






High Prevalence of Post-Traumatic Stress Disorder and Psychological Distress Among Healthcare Workers in COVID-19 Field Hospitals: A Cross-Sectional Study from Vietnam

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Objective: To evaluate the prevalence of post-traumatic stress disorder (PTSD) and other psychological disturbances in the Vietnamese healthcare workers (HCWs) at COVID-19 field hospitals.

Methods: A cross-sectional study was conducted using the Impact of Event Scale–Revised (IES-R) to measure PTSD and the Depression Anxiety Stress scale (DASS) to measure other psychological disturbances. The anxiety about COVID-19 was evaluated by the fear of COVID-19 (FOC) scale. A self-developed questionnaire was used to assess work conditions and HCW’s major concerns and preparedness. Ordinal logistic regression was used to identify factors associated with the severity of PTSD. A structural modeling equation (SEM) model was fitted to examine the correlation between PTSD and other psychological disturbances.

Results: A total of 542 HCWs participated in this study. The prevalence of PTSD was 21.2%, most cases were mild. In the ordinal logistic regression analysis, a history of mental illness, poor preparedness, working in a condition with poor resources, a greater number of concerns, and greater fear of COVID-19 were independently associated with higher severity of PTSD. The prevalence of depression, anxiety, and stress was 46.8%, 38.3%, and 60.2, respectively. In the SEM model, PTSD and psychological disturbances had a strong correlation (standardized covariance 0.86).

Conclusion: The prevalence of PTSD and other psychological disturbances was alarmingly high among HCWs who worked at COVID-19 field hospitals. The reported associated factors can be useful for policymakers and health authorities in the preparation for future pandemics.

Keywords: PTSD, COVID-19, healthcare workers, DASS, fear of COVID, psychological disturbances

Introduction

In the early period of the COVID-19 pandemic, Vietnam managed to effectively control transmission and maintain zero deaths for months.¹ However, the fourth wave of the COVID-19 pandemic, which started on April 27, 2021, has drastically altered the situation, primarily due to the invasion of the Delta variant. As of September 12, 2021, Vietnam had reported 601,349 cases and 15,018 deaths, making this wave the most complicated and lethal COVID-19 period in

Vietnam.² The remarkable increase in the number of confirmed and hospitalized cases had imposed a massive burden on the entire healthcare system.³ In July and August 2021, nearly 15,000 healthcare workers (HCWs) nationwide travelled to the pandemic hotspots in Ho Chi Minh City and other Southern provinces to support local HCWs in screening, triage, and patient care.⁴

Emergency responses to the pandemic rendered HCWs extremely vulnerable due to the high-risk working environment as well as severe mental toll from high work pressures, witnessing deaths, fear of SARS-CoV-2 infection, homesickness, financial problems, and stigmatization. In a systematic review that included 498 HCWs, the main burdens of healthcare providers during the COVID-19 pandemic were inadequate preparedness, emotional challenges, insufficient equipment and information, and work burnout.⁵ Despite the mental burden that they had to bear, HCWs did not receive adequate mental health support and were thus more susceptible to anxiety, depression, and post-traumatic stress disorder (PTSD).⁶ A systematic review reported that the prevalence of anxiety, distress and PTSD of HCWs during the pandemic were 40%, 37%, and 49%, respectively.⁷

Understanding the picture of mental health in HCWs who participate in responding to pandemics is critical in developing appropriate and cost-effective preventative and therapeutic measures for this understaffed but overworked labor force. Therefore, in this study, we aimed to estimate the psychological disturbances of Vietnamese HCWs who worked at COVID-19 field hospitals.

Materials and Methods

Study Design

We conducted a cross-sectional study on the HCWs who worked at eight COVID-19 field hospitals in Ho Chi Minh City from 15th July to 25th September 2021.

Participant's Eligibility

All HCWs who were available during the data collection period were included in the study. Those who were not willing to participate and not actively on duty at the time of the survey due to any leave of absence were excluded.

Sample Size

Sample size was calculated based on the prevalence of PTSD in HCWs at COVID-19 field hospitals in a previous study.⁸ Assuming a prevalence of PTSD in HCWs of 30%, a margin of error of 5%, and a confidence level of 95%, the minimum sample size was 288 participants. Accounting for the non-response rate of 20%, we planned to recruit 346 participants.

Data Collection

We developed an online structured questionnaire using Google Forms, which was then sent to the participants via Zalo and Viber groups of HCWs who were taking care of patients at the field hospitals. After reading the first page that explained the study objectives, participants were asked to provide their informed consent. Only those who chose Yes in the question about informed consent would be taken to the data collection pages; otherwise, the form finished. Collected data included demographic data, medical history, COVID-related information, the preparedness of HCWs before participating in COVID-19 field hospitals, self-assessed work conditions in COVID-19 field hospitals, major concerns, and questionnaires on psychological disturbances.

We evaluated the anxiety about COVID-19 by the fear of COVID-19 (FOC) scale. This scale contains seven items stating the mental and bodily changes when thinking about COVID-19. Participants were asked to rate their agreement to the items using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The overall scores ranged from 7 to 35, with higher scores indicating greater COVID-19 fear. The validated scale of COVID-19 fear was reported with good reliability in various medical settings in Vietnam.^{9,10}

Regarding their preparedness, participants were asked to rate their mental and knowledge preparedness as poor/average/good. We created a composite variable of preparedness, where good preparedness was defined as moderated to good preparation in both aspects, while poor preparedness was defined as poor preparation in either aspect.

To assess the work conditions, we asked participants about 13 items, which could be grouped into conditions of facilities and human resources. For most items, the participants rated their assessment of the condition using a 3-point scale (1 = not at all / poor / never, and 3 = very / good / always). The number of deaths witnessed, nurse-to-patient ratio, doctor-to-patient ratio, and degree of respect from colleagues and patients were assessed in a more detailed scale (4 or 5 points).

We assessed five major concerns including worry about getting COVID-19, spreading COVID-19, impacts on economic status, losing connection with people, and being overloaded using a 4-point Likert scale (1 = never to 4 = always). The responses of often or always were considered “having the major concern”, and we counted the number of major concerns that each participant had.

Study Outcomes

PTSD was our primary endpoint and was measured by the Impact of Event Scale–Revised (IES-R), a psychometric tool developed by Horowitz in 1979 and revised in 1997 to assess catastrophic psychological damage produced by unexpected events.¹¹ The instrument has twenty-two items, belonging to three dimensions (intrusion, avoidance, and hyperarousal). Participants were asked about the degree of distress caused by difficulties for the past seven days and rated the degree using a 5-point Likert-type scale with a range of 0 = not at all to 4 = extremely. The “intrusion” subscale has eight items, “avoidance” eight items, and “hyperarousal” six items. The subscale score is the average score of the items (range 0–4). Item scores are then summed to the overall score (range 0–88). Based on the overall IES-R score, the participant can be classified as normal (0–23), mild (24–32), moderate (33–36) and severe psychological distress (37–88). In our study, a participant with an overall score of 24 or higher was considered “possible PTSD”.^{12–14} The IES-R has been tested for reliability and validity, confirming its strong internal consistency, test-retest reliability, and moderate criterion validity.^{15–17}

Secondary outcomes included other psychological disturbances measured by Depression Anxiety Stress scale (DASS). The DASS is a set of three self-report scales designed to measure the negative emotional states of depression, anxiety, and stress. We used DASS-21, which has twenty-one items, divided into three subscales of depression, anxiety, and stress, each containing seven items. Participants were asked about the psychological disturbances occurred for the past seven days and response using a 4-point Likert-type scale with a range of 0 = not at all to 3 = most of the time. Depression, anxiety, and stress scores are measured by summing the scores of their items. Because the DASS-21 is a shorter version of the 42-item original DASS, the score for each subscale must be multiplied by 2 to calculate the final score. The cut-off points for each subscale were similar to those in previous studies, and based on these thresholds, the final score were classified as: normal, mild, moderate, severe, or extremely severe.^{18–20} The DASS has been tested for reliability and validity, confirming its excellent internal consistency, discriminative, concurrent and convergent validities.^{21–24}

Statistical Analysis

Variables were presented as frequency and percentage for categorical variables, and mean (standard deviation) or median (interquartile range, Q1-Q3) for continuous variables. Stacked bar charts were used to illustrate the distribution of responses regarding outcomes, fear of COVID, and major concerns.

All psychometric scales were evaluated for their psychometric properties using confirmatory factor analysis (CFA) and Cronbach alpha. We did not provide a detailed report of these analyses since they were not our primary objective; results could be provided upon request. All psychometric scales had borderline validity (all reported goodness of fit statistics were very close to their criterion cutoffs) and good internal consistency ([SI Table](#)).

To summarize the work conditions, we first dichotomized the item responses (detailed cutoffs can be provided upon request). Then, latent class analysis (LCA) models were fitted to explore the different types (classes) of work conditions. We later included these types of work conditions in multivariable regression models to evaluate the outcome regarding the differences in work conditions.

The ordinal logistic regression model was used to identify factors associated with the severity of PTSD. The candidates for the regression models were selected on the theoretical basis through literature review and clinical

experience; factors that were not selected based on theory but associated with the outcomes of interest in the univariate analysis might also be included in the models.

We also fitted a structural modeling equation (SEM) model to examine the structure of PTSD and other psychological disturbances constructs. The psychological disturbances construct included three observed variables: depression, anxiety, and stress, which were the total subscale score of the DASS-21. The PTSD construct included the three IES-R subscales (intrusion, avoidance, and hyperarousal). The SEM model aimed to show the correlation between PTSD and other psychological disturbances.

All analyses were performed using Stata/BE 17 (StataCorp LLC, College Station, TX, US). An analysis with P-values of less than 0.05 was considered statistically significant.

Ethical Consideration

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of Bach Mai Hospital under decision No. 2727/QĐ-BVBM dated June 8th, 2021. Online informed consent was obtained before data collection. The participants were informed about the study objectives and their right to withdraw at any moment without giving a reason. Their responses were anonymous and kept confidential.

Results

Participants Characteristics

Five hundreds and forty-three HCWs agreed to participate in this study, of which, 276 (50.8%) were males, 258 (47.5%) married, 252 (46.4%) physicians, 209 (38.5%) nurses, and the median age was 30 years (Q1-Q3 27–36). Nearly half of the participants had more than 5 years of working experience. Sixty-seven (12.3%) of the participants had a history of mental illness (eg, anxiety, insomnia, bipolar disorder), of which, 11 (16.4%) were receiving treatment. All participants, except one, had been vaccinated with 2 doses of COVID-19 vaccine, with the most recent dose being administered for more than 4 weeks before the survey. Forty-nine (9%) participants previously worked at a COVID-19 field hospital, and one-fourth were working for more than 8 weeks at the current COVID-19 field hospital. Half of the participants were working at an emergency department or intensive care unit, while most of them were frequently exposed to COVID-19 patients/samples (Table 1).

Preparedness and Work Conditions

Among the participants, 36.3% and 32.2% claimed that they were well prepared before working at the field hospital in terms of knowledge and mental preparation, respectively. Most participants (80.7%) were classified as “having good preparedness”.

More than half of the participants responded that their hospital had easy access to PPE (59.7%), good infection prevention and control (IPC) protocols (66.3%), and good treatment guidelines (53%). Three-fourth of the participants claimed that they had to perform unfamiliar clinical tasks with insufficient preparation; however, most of them acknowledged that they received sufficient support for their routine clinical tasks (95.1%), for knowledge updates (97.6%), good teamwork (98.9%), and respect from patients and their families (97.8%). Only 17.1% and 16.6% of the participants found that the working schedule and the place for mid-time break were appropriate. Work overload was described by the majority of the participants, with around one-third claimed that at their unit, a nurse was in charge of more than ten patients and a doctor was in charge of more than fifteen patients. Majority of the participants (89%) had witnessed at least one death in their shift (Table 2).

Using an LCA model with seven items, we were able to classify patients into three groups: poor resources, good facilities but poor human resources, and good resources. The marginal plot of class characteristics (S1 Figure) shows the probability of having good work conditions in each item, with good separation between classes. In this LCA model, nearly half of the participants (49.4%) worked at a place with good facilities but poor human resources, and one-fourth each worked at a place with poor resources and good resources.

Table 1 Participant Characteristics (n = 543)

Variables	Results
DEMOGRAPHIC	
Gender, n (%)	
Male	276 (50.8)
Female	267 (49.2)
Age, median (Q1-Q3)	30.0 (27.0; 36.0)
Married and living with spouse, n (%)	258 (47.5)
Religion, n (%)	
Buddhism	78 (14.4)
Christian	15 (2.8)
Traditional Vietnamese religion	43 (7.9)
Atheism	407 (75.0)
Postgraduate education, n (%)	145 (26.7)
Specialty, n (%)	
Physician	252 (46.4)
Nurse	209 (38.5)
Other*	82 (15.1)
Working experience >5 years, n (%)	258 (47.5)
MEDICAL HISTORY	
Having a history of mental illness, n (%)	67 (12.3)
Received treatment, n (%)	11 (16.4)
Having a history of physical illness, n (%)	101 (18.6)
Received treatment, n (%)	38 (37.6)
COVID-RELATED	
Vaccination, n (%)	
1st dose received	6 (1.1)
2nd dose received	537 (98.9)
Time of most recent dose, n (%)	
<4 weeks	52 (9.6)
≥4 weeks	491 (90.4)
Previously worked at a COVID-19 field hospital, n (%)	49 (9.0)
Duration of working at the current COVID-19 field hospital, n (%)	
Less than 1 week	26 (4.8)
1 < 2 weeks	57 (10.5)
2 < 4 weeks	110 (20.3)
4 < 8 weeks	214 (39.4)
≥ 8 weeks	136 (25.0)
Working at ED/ICU at COVID-19 hospital, n (%)	299 (55.1)
Frequently exposure to COVID-19 patients/samples, n (%)	491 (90.4)

Notes: *Other specialties included caregivers, technicians, social workers, and volunteers.

Abbreviations: Q, quartile; ICU, Intensive care unit; ED, Emergency department COVID, Corona virus disease.

Major Concerns and Fear of COVID

A majority of the participants reported that they often/always worried about getting infected with COVID-19 (56.3%), spreading COVID-19 to the people they live with (65.6%), financial problems (63.9%), losing connection with their family and loved ones (44.9%). The feeling of overwhelmed at work was reported by 42.7% of the participants (Figure 1). Only 80 participants (14.7%) had no apparent concerns, more than half of the participants had 3–5 concerns.

Despite having concerns about their situation during COVID-19, a large proportion of participants (between 30% and 70%) disagreed with statements about the fear of COVID (Figure 2). The most commonly encountered feelings were being

Table 2 Work Conditions Assessed by HCWs at the Field Hospitals (n = 543)

Variables	Results
How was the access to personal protective equipment? n (%)	
Poor	11 (2.0)
Average	208 (38.3)
Excellent	324 (59.7)
How was the infection prevention and control protocol? n (%)	
Poor	11 (2.0)
Average	172 (31.7)
Excellent	360 (66.3)
How was the treatment guideline? n (%)	
Poor	37 (6.8)
Average	218 (40.1)
Excellent	288 (53.0)
Have to conduct unfamiliar clinical task with inadequate preparation, n (%)	
Not true	134 (24.7)
Relatively true	309 (56.9)
True	100 (18.4)
Was your teamwork good? n (%)	
Poor	6 (1.1)
Average	309 (56.9)
Excellent	228 (42.0)
Was the current working schedule reasonable? n (%)	
Not reasonable	97 (17.9)
Relatively reasonable	353 (65.0)
Reasonable	93 (17.1)
Was the mid-time break location reasonable? n (%)	
Not reasonable	96 (17.7)
Relatively reasonable	357 (65.7)
Reasonable	90 (16.6)
Did you receive adequate support in daily clinical task? n (%)	
Poor	27 (5.0)
Average	362 (66.7)
Excellent	154 (28.4)
How often have you been provided with updated knowledge on the epidemiology, diagnosis, treatment, and prevention of COVID-19? n (%)	
Not at all	13 (2.4)
Sometimes	191 (35.2)
Always	339 (62.4)
What number is the most fatalities have you witness during your shift? n (%)	
None	125 (23.0)
1 patient	101 (18.6)
2–5 patients	204 (37.6)
6–10 patients	53 (9.8)
More than 10 patients	60 (11.0)
In your unit, what is the ratio of nurse/patient? n (%)	
1 nurse/<3 patients	41 (7.6)
1 nurse/3–5 patients	189 (34.8)
1 nurse/6–10 patients	152 (28.0)
1 nurse/>10 patients	161 (29.7)
In your unit, what is the ratio of doctor/patient? n (%)	
1 doctor/<5 patients	76 (14.0)
1 doctor/5–9 patients	150 (27.6)

(Continued)

Table 2 (Continued).

Variables	Results
I doctor/10–15 patients	147 (27.1)
I doctor/>15 patients	170 (31.3)
Did you get the respect from the patients and their family members? n (%)	
Not at all	12 (2.2)
Sometimes	130 (23.9)
Often	309 (56.9)
Always	92 (16.9)

Abbreviation: COVID, Corona virus disease.

most afraid of COVID-19 (38.3%), uncomfortable to think about COVID-19 (32.6%), afraid of dying of COVID-19 (30.2%), and nervous or anxious when reading news about COVID-19 (28.2%).

Psychological Outcomes

The prevalence of PTSD among participants in this study was 21.2%. Most of the participants with PTSD were at a mild level. The prevalence of depression, anxiety and stress was 46.8%, 38.3% and 60.2; respectively. Most participants with depression, anxiety and stress were at moderate to extremely severe level (Figure 3 and S1 Table). In the SEM model, all components of PTSD and psychological disturbances contributed to the latent constructs. The standardized covariance between PTSD and other psychological disturbances was 0.86, suggesting that PTSD and other psychological disturbances coexisted in many participants (S2 Figure).

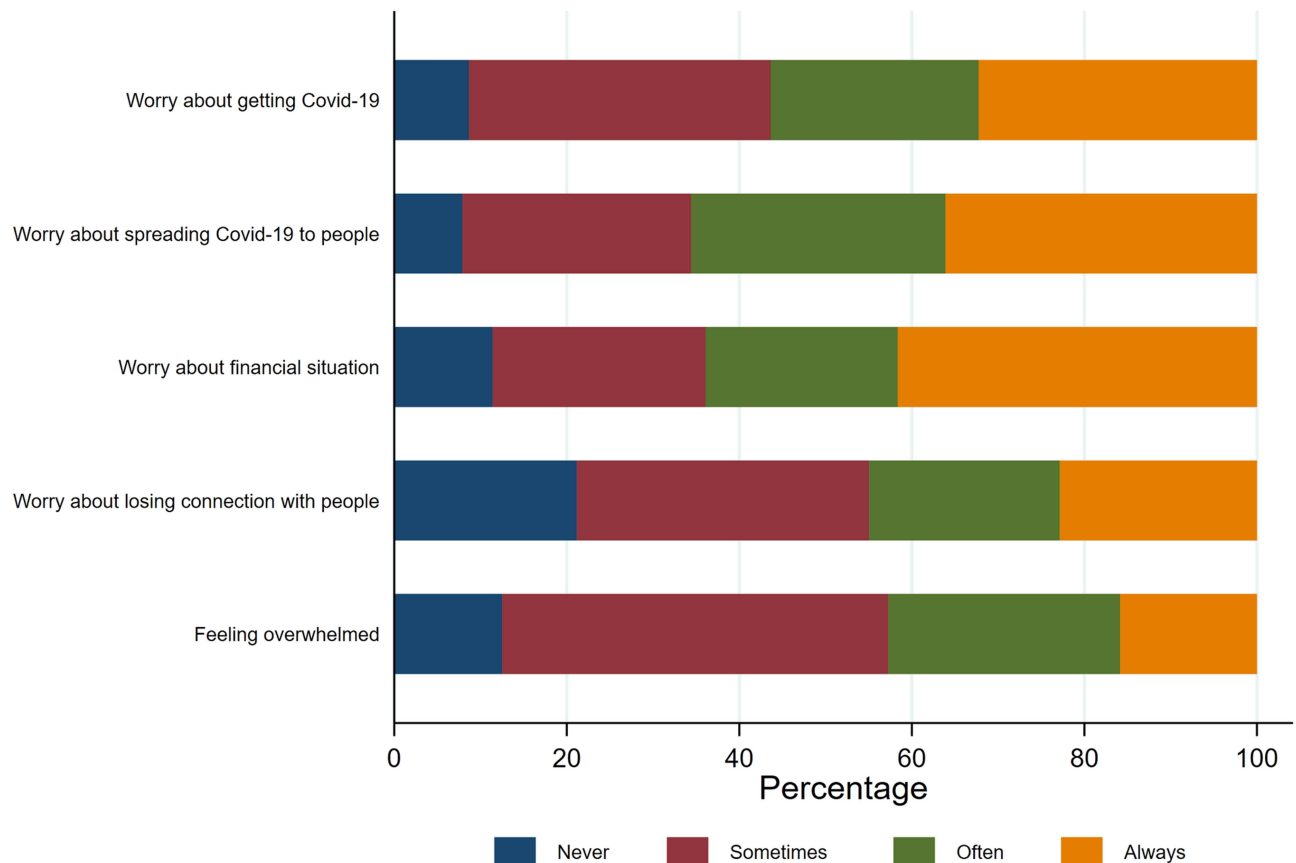


Figure 1 Major concerns of participants (n = 543).

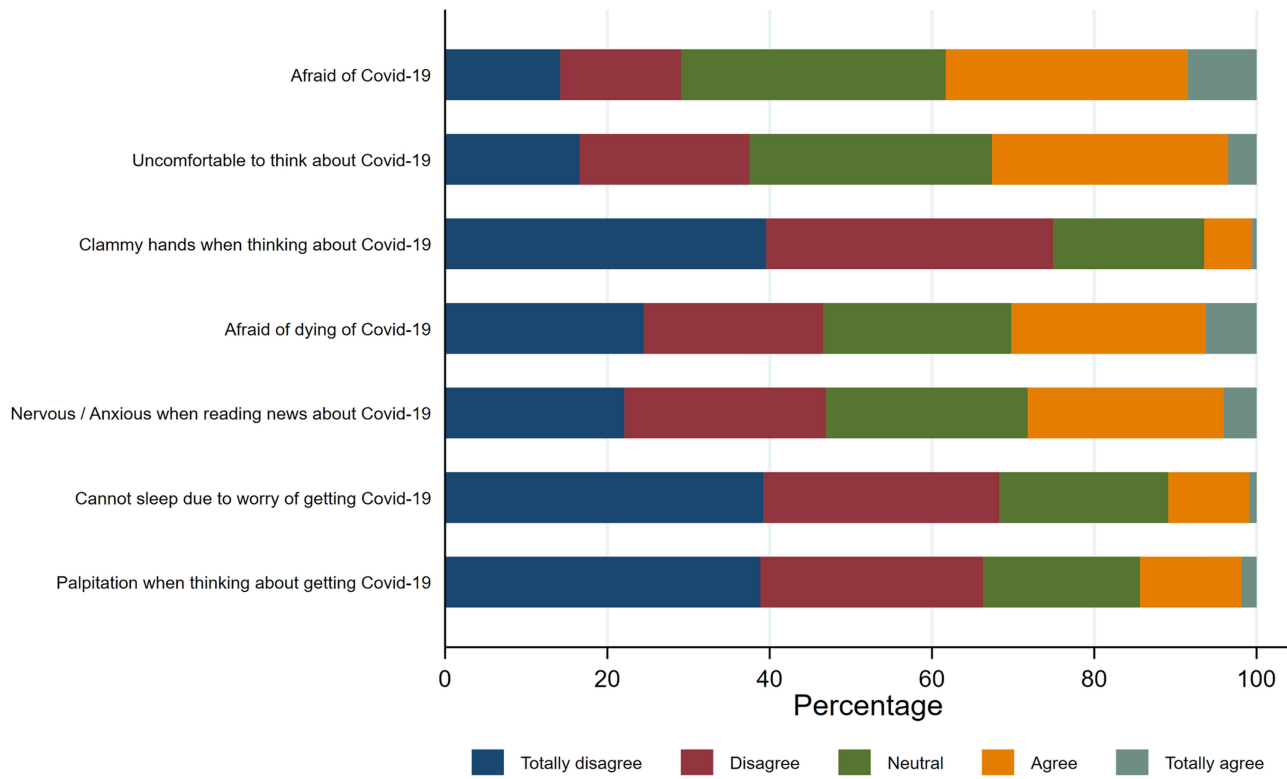


Figure 2 Distribution of the fear of COVID score among study participants (n = 543).

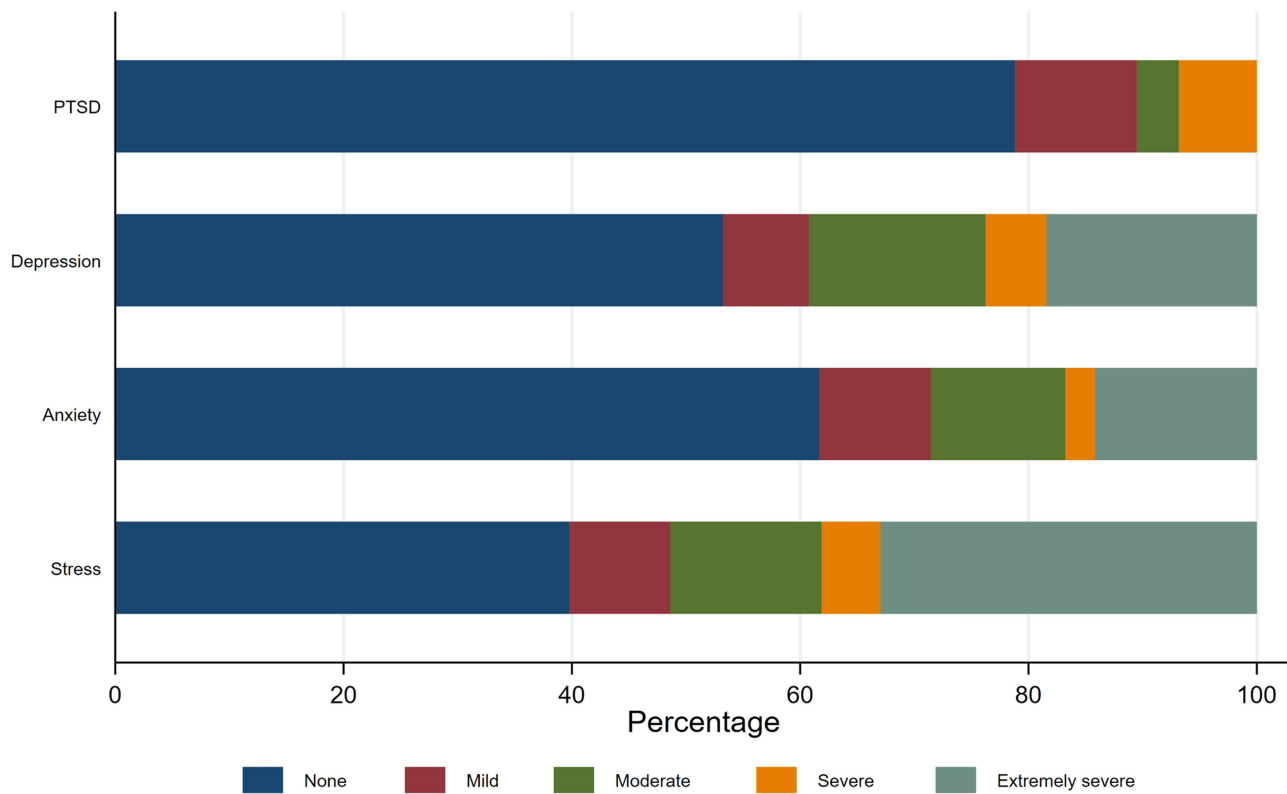


Figure 3 Psychological outcomes among study participants (n = 543). The classification of severity for PTSD using IES-R does not have the “extremely severe” category.

Factors Associated with PTSD Among Participants

In univariate analysis, younger (<40 years) participants, males, and physicians had higher prevalence of moderate/severe PTSD; the differences were not statistically significant. Higher prevalence of severe PTSD was also observed among those who had a history of mental illness, worked at COVID-19 hospital for >8 weeks, had poor preparedness, worked in a condition with poor resources, and had more concerns. Higher fear of COVID-19 scores were observed in participants with moderate/severe PTSD (Table 3).

In the ordinal logistic regression analysis, history of mental illness, poor preparedness, working in a condition with poor resources, more concerns, and greater fear of COVID-19 were independent factors associated with higher severity of PTSD (Table 4).

Discussion

In this study, we examined the prevalence of PTSD symptoms and its associated factors among HCWs working at the field hospitals during the fourth wave of the COVID-19 pandemic in Vietnam. The observed prevalence of PTSD (21.2%) was lower than previously reported (29–76.4%),^{25–30} probably because our study was conducted during the fourth wave, which was nearly two years since the first outbreak in Vietnam, while other studies were carried out during the early phase of the pandemic. Over these two years, there have been long-term adaptive reactions of the Vietnamese health system in general, and frontline HCWs in particular, to the fight against COVID-19. Particularly, part of the healthcare workforce had participated in the fight since the first wave; therefore, by the fourth wave, they had had much

Table 3 Univariate Analysis of Factors Associated with PTSD Among the Study Participants (n = 543)

Variables	Normal	Mild distress	Moderate distress	Severe distress	Total	p-value
Age ≥ 40, n (%)	61 (81.3)	9 (12.0)	3 (4.0)	2 (2.7)	75 (100.0)	0.49
Gender female, n (%)	215 (80.5)	29 (10.9)	8 (3.0)	15 (5.6)	267 (100.0)	0.58
Specialty, n (%)						
Physician	199 (79.0)	21 (8.3)	9 (3.6)	23 (9.1)	252 (100.0)	0.27
Nurse	161 (77.0)	29 (13.9)	8 (3.8)	11 (5.3)	209 (100.0)	
Other	68 (82.9)	8 (9.8)	3 (3.7)	3 (3.7)	82 (100.0)	
Having a history of mental illness, n (%)	34 (50.7)	9 (13.4)	8 (11.9)	16 (23.9)	67 (100.0)	0.00
Working at ED/ICU at Covid-19 hospital, n (%)	236 (78.9)	26 (8.7)	14 (4.7)	23 (7.7)	299 (100.0)	0.17
Working at Covid-19 hospital for >8 weeks, n (%)	95 (69.9)	18 (13.2)	8 (5.9)	15 (11.0)	136 (100.0)	0.02
Preparedness, n (%)						
Bad	64 (61.0)	17 (16.2)	7 (6.7)	17 (16.2)	105 (100.0)	0.00
Good	364 (83.1)	41 (9.4)	13 (3.0)	20 (4.6)	438 (100.0)	
Working condition, class, n (%)						
Poor resources	93 (65.5)	20 (14.1)	7 (4.9)	22 (15.5)	142 (100.0)	0.00
Good facility, Poor human resources	213 (79.5)	32 (11.9)	9 (3.4)	14 (5.2)	268 (100.0)	
Good resources	122 (91.7)	6 (4.5)	4 (3.0)	1 (0.8)	133 (100.0)	
Number of concerns, n (%)						
0	75 (93.8)	3 (3.8)	2 (2.5)	0 (0.0)	80 (100.0)	0.00
1	66 (91.7)	6 (8.3)	0 (0.0)	0 (0.0)	72 (100.0)	
2	70 (86.4)	4 (4.9)	2 (2.5)	5 (6.2)	81 (100.0)	
3	76 (78.4)	9 (9.3)	7 (7.2)	5 (5.2)	97 (100.0)	
4	77 (73.3)	14 (13.3)	4 (3.8)	10 (9.5)	105 (100.0)	
5	64 (59.3)	22 (20.4)	5 (4.6)	17 (15.7)	108 (100.0)	
Total FOC score, median (Q1-Q3)	9.0 (5.0; 14.0)	13.5 (9.0; 15.3)	15.5 (10.0; 20.8)	16.0 (9.0; 21.0)	10.0 (5.0; 15.0)	0.00

Abbreviations: Q, quartile; ICU, Intensive care unit; ED, Emergency department; COVID, Corona virus disease; FOC, fear of COVID. Variables in bold are statistically significant.

Table 4 Univariate and Multivariable Analysis of Factors Associated with PTSD Among the Study Participants. (n = 543)

Variables	Odds ratio	95% CI	p-value
Age ≥40 years	0.750	(0.376, 1.496)	0.413
Female	0.732	(0.457, 1.173)	0.195
Specialty (reference: Physician)			
Nurse	1.068	(0.643, 1.775)	0.799
Other	0.653	(0.319, 1.338)	0.244
Having a history of mental illness	4.063	(2.325, 7.102)	0.000
Working at COVID-19 hospital for >8 weeks	1.293	(0.779, 2.147)	0.321
Poor preparedness	1.927	(1.154, 3.216)	0.012
Work condition (reference: Good resources)			
Poor resources	3.042	(1.420, 6.519)	0.004
Good facility, Poor human resources	1.785	(0.860, 3.707)	0.120
Number of concerns	1.281	(1.086, 1.512)	0.003
Total FOC score	1.084	(1.037, 1.132)	0.000

Note: Variables in bold are statistically significant.

Abbreviations: COVID, Corona virus disease; FOC, fear of COVID; CI, confidence interval.

experience in working at field hospitals. Also, some western nations may have a higher risk of PTSD due to high aspirations for a risk-free existence and strong attention to negative mental health impacts resulting from significant life events.³¹

In our study, poor preparedness was associated with more severe PTSD. Insufficient preparation has been associated with negative psychological consequences among HCWs during previous epidemics of Ebola.³² According to a national cross-sectional study of general public in China during the COVID-19 outbreak, factors regarding preparation (eg, having good preventative and control measures and a highly efficient health system) were reported to be protective factors against psychological disturbances.³³ A cross-sectional study among 823 healthcare professionals in Ghana found that those who were “somewhat prepared” and “prepared” experienced less stress and burnout.³⁴ Inadequate preparedness could contribute to HCW stress and burnout—two psychological indicators that reached crisis levels among HCWs globally even before the COVID-19 pandemic.^{35,36} Without appropriate interventions, stress and burn out could result in lower productivity and effectiveness, decreased job satisfaction and commitment, and poor quality care, which consequently risk the patient’s safety.^{37,38}

HCWs in this study reported a number of concerns about COVID-19 and a high degree of COVID-19 fear. They were worried about getting infected with COVID-19, spreading COVID-19 to the people they live with, financial problems, losing connection with their family and loved ones, and the feeling of overwhelmed at work. These negative feelings were similar to the findings in previous reports^{39,40} and have been also widely reported in past epidemics such as HIV and SARS.^{41,42} We also found that having more concerns and having higher degree of fear were independently associated with more severe PTSD. Of notes, fear of COVID-19 is not only a factor associated with PTSD but also other psychological disturbances.^{34,43} Understanding the psychological impact of having to deal with COVID-19, policy-makers and health authorities need to develop targeted interventions such as developing explicit and up-to-date infection control standards and protocols, providing adequate supplies and training on personal protective equipment, and developing innovative solutions to mental care for HCWs.

Our findings suggest the relationships between past mental history, current PTSD, and other psychological disturbances. HCWs with preexisting mental illnesses have been reported to have higher risks of mental health outcomes such as anxiety, depression and burnout.^{26,44–47} A variety of risk factors make people with mental illnesses susceptible to negative health impacts, including poor physical health, low levels of physical activity, and higher degrees of smoking, drinking, drug abuse, social, and economic hardship.^{48,49} In the setting of isolated COVID hospitals, the situation worsen as they faced many other pressures such as work overload, isolation, being unable to connect with friends and loved ones, and having to witness death. This suggests that a comprehensive strategy is required to deal with the mental health

problems in frontline HCWs, including careful screening before recruiting to the field hospitals, regular monitoring for multiple psychiatric conditions, and in-place plans for switching HCWs between units to provide those with mental issues with proper management and adequate recovery.

This is one of the few studies that had examined the presence of PTSD among Vietnamese HCWs who worked at the field COVID-19 hospitals. The survey was conducted at multiple field hospitals during the heightening period of the COVID-19 wave, enabling us to provide an accurate picture of the prevalent mental health problems among these frontline HCWs. There are some limitations in this study. First, since the participants were not randomly sampled, there might be threats to generalizability, especially when those with severe psychological disturbances might refuse to answer the survey. However, the findings in this study were already very alarming, and our messages are not likely to change. Second, because the study was cross-sectional, we did not make any causal inferences about the relationship between PTSD and other risk factors. Nonetheless, our findings can be used to plan for future pandemics. Third, data were collected via an online form without direct support of a study member. This may result in heterogeneity in the understanding of questions among responders. However, since the study was done at COVID-19 field hospitals, it was impossible for the study teams to enter or travel across the hospitals to interview the HCWs. Also, the psychometric scales used in this study can be used for self-reporting,^{11,50} thus improving the validity of the responses.

In summary, a study on Vietnamese HCWs who worked at the field COVID-19 hospitals revealed alarmingly high prevalence of PTSD and other psychological disturbances among these HCWs. The factors associated with PTSD reported in this study can be useful for policymakers and health authorities in the preparation for future pandemics.

Disclosure

The authors have declared that no competing interests exist.

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