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Factors associated with post-traumatic stress disorder of nurses exposed to corona virus disease 2019 in China

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Abstract

Quantitative studies using validated questionnaires on post-traumatic stress disorder (PTSD) of Nurses exposed to corona virus disease 2019 (COVID-19) in China are rare and the baseline PTSD must first be evaluated before prevention. This study aimed to investigate the factors potentially involved in the level of PTSD of Nurses exposed to COVID-19 in China.

In this cross-sectional study, male and female Nurses (n = 202) exposed to COVID-19 from HuBei China were included in the final sample. The PTSD Checklist-Civilian (PCL-C) questionnaire and Simplified Coping Style Questionnaire (SCSQ) were used for evaluation. Multivariate stepwise linear regression analysis and spearman correlation test were performed to assess the association between various factors associated with PTSD.

The incidence of PTSD in Nurses exposed to COVID-19 was 16.83%, the PCL-C score was 27.00 (21.00–34.00), and the highest score in the three dimensions was avoidance dimension 9.50 (7.00–13.25); multivariable stepwise linear regression analysis showed that job satisfaction and gender were independently associated with lower PCL-C scores (both $P < .001$); PCL-C scores were correlated with positive coping ($r = -0.151$, $P = .032$), negative coping ($r = 0.154$, $P = .029$).

Nurses exposed to COVID-19 from HuBei China with job satisfaction, male and positive coping had low PCL-C scores which necessitate reducing the PTSD level by ways of improving job satisfaction, positive response, and strengthening the psychological counseling of female nurses in order to reduce the risk of psychological impairment.

Abbreviations: COVID-19 = Corona virus disease 2019, M(IQR) = Median (Inter Quartile Range), PCL-C = PTSD Checklist-Civilian, PTSD = Post-Traumatic Stress Disorder, RMB = RenMinBi (Chinese currency), SARS = Severe Acute Respiratory Syndrome, SCSQ = Simplified Coping Style Questionnaire.

Keywords: nurses exposed to COVID-19, PTSD, SCSQ

1. Introduction

Post-traumatic stress disorder (PTSD) is a mental disorder that may develop after exposure to exceptionally threatening or horrifying events. Its main features are re-experience, avoiding traumatic memory and the feeling of continuous threat to be

vigilant or over vigilant.[1] A South African study that investigated the relationship between exposure to critical incidents and prevalence of mental health problems among emergency medical care personnel (including traffic police, fire services, ambulance staff, and sea and air rescue workers) found that symptoms of anxiety, depression, or PTSD intensified when exposure to critical incidents increased.[2] Research shows that paramedics are more prone to develop PTSD symptoms than general population, and positive coping style plays an important role in PTSD symptom relief.[3] Many people show remarkable resilience and capacity to recover following exposure to trauma.[4]

In December 2019, an outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection occurred in Wuhan, Hubei Province. On February 12, 2020, WHO officially named the disease caused by the novel coronavirus as Corona virus Disease 2019 (COVID-19), which has the characteristics of fast transmission, wide transmission, and strong infectious. Droplets, close contact, aerosols, as well as fecal and oral transmission are all routes of transmission of the virus.[5] Most of the patients infected with the virus have fever, dry cough, dyspnea, and other symptoms, and even acute respiratory distress syndrome, septic shock, metabolic acidosis, bleeding, and coagulation dysfunction.[6]

COVID-19 is a highly contagious disease, and nurses are at the front lines of care and are thus more susceptible to infection.[7] This makes the nurses' physiological and psychological state highly stressed and even PTSD. In order to reduce the incidence of PTSD, reduce the clinical symptoms of PTSD and improve the prognosis, it is necessary to understand the influencing factors of

PTSD and make early and effective intervention. The purpose of this study was to investigate PCL-C scores and the incidence of PTSD in Nurses exposed to COVID-19 in China; to analysis of influencing factors of PTSD; and to explore the correlation between the PCL-C scores, positive coping and negative coping.

2. Methods

2.1. Ethics

This study was approved by the Ethics Committee of the Affiliated Hospital of the Inner Mongolia Medical University (approval number: 2020010). All the participants provided a informed consent.

2.2. Study design

This cross-sectional and correlational study was conducted between February 2020 and March 2020, and 211 male and female nurses filled out the questionnaire.

2.3. Setting and participants

Three tertiary hospitals (West District of Wuhan Union Hospital, the First People's Hospital of Jingmen City, the People's Hospital of Zhongxiang City) were randomly selected from Hubei provinces in China for participation. Only tertiary hospitals were selected because they offer high-level specialized health care services.

The inclusion criteria were:

1. registered nurses with designations of Staff Nurse; and
2. Nurses exposed to COVID-19.

The exclusion criteria were:

1. Nurses unwilling to be surveyed; or
2. Assistant nurse.

2.4. Outcome measurements
2.4.1. PTSD checklist-civilian (PCL-C).
The PTSD checklist-civilian version (PCL-C) was translated to Chinese language by Professor Shi Tieying and others.[8] The questionnaire was used to assess the severity of PTSD symptoms. The Cronbach's alpha coefficient for the total scale was 0.840. The item validity was 0.930. The PCL-C comprises of a total of three dimensions (re-experiencing dimension, avoidance dimension, hyperarousal dimension). The intensity and frequency of PTSD symptoms are rated as 5 levels. Total PTSD scores were calculated by summing the scores for all items, with higher scores indicating more severe PTSD symptoms. Study participants with total scores ranging from 38 to 49 were defined as having some degree of PTSD and ranging from 50 to 85 were definitively diagnosed with PTSD.[9]

2.4.2. Simplified coping style questionnaire.
The Simplified Coping Style Questionnaire (SCSQ) was designed by Yaning Xie to evaluate coping style in Chinese.[10] It is a self-rating scale in which a total of 20 items are measured, including positive coping and negative coping. Multilevel scoring was used for each coping (range 0–3), and the results of the SCSQ are the overall positive and negative coping scores. Higher scores indicate higher frequencies of relevant coping. The Cronbach's alpha of the total score is 0.900. It shows that the scale has good reliability. The results of validity analysis show that the coping style can

indeed be divided into two factors: "negative coping" and "positive coping," which is in line with the theoretical concept.

2.5. Data collection/procedure

Socio-demographic information such as age, gender, nationality, professional title (based on the National Unified Examination, with appropriate certificates), work experience, education (based on certificates), average monthly income (RMB), marital status, degree of family support, degree of job satisfaction, training or learning methods protection knowledge, and have you participated in Severe Acute Respiratory Syndrome (SARS) prevention and control were collected from all the participants.

This survey uses the form of a questionnaire star. Before issuing the questionnaire, the participant were informed of the purpose of this research and were assured of their right to refuse to participate or to withdraw from the study at any stage. Researcher issued instructions about filling the questionnaire and a unified guidance language is used to explain the research purpose to the research subjects, thereby ensuring that there was no ambiguity for answering the questions. Participants answered the questionnaire anonymously and hence there was no infringement on patient privacy. The confidentiality of all participants was guaranteed. A questionnaire was considered invalid if more than 10% of the items were not answered.

2.6. Statistical analysis

Data were analyzed using SPSS 19.0 (SPSS Inc, USA). Categorical data were presented as frequencies. The Shapiro–Wilk test and a histogram normal curve were used to test the normal distribution of the PCL-C scores, scores in three dimensions of PCL-C and the two dimensions of SCSQ (positive coping and negative coping). The results of the Shapiro–Wilk test showed that $P < .05$ and that histogram normal curve does not meet the concentration and symmetry. This indicated that the data did not follow a normal distribution pattern. Therefore, M(IQR)median (Inter Quartile Range) were used to describe the data in this study. Two independent samples were tested using the non-parametric Mann–Whitney U test, and multiple independent samples were tested using the non-parametric Kruskal–Wallis H test. Multivariate stepwise linear regression analysis was conducted using the PCL-C score as the dependent variable. The independent variables were those with P-values $< .05$ in univariate analyses. Spearman correlation test was used for the correlations between the PCL-C scores, positive coping and negative coping. Two-sided P-values $< .05$ were considered statistically significant.

3. Results

Out of the total of 211 participants contacted for the study, 9 questionnaires was deemed as being disqualified due to inadequate responses and hence were excluded. Finally 202 questionnaires were included in the final sample, and the effective response rate was 95.7%.

3.1. Participants' characteristics

Socio-demographic data, job characteristics and PCL-C scores of the participants are presented in Table 1 and in Figure 1. When data did not follow a normal distribution pattern, M(IQR)were used to describe the data and the Mann–Whitney U test and Kruskal–Wallis H test was applied. The mean age of the participants was

Table 1

Socio-demographic data, job characteristics and PCL-C Scores of nurses (n=202) exposed to COVID-19 in Tertiary Hospitals in China.

Variable	n (%)	PCL-C scores M (IQR)	Z/H	P
Age (years)		32.00 (29.00–40.00)	2.157	.000***
Gender				
Male	25 (12.4)	19.00 (17.00–26.00)	−3.874	.000***
Female	177 (87.6)	28.00 (22.50–34.50)		
Ethnic group				
Han	167 (82.7)	28.00 (21.00–34.00)	0.446	.800
Mongolian	23 (11.4)	24.00 (19.00–31.00)		
Others	12 (5.9)	29.00 (20.25–42.25)		
Professional title				
Staff nurse	10 (5.0)	25.50 (22.00–32.50)	0.435	.933
Nurse practitioner	104 (51.5)	27.50 (21.00–34.00)		
Chief nurse	59 (29.2)	28.00 (21.00–35.00)		
Deputy director	29 (14.3)	25.00 (20.00–34.00)		
Work experience (years)		10.00 (6.00–19.00)	2.064	.000***
Education				
Junior college	27 (13.4)	22.00 (19.00–34.00)	3.422	.181
Undergraduate	166 (82.2)	28.00 (21.00–34.00)		
Master	9 (4.4)	26.00 (23.50–34.00)		
Average monthly income (RMB)				
1000–3000	5 (2.5)	30.00 (19.00–31.00)	0.595	.898
3001–5000	63 (31.2)	26.00 (21.00–21.00)		
5001–7000	65 (32.2)	26.00 (20.50–34.50)		
>7000	69 (34.1)	28.00 (21.00–37.00)		
Marital status				
Married	148 (73.3)	26.00 (20.25–34.00)	4.498	.106
Unmarried	46 (22.8)	29.00 (21.00–35.50)		
Divorced	8 (3.9)	35.50 (28.00–47.75)		
Degree of family support				
Yes	199 (98.5)	27.00 (21.00–34.00)	3.795	.051
No opinion	3 (1.5)	37.00 (34.00–)		
Degree of job satisfaction				
Very satisfied	95 (47.0)	23.00 (19.00–30.00)	36.101	.000***
Satisfied	79 (39.1)	30.00 (26.00–39.00)		
Neutral	28 (13.9)	30.00 (21.50–38.75)		
Training or learning methods				
Protection knowledge				
Live lecture	26 (12.9)	26.00 (20.75–30.25)	2.952	.707
Online teaching	33 (16.3)	27.00 (21.00–34.00)		
Distribute ppt lecture notes, videos, and video materials	48 (23.8)	28.00 (23.00–37.00)		
Putting on and taking off protective equipment exercises	39 (19.3)	30.00 (21.00–37.00)		
Combat drill	48 (23.8)	26.00 (20.00–33.50)		
Others	8 (3.9)	33.50 (17.50–40.25)		
Have you participated in SARS prevention and control				
Yes	47 (23.3)	28.00 (21.00–37.00)	−0.983	.326
No	155 (76.7)	27.00 (21.00–34.00)		

M (IQR)=median (inter quartile range), PCL-C=PTSD checklist-civilian, RMB=renminbi (Chinese currency).
*** P<.001.

32.00 (29.00–40.00) years (P<.001). The majority of the participants were females and male had lower PCL-C scores than female (P<.001). Work experience was 10.00 (6.00–19.00) years (P<.001). Nurses satisfied with their career had lower PCL-C scores than those who were unsatisfied (P<.001). Nationality, Professional title, Education, Average monthly income (RMB), Marital status, Degree of family support, Training or learning methods Protection knowledge, and have you participated in SARS prevention and control were not associated with PCL-C scores.

3.2. PCL-C scores and scores in the two dimensions of SCSQ

The specifics of these results are provided in Tables 2 and 3, Figures 1–3. The data for the PCL-C scores and scores in the two dimensions of SCSQ were not normally distributed and M(IQR)

were used to describe the data. PCL-C scores were 27.00 (21.00–34.00) points. The minimum value was 17 points (16 cases in total) and the maximum value was 56 points (3 cases in total). PCL-C score between 38 to 85 points accounted for 16.83% (PTSD incidence rate). The highest score in three dimensions was avoidance dimension 9.50 (7.00–13.25). Three dimensions score from high to low, it was the avoidance dimension, re-experiencing dimension, and hyperarousal dimension. Positive coping and negative coping scores were 22.00 (15.00–25.25) and 9.00 (6.00–11.00).

3.3. Analysis of influencing factors of PTSD

Details are shown in Table 4. Multivariate stepwise linear regression analysis was conducted using the PCL-C score as the
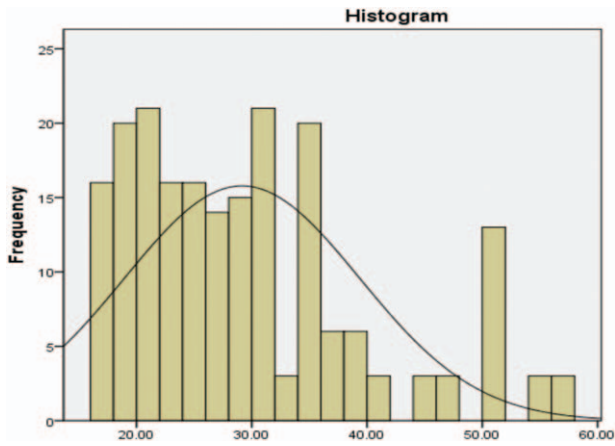
Figure 1. Title: PCL-C Scores normal distribution test chart. Methods: The graph of normal distribution test chart was illustrated according to PCL-C scores as abscissa and frequency as ordinate.

Figure 2. Title: positive coping normal distribution test chart. Methods: The graph of normal distribution test chart was illustrated according to positive coping scores as abscissa and frequency as ordinate.

dependent variable. The independent variables were those with P-values $<.05$ (age, gender, work experience, degree of job satisfaction) in univariate analyses. The variables that remain in the equation were degree of job satisfaction and gender. The coefficient of determination R^2 was 0.180, indicating that these two factors can explain 18% of all PCL-C variation.

3.4. Correlation between the PCL-C scores, positive coping and negative coping

The specifics of these results are provided in Table 5, Figures 1–3. The two dimensions of SCSQ were positive coping and negative coping. The data for the PCL-C scores, positive coping and negative coping were not normally distributed and adopted spearman correlation analysis. The results showed that PCL-C was negatively correlated with positive coping ($r=-.151$, $P<.05$), and PCL-C was positively correlated with negative coping ($r=0.154$, $P<.05$).
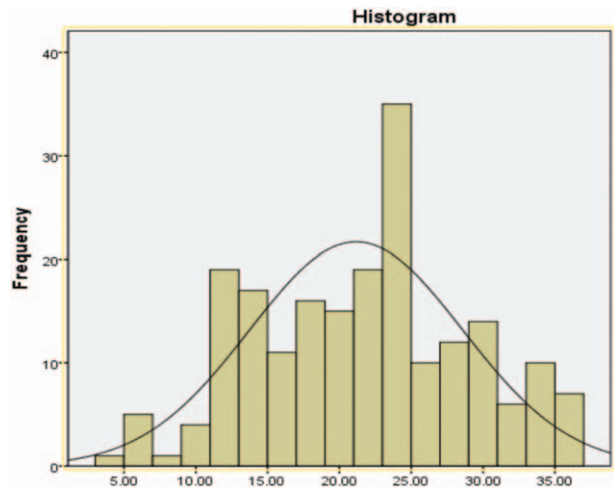
4. Discussion

4.1. PCL-C scores and scores in the three dimensions

This study showed that PCL-C scores were 27.00 (21.00–34.00) points. The minimum value was 17 points (16 cases in total) and the maximum value was 56 points (3 cases in total). PCL-C score between 38 and 85 points accounted for 16.83% (PTSD incidence rate). Since the COVID-19 outbreak was a bio-disaster with profound psychological effects on health workers.[11] Medical and paramedical staff, particularly in service in emergency planning, are frequently exposed to situations of great physical and psychological stress.[12] This study focused on its psychiatric consequences in nurses. The findings of Li et al were not consistent with the results of this study. The positive detection rate and highest score of PTSD are higher than this study.[13] Many previous studies had shown that emergency rescuers were likely to suffer from PTSD after participating in emergency. The prevalence of PTSD among medical staff after

Table 2

PCL-C score distribution (N=202).

PCL-C score	Frequency	Composition ratio (%)
PTSD (17–37 分)	168	83.17
some degree of PTSD (38–49 分)	15	7.42
definitively diagnosed PTSD (50–85 分)	19	9.41

Table 3

PCL-C Scores and scores in the 2 dimensions of SCSQ among nurses (n=202) exposed to COVID-19 in Tertiary Hospitals in China.

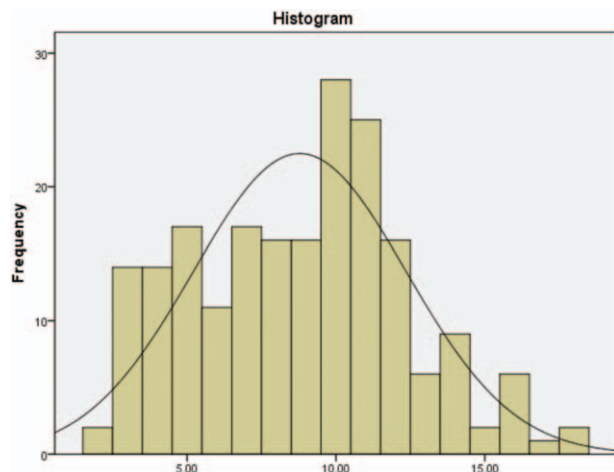| Items	Score M (IQR)	Maximum	Minimum
PCL-C	27.00 (21.00–34.00)	56.00	17.00
Re-experiencing dimension	9.00 (6.00–11.00)	18.00	5.00
Avoidance dimension	9.50 (7.00–13.25)	22.00	7.00
Hyperarousal dimension	8.00 (6.00–12.00)	20.00	5.00
Positive coping	22.00 (15.00–25.25)	36.00	4.00
Negative coping	9.00 (6.00–11.00)	18.00	2.00

Figure 3. Title: negative coping normal distribution test chart. Methods: The graph of normal distribution test chart was illustrated according to negative coping scores as abscissa and frequency as ordinate.

Table 4

Multivariate stepwise linear regression analysis of factors influencing the PCL-C Scores among nurses (n = 202) exposed to COVID-19 in Tertiary Hospitals in China.

Influential factor	B	SE	β	t	P
Constant	7.340	4.064	–	1.806	.042*
Degree of job satisfaction	5.110	0.926	0.354	5.520	<.001***
Gender	7.080	1.985	0.229	3.566	<.001***

$F = 21.894$, $P < .001$, $R = 0.425$, $R^2 = 0.180$.

β = standard regression coefficient, B = partial regression coefficient, SE = standard error.

* $P < .05$.

*** $P < .001$.

Wenchuan earthquake was 19%.[14] The prevalence of PTSD among search and rescue workers in 2 months after the binge earthquake was 25%.[15] During the SARS epidemic in 2003, the detection rate of PTSD among medical staff at the first line was high Up to 25.8%.[16] The findings of Pompili et al have reported that almost half of the psychologists reported post-traumatic stress symptoms that did not subside until at least 6 months had elapsed.[17]Therefore, social should focus on the supportive and therapeutic resources available for nurses. There is a need for urgent intervention after crisis to identify and treat those with PTSD as such approach can reduce the risk of psychological impairment.[18]

The study showed that the highest score in three dimensions was avoidance dimension 9.50 (7.00–13.25); three dimensions score from high to low, it was the avoidance dimension, re-experiencing dimension, and hyperarousal dimension. The findings of Li et al have reported that the highest score in three dimensions was avoidance dimension.[13] However, other occupational exposures existing studies have found the opposite. Regarding medical staff members exposed to H7N9 patients and disaster relief medical staff, previous studies have reported that the highest score in three dimensions was re-experiencing dimension.[19,20] The reason may be that different occupational exposures caused different pressures on medical staff.

4.2. Analysis of influencing factors of PTSD

The results showed that job satisfaction and gender were influencing factors of PTSD. Some studies reported results similar to our findings and indicated that mental health is highly relevant to work satisfaction.[21–23] Nurses who are dissatisfied with their jobs often feel that they are working in a dysfunctional system which affects the quality of their tasks and their self-esteem,[24] which are associated with higher PTSD scores. The findings of Pompili et al have reported that patients with mood disorders were 2.90 times more likely to be women than patients with psychosis.[25]Several other studies have reported that women

exposed to traumatic events are more likely to develop PTSD than men.[19,26–28] However, other existing studies have found the opposite.[29] This phenomenon might be attributable to the fact that the injuries sustained by the men after experiencing physical violence were more severe than those of the women.[30] This discrepancy also may be explained by the fact that males display a higher basal cortisol level (during fertility years) associated with lower prevalence of stress-related psychopathology.[31]

4.3. Correlation between the PCL-C scores, positive coping and negative coping

The results showed that PCL-C was negatively correlated with positive coping, and PCL-C was positively correlated with negative coping. Active coping is "process of taking active steps to try to remove or circumvent the stressor or to ameliorate its effects."[32] Negative coping is marked by avoidance (e.g., ignoring the problem) or other maladaptive efforts (e.g., self-blame, venting) that worsen rather than resolve the challenge.[33,34] The results is consistent with previous research results. When medical staff encounter traumatic events, negative coping styles are more likely to increase their tendency to develop PTSD symptoms, and active coping can help prevent or alleviate PTSD symptoms.[30,35–39]

5. Conclusion

The innovations of this study can be summarized as the factors potentially involved in the level of PTSD of Nurses exposed to COVID-19 in China. Nurses exposed to COVID-19 from HuBei China with job satisfaction, male and positive coping had low PCL-C scores. Which necessitates empowering the nurses by way of education and training programs, reach their goals at the individual and team level, getting career progression thereby ensuring their job satisfaction. Effective and sustainable psychological counseling should be directed particularly to the female nurses in order to reduce the risk of psychological impairment. Active coping includes initiating direct action, increasing one's efforts, and trying to execute a coping attempt in stepwise fashion.

6. Research limitations and future research ideas

This study has several limitations. First, the self-assessment method may be relatively subjective. A third-party evaluation should be used in future studies and to validate the self-assessments. Second, the study covered only tertiary hospitals in HuBei provinces of China, thus limiting the generality of the conclusions. Future research should be conducted nation-wide. Third, confounding factors such as stress, work conflict, time management, and team work had not assessed. Fourth, due to flaws in the study design,

Table 5

Associations between PCL-C Scores and scores in the 2 dimensions of SCSQ in nurses (n = 202) exposed to COVID-19 in Tertiary Hospitals in China.

Variables	Positive coping	Negative coping
PCL-C		
r	−0.151	0.154
P	.032*	.029*

M (IQR) = median (Inter Quartile Range), PCL-C = PTSD Checklist-Civilian.

* $P < .05$.

we failed to calculate the sample size by power analysis before the study. Alternatively, we calculated the sample size according to the number of variables (10 times of the variables), and taking a 10% attrition rate into consideration, the total sample size was determined to be 132. In the present study, there are a total of 202 valid questionnaires, we believe the participant's number is sufficient. Despite these limitations, the present research is meaningful.

Author contributions

Data curation: Wennv Hao.
Formal analysis: Yaxi Wang, Hongtao Guo, Wennv Hao.
Funding acquisition: Wennv Hao.
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Validation: Yaxi Wang, Wennv Hao.
Visualization: Hongtao Guo.
Writing – original draft: Yaxi Wang, Wennv Hao.
Writing – review & editing: Yaxi Wang, Wennv Hao

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