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Mental Health Among Healthcare Workers During the COVID-19 Pandemic in Vietnam

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Objectives: The objective of this study was to characterize mental health issues among Vietnamese healthcare workers (HCWs) and to identify related factors.

Methods: A cross-sectional study was conducted with 990 HCWs in 2021. Their mental health status was measured using the Depression, Anxiety, and Stress Scale.

Results: In total, 49.9%, 52.3%, and 29.8% of respondents were found to have depression, anxiety, and stress, respectively. The multivariable linear regression model revealed that factors associated with increased anxiety scores included depression scores (β, 0.45; 95% confidence interval [CI], 0.39 to 0.51) and stress scores (β, 0.46; 95% CI, 0.41 to 0.52). Factors associated with increased depression scores included being frontline HCWs (β, 0.57; 95% CI, 0.10 to 1.10), stress scores (β, 0.50; 95% CI, 0.45 to 0.56), and anxiety scores (β, 0.41; 95% CI, 0.36 to 0.47), while working experience was associated with reduced depression scores (β, -0.08; 95% CI, -0.16 to -0.01). Factors associated with increased stress scores included working experience (β, 0.08; 95% CI, 0.00 to 0.16), personal protective equipment interference with daily activities (β, 0.55; 95% CI, 0.07 to 1.00), depression scores (β, 0.54; 95% CI, 0.48 to 0.59), and anxiety scores (β, 0.45; 95% CI, 0.39 to 0.50), while age was associated with reduced stress scores (β, -0.12; 95% CI, -0.20 to -0.05).

Conclusions: Specific interventions are necessary to enhance and promote the mental health of HCWs so they can successfully cope with the circumstances of the pandemic.

Key words: Mental health, Healthcare workers, COVID-19, Vietnam

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INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and its associated disease, coronavirus disease 2019 (COVID-19), first emerged in Wuhan, China, at the end of December 2019. It then spread throughout the country and garnered significant global concern [1]. The World Health Organization was compelled to declare COVID-19 a global public health emergency, highlighting its major impact worldwide [2]. Healthcare workers (HCWs) are a particularly affected group, facing not only immense physical demands and workloads

but also psychological stress during the epidemic prevention and control efforts. Numerous studies have demonstrated that the COVID-19 pandemic adversely affected the mental health of HCWs, with a marked increase in the prevalence of insomnia, fatigue, depression, anxiety, and stress [3-5].

Vietnam experienced 4 waves of the COVID-19 pandemic up to April 2021 [6]. The Delta variant, during the fourth wave, exacerbated the situation in Vietnam, particularly among the unvaccinated population. By the end of August 2021, the country was averaging about 12 000 cases and 440 COVID-19-related deaths daily [7]. This surge resulted in an overwhelming workload for the healthcare system. The mental health of HCWs has become a significant concern. Although studies on the mental health of HCWs in Vietnam had been conducted previously, during the pandemic, this issue was not given priority and research was limited in scope. The majority of data pertained to the public's response, neglecting the experiences of HCWs during the COVID-19 pandemic. Only a handful of studies have been conducted, and these were limited to small-scale investigations in certain hospitals, specific subjects, or a narrow range of mental health aspects. Moreover, research on how job characteristics during pandemic prevention and control efforts, as well as the nature of protective equipment, affect the mental health of HCWs in Vietnam is scarce.

Therefore, we aimed to characterize mental health issues among Vietnamese HCWs and their related factors during the COVID-19 pandemic. Our findings will provide empirical evidence to inform practical policies that ensure better working conditions, thereby contributing to the reduction of the burden on HCWs in preparation for future pandemics.

METHODS

Study Design and Participants

A cross-sectional study was conducted using an online questionnaire. Data collection took place from October 2021 to November 2021 across 3 regions of Vietnam (south, central, north). A total of 990 HCWs participated in the survey. The participants included in this study were physicians, nurses, administrative officers, pharmacists, technicians, midwives, practitioners of traditional medicine, and public health staff.

Data Collection and Measurements

HCWs were randomly selected from a list managed by the provincial health departments. The selected provinces were considered COVID-19 hotspots in three regions of Vietnam, including Ho Chi Minh City, Dong Nai, Binh Duong, Dong Thap, and Tien Giang in Southern Vietnam; Quang Tri, Hue, and Phu Yen in Central Vietnam; and Bac Giang and Bac Ninh in Northern Vietnam (Table 1). All HCWs involved in COVID-19 pandemic control and prevention at the selected health facilities were listed. Subsequently, a link to the questionnaire was sent randomly to each individual via the email address provided. The questionnaire was designed with three parts: (1) socio-demographic and work characteristics, (2) use of protective equipment by participants, and (3) mental health among HCWs, assessed using the Depression, Anxiety, and Stress Scale (DASS-21) [8].

The data on socio-demographic and work characteristics included sex, age, education level, chronic diseases, marriage status, working time, experience in the healthcare system, work position during the pandemic, and whether participants had observed death or severe cases. Frontline HCWs were categorized according to their job roles during the pandemic.

The characteristics of personal protective equipment (PPE) usage in the participants' data included the daily duration of wearing protective clothing, medical gloves, goggles/respirators, and specialized masks. Additionally, issues such as PPE not matching the wearer's size, the type of PPE, and interference with activities, communication, and hygiene are included.

Mental health outcomes for all participants were measured using the DASS-21 scale. The DASS-21, a condensed version of

Table 1. Distribution of the participants according to province and region (n=990)

Distribution of the participants	n (%)
Southern Vietnam	
Ho Chi Minh City	332 (33.5)
Binh Duong	112 (11.3)
Dong Nai	61 (6.2)
Dong Thap	75 (7.6)
Tien Giang	72 (7.3)
Northern Vietnam	
Bac Ninh	77 (7.8)
Bac Giang	76 (7.7)
Central Vietnam	
Thua Thien Hue	71 (7.2)
Quang Tri	32 (3.2)
Phu Yen	63 (6.4)
Other provinces (Da Nang, Binh Dinh, Quang Nam, Nghe An)[1]	19 (1.9)

[1]All provinces in "other provinces" are in the central area of Vietnam.

the DASS-42, is a self-report instrument designed to quantify the negative emotional states of depression, anxiety, and stress. The DASS-21 had a very good internal consistency in this survey, with a Cronbach's α of 0.88 [9]. It comprises three 7-item subscales corresponding to depression, anxiety, and stress. The instrument employs a 4-point Likert scale, with response options ranging from "never" to "almost always" (0-3 score range), reflecting experiences over the past week. Subscale scores are calculated by summing the responses to all items within each subscale, as outlined by Lovibond and Lovibond [8].

Statistical Analysis

Data were entered into EpiData version 3.1 (EpiData Association, Odense, Denmark) and analyzed using SPSS version 20.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics summarized participants' socio-demographic factors. The arithmetic mean and standard deviation were reported for continuous variables, while counts and percentages were reported for categorical variables. The independent samples *t*-test was used to compare continuous variables between the two groups, and the chi-square (χ^2) test was used for categorical variables. Multivariable linear regression analysis employing the two-way stepwise method was utilized to evaluate the independent associations between the outcome variables (HCWs' depression, anxiety, and stress scores) and predictor variables, including all participants' socio-demographic and work characteristics, as well as characteristics related to the use of protective equipment. The significance level (α) was set at 0.05 for determining statistically significant results.

Ethics Statement

This study was reviewed and approved by the Medical Ethics Committee of the Institute of Public Health of Ho Chi Minh City, Vietnam (No. H202/041).

RESULTS

Socio-demographic and Work Characteristics of the Study Population

The majority of the study's participants were female (63.1%), with a mean age of 33.2±6.8 years; the youngest participant was 20, and the oldest was 61. Those with a graduate education represented the largest group (56.2%), followed by those with technical/vocational college education (31.2%) and undergraduate degrees (12.6%). A significant majority of the subjects did not have chronic diseases (93.6%) and were married (60.6%). There was an increase in working hours compared to the pre-pandemic period, affecting 56.1% of the participants. The mean work experience in the healthcare system among the subjects is 8.6±6.3 years, with the shortest tenure being just 0.1 years and the longest spanning 43.0 years. A majority of the participants (59.6%) worked on the front lines during the pandemic, and 59.7% reported observing an increase in deaths or severe cases compared to the period before the pandemic (Table 2).

The mean daily usage time for protective clothing was 6.2±3.1 hours. For medical gloves, the mean daily usage time was 6.3±3.2 hours. Goggles or face shields were used for an average of 7.0±3.3 hours per day. Specialized masks were worn

Table 2. Socio-demographic and work characteristics of the study participants (n=990)

Characteristics	n (%)
Sex	
Male	365 (36.9)
Female	625 (63.1)
Age (y)	
Mean±SD	33.2±6.8
Median [Min-Max]	32.0 [20.0-61.0]
Education	
Graduate	556 (56.2)
Postgraduate	125 (12.6)
Technical/vocational college	309 (31.2)
Chronic diseases	
Yes	63 (6.4)
No	927 (93.6)
Marriage status	
Single/divorced/widowed/separated	390 (39.4)
Married	600 (60.6)
Working time	
Did not change	435 (43.9)
Increased during the pandemic	555 (56.1)
Experience in the healthcare system (y)	
Mean±SD	8.6±6.3
Median [Min-Max]	7.3 [0.1-43.0]
Work during the pandemic (role)	
Frontline	590 (59.6)
Non-frontline	400 (40.4)
Observed death/severe cases	
Did not change	399 (40.3)
Increased during the pandemic	591 (59.7)

SD, standard deviation; Min, minimum; Max, maximum.

Table 3. Characteristics of study participants using protective equipment (n=990)

Characteristics	n (%)
Time using protective clothing per day (hr)	
Mean±SD	6.2±3.1
Median [Min-Max]	6.0 [1.0-24.0]
Time using medical gloves per day (hr)	
Mean±SD	6.3±3.2
Median [Min-Max]	6.0 [1.0-24.0]
Time using goggles/droppers per day (hr)	
Mean±SD	7.0±3.3
Median [Min-Max]	7.0 [1.0-24.0]
Time using specialized masks per day (hr)	
Mean±SD	9.3±5.3
Median [Min-Max]	8.0 [1.0-24.0]
PPE does not match in terms of size or type	
Yes	268 (27.1)
No	722 (72.9)
PPE interferes with activities, communication, hygiene	
Yes	571 (57.7)
No	419 (42.3)

SD, standard deviation; Min, minimum; Max, maximum; PPE, personal protective equipment.

for an average of 9.3±5.3 hours daily. Additionally, 27.1% of the study participants reported that the PPE was unsuitable in size and type, while 57.7% felt that PPE interfered with their activities, communication, and hygiene (Table 3).

Depression, Anxiety, and Stress Status of Study Participants and Related Factors

The depression, anxiety, and stress rates among HCWs were 49.9%, 52.3%, and 29.8%, respectively. The average anxiety score for HCWs in this study was 9.5±8.7, ranging from a minimum of 0 to a maximum of 42. The average depression score was 10.8±8.8, with scores spanning from 0 to 42. Similarly, the mean stress score for HCWs was 11.9±9.2, with the lowest score recorded as 0 and the highest as 42.

Univariate analysis revealed associations between the three states of anxiety, depression, and stress and various characteristics: sex, age, work experience, daily duration of medical glove use (in hours), daily duration of specialized mask use (in hours), incorrect PPE size, PPE type, and the interference of PPE with activities, communication, and hygiene. Specifically, there was a link between anxiety and the presence of chronic diseases. Depression was associated with marital status, job responsibilities, having observed death or severe cases, daily

Table 4. Depression, anxiety, and stress status of study participants and related factors

Variables	Anxiety			Depression			Stress		
	No (n=472)	Yes (n=518)	*p*-value[1]	No (n=496)	Yes (n=494)	*p*-value[1]	No (n=695)	Yes (n=295)	*p*-value[1]
Sex			0.008			0.003			<0.001
Male	154 (32.6)	211 (40.7)		160 (32.3)	205 (41.5)		231 (33.2)	134 (45.4)	
Female	318 (67.4)	307 (59.3)		336 (67.7)	289 (58.5)		464 (66.8)	161 (54.6)	
Age			0.021			<0.001			0.001
Mean±SD	33.6±7.0	32.8±6.6		33.8±6.9	32.5±6.6		33.6±7.0	32.2±6.3	
Median [Min-Max]	32.0 [20.0-61.0]	31.0 [20.0-59.0]		33.0 [20.0-61.0]	31.0 [20.0-59.0]		32.0 [20.0-61.0]	31.0 [20.0-55.0]	
Education			0.803			0.601			0.403
Graduate	262 (55.5)	294 (56.8)		274 (55.2)	282 (57.1)		381 (54.8)	175 (59.3)	
Postgraduate	58 (12.3)	67 (12.9)		68 (13.7)	57 (11.5)		90 (12.9)	35 (11.9)	
Technical/vocational college	152 (32.2)	157 (30.3)		154 (31.0)	155 (31.4)		224 (32.2)	85 (28.8)	
Chronic diseases			0.018			0.151			0.701
Yes	21 (4.4)	42 (8.1)		26 (5.2)	37 (7.5)		43 (6.2)	20 (6.8)	
No	451 (95.6)	476 (91.9)		470 (94.8)	457 (92.5)		652 (93.8)	275 (93.2)	

(Continued to the next page)

Table 4. Continued from the previous page

Variables	Anxiety			Depression			Stress		
	No (n=472)	Yes (n=518)	*p*-value[1]	No (n=496)	Yes (n=494)	*p*-value[1]	No (n=695)	Yes (n=295)	*p*-value[1]
Marital status			0.069			0.005			0.069
Single/divorced/widowed/separated	172 (36.4)	218 (42.1)		174 (35.1)	216 (43.7)		261 (37.6)	129 (43.7)	
Married	300 (63.6)	300 (57.9)		322 (64.9)	278 (56.3)		434 (62.4)	166 (56.3)	
Working time			0.201			0.901			0.401
Did not change	218 (46.2)	217 (41.9)		219 (44.2)	216 (43.7)		312 (44.9)	123 (41.7)	
Increased during the pandemic	254 (53.8)	301 (58.1)		277 (55.8)	278 (56.3)		383 (55.1)	172 (58.3)	
Experience in the healthcare system (y)			0.039			0.001			<0.001
Mean±SD	9.0±6.5	8.2±6.1		9.2±6.5	7.9±6.0		9.0±6.4	7.6±6.0	
Median [Min-Max]	8.0 [0.1-43.0]	7.0 [0.1-31.0]		8.1 [0.1-43.0]	6.8 [0.1-31.0]		8.0 [0.1-43.0]	6.1 [0.1-30.5]	
Work during the pandemic[1]			0.110			<0.001			<0.001
Frontline	269 (57.0)	321 (62.0)		263 (53.0)	327 (66.2)		390 (56.1)	200 (67.8)	
Non-frontline	203 (43.0)	197 (38.0)		233 (47.0)	167 (33.8)		305 (43.9)	95 (32.2)	
Observed death/serious cases			0.100			0.003			0.024
Did not change	203 (43.0)	196 (37.8)		223 (45.0)	176 (35.6)		296 (42.6)	103 (34.9)	
Increased during the pandemic	269 (57.0)	322 (62.2)		273 (55.0)	318 (64.4)		399 (57.4)	192 (65.1)	
Time using protective clothing per day (hr)			0.201			0.006			0.013
Mean±SD	6.1±3.2	6.3±3.0		6.0±3.0	6.5±3.2		6.1±3.1	6.5±3.0	
Median [Min-Max]	6.0 [1.0-24.0]	6.0 [1.0-24.0]		6.0 [1.0-24.0]	6.2 [1.0-24.0]		6.0 [1.0-24.0]	6.2 [1.0-24.0]	
Time using medical gloves per day (hr)			0.024			0.002			<0.001
Mean±SD	6.1±3.3	6.5±3.1		6.1±3.3	6.6±3.2		6.1±3.3	6.8±3.0	
Median [Min-Max]	6.0 [1.0-23.0]	6.3 [1.0-24.0]		6.0 [1.0-23.0]	6.3 [1.0-24.0]		6.0 [1.0-24.0]	7.0 [1.0-24.0]	
Time using goggles/droppers per day (hr)			0.302			0.009			0.002
Mean±SD	7.0±3.5	7.1±3.1		6.8±3.2	7.3±3.3		6.9±3.3	7.4±3.1	
Median [Min-Max]	7.0 [1.0-24.0]	7.0 [1.0-24.0]		7.0 [1.0-24.0]	8.0 [1.0-24.0]		7.0 [1.0-24.0]	8.0 [1.0-24.0]	
Time using specialized masks per day (hr)			0.007			0.010			0.023
Mean±SD	8.9±5.1	9.7±5.4		8.8±4.9	9.8±5.5		9.1±5.2	9.8±5.5	
Median [Min-Max]	8.0 [1.0-24.0]	8.0 [1.0-24.0]		8.0 [1.0-24.0]	8.0 [1.0-24.0]		8.0 [1.0-24.0]	8.0 [1.0-24.0]	
PPE does not match in terms of size or type			<0.001			<0.001			<0.001
Yes	104 (22.0)	164 (31.7)		108 (21.8)	160 (32.4)		159 (22.9)	109 (36.9)	
No	368 (78.0)	354 (68.3)		388 (78.2)	334 (67.6)		536 (77.1)	186 (63.1)	
PPE interferes with activities, communication, hygiene			0.003			0.005			0.037
Yes	249 (52.8)	322 (62.2)		264 (53.2)	307 (62.1)		386 (55.5)	185 (62.7)	
No	223 (47.2)	196 (37.8)		232 (46.8)	187 (37.9)		309 (44.5)	110 (37.3)	

Values are presented as number (%).
SD, standard deviation; Min, minimum; Max, maximum; PPE, personal protective equipment.
[1]Pearson chi-square test; Wilcoxon rank sum test.

time spent in protective clothing (in hours), and daily time spent using goggles or respirators (in hours). Similarly, stress was associated with having observed death or severe cases, daily time spent in protective clothing (in hours), and daily time spent using goggles or respirators (in hours) (Table 4).

The multivariate linear regression model was conducted using the Enter method. All variables that were statistically significant in the univariate analysis were included in the model, with adjustments made for age and sex. The model revealed that factors contributing to increased anxiety scores included depression scores (β, 0.45; 95% confidence interval [CI], 0.39 to 0.51; $p<0.001$) and stress scores (β, 0.46; 95% CI, 0.41 to 0.52; $p<0.001$). Furthermore, the model identified that factors associated with higher depression scores were being frontline HCWs (β, 0.57; 95% CI, 0.10 to 1.10; $p<0.05$), stress scores (β, 0.50; 95% CI, 0.45 to 0.56; $p<0.001$), and anxiety scores (β, 0.41; 95% CI, 0.36 to 0.47; $p<0.001$). Conversely, work experience in the healthcare system was found to decrease depression scores (β, -0.08; 95% CI, -0.16 to -0.01; $p<0.05$). Regarding stress scores, the model indicated that factors leading to increased stress included work experience in the healthcare system (β, 0.08; 95% CI, 0.00 to 0.16; $p<0.05$) and the interference of PPE with daily activities, communication, and hygiene (β, 0.55; 95% CI, 0.07 to 1.00; $p<0.05$), along with depression scores (β, 0.54; 95% CI, 0.48 to 0.59; $p<0.001$) and anxiety scores (β, 0.45; 95% CI, 0.39 to 0.50; $p<0.001$). Age was the only factor found to reduce stress scores (β, -0.12; 95% CI, -0.20 to -0.05; $p<0.05$) (Table 5).

DISCUSSION

Our research results indicated that 49.9%, 52.3%, and 29.8% of HCWs in three regions of Vietnam exhibited symptoms of depression, anxiety, and stress, respectively, as measured by the DASS-21 scale. These figures are substantially higher than those reported by Van [10] in a 2020 study conducted in Hanoi, the capital city in the north of the country, which found that the prevalence of depression, anxiety, and stress among HCWs involved in COVID-19 epidemic prevention and control was 5.7%, 19.5%, and 8.0%, respectively. A study by Le Thi Ngoc et al. [11] in the southern provinces of Vietnam reported rates of 18.0%, 11.5%, and 7.7% for depression, anxiety, and stress, respectively. The discrepancy in findings may be due to differences in the timing of the research; the studies by Van [10] and Le Thi Ngoc et al. [11] were conducted at a time when the number of cases in Vietnam was considerably lower, thanks to early and effective management strategies that focused on limiting community transmission. In contrast, our study took place during a phase of the COVID-19 epidemic characterized by unpredictable changes, including the emergence of new, highly infectious variants, which posed significant challenges to disease prevention efforts and placed immense pressure

Table 5. Multivariable linear regression models predicted anxiety, depression, stress of Vietnamese HCWs during the COVID-19 pandemic

Variables	Anxiety scores	*p*-value	Depression scores	*p*-value	Stress scores	*p*-value
Female	-0.34 (-0.83, 0.15)	0.201	-0.26 (-0.73, 0.22)	0.302	0.28 (-0.20, 0.77)	0.301
Age	0.06 (-0.01, 0.14)	0.110	0.06 (-0.01, 0.13)	0.120	-0.12 (-0.20, -0.05)	0.001
Chronic diseases	-0.41 (-1.40, 0.56)	0.401	0.24 (-0.68, 1.20)	0.602	0.25 (-0.70, 1.20)	0.602
Experience in the healthcare system (y)	-0.01 (-0.09, 0.07)	0.802	-0.08 (-0.16, -0.01)	0.033	0.08 (0.00, 0.16)	0.039
Frontline HCWs	-0.49 (-1.00, 0.01)	0.056	0.57 (0.10, 1.10)	0.018	0.04 (-0.45, 0.54)	0.900
Observed death/serious cases	-0.42 (-0.91, 0.07)	0.091	0.20 (-0.26, 0.67)	0.401	0.33 (-0.15, 0.80)	0.200
Time using protective clothing per day (hr)	-0.02 (-0.14, 0.09)	0.701	0.06 (-0.05, 0.17)	0.301	-0.05 (-0.17, 0.06)	0.400
Time using medical gloves per day (hr)	0.04 (-0.08, 0.15)	0.501	-0.02 (-0.13, 0.09)	0.801	0.01 (-0.10, 0.12)	0.900
Time using goggles/droppers per day (hr)	-0.05 (-0.15, 0.05)	0.302	-0.03 (-0.12, 0.07)	0.602	0.08 (-0.01, 0.18	0.094
Time using specialized masks per day (hr)	0.01 (-0.04, 0.06)	0.801	0.02 (-0.03, 0.06)	0.501	-0.02 (-0.07, 0.03)	0.501
PPE does not match in terms of size or type	-0.06 (-0.60, 0.49)	0.801	0.49 (-0.03, 1.00)	0.063	0.02 (-0.52, 0.56)	>0.999
PPE interferes with activities, communication, hygiene	-0.06 (-0.54, 0.43)	0.801	-0.33 (-0.80, 0.13)	0.201	0.55 (0.07, 1.00)	0.024
Depression scores	0.45 (0.39, 0.51)	<0.001	-	-	0.54 (0.48, 0.59)	<0.001
Stress scores	0.46 (0.41, 0.52)	<0.001	0.50 (0.45, 0.56)	<0.001	-	-
Anxiety scores	-	-	0.41 (0.36, 0.47)	<0.001	0.45 (0.39, 0.50)	<0.001

Values are presented as β (95% confidence interval).
HCW, healthcare workers; COVID-19, coronavirus disease 2019; PPE, personal protective equipment.

on the healthcare system and HCWs [12,13]. Additionally, the sample size and scope of the studies may influence the results. The earlier studies had smaller sample sizes and were confined to a few hospitals in Hanoi and Ho Chi Minh City [10,11], whereas our study had a relatively large sample size and was conducted across three distinct regions of Vietnam.

Compared with other studies worldwide, our results are fairly consistent with those reported by Liu et al. [14] in China, which indicated that the prevalence of depression, anxiety, and stress among HCWs was 50.7%, 44.7%, and 73.4%, respectively. At that time, China was the initial epicenter of the epidemic, experiencing a daily rise in infection and death rates. HCWs were confronted with acute challenges, including an overwhelmed healthcare system and a scarcity of protective gear, leading to significant stress in disease prevention efforts. Consequently, mental health disorders were widespread among HCWs [5,15]. The COVID-19 epidemic escalated rapidly, with a sharp increase in case numbers, necessitating extended work shifts for HCWs who managed patients with varying degrees of pathology and severity [5,15-23]. This situation resulted in a shortage of essential materials and equipment for patient care, placing HCWs in a perilous environment and making them vulnerable to mental health issues such as depression, anxiety, and stress. However, it is important to note that the study by Liu et al. [14] utilized various scales and differed from our approach, leading to discrepancies in the reported stress prevalence between their study and ours.

Meanwhile, the study conducted by Jemal et al. [24] revealed a high prevalence of mental health symptoms among HCWs during the COVID-19 pandemic. Of the 816 participants, 60.3% reported symptoms of depression, 78.0% reported symptoms of anxiety, and 33.8% reported symptoms of stress. These figures are significantly higher than those reported in our study. The difference may stem from the increased fear of COVID-19 and/or the scarcity of PPE in central Ethiopia. Notably, 71.1% of the respondents indicated that the available PPE was insufficient and did not meet the needs of HCWs [24].

Our study also showed that work experience within the healthcare system influences the depressive symptoms of HCWs. HCWs with less work experience were more prone to depressive symptoms than those with many years of service in the healthcare system. The research conducted by Jemal et al. [24] supports our findings, showing that HCWs with less than 10 years of work experience were significantly more likely to exhibit depressive symptoms compared to their more experienced counterparts. Similarly, another study found that HCWs with less work experience had higher levels of depression, anxiety, and stress. Similarly, another study found that HCWs with less work experience had higher levels of depression, anxiety, and stress [25]. This could be due to less experienced HCWs having a greater fear of infection, which in turn leads to higher levels of depression and anxiety during epidemic outbreaks [26]. However, in contrast to our study and several others [24-26], the research by Tiete et al. [27] identified an underreported level of experience as a significant risk factor, suggesting that work experience neither shields against nor heightens vulnerability to COVID-19 stressors. Work experience in the healthcare system was also significantly associated with stress symptoms. This factor increases the stress scores of HCWs. These findings align with those of Vyas et al. [25], which demonstrated that health workers with less work experience exhibited higher stress symptoms. However, in contrast to the study of Van [10], it was found that people with a longer service duration (>5 years) had a higher level of mental health disorders than those with a shorter service duration (<5 years). This may be because those with many years of work have encountered a variety of medical situations, understand the dangers of COVID-19 to the community relative to other diseases, and are acutely aware of their significant responsibility towards patients. Consequently, they may have a higher likelihood of experiencing increased mental health disorders.

Age also increased the risk of developing stress symptoms among HCWs. It was shown that younger HCWs were at a higher risk for mental health disorders, perhaps due to their lack of experience and having never faced a large and entirely novel pandemic; such a mentality was understandable [10]. This result is consistent with the study conducted in China [28] and the study by Jemal et al. [24] in Ethiopia.

Regarding depression, our study demonstrated a positive correlation between depression and anxiety scores, as well as between depression and stress scores. Additionally, a positive correlation was observed between anxiety and stress. These findings indicate that higher depression scores are associated with elevated anxiety and stress scores among HCWs, and the reverse is also true; a similar relationship exists between anxiety and stress scores.

Given the infectious nature of COVID-19, particularly with more contagious variants, HCWs must use PPE during work to prevent infection for themselves and the wider community. Long-term use of PPE can lead to acute health issues and vari-

ous mental health problems for HCWs. In this study, we found that prolonged wearing of PPE was significantly associated with symptoms of depression, anxiety, and stress. Excessive workload and wearing PPE for extended periods in hot conditions have exposed HCWs to problems such as interference with work activities, communication, and hygiene. These issues can even lead to thermal shock and depleted health conditions. They have impacted cognitive and physical performance, jeopardizing the safety and health of HCWs and leading to an increase in mental health disorders [24,29,30]. This result was further confirmed in the multivariate regression model, which showed that prolonged use of PPE interferes with activities, communication, and hygiene and increases the risk of developing stress symptoms among HCWs. Additionally, unsuitably sized and typed PPE, along with prolonged use and concerns about the risk of virus infection, also increased the risk of mental health problems for HCWs. This highlights the limitation that PPE was mass-produced and not optimized for individual needs. The study by Davey et al. [29] found similar results to ours, indicating that respondents' experiences underscored the impact of prolonged PPE use on the mental health of HCWs. The condition was associated with medical issues such as acute kidney disease, particularly when chronic dehydration occurred [31]. "Hangover-like" symptoms were also reported in HCWs who frequently faced heat stress conditions, potentially affecting sleep, appetite, and relationships with friends and family, thereby causing mental health problems for HCWs [29,32]. Some respondents expressed fear about going to work due to the requirement to wear PPE, and others were uncertain if they could cope with the next wave of the COVID-19 pandemic without a change in PPE policy [29]. Presumably, shorter shifts and, consequently, shorter durations of PPE use may be an effective strategy to avoid the adverse effects of prolonged PPE use [33]. Previous studies have indicated that being equipped with quality PPE can help HCWs feel protected from the virus and limit the risk of infecting family members upon returning home, thereby reducing the likelihood of stress [34-37].

The current study has some limitations. This study explored factors associated with mental health issues among HCWs, offering insights into potential underlying causes that could guide future interventions. It is important to recognize, however, that the study provides only a snapshot of HCWs' mental health in Vietnam during the COVID-19 pandemic and does not permit an analysis of causal relationships between the identified factors and mental health issues. Furthermore, the data were gathered using self-reported questionnaires, which may be subject to social desirability and recall biases. Finally, the representativeness of the sample warrants consideration, as data collection did not extend throughout Vietnam.

NOTES

Conflict of Interest

The authors have no conflicts of interest associated with the material presented in this paper.

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