POST-TRAUMATIC STRESS DISORDER DUE TO COVID-19 PANDEMIC ON HEALTHCARE WORKERS IN VARIOUS HOSPITALS IN DA NANG, 2021

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The COVID-19 pandemic posed a significant challenge to healthcare workers (HCWs), resulting in adverse effects on their mental health. This study aims to identify post-traumatic stress disorder (PTSD) due to the COVID-19 pandemic and related factors among healthcare workers in Da Nang, 2021. A cross-sectional study was conducted among 230 healthcare workers through a purposive sampling. The Impact of Event Scale-Revised (IES-R) was used to measure post-traumatic stress disorder. The prevalence of post-traumatic stress disorder among healthcare workers in this study was 33.04% (95% CI: 27.00 – 39.53). The levels of post-traumatic stress disorder were categorized into four groups: normal (57.83%), clinically concerning (9.13%), post-traumatic stress disorder (6.52%), and extreme symptoms (26.52%). Gender, age group, living status, workplace and risk of exposure to COVID-19 were significantly associated at p-value < 0.05. This study revealed a significant presence of post-traumatic stress disorder among the healthcare workers in the sample. Additional support should be provided to healthcare workers in order to address and mitigate the impact of PTSD due to COVID-19.

Keywords: Post-traumatic stress disorder, COVID-19, Da Nang, healthcare workers.

I. INTRODUCTION

The COVID-19 pandemic has emerged as the most significant global health crisis in recent years, characterized by its rapid and widespread transmission. The first known cases were identified in Wuhan, China, in December 2019, the virus spread quickly worldwide, infecting nearly all countries in a short period. The World Health Organization recognized the severity of the novel coronavirus outbreak, declaring it a global pandemic in March 2020. As of March 2023, more than 759 million confirmed cases and nearly 6.8 million deaths related to COVID-19 had been reported globally.[1] Vietnam has experienced four distinct epidemic waves of COVID-19, with the number of cases increasing during subsequent waves.[2]

The COVID-19 pandemic has posed a significant challenge to healthcare personnel, particularly those at the forefront of the battle against the virus. They are tasked with the critical responsibility of communicating accurate information about the disease to the public while avoiding inciting fear and panic. Additionally, they must protect themselves from contracting the virus while maintaining treatment efficacy and dealing with other stressors that are associated with COVID-19.[3] Therefore, health professionals are under overwhelming psychological pressure, which may lead to

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various psychological problems, such as fear, depression, post-traumatic stress disorder and insomnia.[4] Despite professional training and expertise, healthcare workers at risk for PTSD sharply increased during the pandemic. An epidemiological survey of medical staff and public service workers revealed that 27.7% of the participants reported PTSD symptoms during the COVID-19 outbreak.[5] A recent systematic review with meta-analysis established that the prevalence of PTSD among healthcare workers dealing with COVID-19 ranged from 2.9% to 49.5%.[6]

The examination of the impact of COVID-19 on the mental well-being of healthcare professionals holds great significance, as it can establish crucial baseline data for healthcare managers to enable them to promptly screen and assess the mental health status of their personnel. Da Nang was an important urban center located in Central Vietnam. As of June 13th 2021, Da Nang was one of the five cities/ provinces with the highest number of reported COVID-19 cases in the fourth wave of the COVID-19 pandemic in Vietnam.[7] Therefore, we conducted this study aimed to identify post-traumatic stress disorder due to the COVID-19 pandemic and related factors among healthcare workers in Da Nang, 2021.

II. METHODS

1. Study subjects

Healthcare workers in health facilities that have been treating patient infected with COVID-19 in Da Nang in 2021.

Inclusion criteria:

- Healthcare workers directly involved in medical examination, treatment and care for patients at hosp Employed continuously at the establishment for at least 6 months or more.

- Agreed to participate in the study.

Exclusion criteria:

- Healthcare workers were absent during the study period.

- Healthcare workers infected with COVID-19 at the time of the study.

2. Methods

Study design

A cross-sectional study was applied

Study duration and location

Duration: Study was conducted from October 2021 to May 2023. The data was collected in December 2021.

Location: Study was conducted at 4 hospitals treating patient infected with COVID-19 in Da Nang included 199 Hospital, Da Nang Hospital for Lung Diseases, Son Tra Hospital, Thanh Khe Hospital.

Sample size

In this study, sample size for estimating a population proportion was used

$$n = Z^2_{1-\alpha/2} \frac{p(1 - p)}{d^2}$$

In which:

n: Minimum study sample size

p = 0.175 (the proportion of PTSD in health care staffs at 2 hospitals in the North of Vietnam during COVID-19 pandemic)[8]

$Z_{1-\alpha/2}$: The critical value of the normal distribution (is 1.96 with a confidence level of 95%, α = 0.05)

d: absolute error (d = 0.05)

After calculating, the minimum sample size was n = 221. In fact, we recruited 230 healthcare workers from 4 hospitals in Da Nang to participate in the study.

Sampling method

A purposive sampling method was applied to recruit participants for this study. We purposely

selected four hospitals, including one central hospital (199 Hospital), one provincial hospital (Da Nang Hospital for Lung Diseases) and two district hospitals (Son Tra Hospital and Thanh Khe Hospital). Then, all healthcare workers who were at work in outpatient clinic, emergency department, internal/general internal medicine department, intensive care unit and infectious diseases department were selected for the study.

Data collection method

The data collection process involved several steps, including planning and scheduling a time to collect the data. The research team also obtained permission from the hospital leader before proceeding with data collection. The researchers interviewed the study subjects directly. They ensured that confidentiality and objectivity were maintained throughout the process, and participation in the research was completely voluntary. Finally, the research team checked and processed incomplete questionnaires to ensure the data was complete and accurate.

Study variables

Demographic characteristics of participants in the study included age, gender, ethnicity, religion, marital status, living status and educational level. The occupational characteristics were also collected, including job title, workplace, years of working experience, working time during COVID-19 and risk of exposure to COVID-19.

PTSD was measured using 22-item Impact of Event Scale-Revised (IES-R). Each question was rated on a 5-point Likert scale, with responses ranging from 0 (Not at all) to 4 (Extremely). The total score obtained from the 22 questions of the IES-R, which ranged from 0 to 88, was used to categorize the levels of PTSD into four categories: Normal (less than 24 points), Clinical concern (24-36 points), PTSD (33-36 points), and Extreme symptoms (37 points or higher). A cut off score of 33 or greater indicated a positive diagnosis for PTSD.[9] The IES-R scale has been validated to measure levels of PTSD and has demonstrated high internal consistency for the total scale (Cronbach's alpha=0.96) in a sample of Vietnam veterans.[9]

Statistical analysis

All collected data was checked for completeness and consistency and entered into Epidata version 3.1 and then exported to STATA software version 16 for analysis. Descriptive statistics were performed through the calculation of mean values, standard deviations for quantitative variables and the frequency, percentage for qualitative variables. Multivariable logistic regression models were applied to identify factors associated with PTSD due to COVID-19 of participants. Statistical significance was defined at a p-value of less than 0.05.

3. Ethical Considerations

The study was ethically approved by Ministry of Health dated on 19 January 2021 (Number 377/QĐ-BYT). Research subjects were explained about the purpose and content of the research. Their participation was informed as voluntary and that they have the right to refuse or withdraw from the study at any time. The data was collected accurately, honestly, and solely for the purpose of conducting research.

III. RESULTS

Table 1. Demographic characteristics of participants

Characteristics	Frequency (n = 230)	Percentage (%)
Gender		
Male	46	20
Female	184	80
Age group		
<30 years	63	27.39
30-<40 years	121	52.61
40-<50 years	32	13.91
≥50 years	14	6.09
Ethnicity		
Kinh	230	100
Others	0	0
Religion		
No	213	92.61
Yes	17	7.39
Marital status		
Single/ Separated/ Widowed	61	26.52
Married	169	73.48
Living alone		
Yes	35	15.22
No	195	84.78
Education		
Lower than university	94	40.87
University	104	45.22
Higher than university	32	13.91
	Mean (Min- Max)	SD
Age (years)	34.08 (22- 61)	7.59

Table 1 shows the demographic characteristics of healthcare workers who participated in this study, conducted in Da Nang. Of the 230 participants, the mean age was 34.08 ± 7.59 years, and the gender distribution was 20% male and 80% female. Moreover, the

majority of participants were of Kinh ethnicity (100%), reported no religious affiliation (92.61%), and were married (73.48%). Most participants were not living alone (84.78%) and had university education (45.22%).

Table 2. Occupational characteristics of participants

Characteristics	Frequency (n = 230)	Percentage (%)
Occupation		
Doctor	62	26.96
Nurse	158	68.7
Others (technicians, nursing assistants)	10	4.35
Department		
Outpatient clinic	41	17.83
Emergency	35	15.22
Internal/General internal medicine	75	32.61
Intensive care	38	16.52
Infectious diseases	27	11.74
Others (surgery, diagnostic imaging…)	14	6.09
Working years		
<5 years	44	19.13
5-<10 years	44	19.13
10-<15 years	97	42.17
≥15 years	45	19.57
The average working time during COVID-19		
≤8 hours/day	62	26.96
>8 hours/day	168	73.04
Risk of exposure to COVID-19		
Almost none	27	11.74
Several times per week	9	3.91
Everyday	194	84.35
	Mean (Min- Max)	SD
Working experience (years)	9.90 (1 - 30)	6.08
The average working time during COVID-19	10.74 (4 - 23)	3.18

Table 2 presents the occupational characteristics of participants. Of 230 participants, 68.7% were nurse, 26.96% were doctor and 4.35% were others (technicians, nursing assistants). The highest proportion of participants (42.17%) had experiences from10 to less than 15 years. Regarding their working hours during COVID-19, the majority (73.04%) reported working more than 8 hours per day. Most participants (84.35%) reported being exposed to COVID-19 everyday, while only 11.74% reported being almost not at risk of exposure.

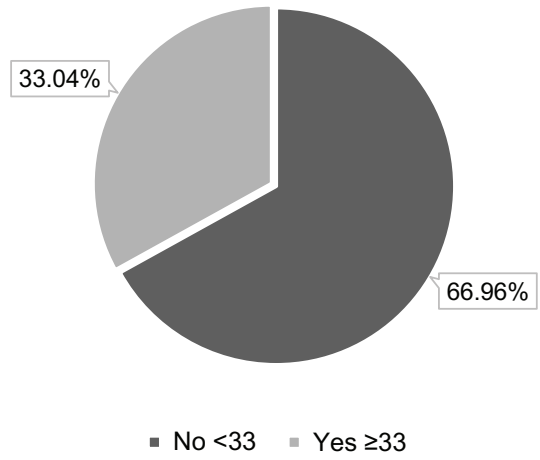

Figure 1. Prevalence of overall post-traumatic stress disorder due to COVID-19 on healthcare workers through IES-R score (n = 230)

Figure 1 presents the overall prevalence of PTSD among healthcare workers based on their IES-R scores. The proportion of PTSD on HCWs in this study was 33.04% (95% CI: 27.00 - 39.53).

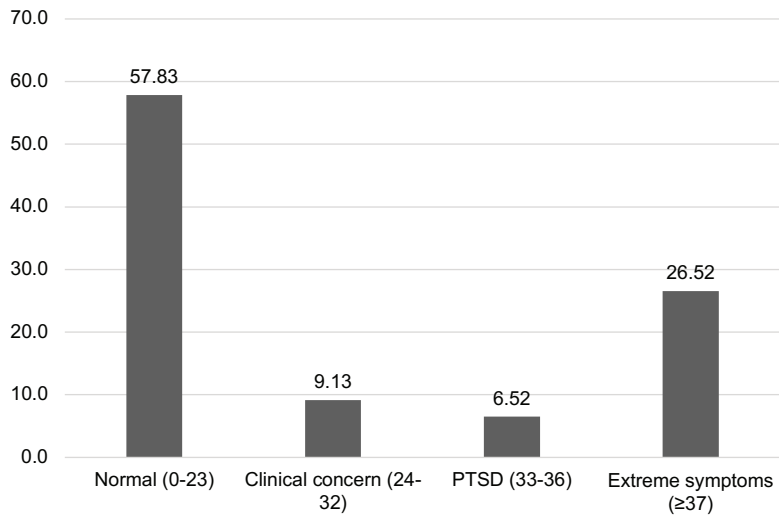

Figure 2. Levels of post-traumatic stress disorder due to COVID-19 on healthcare workers through IES-R score (n = 230)

Figure 2 depicts the levels of PTSD among healthcare workers based on their IES-R score. The levels of PTSD on HCWs were categorized into four groups: normal (57.83%), clinically concerning (9.13%), PTSD (6.52%), and extreme symptoms (26.52%).

Table 3. Multivariable logistic regression analysis of the factors associated with PTSD due to the COVID-19 pandemic on HCWs

Factors	PTSD		OR (95% CI)	p
	Yes	No		
	n (%)	n (%)		
Gender				
Male	11 (23.91)	35 (76.09)	1	-
Female	65 (35.33)	119 (64.67)	2.50 (1.01 - 6.22)	**0.048**
Age group				
<30 years	21 (33.33)	42 (66.67)	2.29 (0.34 - 15.69)	0.398
30-<40 years	36 (29.75)	85 (70.25)	1.71 (0.27 - 10.80)	0.571
40-<50 years	17 (53.13)	15 (46.88)	7.41 (1.10 - 49.78)	**0.039**
≥50 years	2 (14.29)	12 (85.71)	1	-
Religion				
No	71 (33.33)	142 (66.67)	1	-
Yes	5 (29.41)	12 (70.59)	1.33 (0.39 - 4.46)	0.648
Marital status				
Single/ Separated/ Widowed	16 (26.23)	45 (73.77)	1	-
Married	60 (35.50)	109 (64.50)	1.19 (0.51 - 2.75)	0.685
Living alone				
Yes	4 (11.43)	31 (88.57)	1	-
No	72 (36.92)	123 (63.08)	4.10 (1.17 - 14.34)	**0.027**
Education				
Lower than university	33 (35.11)	61 (64.89)	1.05 (0.31 - 3.54)	0.941
University	32 (30.77)	72 (69.23)	0.91 (0.29 - 2.89)	0.875
Higher than university	11 (34.38)	21 (65.63)	1	-
Occupation				
Doctor	20 (32.26)	42 (67.74)	1.88 (0.29 - 12.18)	0.508

Factors	PTSD		OR (95% CI)	p
	Yes	No		
	n (%)	n (%)		
Nurse	53 (33.54)	105 (66.46)	1.25 (0.22 - 7.21)	0.804
Others	3 (30.00)	7 (70.00)	1	-
Department				
Others	57 (29.23)	138 (70.77)	1	-
Emergency	19 (54.29)	16 (45.71)	2.98 (1.28 - 6.89)	**0.011**
Working years				
<5 years	15 (34.09)	29 (65.91)	2.32 (0.64 - 8.34)	0.198
5-<10 years	12 (27.27)	32 (72.73)	1.54 (0.49 - 4.91)	0.463
10-<15 years	34 (35.05)	63 (64.95)	1.83 (0.71 - 4.74)	0.213
≥15 years	15 (33.33)	30 (66.67)	1	-
The average working time during COVID-19				
≤8 hours/day	22 (35.48)	40 (64.52)	1	-
>8 hours/day	54 (32.14)	114 (67.86)	0.93 (0.45 - 1.91)	0.836
Risk of exposure to COVID-19				
Almost none	3 (11.11)	24 (88.89)	1	-
Everyday	70 (36.08)	124 (63.92)	4.38 (1.05 - 18.30)	**0.043**
Several times per week	3 (33.33)	6 (66.67)	8.27 (1.01 - 67.86)	**0.049**

Table 3 presents the factors associated with PTSD caused by the COVID-19 pandemic through a multivariable logistic regression analysis. The analysis showed that gender, age, living alone status, workplace, and risk of exposure to COVID-19 were significantly associated with PTSD at a p-value < 0.05.

IV. DISCUSSION

Healthcare workers involved in treating COVID-19 patients face a higher likelihood of experiencing mental health symptoms compared to the general population. This study showed the prevalence of PTSD due to the COVID-19 pandemic and related factors among 230 healthcare workers in Da Nang.

In this study, the overall prevalence of post-traumatic stress disorder among healthcare workers during the COVID-19 pandemic was 33.04% (95% CI: 27.00- 39.53), with extreme symptoms accounting for 26.52%. This finding was lower than the rates reported in previous studies conducted China during the initial COVID-19 pandemic (53.8%).[10] In Vietnam, the current study found a higher prevalence of PTSD among HCWs compared to a previous study conducted in several hospitals in the Northern region in 2020, which used the PSS-

SR scale and reported a prevalence rate of 17.5%.[8] The difference in prevalence of PTSD in this study compared to previous studies could be attributed to the timing of the survey. At the time of conducting this research, Vietnam was in the midst of the fourth wave of the COVID-19 pandemic, with a significant increase in cases and deaths. As of November 21, 2021, Vietnam has reported 1,094,514 cases and 23,761 deaths, ranking 37/223 countries and territories in terms of confirmed cases in the world.[11] Medical staff were faced with limited resources, and were required to participate in anti-epidemic work, which involved daily contact with COVID-19 patients and at risk of infection at any given time.[12] This increased pressure on mental health among healthcare workers in 2021 compared to earlier stages of the pandemic. In addition, the prevalence of PTSD in this study was higher than that reported in study conducted in Norway (28.9%).[5] The prevalence of PTSD in healthcare workers may difference depending on various factors such as variations in the subjects and study locations, time gaps between studies, differences in measures utilized to evaluate PTSD, disparities in policies that support healthcare workers, and the effects of the COVID-19 pandemic in different locations.

The study employed multivariable logistic regression to analyze factors associated with PTSD caused by the COVID-19 pandemic. The results indicated that female healthcare workers had 2.5 times higher odds of developing PTSD compared to male healthcare workers (95% CI: 1.01 - 6.22). This finding is consistent with a previous study of 1,092 healthcare workers in the United States, which reported higher rates of PTSD among female healthcare workers during the pandemic (OR=2.05, 95% CI: 1.30 – 3.23).[13] The findings suggest that women may be more susceptible to environmental stressors, particularly in the context of epidemics. On the other hand, the causative of the higher prevalence of the symptoms in females can be due to changes in the levels of ovarian hormones during exposure to these stressful environmental conditions. Another part may be related to the probable further negative cognitive changes among females in this situation.[14] The study discovered that HCWs between the ages of 40 and 49 had the greatest risk of developing PTSD (OR=7.41, 95% CI: 1.10 - 49.78), compared to HCWs aged 50 or older. This suggests that younger age is a risk factor for PTSD in healthcare workers, which is consistent with a systematic review of 17 publications conducted in 2020.[15] This may be because older HCWs may be more financially secure, have established family support, and hold higher positions in their profession. Additionally, older HCWs have more expertise and are better prepared, both in terms of their professional skills and psychological resilience, to deal with PTSD caused by the COVID-19 pandemic. The study found that working in the emergency department during the COVID-19 pandemic increased the risk of developing PTSD among the sample (OR=2.88, 95%CI: 1.38- 5.99). These findings are consistent with the results reported in the systematic review conducted by Carmassi et al, which concluded that healthcare workers' level of exposure to stressful work-related situations, such as working in emergency departments, is one of the most significant risk factors for developing PTSD during coronavirus outbreaks.[16] The increased demand for emergency care during the pandemic led to higher workloads for healthcare workers, longer working hours, and managing more patients with limited resources and support. This heightened exposure to traumatic events and high levels of stress during the pandemic likely contributed to a higher risk of developing PTSD among

healthcare workers working in emergency departments. his highlights the importance of providing adequate resources, support, and mental health services for healthcare workers, particularly those working in high-risk environments like emergency departments, during and after the COVID-19 pandemic. This study found that healthcare workers with less work experience had an increased risk of developing PTSD compared to those with 15 or more years of working experience. This result is consistent with a previous study conducted on medical staff in emergency departments in China, which suggested that healthcare workers with less work experience are more susceptible to developing depressive symptoms and PTSD.[17] We cou;d explain that experienced healthcare workers are better equipped to cope with the psychological effects of the COVID-19 pandemic, thanks to their professional expertise and psychological resilience. This may be attributed to their extensive exposure to clinical situations over the years, which helps them develop better self-regulation and coping mechanisms to manage the challenges posed by the pandemic. The study found that healthcare workers with greater exposure to COVID-19 were at a significantly higher risk of developing PTSD than those with less exposure. The odds ratio for developing PTSD is 4.38 (95% CI: 1.05-18.30) for healthcare workers with daily exposure risk and 8.27 (95% CI: 1.01-67.86) for those with exposure several times a week, compared to those with almost no exposure risk. These results suggested that HCWs with high levels of exposure to COVID-19 are at a higher risk of developing PTSD than HCWs with low levels of exposure. The fear of contracting the disease due to daily exposure can cause anxiety among HCWs, and they may also be worried about spreading the virus to their loved ones if they come into contact with them.

This study not only determine the prevalence of PTSD caused by COVID-19, but also investigates potential risk factors associated PTSD among HCWs in Da Nang province in 2021. The findings from this study have important policy implications. For the primary health sector, it provides important evidence for PTSD prevention and suggests promoting targeted interventions and mobilizing government support. The health sector at the provincial and central levels should prioritize policies for HCWs in Da Nang, providing appropriate resources to improve HCW health, and developing health education and communication programs. However, there were limitations to our study that should be considered when interpreting the results. This was a cross-sectional study which does not enable to determine any causal relations between associated factors and the development of PTSD. Research with the appropriate design is required to explore if any cause-and-effect relationship exists. Moreover, important factors such as health history, social scope and lack of preparation have been missed which could predict PTSD. Therefore, more in-depth studies are needed to assess the long-term psychological impact on health workers in order to take necessary and timely interventions.

V. CONCLUSION

The overall prevalence of post-traumatic stress disorder among healthcare workers during the COVID-19 pandemic was 33.04% (95% CI: 27.00 – 39.53), with extreme symptoms accounting for 26.52%. The results of the multivariable logistic regression analysis showed that gender, age, living status, workplace and risk of exposure to COVID-19 were significantly associated with PTSD at a p-value < 0.05.

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