



TWO-YEAR FOLLOW-UP OF POST-TRAUMATIC STRESS DISORDER SYMPTOMS IN HEALTHCARE WORKERS AFTER THE COVID-19 PANDEMIC IN CHINA

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Abstract

Objectives: This study aimed to conduct a 2-year follow-up of mental disorders in healthcare workers (HCWs) in a region of China outside the epidemic's core zone who happened to be directly or possibly exposed to persons with COVID-19. **Material and Methods:** A cognitive analysis scale was utilized in the evaluation the mental or emotional state of HCWs at Xuzhou Medical University's affiliated hospital in the city of Xuzhou, China (a non-core epidemic area) 2 years after the first assessment during the COVID-19 pandemic. A total of 165 HCWs were selected as the study subjects. In accordance to the exposure risk of COVID-19 patients, the subjects were separated into 2 categories: a group with a high risk HCW (HHCW) (HCWs working in COVID-19-positive wards; N = 91) and a group with a minimal risk HCW (LHCW) (HCWs who worked in wards without COVID-19 patients at the same hospital; N = 75). The clinical as well as demographic information of every HCWs were collected. **Results:** The demographic data revealed significant differences in terms of occupation, remuneration, and selfless concerns amidst both categories ($p < 0.05$). There lacked a statistically notable difference in the occurrence of PTSD between the 2 groups. Data was analyzed for factors associated with PTSD, and the results showed that psychological resilience, job risk, and stress in the workplace were risk factors for PTSD. Additionally, the results of the logistic regression analysis showed that psychological resilience was a significant shared risk factor for PTSD in HCWs after the COVID-19 pandemic. **Conclusions:** The 2-year follow-up showed no statistical difference in the incidence of PTSD between the HHCW group and the LHCW group. Workplace stress, occupational hazards, and psychological resilience were the major contributing risk factors for PTSD in HCWs. *Int J Occup Med Environ Health.* 2023;36(3):324–32

Key words:

work stress, healthcare workers, COVID-19, psychological resilience, post-trauma stress disorders, job risk

INTRODUCTION

A pandemic happens to be a public health disaster, which poses a risk to human life and results in numerous diseases and fatalities. The COVID-19 epidemic, according to the World Health Organization, killed thousands of individuals while affecting millions of

others [1]. Public health crises, such as COVID-19, have ramifications for the well-being, health, and safety of people and society, with effects ranging from emotional reactions to morbid behaviors and noncompliance to public health mandates (e.g., immunization and quarantine) [2].

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All groups, including healthcare workers (HCWs) [3], who were more susceptible to cognitive symptoms (for instance; insomnia, anxiety, depression, as well as emotional turmoil) during the coronavirus pandemic [4–6], are at significant risk from the COVID-19 pandemic's impact on mental health. Therefore, it is crucial to pay attention to the critical issue of psychiatric illnesses among HCWs [7].

Previous research has found a high level of emotional distress among coronavirus-affected people and first-line HCWs [8]. Most of the emotional repercussions (e.g., melancholy, stress, sleeplessness, anxiety, irritability, bewilderment, unhappiness, stigma, and anger) were connected with isolation, according to a recent analysis of a sample of confined persons and HCWs [9,10]. The researchers of this study previously reported a significant frequency of post-traumatic stress disorder (PTSD) symptoms among HCWs during the severe acute respiratory syndrome (SARS) outbreak in China [11]. Previous research found that HCWs experienced significant PTSD symptoms during the 2003 SARS pandemic [12–15], and follow-up investigations revealed a high frequency of melancholy, stress, and post-traumatic symptoms among HCWs. Healthcare workers were also reported to be under more stress than nonmedical workers, even years after the SARS outbreak [16,17]. As a result, it was expected that the COVID-19 outbreak would have a long-term psychological effect on medical personnel.

So far, little information has been revealed on the mental health of HCWs following the coronavirus pandemic. The current study followed up on the HCWs from the authors' prior study, with the goal of examining their psychological condition 2 years after the initial examination.

MATERIAL AND METHODS

Study design and participants

The Xuzhou Medical University affiliate hospital in Xuzhou, China, was authorized to examine patients with

COVID-19 in the context of this cross-sectional research. The institution hired all of the HCWs that participated in this study. The authors used a total of 165 HCWs as participants while researching. Participants were categorized into 2 categories according to their coronavirus exposure risk. The groups involve the health care workers who worked wards with patients who tested positive for coronavirus accounting for 91, and the HCWs working in non-COVID wards accounting for 75.

The HCW confederation included medical professionals working in wards without COVID-19 at that infirmary, but the high risk HCW (HHCW) federation included health specialists (nurses, physicians, and other employees) who operated in COVID-19 wards to take care of COVID-19 patients. Participants who completed all questions in >20 min or 30 min or could not complete the queries were disqualified from the investigation. This assessment was carried out following the Helsinki Declaration's guidelines and got cleared by the ethical board of the associated hospital of Xuzhou Medical University. Each participant filled out an informed consent form.

Evaluations of mental disorders as well as behavioral tests in HCWs

The current study's authors used the *PTSD Checklist-Civilian Version* to measure psychological resilience, altruistic behavior, work stress, and job risk, as previously reported [11]. The *PTSD Checklist-Civilian Version* has been validated in nonclinical populations as a reliable and valid measure of PTSD [18,19]. To ensure confidentiality, the surveys were self-administered and anonymous.

Statistical analysis

Software called SPSS v. 23 was utilized for analyzing data using statistical methods. While definite attributes were denoted by rate and percentage, uninterrupted variables were described by the standard deviation or median, mean, and interquartile range. Non-parametric indica-

tors (Mann-Whitney U tests) were used to look at the disparities amid both parties. Group data was examined using Pearson's χ^2 test or Fisher's exact test, while PTSD threat factors were examined using a multi-factor logistic deterioration model. Every statistical test was 2-sided, and a p value of 0.05 indicates statistical significance.

RESULTS

Demographic characteristics and psychological evaluations of HCWs

One hundred sixty-five valid HCW questionnaires were collected for the ongoing research. The Table 1 summarizes the key demographic traits of every research participant. Among the 165 HCWs, 91 (56.3%) were classified as HHCWs, while 74 (43.7%) were classified as LHCWs.

The parameters associated with the 2 groups were examined. The results showed that the 2 groups had statistically significant differences in gender, salary, profession, and altruistic behaviors ($p < 0.05$) (Table 1).

Professional differences: The proportions of doctors, nurses, and other employees in the LHCW group were 47.3%, 27%, and 10.9%, respectively, whereas, in the HHCW group, they were 42.9%, 53.8%, and 3%. Due to this, the LHCW category possessed lesser nurses compared to the HHCW classification ($p = 0.001$). As compared to the LHCW group (93.2%, 5.4%, and 1.4%, respectively), the percentages of severe, mild, and non-symptomatic PTSD in the HHCW group were 85.7%, 9.9%, and 4.4%, respectively. There lacked any statistically noteworthy distinctions amid both categories. ($p > 0.05$) (Table 1).

Employment risk, work stress, and psychological resilience associated with PTSD symptoms in HCWs

The patients were categorized based on their scores as either asymptomatic or mild, moderate, or severe symptoms to spot the risk components for PTSD better. Chi-squared assessment was done. The results demonstrated

a statistically notable affiliation amid the proportion of asymptomatic participants as well as psychological resilience, job risk, and work stress ($p = 0.019$, $p = 0.024$, together with $p = 0.037$, respectively). Yet, the data revealed no discernible differences in terms of coping mechanisms, altruistic behavior, age, education, income, marital status, or profession (Table 2).

Common risk factors associated with PTSD symptoms

The shared risk variables for moderate-to-severe PTSD were found using logistic regression analysis. The findings demonstrated that psychological resilience was a frequent inducer related to moderate-to-severe PTSD (odds ratio [OR] = 0.955, 95% confidence interval [CI]: 0.919–0.992, and $p = 0.019$). However, there was no statistically remarkable difference amidst job risk (OR = 1.473, 95% CI: 0.603–3.596, as well as $p = 0.395$) and stress in the workplace (OR = 1.693, 95% CI: 0.687–4.175, and $p = 0.253$). These findings from the research show that HCWs who have trouble adjusting to a demanding setting are prone to having PTSD symptoms of moderate to severe intensity (Table 3).

DISCUSSION

Psychological health conditions like PTSD, stress, anxiety, as well as anguish are more prevalent during natural disasters [20]. The COVID-19 epidemic had a remarkable psychological impact on HCWs, and its stress resulted in rapid changes in their psychological state [10,21,22]. Detecting these changes during the acute period might increase comprehension of coping techniques and the authors' capacity to contribute.

The new study centers on a 2-year follow-up of the mental impacts of coronavirus in hospital environments following the results of the earlier publication.

According to the primary research outcomes, approx. two-thirds of health care workers were asymptomatic. After 2 years of follow-up, the percentage of asymptom-

Table 1. The demographic characteristic of the participants at Xuzhou Medical University's affiliated hospital in the city of Xuzhou, China, 2 years after the first assessment during the COVID-19 pandemic

Variable	Participants (N = 165) [n (%)]		T-test/ χ^2	p
	high risk HCW (N = 91)	low risk HCW (N = 74)		
Gender			5.017	0.025
female	70 (76.9)	45 (60.8)		
male	21 (23.1)	29 (39.2)		
Age			0.742	0.690
18–30 years	28 (30.8)	24 (32.4)		
31–40 years	53 (58.2)	39 (52.7)		
41–60 years	10 (11.7)	11 (14.9)		
Education			0.016	0.898
bachelor	55 (60.4)	44 (59.5)		
postgraduate	36 (39.6)	30 (40.5)		
Salary (CNY)			6.820	0.033
30 000–80 000	14 (15.4)	20 (27.0)		
90 000–150 000	55 (60.4)	30 (40.5)		
>150 000	22 (24.2)	24 (32.4)		
Marital status			2.457	0.302
married	73 (80.2)	52 (70.3)		
single	17 (18.7)	20 (27.0)		
divorced	1 (1.1)	2 (2.7)		
Profession			18.635	0.000
nurse	49 (53.8)	20 (27.0)		
doctor	39 (42.9)	39 (47.3)		
other stuff	3 (3.3)	15 (10.9)		
Coping style			1.482	0.223
negative coping	34 (37.4)	21 (28.4)		
positive coping	57 (62.6)	53 (71.6)		
Altruistic behaviors	33 (26.42)	29 (20.38)	2.647	0.009
Psychological resilience	64 (51.74)	62.5 (51.70)	1.106	0.270
Work stress			0.799	0.671
mild	34 (37.4)	25 (33.8)		
moderate	40 (44.0)	31 (41.9)		
severe	17 (18.7)	18 (24.3)		

Table 1. The demographic characteristic of the participants at Xuzhou Medical University's affiliated hospital in the city of Xuzhou, China, 2 years after the first assessment during the COVID-19 pandemic – cont.

Variable	Participants (N = 165) [n (%)]		T-test/ χ^2	p
	high risk HCW (N = 91)	low risk HCW (N = 74)		
Job risk			0.456	0.796
low	39 (42.9)	28 (37.8)		
moderate	37 (40.7)	32 (43.2)		
high	15 (16.5)	14 (18.9)		
Post-traumatic stress disorder (PTSD)			2.338	0.345
no symptoms	78 (85.7)	69 (93.2)		
mild	9 (9.9)	4 (5.4)		
severe	4 (4.4)	1 (1.4)		

atic patients in the LHCW group was higher than during the initial study, implying a continued enhancement of the mental health of plenty of HCWs. The moderate adjustment to COVID-19 along with the effects of coping style, job risk, and decreased work stress contributed to a non-significant variation in the emotional symptoms between the LHCW group and the HHCW group. Moderate-to-severe PTSD symptoms were associated with psychological resilience.

A cross-sectional review was carried out during the middle east respiratory syndrome (MERS) outbreak in 2015; the incidences reported in the study were 42.9% for PTSD and 27% for the likelihood of anxiety and depression after 12 months [23]. The authors of the current study reported previously 63.8% anxiety, 28.7% PTSD, 35.2% insomnia, and 64.8% depression in the HHCW group [11]. Another study reported the association of a workmate's death with insomnia, depression, and PTSD symptoms. Hospitalization and quarantine were affiliated with PTSD together with elevated stress levels [24].

The rates of prevalence of PTSD symptoms observed in the present study were at the lower end. Furthermore, a 44-study systematic review discovered that 11–73.4%

of HCWs suffered PTSD-like symptoms amidst the most recent epidemics of SARS, Middle East respiratory syndrome (MERS), influenza A, and Ebola. These symptoms persisted for at least 1–3 years in 10%–40% of HCWs [25–27]. One possible reason behind the prevalence of psychological disorders in HCWs is that they struggle to cope with highly infectious diseases and work stress.

A study of 769 HCWs (from SARS and non-SARS units) was carried out 1 year and 7 months after the COVID-19 outbreak. Healthcare workers in the SARS unit had higher rates of PTSD symptoms and mental anguish in comparison to HCWs in the unit without SARS [28]. Different transmission rates can explain the significant differences in outcome, stress level, awareness of healthcare settings, the prevalence of arbitrating factors, and approach to psychological and occupational support between the 2 units.

During the disease outbreak, 1 source of stress for HCWs is being assigned unusual work tasks [29]. Proper training in job responsibility skills is essential for staff to build psychological resilience.

The 2019 (COVID-19) pandemic has exerted an alarming situation on HCWs worldwide. The HCWs will be needed

Table 2. Severity categories of post-traumatic stress disorder (PTSD) measurements in subgroups of the participants at Xuzhou Medical University's affiliated hospital in the city of Xuzhou, China, 2 years after the first assessment during the COVID-19 pandemic

Variable	Participants with PTSD symptoms (N = 165) [n (%)]			Z-test/ χ^2	p
	no symptoms	mild/moderate symptoms	severe symptoms		
Gender				1.861	0.431
female	101 (68.7)	9 (69.2)	5 (100)		
male	46 (31.3)	4 (30.8)	0		
Age				4.266	0.339
18–30 years	45 (30.6)	6 (46.2)	1 (20.0)		
31–40 years	84 (57.1)	6 (46.2)	2 (40.0)		
41–60 years	18 (12.2)	1 (7.7)	2 (40.0)		
Education				2.412	0.302
bachelor	85 (57.8)	10 (76.9)	4 (80.0)		
postgraduate	62 (42.2)	3 (23.1)	1 (20.0)		
Salary (CNY)				1.919	0.785
30 000–80 000	29 (19.7)	4 (30.8)	1 (20.0)		
90 000–150 000	75 (51.0)	7 (53.8)	3 (60.0)		
>150 000	43 (29.3)	2 (15.4)	2 (20.0)		
Marital status				3.176	0.510
married	113 (76.9)	8 (61.5)	4 (80.0)		
single	31 (21.1)	5 (38.5)	1 (20.0)		
divorced	3 (2.0)	0	0		
Profession				2.530	0.615
nurse	59(40.1)	7 (53.8)	3(60.0)		
doctor	72 (49.0)	4 (30.8)	2 (40.0)		
other stuff	16 (10.9)	2 (15.4)	0		
Coping style				4.569	0.111
negative	45 (30.6)	7 (53.8)	3 (60.0)		
positive	102 (87.4)	6 (46.2)	2 (40.0)		
Altruistic behaviors	32 (24.40)	33 (23.34)	32 (31.44)	0.655	0.721
Psychological resilience	65 (57.74)	56 (46.57)	51 (50.60)	7.946	0.019
Job risk	67(40.6)	69(41.8)	29(17.6)	7.070	0.024
Work stress	59 (35.8)	71 (43.0)	35 (21.2)	6.325	0.037

Bolded are statistically significant values.

to sustain a high-pressure condition for an extended period because COVID-19 will become a chronic health problem.

Suggestions to enhance the psychological resilience of HCWs have been made in the relevant literature. Huffman et al. [30] state that strengthening positive coping strate-

Table 3. Logistic regression analysis for the risk factors associated with post-traumatic stress disorder (PTSD) in the participants at Xuzhou Medical University's affiliated hospital in the city of Xuzhou, China, 2 years after the first assessment during the COVID-19 pandemic

Variable	OR	95% CI	p
Psychological resilience	0.955	0.919–0.992	0.019
Job risk	1.473	0.603–3.596	0.395
Work stress	1.693	0.687–4.175	0.253

gies through training helps improve the HCWs' mental health during the pandemic. Certain scholars suggested that group and individual skill training programs should be developed for HCWs to build resilience and coping skills; these should include cognitive behavioral therapy or mindfulness-based therapy [31]. Resilience in stressful events was founded in 2012 to assist medical workers with face-to-face psychological first aid and psychological support [32]. According to reports, the rapid course in psychological first aid has statistically significantly improved the psychological resilience of HCWs [33].

The current study contains several drawbacks. Because this was a single-center study, to begin with, the sample size for HCWs might be too minimal to generalize to the overall populace. As a result, a multi-center review ought to be carried out to assess HCWs' psychological health in more depth. The period of every HCW in the COVID-19 ward was not reported in this study, which is a crucial element impacting HCWs' mental health. Thirdly, the initial research design did not take the participant's medication history into account, and all questionnaires were completed freely, which might skew the results.

CONCLUSIONS

The results reveal a significant reduction in symptoms of mild to severe PTSD. This significant improvement in positive PTSD symptoms could result from improved coping styles and altruistic behaviors, decreased anxiety about job loss, and decreased work stress. Positive psychology treatment, cognitive behavioral therapy, psychological support therapy, and pharmaceuticals, among others,

must be done as soon as possible to improve the psychological welfare of HCWs subjected to COVID-19.

Author contributions

Research concept: Hao Chen, Qing Ma

Research methodology: Bo Du

Interpretation of results: Shi-Guang Zhu

Statistical analysis: Shi-Guang Zhu

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