shows that the perceived threat of COVID-19 mediates the relationship between social support and COVID-19 related stress in T1, but not in T2. **(B)** Shows that the perceived protection of COVID-19 mediates the relationship between social support and COVID-19 related stress both in T1 and T2. **(C)** Shows that the perceived controllability of COVID-19 mediates the relationship between social support and COVID-19 related stress both in T1 and T2. $*p < 0.05$, $**p < 0.01$, and $***p < 0.001$.

may explain why people experienced fewer stress reactions. An alternative explanation is that quite a few Chinese cities were in lockdown during Time 1. This sudden lifestyle change could have increased stress levels (30), which would have decreased after the cities reopened (31).

In contrast to recent findings showing higher social support as the lockdown was lifted (32), we found that people reported lower social support 1 year after the first wave of the pandemic. This deviation from expectation may be partly due to post-pandemic changes in people's lifestyles and jobs (e.g., more people preferring to work from home or losing their jobs) (33). It is also worth noting that our results suggest that social support as a protective factor is significantly and negatively correlated with

COVID-19 related stress across different time points. This is in line with our second hypothesis and previous studies (2, 34).

Further, as with our third hypothesis, perceived protection and perceived controllability mediated the association between social support and stress at both Times 1 and 2. Previous research has suggested that support from the government, family, and friends influences people's perceived risk and health-seeking behaviors (35). Concurrently, a higher level of perceived safety and sense of control consequently alleviates stress responses (36, 37). Equally important, social support indirectly influenced COVID-19 related stress through the perceived threat of COVID-19 during the outbreak. However, this meditation effect was not observed after 1 year, indicating that the perceived threat only had a conditional impact on

the association under the special pandemic circumstances. Noticeably, perceived threat acted as a suppressor of the mediating effect of social support on stress. In line with these results, social support may not always be coping mechanism for distress (37). In a distressing environment, people may not want to be exposed to greater concerns or unwanted information from social contacts, which can lead to uncertainty and anxiety (38). Therefore, at Time 1, when most people faced numerous struggles (e.g., in finance, work, and mental health), social support may have reinforced their negative feelings. These findings provide new evidence for the influence of social support on COVID-19 related stress and insights into the importance of social support on mental health during the pandemic in the current society of China.

Strengths and limitations

The current study extended our previous work (39) by examining the perceptions of COVID-19 as mediators in the mechanism of social support influencing COVID-19 related stress. Adequate social support provides individuals with more information on COVID-19, thus reducing COVID-19 related stress and promoting mental well-being. In addition, these findings provide insights into interventional strategies for mental well-being. Interestingly, perceived threat had a suppressive mediation effect, which might mean that under special circumstances (i.e., highly contagious infectious situations), social contact may increase perceived threat, thus affecting well-being and health. This study does have several limitations. First, owing to the cross-sectional nature of the design, causal inferences could not be made. Further experimental research is required to confirm these relationships. Second, the online data collection method used may have affected the survey reliability. Future studies should also consider using other measurements. Third, most of the participants in this study were managers and students; therefore, caution should be exercised in generalizing the present results to people with other jobs.

Conclusion

In summary, at Time 2, Chinese people reported less COVID-19-related stress and social support. Furthermore, perceived protection and controllability of COVID-19 mediated the relationship between social support and stress at Times 1 and 2. The perceived threat of COVID-19 only functioned as a mediator during the first wave. These results indicate that the stress response may fluctuate over time. The perceived threat of COVID-19 seemed to play a more important role between social support and stress at the beginning of the outbreak. Future research is needed to examine and address potential disparities in COVID-19 related stress and social support over time. Public health interventions should emphasize the importance of modulating perceptions of COVID-19 over the pandemic course. In addition, the use of technology in facilitating social support during the pandemic should be explored.

Data availability statement

The datasets presented in this study can be found in the **Supplementary material** and online repositories: https://osf.io/g2eup/.

Ethics statement

The studies involving human participants were reviewed and approved by Institutional Review Board of Kangning Hospital. The patients/participants provided their written informed consent to participate in this study.

Author contributions

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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/fpsyt.2022.1009810/full#supplementary-material

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