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Original Article

Post-Traumatic Stress Disorder among Frontline Nurses during the COVID-19 Pandemic and Its Relationship with Occupational Burnout

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Abstract

Objective: This study aimed to determine the level of post-traumatic stress disorder (PTSD) among nurses and its relationship with occupational burnout.
Method: This online cross-sectional survey was conducted from late November to early January 2020 in six hospitals in Iran. 309 frontline nurses in COVID-19 wards were selected via stratified random sampling and asked to complete a sociodemographic questionnaire, the Impact of Event Scale-revised version (IES-R), and the Maslach Burnout Inventory–Human Services Survey (MBI-HSS) in an anonymous online survey. Data management and analysis were performed in SPSS 25.0 using descriptive and inferential statistics, including Pearson's correlation coefficient, independent samples t-test, ANOVA, and linear regression.
Results: The majority of the participants were women (81.6%) with a mean ± SD age of 31.56 ± 6.42 years. The mean ± SD of the total PTSD score was 39.2 ± 16.44 years, indicating severe PTSD among nurses. The mean ± SD of the total occupational burnout score was 82.77 ± 19.38, expressing moderate burnout. The findings also demonstrated a significant moderate correlation between PTSD and occupational burnout ($r = 0.363$, $P < 0.001$). Univariate analysis revealed a significant relationship of occupational burnout with PTSD, work experience, number of night shifts per month, and employment status ($P < 0.05$). However, in multivariate analysis, only PTSD had a positive and significant relationship with occupational burnout ($P < 0.001$; $R2 = 160$; $\beta = 0.339$) and was a predicting factor for it.
Conclusion: We found that both PTSD and burnout are common among nurses. Given the role of PTSD especially as a predictor of burnout and the significant impact of these disorders on occupational and non-occupational activities, immediate and appropriate measures are necessary to monitor and reduce their effects on the nurses who are at the forefront of fighting the pandemic.

Key words: *Burnout; COVID-19; Nurses; Post-Traumatic Stress Disorder (PTSD)*

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Since late 2019, the novel Coronavirus (SARS-CoV2) has been threatening the human population. In fewer than two decades, the world has faced three deadly epidemics by coronaviruses (1). Before 2002, coronaviruses were assumed not to cause a serious problem. However, in late 2002, with the SARS epidemics in China (2) and some other countries, researchers realized coronaviruses could cause much more severe diseases than the common cold (3). As highly contagious agents, coronaviruses cause severe and deadly problems similar to acute respiratory syndrome (4). As of March 12th, 2021, the World Health Organization (WHO) reported the incidence of COVID-19 as over 119 million cases worldwide with 2.64 million deaths (5). Global statistics reveal a high mortality rate (9.1%) for COVID-19. in addition to its high severity and contagion (6). In Iran, the first positive case was reported on February 19th, 2019, in Qom (7). The high prevalence of COVID-19 during the pandemic, with its additional workload, has greatly impacted Iran's healthcare system (8). Since healthcare workers (HCWs), especially nurses, are in the frontline of the battle against infectious diseases, including COVID-19, they are the first to be exposed to this virus and its psychological impacts (9).

A cross-sectional study by Liu *et al.* (2020) in China during the COVID-19 pandemic showed that 164 of 512 HCWs had direct contact with a COVID-19 patient and that 12.5% of those 512 HCWs suffered from anxiety (10). A study in Egypt reported that nurses working in COVID-19 hospitals had higher scores in all physical, mental, and social stressors than nurses working in general hospitals (11). Results of studies on SARS and Ebola epidemics suggest that HCWs suffer several traumatic psychological disorders such as anxiety, fear, stress, and stigma (10). In a study conducted in Italy by Naldi *et al.* during the COVID-19 epidemic, one-third of the samples had severe anxiety and distress. Post-traumatic stress symptoms were reported in 60% of nurses, and approximately 41% had severe emotional fatigue (12). Also, Giusti *et al.* (2020) reported that 36/6% of the HCWs suffered from PTSD and psychological distress during the COVID-19 epidemic (13).

Different factors lead to nurses' psychological distress and psychiatric disorders, including long shifts; fear of transmitting the disease to one's family, colleagues, and friends; work stress; fear of isolation; and insecurity (14). Moreover, nurses run a high risk of PTSD as the frontline personnel in the battle against COVID-19, who are exposed to stressful working conditions and constantly witness death and trauma with so many patients (14) (15). PTSD is an involuntary recall of a trauma riddled with flashbacks, a high level of emotion, and reliving lived experiences (16). Symptoms of PTSD include re-experiencing the trauma in dreams, remembering the past, having intrusive thoughts and avoiding conditions that remind one of the traumas, as well as psychological numbness and hyperarousal, characterized by problems such as difficulty sleeping and concentrating, irritability, and hypervigilance (17). The prevalence of PTSD is affected by the severity, duration, and type of exposure (direct or indirect) to the experienced trauma (18). These symptoms may emerge immediately, one month or several months after the traumatic incident (19). The incidence of PTSD after epidemics such as MERS and SARS has been studied. Extensive studies on SARS epidemics in different countries reported that about 10% of people suffered high levels of PTSD symptoms (20). According to Si *et al.* (2020), the prevalence of PTSD in HCWs was reported to be 40/2% after the COVID-19 epidemics (21).

The persistence of PTSD and psychological pressures lead to burnout syndrome (BOS), physical fatigue, and emotional exhaustion in nurses. Individuals lack the physical and mental resources required to meet occupational demands and expectations and have difficulty in personal interactions (22). Although BOS usually occurs over time and due to organizational risk factors, crises such as pandemics and their severity can also cause emotional fatigue (13, 14). The psychological pressure resulting from PTSD and BOS causes pessimism in nurses and disrupts their interpersonal relations, thereby considerably affecting the quality of their activities, and its persistence will lead to increased patient dissatisfaction, reduced recovery rate, care errors, and increased mortality (22).

The risk of BOS rises in nurses due to COVID-19 conditions, such as wearing personal protective equipment and the fatigue it causes, and the psychological pressure due to the possibility that one or one's family may contract the disease. Epidemics like SARS did not last long and had a lower mortality rate. SARS lasted from late 2002 to mid-2003, with 8000 positive cases and 774 deaths (2). However, COVID-19 is still active, has an unknown future, has impacted the entire world, and has higher incidence and mortality rates. Therefore, the higher workload and psychological burden that it causes may lead to more salient and diverse effects on HCWs. The burden and the pressure that are the results of this pandemic mandate addressing this issue more carefully (15). Protecting HCWs during the pandemic should be an important component of healthcare measures (23). In Iran, no study has been performed to simultaneously investigate nurses' burnout and post-traumatic stress during the COVID-19 pandemic. Thus, the present study aimed to determine the level of PTSD among frontline nurses taking care of COVID-19 patients and its relationship with BOS.

Materials and Methods

Study design and Participants

This online survey was conducted from late November 2020 to early January 2021 among 309 COVID-19 ward

nurses from six hospitals in Lorestan Province, west of Iran. The required sample size was calculated to be 305 based on a previous study (27): SD of the PTSD score = 21.51, 95% confidence interval and desired margin of error of d = 2.4.

Inclusion and Exclusion criteria

The criteria for selecting the subjects were as follows: willingness to participate, work experience of more than one month in COVID-19 wards, no history of traumatic incidents such as the death of loved ones and accidents in the past six months (24), and no history of psychological disorders and anxiety (self-reported) (22). Pregnant women were excluded from the study.

Study procedure

Before undertaking the investigation, ethical clearance was obtained from the Deputy for Treatment of the Lorestan University of Medical Sciences. The telephone numbers of 1200 currently working nurses were obtained. Each hospital was considered a stratum, and the participants were selected by a simple random sampling method in proportion to the population of nurses in each hospital based on the inclusion criteria. Finally, 650 telephone numbers were selected via random stratified sampling (Figure 1). To adhere to social distancing due to the pandemic, the survey link was sent to the nurses online via the WhatsApp messenger. The nurses in each hospital had already shared online professional groups on WhatsApp. The questionnaire was organized by Google Form App and sent to nursing groups on WhatsApp. The researcher obtained permission to share the questionnaire in these groups, and the nurses were asked to complete and return the questionnaire within three days after receiving the link.

Study tools

The online questionnaire had three parts. The first part collected sociodemographic information: age, sex, marital status, number of children, education level, work experience as a nurse, position, working shift, number of night shifts per month, number of working hours per month, number of overtime hours per month, place of residence, employment status, history of chronic diseases, history of infection with COVID-19, and suspected or definitive cases of COVID-19 among coworkers. The second and third parts included the Impact of Event Scale - revised version (IES-R) and the Maslach Burnout Inventory–Human Services Survey (MBI-HSS).

The IES was developed in 1979 by Horowitz *et al.* and later revised by Weiss and Marmar, who added the dimension of hyperarousal in 1997. IES-R has 22 items in three main dimensions of intrusion (8 items), hyperarousal (6 items), and avoidance (8 items). The respondents report the frequency of experiencing each symptom in the past seven days on a five-point Likert scale from 0 (not at all) to four (extremely). The total score ranges from 0 to 88. A score of > 24 indicates some PTSD symptoms, a score of > 33 is the best cut-off point, and a score of > 37 shows suppression of the immune system and severe PTSD. A score of 88 indicates the most severe case which requires immediate medical intervention. The psychometrics of this scale have been assessed in Iran. The test-retest reliability coefficients of the instrument were 0.57, 0.51, and 0.59, respectively, for the subscales of intrusion, avoidance, and hyperarousal. The Cronbach's alpha varied from 0.67 to 0.87 for the dimensions (25, 26).

MBI-HSS has 22 items and three subscales of emotional exhaustion (nine items), depersonalization (five items), and personal accomplishment (eight items) on a seven-point Likert scale from never (1) to very much (7). The frequency of items is calculated from a few times a year (7) to never (1), and the severity of each ranges from never (1) to very much (7). We used the severity scale. The minimum and maximum possible scores were 22 and 154. A score of 22-59 indicates low BOS, 59-88 indicates moderate BOS, and a score higher than 88 indicates high BOS (27). In the emotional exhaustion dimension, a score of 27 and above indicates a high level of emotional exhaustion, and a score below 16 indicates moderate exhaustion. In the personal accomplishment dimension, a score of 31 and below indicates a low level of performance, 31-39 indicates moderate performance, and a score higher than 39 indicates a high level of performance. In the depersonalization dimension, a score of 13 and above indicates a high level of depersonalization, 7-12 indicates moderate depersonalization, and a score below 6 indicates a low level of depersonalization (28). Moalemi *et al.* (2018) evaluated the tool's psychometric properties in an Iranian nursing community and approved its content and construct validity. Its reliability was approved through the internal consistency method with a Cronbach's alpha coefficient of 0.75 for the whole tool. Cronbach's alpha for all three dimensions was also reported above 0.7 (29).

Statistical analyses

The data were managed and analyzed in SPSS 25 via descriptive and inferential statistics. Pearson's correlation coefficient was used to analyze the relationship between quantitative variables and BOS, and t-test and ANOVA were used to investigate the relationship between qualitative variables and burnout. After the univariate regression test, variables with a significant or nearly significant relationship with burnout (PTSD, work experience, number of night shifts per month, and employment status) were examined using the multiple linear regression (enter) test. A P-value < 0.05 was considered statistically significant.

Ethics approval

The present study received an ethics code and approval (IR.LUMS.REC.1399.208) from the Deputy for Research and Technology, Lorestan University of Medical Sciences. An anonymous list of the nurses' telephone numbers was obtained. The online questionnaire contained information about the study, its

objectives, how the telephone numbers were obtained, the anonymity of the survey, and instructions for completing the questionnaire. All the participants were ensured of the voluntary nature of the study and the confidentiality of the data.

Results

In this study, 650 questionnaires were distributed, of which 309 were fully completed (response rate = 47.5%). Therefore, 309 nurses were included. The majority (81.6%) were women, while 18.4% were men. The participants' mean age was 31.56 years, with a mean work experience of 7.6 years. Moreover, 92.9% had a B.Sc., 89% worked rotating shifts, 45.3% had a history of contracting COVID-19, and 34% had a history of chronic diseases. Table 1 summarizes the participants' other information.

The mean total PTSD score was 39.2 (16.44), indicating severe post-traumatic stress. The mean total score and scores of each dimension are given in Table 2. The mean score of the avoidance dimension was lower among contract nurses than temporary (P = 0.035) and permanent nurses (P = 0.033). Also, the total PTSD score (P = 0.009) and scores of the intrusion (P = 0.007) and hyperarousal (P = 0.006) dimensions were higher in nurses with chronic diseases, compared to nurses without a history of a chronic disease. Also, the score of the hyperarousal dimension (P = 0.027) was higher in nurses with a history of contracting COVID-19. No significant differences were found between other sociodemographic variables and the total score of PTSD or its dimensions.

The mean BOS score was 82.37 ± 19.38, expressing moderate BOS among nurses. The mean BOS score fell in the severe pain range for the two subscales of emotional exhaustion and depersonalization and was moderate in the subscale of performance success (Table 2). The scores of emotional exhaustion (P = 0.015) and the total score of burnout (P = 0.013) were higher in temporary nurses than contract nurses. Moreover, clinical nurses scored higher in emotional exhaustion than senior nurses (P = 0.039). There was a significant positive correlation between having more than six-night shifts per month and BOS score in the dimension of emotional exhaustion (P = 0.011). Other demographic characteristics did not show a statistically significant difference with the mean total score of BOS or its dimensions. Finally, a significant moderate correlation was observed between PTSD and BOS (r = 0.363, P < 0.001).

Pearson's correlation test was applied to examine the relationship between quantitative variables and burnout, and revealed the positive and significant relationship of BOS with PTSD (r = 0.129; P < 0.001) and the number of night shifts per month (r = 0.112; P = 0.050), and a negative and significant relationship between work experience (r = 0.100; P = 0.081) and BOS. Meanwhile, burnout had no significant relationship with age, the number of children, working hours, and overtime work (Table 3). Table 4 shows the relationship between qualitative variables and burnout.

Accordingly, a significant difference was observed among the three employment groups in terms of burnout; that is, the mean score of burnout in the temporary workgroup was 53.88 (41.17), compared to 87.82 (33.20) in the permanent workgroup and 64.79 (98.18) in the contract workgroup (P = 0.011). Other qualitative variables (education, gender, marital status, job status, residence, place of work, and working shift) were not significantly related to burnout. After the univariate regression test, the variables that significantly or nearly significantly related to burnout including PTSD, work experience, number of night shifts per month, and employment status, were assessed using the multiple linear regression (enter) test. The results showed that only PTSD predicts burnout positively and significantly (P < 0.001; R2 = 160; β = 0.339), and there was no significant relationship between work experience, number of night shifts per month, and employment status (Table 5).

Table 1. The Demographic and Occupational Characteristics of the Nurses (N = 309)

Variable		Frequency (Percentage)	Variable		Frequency (Percentage)
Sex	Male	57 (18.4%)	Education level	B.S.	287 (92.9%)
	Female	252 (81.6%)		M.Sc.	22 (7.1%)
Marital status	Unmarried	129 (41.7%)	Occupation position	Nurse	266 (86.1%)
	Married	180 (58.3%)		Shift leader	22 (7.1%)
				Head nurse	14 (4.5%)
				Supervisor	7 (2.3%)
Residence	Native	273 (88.3%)	Shift	Fixed	34 (11%)
	Non-native	36 (11.7%)		Rotating	275 (89%)

History of chronic illness	Hypertension	9 (2.9%)	Employment Status	Contract work	139 (48.2%)
	Diabetes	5 (1.6%)		Temporary work	58 (18.8%)
	Cardiac-respiratory	12 (3.9%)		Permanent work	102 (33.0)
	Autoimmune	5 (1.6%)	Hospital	Shohadaye Ashayer	96 (31.1%)
	Renal	2 (0.6%)		Shahid Rahimi	71 (23%)
	Backache	58 (18.8%)		Ayatollah Boroojerdi	54 (17.5%)
	Migraine	14 (4.5%)		Shaheed Valian	32 (10.4%)
	None	204 (66%)		Imam Khomeini	32 (10.4%)
History of COVID-19	Yes	140 (45.3%)		Haft-e Tir	24 (7.8%)
	No	169 (54.7%)	Ward	General	60 (19.4%)
Number of children	0	186 (60.2%)		Intensive care	161 (52.1%)
	1	79 (25.6%)		Surgery	32 (10.4%)
	2	34 (11%)		Other	56 (18.1%)
	More than two	10 (3.2%)	Night shifts per month	< 6 nights	184 (59.5%)
Suspected or definitive cases among coworkers	Yes	235 (76.1%)		> 6 nights	125 (40.5%)
	No	74 (23.9%)			
Variable		**Mean (SD)**	**Variable**		**Mean (SD)**
Age (year)	Max:52 Min:22	31.60 (6.42)	Work hours (per month)	Max:220 hours Min:140 hours	168.65 (9.21)
Work experience (year)	Max:28 Min:1	7.60 (6.07)	Overtime hours (per month)	Max:176 hours Min:0 hours	47.20 (31.40)
Number of night shifts (per month)	Max:13 night Min: 0 night	70.5 (83.2)			

Table 2. Mean Total Score and the Scores of Dimensions of Post-Traumatic Stress Disorder and Professional Burnout Severity among Nurses

Variable	Mean (SD)	Maximum of score	Minimum of score
The total score of PTSD	39.19 (16.44)	88.00	3.00
Avoidance	14.41 (6.18)	33.00	1.00
Intrusion	12.41 (6.17)	28.00	0.00
Hyperarousal	12.36 (6.23)	29.00	1.00
The total score of professional burnout severity	82.37 (19.38)	139.00	27.00
Emotional exhaustion	33.34 (13.12)	63.00	9.00
Depersonalization	16.14 (5.81)	57.00	5.00
Personal accomplishment	32.89 (6.84)	50.00	9.00

Table 3 Correlation between Post-Traumatic Stress, Demographic Variables and Professional Burnout

Variable	Professional burnout	Statistical test
Post-traumatic stress	r = 0.129 P = < 0.001*	Pearson's correlation coefficient
Age	r = -0.084 P = 0.143	
Number of children	r = -0.034 P = 0.549	
Work experience	r = -0.100 P = 0.081	
Work hours (per month)	r = 0.062 P = 0.277	
Overtime hours (per month)	r = 0.074 P = 0.194	
Number of night shifts (per month)	r = 0.112 P = 0.050*	

*. Correlation is significant at the 0.01 level (2-tailed).

Table 4. The Association of Demographic and Occupational Characteristics with Professional Burnout

Variable		Professional burnout		P-value
		N	Mean (SD)	
Education level	B.S.	287	82.75 (18.92)	0.221*
	M.S.	22	77.50(24.64)	
Sex	Female	252	81.67(19.65)	0.698*
	Male	57	85.49(17.97)	
Marital status	Single	129	81.1(18.06)	0.488*
	Married	180	84.4(20.05)	
Occupation position	Nurse	266	82.47(19.44)	0.467**
	Shift leader	22	85.36(18.13)	
	Head nurse	14	75.07(15.26)	
	Supervisor	7	83.85(27.88)	
Residence	Native	273	82.59(19.30)	0.593*
	Non-native	36	80.75(20.17)	
Ward	General	60	83.65(20.52)	0.758**
	Intensive care	161	81.95(18.16)	
	Surgery	32	84.81(22.13)	
	Other	56	80.85(20.20)	
Employment Status	Contract work	149	79.64(18.98)	0.011**
	Temporary work	58	88.53(17.41)	
	Permanent work	102	82.87(20.33)	
Shift	Fixed	34	81.23(20.77)	0.724*
	Rotating	275	82.52(19.24)	

*T-test
**ANOVA

Table 5. Multivariate Linear Regression of Occupational Characteristics and Burnout

	B	SE B	*β*	*P -value*
IES-R	0.400	0.063	0.339	< 0.001
Work experience	-1.504	3.226	-0.101	0.642
Night shifts per month	0.744	0.423	0.109	0.079
Employment Status				
Temporary work compared to contract work	7.457	9.158	0.181	0.129
Permanent work compared to contract work	9.710	6.382	0.196	0.146
Adj R^2 = 0.146		R^2 = 0.160	R = 0.399	

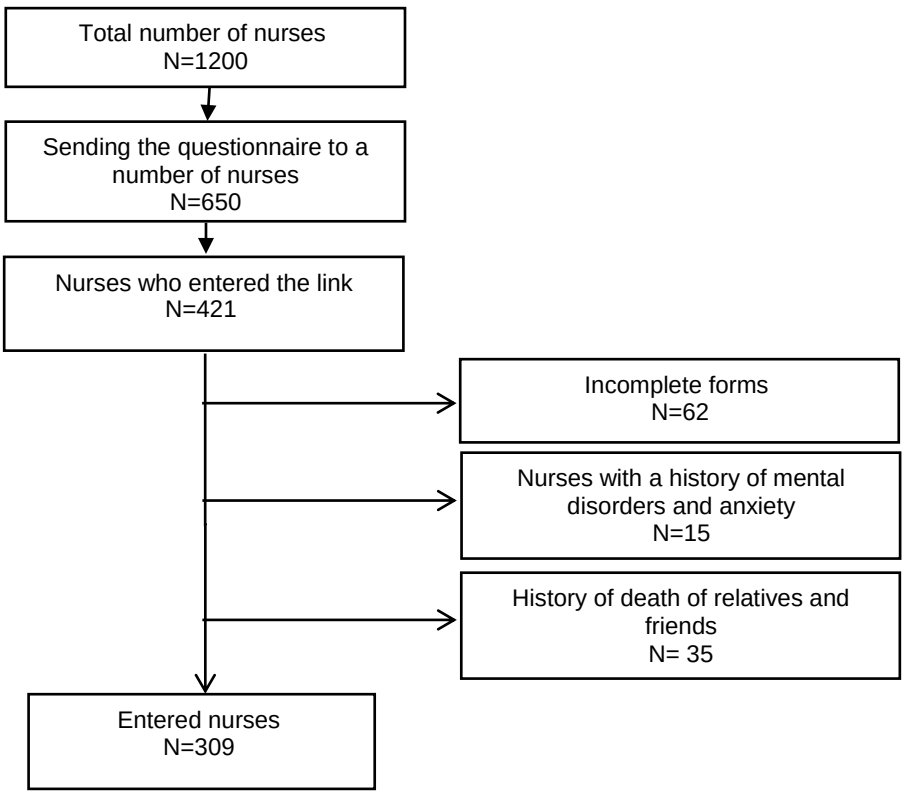

Figure 1. The Process of Selecting the Nurses and Entering the Study

Discussion

This study was conducted to determine the level of PTSD among nurses and its relationship with BOS. Our findings showed that the mean score of total PTSD among them was 39.2, indicating severe PTSD and suppression of their immune system. The mean total BOS score was 82.37, expressing moderate BOS among them.

In line with our results, Giusti *et al.* (2020) reported PTSD symptoms in 36.6% of HCWs in Italy and severe emotional exhaustion in 31.9% of them (13). Another study in Italy reported PTSD symptoms in 60% of nurses and severe emotional exhaustion in nearly 41% (32). Havaei *et al*. (2021) reported PTSD (47%) and high emotional exhaustion (60%) (30). Similarly, Hu *et al*. (2020) recruited COVID-19 frontline nurses in China and reported moderate burnout and a high degree of fear in them. Moreover, half of them reported moderate to severe burnout, 60.5% had emotional exhaustion, and 42.3% reported depersonalization (31). These results are consistent with those obtained in studies conducted during MERS and SARS epidemics (15).

However, the level of PTSD reported in our study was significantly higher than that associated with the COVID-19 pandemic reported by Johnson *et al.* (35, 36). One possible reason is that our study population included nurses, while Johnson *et al.* (2020) examined HCWs, including physicians, nurses, psychologists, and other HCWs (32). Tomar *et al.* (2020) also mentioned major measures for infection control during data collection in India (33). Examining the mental effects of COVID-19 on HCWs in China, Si *et al.* found that nurses became more anxious than others during the

COVID-19 pandemic (21). Another study also reported increased distress in nurses compared to physicians. Nurses are probably more vulnerable due to closer and more frequent contact with COVID-19 (12). In line with our results, a systematic review by D'ettorre *et al.* suggested immediate interventions to protect HCWs against traumatic events of this pandemic (34).

During the COVID-19 pandemic, a sudden rise in the number of critically ill patients and the burden of decision-making affect stress and anxiety. Some studies have reported the incidence of PTSD following a sense of uncertainty, fear of disease transmission to oneself and others, and etc. (35, 36). Symptoms of post-traumatic stress disrupt nurses' critical thinking. Furthermore, critical situations reduce their decision-making capability, which affects the quality of the care they provide (22). These results clearly show the consequences of COVID-19 on HCWs' health and efficiency. According to some experts, an increased risk of damaging physical and psychological outcomes in the long term is associated with BOS. Increased sick leave requests, absenteeism, turnover, and poor efficiency are associated with BOS (37).

We also found that nurses suffer moderate BOS, consistent with several studies in different places (12, 38). In line with the present study, Orru *et al.* (2021) concluded that more than 50% of HCWs suffered BOS during the COVID-19 pandemic and that more than 40% of them reported moderate to severe PTSD symptoms (39). These feelings in HCWs increase due to the nature of the work with patients with COVID-19, and the risk of infection while working in such departments, especially in ICUs, can cause burnout (38). The findings also demonstrated a significant moderate correlation between PTSD and BOS. Multivariate analysis showed that only PTSD has a positive and significant relationship with burnout. Previous studies have demonstrated that PTSD is a predictor of burnout (13, 40, 41). While other studies have described other factors such as long working hours, fear of infection, and perceived support as predictors of burnout components (24). Kim *et al.* (2018) found that post-traumatic stress was significantly related to BOS during the MERS epidemic in South Korea (22). In another study conducted to examine Iranian nurses' mental health during the COVID-19 pandemic, 20.1% of the nurses had experienced stress (42).

Similarly, Chen *et al.* (2020) evaluated the trauma and BOS induced by the COVID-19 pandemic among nurses and concluded that 13.3% of the nurses showed trauma symptoms, and 39.3% showed moderate degrees of emotional exhaustion (43). These results agree with Hamed *et al.'s* (2020) findings, which showed that almost all nurses with PTSD develop BOS, but the opposite is not always true (40). Their results showed that 86% of nurses with PTSD were also positive for BOS, indicating that nurses with PTSD will be vulnerable to BOS (40). According to Restauri and Sheridan (2020), increased exposure to stress and trauma in various aspects of life, including a sharp increase in workplace stress due to a pandemic, may increase PTSD among physicians if combined with burnout (41). Mealer *et al.* (2020) reported that 98% of nurses with PTSD diagnostic criteria were positive for at least one type of BOS.

In contrast, none of the nurses with BOS symptoms had the PTSD diagnostic criteria (44). In a 2020 study by Johnson *et al.* on HCWs during the COVID-19 pandemic, there was a significant positive relationship between BOS and PTSD symptoms after controlling for demographic variables, anxiety, and depression (32). Another study reported predictors of burnout components as increased workload, ongoing contact with COVID-19 patients, and psychological aspects of caring for them (13).

The COVID-19 pandemic can lead to chronic BOS and acute pandemic-induced trauma by creating chronic stress in the workplace. If BOS accompanies increased workplace stress due to the pandemic, it can increase PTSD among the staff. Co-occurrence of PTSD and BOS and their consequences can lead to the combined effects of these two phenomena (40). Regarding COVID-19 as a traumatic event, Restauri and Sheridan (2020) believe such stressful events can cause acute stress disorders and PTSD if continued. They believe that BOS results from excessive exposure to environmental stressors, and it is necessary to study the intersection of these two phenomena to realize the interventions (41). According to Hamed *et al.* (2020), despite extensive study of the relationship between BOS and PTSD, no clear understanding of the relationship has yet been achieved (40).

Limitation

One of the limitations of this study was that nurses' psychological and physiological conditions could not be evaluated before taking care of COVID-19 patients because the COVID-19 pandemic occurred abruptly. Moreover, PTSD is associated with some psychiatric and physical comorbidities such as depression, panic disorders, other psychiatric problems, and problems in marital, family, and social relations. Furthermore, cross-sectional correlational studies cannot determine the cause of outcomes. Therefore, one cannot use this methodology to detect and examine the outcomes, especially PTSD, easily. Conducting a mixed-methods study to understand the personal experiences of nurses may deepen the research and lead to better results. Another limitation of our study was a failure to assess confounding factors of anxiety and perceived social support.

Furthermore, depression, anxiety, etc., were assessed according to the participants' self-report, not through valid tools. It is recommended that future studies examine the prevalence of comorbid PTSD and psychological disorders. Our study focused on

demographic and occupational factors in Iran. It is suggested that future studies also consider factors such as social and family support. It is also suggested that qualitative methods be adopted for an in-depth examination of the problems experienced by nurses and recording their experiences in epidemics to enrich the study.

Conclusion

Nurses are on the frontline of dealing with stressful situations during pandemics. Nurses face many traumatic situations during crises, as reported in this study. The mental stress related to PTSD and the failure to intervene or treat it disrupt the performance of healthcare providers. Analyzing factors related to mental health can lead us to find more effective preventive and therapeutic strategies for dealing with mental health problems. Given the role of PTSD as a predictor of BOS and the significant impact of these disorders on occupational and non-occupational activities, immediate and appropriate measures are necessary to monitor and reduce their effects among nurses at the forefront of fighting the pandemic. Further studies are also needed to determine the specific relationship between BOS and PTSD.

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Conflict of Interest

None.

References

1. Gralinski LE, Menachery VD. Return of the Coronavirus: 2019-nCoV.Viruses.2020;12(2): 135.
2. Yang Y, Peng F, Wang R, Yange M, Guan K, Jiang T, et al. The deadly coronaviruses: The 2003 SARS pandemic and the 2020 novel coronavirus epidemic in China. J Autoimmun. 2020; 109:102434.
3. Habibi R, Burci GL, de Campos TC, Chirwa D, Cinà M, Dagron S, et al. Do not violate the International Health Regulations during the COVID-19 outbreak. Lancet. 2020;395(10225):664-6.
4. Wilson ME, Chen LH. Travellers give wings to novel coronavirus (2019-nCoV). J Travel Med. 2020;27(2):taaa015.
5. WHO. world health organization. Coronavirus disease 2019(covid-19) situation report. 2021;22-March.
6. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A novel coronavirus from patients with pneumonia in China, 2019.N Engl J Med. 2020;382:727-733.
7. Behzadnia MJ, Saboori F. COVID-19 Outbreak Management in Hospitals of Iran; Strengths and Weaknesses. J Mil Med. 2020;22(2):203-4.
8. Meskarpour-Amiri M, Shams L, Nasiri T. Identifying and Categorizing the Dimensions of Iran's Health System Response to the Covid-19 Pandemic.JMilMed.2020;22(2):108-14.
9. Li S, Wang Y, Xue J, Zhao N, Zhu T. The Impact of COVID-19 Epidemic Declaration on Psychological Consequences: A Study on Active Weibo Users. Int J Environ Res Public Health. 2020;17(6).
10. Liu CY, Yang YZ, Zhang XM, Xu X, Dou QL, Zhang WW, et al. The prevalence and influencing factors in anxiety in medical workers fighting COVID-19 in China: a cross-sectional survey. Epidemiol Infect. 2020;148:e98.
11. Said RM, El-Shafei DA. Occupational stress, job satisfaction, and intent to leave: nurses working on front lines during COVID-19 pandemic in Zagazig City, Egypt. Environ Sci Pollut Res Int. 2021;28(7):8791-801.
12. Naldi A, Vallelonga F, Di Liberto A, Cavallo R, Agnesone M, Gonella M, et al. COVID-19 pandemic-related anxiety, distress and burnout: prevalence and associated factors in healthcare workers of North-West Italy. BJPsych Open. 2021;7(1):e27.
13. Giusti EM, Pedroli E, D'Aniello GE, Stramba Badiale C, Pietrabissa G, Manna C, et al. The Psychological Impact of the COVID-19 Outbreak on Health Professionals: A Cross-Sectional Study. Front Psychol. 2020; 11:1684.
14. Ornell F, Halpern SC, Kessler FHP, Narvaez JCM. The impact of the COVID-19 pandemic on the mental health of healthcare professionals. Cad Saude Publica. 2020;36(4):e00063520.
15. Carmassi C, Foghi C, Dell'Oste V, Cordone A, Bertelloni CA, Bui E, et al. PTSD symptoms in healthcare workers facing the three coronavirus outbreaks: What can we expect after the COVID-19 pandemic. Psychiatry Res. 2020; 292:113312.
16. Foa EB, McLean CP, Zang Y, Zhong J, Powers MB, Kauffman BY, Rauch S, Porter K, Knowles K. Psychometric properties of the posttraumatic diagnostic scale for DSM–5 (PDS–5). APA PsycNet. 2016;28(10):1166.
17. Pitman RK, Rasmusson AM, Koenen KC, Shin LM, Orr SP, Gilbertson MW, Milad MR, Liberzon I. Biological studies of post-traumatic stress disorder. Nat.Rev. Neurosci.2012;13(11):769-87.
18. Rauch SA, Favorite T, Giardino N, Porcari C, Defever E, Liberzon I. Relationship between anxiety, depression, and health satisfaction among veterans with PTSD. J Affect Disord. 2010;121(1-2):165-8.
19. Asim M, van Teijlingen E, Sathian B. Coronavirus Disease (COVID-19) and the risk of Post-Traumatic Stress Disorder: A mental health concern in Nepal. Nepal J Epidemiol. 2020;10(2):841-4.
20. Wu P, Fang Y, Guan Z, Fan B, Kong J, Yao Z, et al. The psychological impact of the SARS

epidemic on hospital employees in China: exposure, risk perception, and altruistic acceptance of risk. Can J Psychiatry. 2009;54(5):302-11.
21. Si MY, Su XY, Jiang Y, Wang WJ, Gu XF, Ma L, et al. Psychological impact of COVID-19 on medical care workers in China. Infect Dis Poverty. 2020;9(1):113.
22. Kim Y, Seo E, Seo Y, Dee V, Hong E. Effects of Middle East Respiratory Syndrome Coronavirus on post-traumatic stress disorder and burnout among registered nurses in South Korea.Int.J.Healthc.2018;4(2):27-33.
23. Pothiawala S. Psychological Impact of the COVID-19 on Health Care Workers in the Emergency Department. Adv J Emerg Med. 2020;4(2s):e58.
24. Hosseininejad SM, Jahanian F, Elyasi F, Mokhtari H, Koulaei ME, Pashaei SM. The prevalence of post-traumatic stress disorder among emergency nurses: a cross sectional study in northern Iran. Biomedicine (Taipei). 2019;9(3):19.
25. Aminizadeh M, Tirgari B, Iranmanesh S, Garoosi B, Karimi M, Sheikh-Bardsiri H. Post-traumatic stress disorder prevalence in employees of emergency departments of teaching hospitals affiliated to Kerman University of Medical Sciences, Iran.J Manage Med Inform Sch 2013;1(1):18-25.
26. Panaghi L, Mogadam JA. Persian version validation in impact of event Scale-Revised. TU MJ. 2006;64(3):52-60.
27. Sheykhi M, Naderifar M, Firouzkohi M, Abdollahimohammad A, Akbarizadeh MR. The effect of group logo therapy on burnout of nurses in special wards.IJPN.2020;8(2):57-65.
28. Firouzkohi M, Abdollahimohammad A, Akbarizadeh MR. The Effect of Group Logo therapy on Burnout of Nurses in Special Wards. IJPN. 2020;8(2):57-65.
29. Moalemi S, Kavosi Z, Beygi N, Deghan A, Karimi A, Parvizi MM. Evaluation of the Persian Version of Maslach Burnout Inventory-Human Services Survey among Iranian Nurses: Validity and Reliability. Galen Med J. 2018;7:e995.
30. Havaei F, Ma A, Staempfli S, MacPhee M. Nurses' Workplace Conditions Impacting Their Mental Health during COVID-19: A Cross-Sectional Survey Study. Healthcare (Basel). 2021;9(1):84.
31. Hu D, Kong Y, Li W, Han Q, Zhang X, Zhu LX, et al. Frontline nurses' burnout, anxiety, depression, and fear statuses and their associated factors during the COVID-19 outbreak in Wuhan, China: A large-scale cross-sectional study. EClinicalMedicine.2020;24:100424.
32. Johnson SU, Ebrahimi OV, Hoffart A. PTSD symptoms among health workers and public service providers during the COVID-19 outbreak. PLoS One. 2020;15(10):e0241032.
33. Tomar BS, Suman S, Singh P, Raj P, Nathiya D. Mental health outcome and professional quality of life among healthcare workers during COVID-19 pandemic: A frontline-COVID survey. HMJ.2020;13(4):196.
34. d'Ettorre G, Ceccarelli G, Santinelli L, Vassalini P, Innocenti GP, Alessandri F, et al. Post-Traumatic Stress Symptoms in Healthcare Workers Dealing with the COVID-19 Pandemic: A Systematic Review. Int J Environ Res Public Health. 2021;18(2):601.
35. Lee SM, Kang WS, Cho AR, Kim T, Park JK. Psychological impact of the 2015 MERS outbreak on hospital workers and quarantined hemodialysis patients. Compr Psychiatry. 2018;87:123-7.
36. Kwek SK, Chew WM, Ong KC, Ng AW, Lee LS, Kaw G, et al. Quality of life and psychological status in survivors of severe acute respiratory syndrome at 3 months postdischarge. J Psychosom Res. 2006;60(5):513-9.
37. Salvagioni DAJ, Melanda FN, Mesas AE, González AD, Gabani FL, Andrade SM. Physical, psychological and occupational consequences of job burnout: A systematic review of prospective studies. PLoS One. 2017;12(10):e0185781.
38. Ferry AV, Wereski R, Strachan FE, Mills NL. Predictors of UK healthcare worker burnout during the COVID-19 pandemic. Qjm. 2021;114(6):374-80.
39. Orrù G, Marzetti F, Conversano C, Vagheggini G, Miccoli M, Ciacchini R, et al. Secondary Traumatic Stress and Burnout in Healthcare Workers during COVID-19 Outbreak. Int J Environ Res Public Health. 2021;18(1).
40. Hamed RA, Abd Elaziz SY, Ahmed AS. Prevalence and predictors of burnout syndrome, post-traumatic stress disorder, depression, and anxiety in nursing staff in various departments. MECP.2020;27(1):1-8.
41. Restauri N, Sheridan AD. Burnout and Posttraumatic Stress Disorder in the Coronavirus Disease 2019 (COVID-19) Pandemic: Intersection, Impact, and Interventions. J Am Coll Radiol. 2020;17(7):921-6.
42. Zhang SX, Liu J, Afshar Jahanshahi A, Nawaser K, Yousefi A, Li J, et al. At the height of the storm: Healthcare staff's health conditions and job satisfaction and their associated predictors during the epidemic peak of COVID-19. Brain Behav Immun. 2020; 87:144-6.
43. Chen R, Sun C, Chen JJ, Jen HJ, Kang XL, Kao CC, et al. A Large-Scale Survey on Trauma, Burnout, and Posttraumatic Growth among Nurses during the COVID-19 Pandemic. Int J Ment Health Nurs. 2021;30(1):102-16.
44. Mealer M, Burnham EL, Goode CJ, Rothbaum B, Moss M. The prevalence and impact of post traumatic stress disorder and burnout syndrome in nurses. Depress Anxiety. 2009;26(12):1118-2.