

Prevalence and Factors Associated with Post-Traumatic Stress Disorder in Healthcare Workers Exposed to COVID-19 in Wuhan, China: A Cross-Sectional Survey

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Abstract

Background: The COVID-19 pandemic has posed significant threats to both physical and psychological health of healthcare workers working in the front-line combating COVID-19. However, evidence regarding the long-term impact of COVID-19 is limited. Therefore, we conducted this cross-sectional survey to investigate the prevalence, factors and impact of post-traumatic stress disorder (PTSD) in healthcare workers exposed to COVID-19 eight months after end of outbreak in Wuhan, China.

Methods: A web-based questionnaire was delivered as a link via the communication application WeChat to those healthcare workers who worked at several COVID-19 units in Wuhan during the outbreak (from November 2019 to April 2020). The questionnaire included questions on social-demographic data, the post-traumatic stress disorder checklist-5, the family care index questionnaire, and the quality of life scale. The prevalence, risk and protective factors, and impact of post-traumatic stress disorder healthcare workers were then analyzed with logistic regression.

Results: Among the 659 participants, 90 healthcare workers were still suffering from PTSD eight months after the end of outbreak of COVID-19 in Wuhan, in which avoidance and negative impact were the most affected dimensions. Suffering from chronic disease, experiencing social isolation, and job dissatisfaction came up as independent risk factors of PTSD, while obtaining COVID-19 related information at an appropriate frequency, good family function, and working in well-prepared mobile cabin hospitals surfaced as protective factors. The impact of PTSD on COVID-19-exposed healthcare workers was apparent by shortened sleeping time, feeling of loneliness, poorer quality of life and intention to resign.

Conclusions: Eight months after the end of the COVID-19 outbreak in Wuhan, the level of PTSD in healthcare workers exposed to COVID-19 was still high. Apart from the common recognized risk factors, comorbid of chronic disease was identified as the new independent risk factors of developing PTSD. For countries where the pandemic is still ongoing or in the case of future outbreaks of new communicable diseases, this research may contribute to preventing cases of PTSD in healthcare workers exposed to infectious diseases under such circumstances.

1 Background

Coronavirus disease 2019 (COVID-19) is a highly contagious acute infectious respiratory disease caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2)¹. The outbreak of COVID-19 emerged in Wuhan (China) in the last month of 2019 and the subsequent spread outside of China led the World Health Organization (WHO) Emergency Committee to declare a Public Health Emergency of International Concern (PHEIC) on January 30, 2020² (Nishiura, 2020), and a pandemic on March 11, 2020. The COVID-19 pandemic not only causes physical diseases, but also leads to great psychological distress. An important group experiencing severe distress are the doctors and nurses caring for COVID-19 patients, which is not surprising as several studies have reported that medical staff comprise one of the most

vulnerable sectors in the population during global events^{3,4,5}. To date, with more than 162 million detected infections worldwide and the pandemic far from being contained, investigating the psychological impact of this pandemic on healthcare workers (HCWs) has become increasingly important, especially the long-lasting impact on those working at the early stage of the pandemic. Post-traumatic stress disorder (PTSD) refers to an individual's delayed appearance and long-lasting mental disorder caused by sudden, catastrophic or threatening life events^{6,7}. It is an emotional disorder dominated by fear and anxiety, which might lead to depression, helplessness, memory impairment, and decreased work quality⁸. Being isolated, working in high-risk positions, and having contact with infected people are known risk factors of PTSD⁹. The COVID-19 pandemic very likely also exerts a similar impact on HCWs. Indeed, several studies have reported that a proportion of first-line HCWs developed PTSD and that their work and life were affected significantly^{10,11,12}. A quantitative study indicated that the outbreak of COVID-19 in Wuhan had a clear impact on the mental health of local HCWs, with 22.4% reporting moderate and 6.2% severe disturbances¹³. Other studies have also investigated the PTSD status and risk factors of front-line HCWs^{14,15,16}. However, most of these studies investigated short-term PTSD symptoms soon after the outbreak, and any evidence of long-term PTSD related to COVID-19 is limited thus far. Therefore, in the present study, we aim to investigate the prevalence of PTSD and corresponding factors in HCWs exposed to COVID-19 eight months after the end of the outbreak in Wuhan.

2 Methods

2.1 Study design

A web-based questionnaire was delivered between November and December 2020 as a link via a communication application (WeChat) to those HCWs, who worked at several COVID-19 units (including the emergency department, outpatient, fever clinic, intensive care unit, infection ward, isolation ward, mobile cabin hospital) in Wuhan, from the onset of the COVID-19 outbreak. This study was approved by the Ethics Committee of the First Affiliated Hospital of Wannan Medical College (Yijishan Hospital) (approval number 20201025). All participants provided written informed consent.

2.2 Participants

HCWs having cared for COVID-19 patients in Wuhan were recruited by snowball sampling¹⁷. Inclusion criteria were HCWs who worked at a COVID-19 designated institution, had direct contact with COVID-19 patients, or had close contact with those provided health care service to COVID-19 patients. The post-hoc analysis indicated that all participants had worked in the designated institutions for more than 7 days, hence we did not set an exclusion criterion to a minimal working time in the designated institutions. Exclusion criteria were non-HCWs, and provision of invalid answers of the questionnaire.

2.3 Instruments

2.3.1 Social-demographic, job and COVID-19 related variables

Social-demographic variables in the questionnaire include age, gender, marital status, education level (college diploma, bachelor, or master and above), occupation (doctor, nurse or non-clinical; which includes nurses and doctors carrying out administrative and logistics tasks during the outbreak of COVID-19 due to lack of human resource in these departments), whether suffering from chronic diseases, and whether being the only child. Job-related variables include work experience (≤ 2 years, 2–5 years, 6–10 years, 11–20 years and > 20 years), position level (unrated, elementary, intermediate, advanced) and department (emergency department, outpatient, fever clinic, intensive care unit, infection ward, isolation ward, mobile cabin hospital). COVID-19 related variables include number of working days during the epidemic, experience in caring for patients suffering from other respiratory infectious diseases (e.g. SARS, MERS, influenza), direct care for COVID-19 patients, occupational exposure without protection, getting infected, relatives or close friends getting infected or died of COVID-19 (diagnosed by qPCR or clinical diagnostic criteria), having been in quarantine and time of quarantine due to COVID-19, experience of social isolation, received psychological assistance, having received an award for fighting COVID-19, frequency of obtaining COVID-19 related information (rarely, sometimes, always), sleeping time (< 5 h, 6–8 h, > 8 h), job satisfaction (dissatisfied, neutral, satisfied), intention to resign, feeling of loneliness (rarely, sometimes, often).

2.3.2 PCL-5, family care index questionnaire, and quality of life scale

The presence and severity of PTSD symptoms were measured by the post-traumatic stress disorder checklist-5 (PCL-5), containing 20 self-report items, with high reliability and validity^{18,19}. Each item of PCL-5 has five-point Likert score (0 = not at all, 1 = a little bit, 2 = moderately, 3 = quite a bit and 4 = extremely). Individual's score of PCL-5 ranges from 0 to 80, and the cut-off point score for diagnosis PTSD was set as more than or equal to 33, with a higher score indicating more serious PTSD symptoms²⁰.

Family function was assessed with the family care index questionnaire (Adaptation, Partnership, Growth, Affection and Resolve, APGAR) designed by the University of Washington²¹. The questionnaire contains five dimensions: adaptation, partnership, growth, affection and resolve. The questionnaire uses a Likert 3-level scoring response model, 0 points (almost never), 1 point (sometimes), 2 points (often like this). The full score of the scale is 10 points, and 0 to 3 point indicates a severe family dysfunction, 4 to 6 point indicates a moderately impaired family function, and a score of 7 to 10 indicates a good family function.

Quality of life was measured with the Chinese QOL questionnaire²², with a total of 6 items, assessing the physical health, mental health, economic status, work or study status, family relationship and non-family peers' relationship, respectively. The answers are divided into 5 levels (1=very poor, 2=poor, 3=fair, 4=good, and 5=very good).

2.4 Statistical analysis

Continuous variables were summarized as either means and standard deviations or medians and interquartile range as appropriate. Categorical variables were described as frequencies and percentages. The differences between groups with or without PTSD were analyzed by Fisher's exact test and the Mann – Whitney *U* test for continuous variables. Factors associated with PTSD were identified using logistic regression Adjustment for the following variables (determined *a priori*) was conducted in a forward stepwise manner: age, suffered from chronic diseases, being an only child, occupational exposure without protection, relatives or friends be infected, relatives or friends died of COVID-19, the experience of social-isolation, job satisfaction, frequency of obtaining COVID-19 related information, working department, and variables with $p \leq 0.2$ in the univariable analysis. Odds ratios (OR) and 95% confidence intervals (CI) were reported. Two-tailed $p < 0.05$ was considered statistically significant. All analyses were performed using R software version 3.6.2 (R Foundation for Statistical Computing).

3 Results

3.1 Participant's Characteristics

A total of 667 HCWs participated in the survey, and after exclusion of 8 questionnaires because of invalid answers, 659 participants were included in the final analysis. Among the participants, 573 (86.9%) were nurses, 55 (8.3%) were doctors, and 31 (4.7%) were non-clinical HCWs. Females accounted for 90.6% (597) of the participants. Most of the HCWs engaged in fighting COVID-19 were relatively young, 223 (33.8%) aged between 31 to 40 years, and 316 (48%) were younger than 30 years. The majority of participants in this survey had a bachelor degree (509, 77.2%) and had a primary (377, 57.2%) to middle (221, 33.5%) job title. 425 (64.5%) participants were married, while 234 (35.5%) were unmarried/divorced/widowed (Table 1).

In this survey, there were 90 (13.7%) HCWs with a PCL-5 score ≥ 33 , and were then considered as suffering from PTSD. Compared with those participants without PTSD, the incidence rate of suffering from chronic diseases (20, 22.2% vs. 59, 10.4%, $p = 0.002$), occupational exposure without protection (18, 20% vs. 61, 10.7%, $p = 0.019$), relatives or close friends died of COVID-19 (32, 35.6% vs. 121, 21.3%, $p = 0.004$), experience of social isolation (36, 40% vs. 111, 19.5%, $p < 0.001$), and dissatisfaction with job (32, 35.6% vs. 79, 13.9%, $p < 0.001$) were higher in HCWs with PTSD. By contrast, there was no statistical significance in the rate of the following: having had the experience in caring other infectious diseases, having been infected, relatives or close friends gotten infected, experienced social isolation, received psychological assistance, awarded for fighting COVID-19, as well as the time of working during the epidemic, time of quarantine due to COVID-19 and frequency of obtaining COVID-19 related information. Regarding department, HCWs working in the mobile cabin hospitals (a simple hospital converted from gymnasiums and conference centers in March, 2020, mostly used to treat patients with COVID-19 who had mild symptoms²³) had the lowest rate of PTSD (26, 10.2%). Moreover, the APGAR score of family function was lower in PTSD group compared with non-PTSD participant (5, 4-8, vs. 8, 5-10, $p < 0.001$) (Table 1).

3.2 Dimension's characteristics of PTSD in PCL-5

The score of each dimension was shown in Table 2. Compared with non-PTSD HCWs, those with PTSD had a higher score in all six dimensions, among which avoidance (0.00 [0.00, 1.00] vs 2.00 [1.00, 2.00], $p < 0.001$) and negative impact (0.75 [0.25, 1.00] vs 2.00 [1.25, 2.00], $p < 0.001$) were the most affected dimensions.

3.3 Impact of PTSD on participants

Compared with non-PTSD HCWs, PTSD participants reported a higher score of panic (5.00 [5.00, 7.00] vs. 4.00 [2.00, 5.00], $p < 0.001$), shorter sleeping time, poorer quality of life (18.00 [16.00, 19.00] vs. 20.00 [18.00, 23.00], $p < 0.001$), and more frequent feelings of loneliness. Moreover, 61.1% (55) of HCWs with PTSD intended to resign from the current job, compared to 32% (182) in those without PTSD. Only a small proportion (39, 6.9%) of participants without PTSD thought they needed to seek psychological assistance, while 44.4% (40/90) of the participants with PTSD were planning to consult with a psychologist (Table 3).

3.4 Risk factors associated with PTSD in HCWs

In order to identify factors that are associated with PTSD, we have run a logistic regression model. The results indicate as independent risk factors of PTSD: suffering from chronic diseases (2.19, 1.11-4.24, $p = 0.02$), experienced social isolation (2.38, 1.37-4.13, $p = 0.002$), and dissatisfaction with job (4.92, 1.30-6.23, $p = 0.012$), while obtaining COVID-19 related information at an appropriate frequency (sometimes, (0.51, 0.26-0.98, $p = 0.04$)), good function of family (0.27, 0.16-0.46, $p < 0.001$), and working in the well-prepared cabin hospitals (0.46, 0.23-0.94, $p = 0.03$) were protective factors of developing PTSD (Table 4).

4 Discussion

The prevalence of PTSD in this study is 13.7% (90/659) which is lower than reported in a recent study (61.8%)²⁴. In that study, only front-line nurses were included and were all screened with PTSD immediately after having worked in COVID-19 units. Other studies have indicated that nurses were more vulnerable than other HCWs to PTSD^{25,26}. In our analysis, we also included other HCWs besides nurses; therefore, the impact of COVID-19 on HCWS can be more fully evaluated, although nurses still accounted for the majority of the participants (86.9%, 573/659). Furthermore, the time points of the PTSD screening were quite different. In the present study, all participants were screened eight months after the exposure to COVID-19. The results of these previous studies, together with the results reported here, suggest that the incidence of COVID-19-related PTSD decreases over time. A similar decreasing trend was also reported in PTSD caused by a devastating earthquake, in which the PTSD rate was 8.4% one month after the earthquake, decreased to 4.3% three months later, and dropped to 3.4% half a year later²⁷.

In terms of factors associated with long-term PTSD, we identified that participants with a poorer score of family function, experienced social isolation and dissatisfaction with their job were at higher risk of developing PTSD, which highlighted the importance of support from supervisors, colleagues, family and society. This is in line with previous studies, as these factors were also frequently reported in HCWs exposed to SARS^{28,29,30}. In the present study, working in cabin hospitals was identified as an independent protective factor of PTSD. Compared with other hospital departments, mobile cabin hospitals in China were well prepared with enough protective equipment, staff and well-organized infection prevention control strategies, which increased the sense of security and hence decreased the extent of the impact of COVID-19 itself. Likewise, other studies have reported that a structured unit with perceived safety of the working environment enhanced the resilience against PTSD^{31,32}. Interestingly, in our study, we found that physical chronic disease was associated with developing PTSD in HCWs, something that has not been reported before to our knowledge. As medical professionals, HCWs know that chronic diseases are independent risk factors of developing severe disease and would cause a higher mortality in COVID-19. Therefore, this professional knowledge might cause the fear of developing serious disease when infected with COVID-19 and subsequently caused higher stress than those without physical chronic diseases. Previous research has reported that psychiatric disorders are risk factors of developing PTSD in SARS and MERS^{33,34}. Therefore, both from a physical, as well as a psychological point of view, it is recommended to avoid deploying HCWs with chronic diseases, to care for COVID-19 patients or other communicable diseases.

Regarding the impact of PTSD on daily life, although the frequency of panic did not show any statistically significant difference between participants with or without PTSD, those with PTSD did have a poorer score of quality of life, often feel lonely, and sleep less than that without PTSD. Strikingly, 44.4% (40) of the participants with PTSD thought they were in need of psychological assistance. A study done immediately after the outbreak was brought under control in Wuhan, demonstrated that of all HCWs caring for COVID-19 patients included, 36.3% had accessed psychological materials, 50.4% had accessed psychological resources available through media, and 17.5% had participated in counseling or psychotherapy³⁵. Therefore, the hospital should allocate more resources to make psychological assistance more accessible for staff directly or indirectly exposed to COVID-19. Moreover, the intention to resign in participants with PTSD was twice higher than in those without PTSD in the present study, which is significantly consistent with the dimension of avoidance score. Combined with this evidence, it seems good if hospitals would offer opportunities to HCWs at risk for PTSD (or all, depending on capacity) to rotate to other positions for certain periods, to lower prolonged fear related to caring for COVID-19 patients, as was also suggested in a study on work-related PTSD³⁶.

Strength and Limitations

The strength of this research is the long-term (8-month) information of the mental health of HCWs after the end of COVID-19 pandemic. Our research provides evidence to design strategies to prevent PTSD among HCWs during the COVID-19 pandemic. However, there are some limitations in this study. First of

all, this study only investigated medical staff in a few local hospitals in Wuhan, and might not be generalizable to all medical staff, Second, the self-report questionnaire is a screening tool for PTSD and not a diagnostic tool, and therefore might generate some bias, especially may over-estimate the incidence of PTSD. This survey was conducted through an application, so HCWs with PTSD, especially those with severe symptoms, might be reluctant to participate in the survey, which might lead to underreporting. Finally, the prevalence and factors associated with PTSD may change dynamically as the pandemic is ongoing; thus evidence generated by the present study might not suitable for other periods and or regions. Therefore, a multi-center survey, with multiple time points and a large sample is still warranted to assess the PTSD level of HCWs exposed to COVID-19 patients.

Conclusion

The prevalence of PTSD was 13.7% among HCWs 8-month after the exposure of COVID-19. Suffered from chronic disease, experience of social isolation, dissatisfied with job were independent risk factors of PTSD, while obtaining COVID-19 related information at an appropriate frequency, good function of family, and working in the well-prepared mobile cabin hospitals were protective factors of developing PTSD. The impact of PTSD on HCWs was shorter sleeping time, feeling of loneliness, poorer quality of life and intention to resign.

List Of Abbreviations

COVID-19: Coronavirus disease 2019

SARS-CoV-2: severe acute respiratory syndrome coronavirus-2

PTSD: Post-traumatic stress disorder

HCWs: healthcare workers

SARS: Severe acute respiratory syndrome

MERS: Middle East respiratory syndrome

PCL-5: post-traumatic stress disorder checklist-5

APGAR: adaptation, partnership, growth, affection and resolve

Declarations

Ethics approval and consent to participate

Ethical approval for this study was provided by the Ethics Committee of the Yijishan Hospital of Wannan Medical College (approval number 20201025). All data collection activities for this study were

implemented with informed consent of participants

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author (H. L.) on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

LLP, BT, LZ and HL conceived the paper. LLP, LZ, QCX and BT wrote the manuscript with input from all the authors. LLP, HL developed the questionnaire for the data collection. XK, XCZ, FXF, LLG and ML collected and cleaned data. LZ, LLP and QCX analyzed the data. BT provided overall technical review and critical revision. All authors provided final approval for publication.

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