

RETRACTED ARTICLE: Psychotherapy and Follow-Up in Health Care Workers After the COVID-19 Epidemic: A Single Center's Experience

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Objective: The present study aims to analysis the mental health of high-risk health care workers (HHCWs) and low-risk HCWs (LHCWs) who were respectively exposed to COVID-19 wards and non-COVID-19 wards by following up on mental disorders in HCWs in China for 6 months.

Methods: A multi-psychological assessment questionnaire was used to follow up on the psychological status of HCWs in the Affiliated Hospital of Xuzhou Medical University in Xuzhou City (a non-core epidemic area) at 6 months after the first evaluation conducted during the COVID-19 epidemic. Based on the risk of exposure to COVID-19 patients, the HCWs were divided into two groups: high-risk HCWs, who worked in COVID-19 wards, and low-risk HCWs, who worked in non-COVID-19 wards.

Results: A total of 198 HCWs participated in the study, and 168 questionnaires were selected for evaluation. Among them, 93 (55.4%) were in the HHCW group and 75 (44.5%) were in the LHCW group. Significant differences were observed in salary, profession, and altruistic behavior between the two groups ($P < 0.05$). There were no significant differences in the anxiety, depression, insomnia, or posttraumatic stress disorder (PTSD) scores between the two groups. Logistic regression revealed that work stress was a major joint risk factor for mental disorders in HCWs. Among all the HCWs, a total of 58 voluntarily participated in psychotherapy; the analysis showed a significant decrease in anxiety, depression, PTSD, work stress, and work risk after attending psychotherapy. There were also significant differences in positive and negative coping styles before and after psychotherapy.

Conclusion: In the present follow-up, work stress was the major contributing factor to mental disorders in HCWs. Psychotherapy is helpful in terms of stress management and should be provided to first-line COVID-19 HCWs.

Keywords: COVID-19, anxiety, depression, posttraumatic stress disorder, insomnia, work stress

Introduction

The COVID-19 pandemic is a hazard to human life as well as a health emergency in which a significant number of infections and deaths have occurred. The World Health Organization documented that the COVID-19 pandemic has caused millions of infections and hundreds of thousands of deaths.¹ Such public health emergencies affect individuals' and communities' health, safety, and well-being; the consequences may include emotional responses and morbid behaviors as well as a failure to comply with public health instructions (eg, home quarantine and immunization).^{2,3}

The COVID-19 pandemic is a global health threat and disaster, and its effect on mental health is a major threat to the pandemic response in all populations, including health care workers (HCWs).⁴⁻¹⁰ Indeed, HCWs have been prone to

psychological manifestations, such as depression, anxiety, insomnia, and stress, during the COVID-19 outbreak.^{11–20} Therefore, psychological disorders in HCWs are also an important issue to be addressed.²¹ About one thousand seven hundred studies evaluate the mental health of HCWs during the COVID-19.

Previous studies have demonstrated that emotional distress is common among COVID-19-affected populations and first-line HCWs.²² A recent review of psychological sequelae among quarantined individuals and health care providers revealed that many of the emotional consequences, including stress, depression, insomnia, irritability, fear, confusion, frustration, anger, stigma, and boredom, were associated with isolation.^{23,24} Another study conducted in Spain revealed that emotional exhaustion and secondary traumatic stress are associated with job stress and workload;²⁵ moreover, the meta-analysis showed that one third of HCWs in China suffered from anxiety, stress, and depression.²⁶ Additional research shows that the nurses exposed to COVID-19 patients experience long-lasting emotional distress.²⁷ It has been reported that 8.4% public health workers in the United States has the suicidal ideation during the COVID-19 pandemic.²⁸ Depression may be a target areas of early intervention for reduction of suicidal ideation amongst healthcare workers during the COVID-19 pandemic.²⁹

A previous report conducted by the authors of this study also indicated a high prevalence of posttraumatic stress disorder (PTSD) symptoms in HCWs in China during the COVID-19 pandemic.³⁰ Previous studies have shown that HCWs suffered from severe PTSD and PTSD symptoms during the severe acute respiratory syndrome (SARS) epidemic.^{31–34} Follow-up studies showed a higher prevalence of depression, anxiety, or PTSD symptoms as well as a higher level of stress in HCWs than in nonmedical staff, even 1–2 years after the SARS epidemic.^{35,36} To date, few follow-up data have been reported on the psychological status of HCWs after the COVID-19 pandemic.

As has already been established, confronting mental disorders in HCWs is essential for public health during the time of COVID-19, and addressing some of the psychological disorders in HCWs requires psychotherapy.³⁷ To date, different lengths of psychodynamic therapy have been developed to cure these kinds of conditions. In addition to various forms of psychotherapy, short-term psychodynamic therapy has been designed to treat multiple usual mental disorders, such as anxiety, depression, particular behavioral disorders, and personality disorders.³⁸ Short-term psychodynamic therapy varies in duration, usually lasting 12–24 sessions.³⁹

Moreover, some studies are based on the self-perception of mood and well-being during the short-term screening processes. The extended duration of the pandemic and the increase in the requirement for the gold standard of mental health measurement among HCWs, and the design of longitudinal and cross-sectional studies to generate good psychotherapy on mental health. Therefore, we assessed the psychological status of high-risk HCWs (HHCWs) and low-risk HCWs (LHCWs) by following up with the HCWs for 6 months after the first evaluation.

Methods

Study Design and Participants

The follow-up study was conducted at the Affiliated Hospital of Xuzhou Medical University, which was designated for the treatment of patients with COVID-19 by Xuzhou City, Jiangsu Province, China. All HCWs participating in this study were medical staff who worked in the Affiliated Hospital of Xuzhou Medical University from January 17, 2020, to April 1, 2020. They were divided into two groups: high-risk HCWs (HHCWs) and low-risk HCWs (LHCWs). The HHCWs comprised the medical staff (doctors, nurses, and other staff) who worked in COVID-19 wards treating COVID-19 patients. LHCWs comprised the medical staff who worked in the non-COVID-19 wards in the same hospital. Participants who (1) answered all questions in >30 minutes or <2 minutes or (2) did not answer all questions were excluded from the study. The study was approved by the Ethics Committee of the Affiliated Hospital of Xuzhou Medical University (Code: XYFY2021-KL189-01). This study was conducted in accordance with the declaration of Helsinki. Written informed consent was obtained from all participants.

Mental Disorder and Behavioral Test Evaluations in HCWs

The questionnaires containing the General Anxiety Disorder-7 (GAD-7), Patient Health Questionnaire-9 (PHQ-9),⁴⁰ Insomnia Severity Index (ISI), PTSD checklist-Civilian version, altruistic behavior, psychological resilience, job risk,

and work stress assessments after the outbreak of COVID-19 were distributed among the HCWs as previously described.³⁰ The questionnaires were self-administered and anonymous to guarantee confidentiality.

Psychotherapy

In terms of psychotherapy for HCWs, the inclusion criteria were: (1) voluntary participation; (2) PLC-C scale score > 17; (3) GAD-7 scale score > 4 points; (4) PHQ-9 scale score > 5 points; and (5) ISI scale score > 8. The HCWs who met the first criterion (voluntary participation) and one of the remaining criteria (2–5) were selected for psychotherapy.

Psychotherapy Intervention

The psychotherapy intervention was implemented in two stages. The first stage consisted of a series of lectures on mental health and psychosomatic diseases, emotional and mental health management, psychological counseling, communication skills, interpersonal relationships at work, and stress management. The lectures were delivered twice a week for four weeks by a psychological consultant at the Affiliated Hospital of Xuzhou Medical University.

The second stage involved cognitive behavioral therapy. All the participants were assigned to groups, with 10 persons in each group. A trained psychotherapist delivered a total of 10 sessions of cognitive behavioral therapy (70–90 minutes each). Multiple exercises were performed, including listening to each other's problems and guiding group members to understand the causes of anxiety and depression. All members were encouraged to participate in a number of different activities, including: (1) filling out dysfunctional thought forms; (2) explaining their common negative automatic thoughts; (3) learning relaxation exercises, supplemented by music therapy (various natural sounds); and (4) completing assigned homework.

Statistical Analysis

Data analysis was performed using IBM SPSS Statistics for Windows (Version 23.0). Continuous variables were expressed as the mean \pm standard error (SE) or the median and interquartile range, while categorical variables were analyzed as the frequency and percentage. Nonparametric statistics (Mann–Whitney *U*-tests) were utilized to assess differences between the two groups. Categorical variables were analyzed by adopting Fisher's exact test or Pearson's χ^2 test. Multifactor logistic regression modeling was used to analyze PTSD risk factors. All statistical tests were two-sided, and a *P* value of <0.05 was considered statistically significant.

Results

Demographic Characteristics and Psychological Evaluation of HCWs

The study area MAP is shown in Figure 1. In the present study, 198 HCWs were invited to participate in an online questionnaire survey; a total of 168 valid questionnaires were received (84.3% response rate). The clinical data of these 168 HCWs were collected for further analysis. The categorical variables were analyzed by the frequency and percentage, and Mann–Whitney *U*-tests were used to evaluate the statistical differences between the groups. The primary demographic data of all participants in this study are summarized in Table 1.

Among the HCWs included in the present study, 93 (55.4%) were HHCWs, and 75 (44.6%) were LHCWs. Related parameters in the two groups were analyzed. The findings indicated that gender, salary, profession, and altruistic behavior differed significantly between the two groups (*P* < 0.05). These results indicate that the proportions of gender, salary, participants based on profession, and altruistic behavior were higher in HHCWs than in LHCWs.

The HHCW group comprised 69 females (74.2%), and the proportion of doctors, nurses, and other staff was 44.1%, 52.7%, and 3.2%, respectively; meanwhile, the LHCW group comprised 45 females (60%), and the proportion of doctors, nurses, and other staff was 54.7%, 26.7%, and 18.7%, respectively. The proportion of doctors was higher in the LHCW group than in the HHCW group, and the proportion of nurses was lower in the LHCW group than in the HHCW group; the results were statistically significant ($\chi^2 = 17.579$, *P* < 0.001).

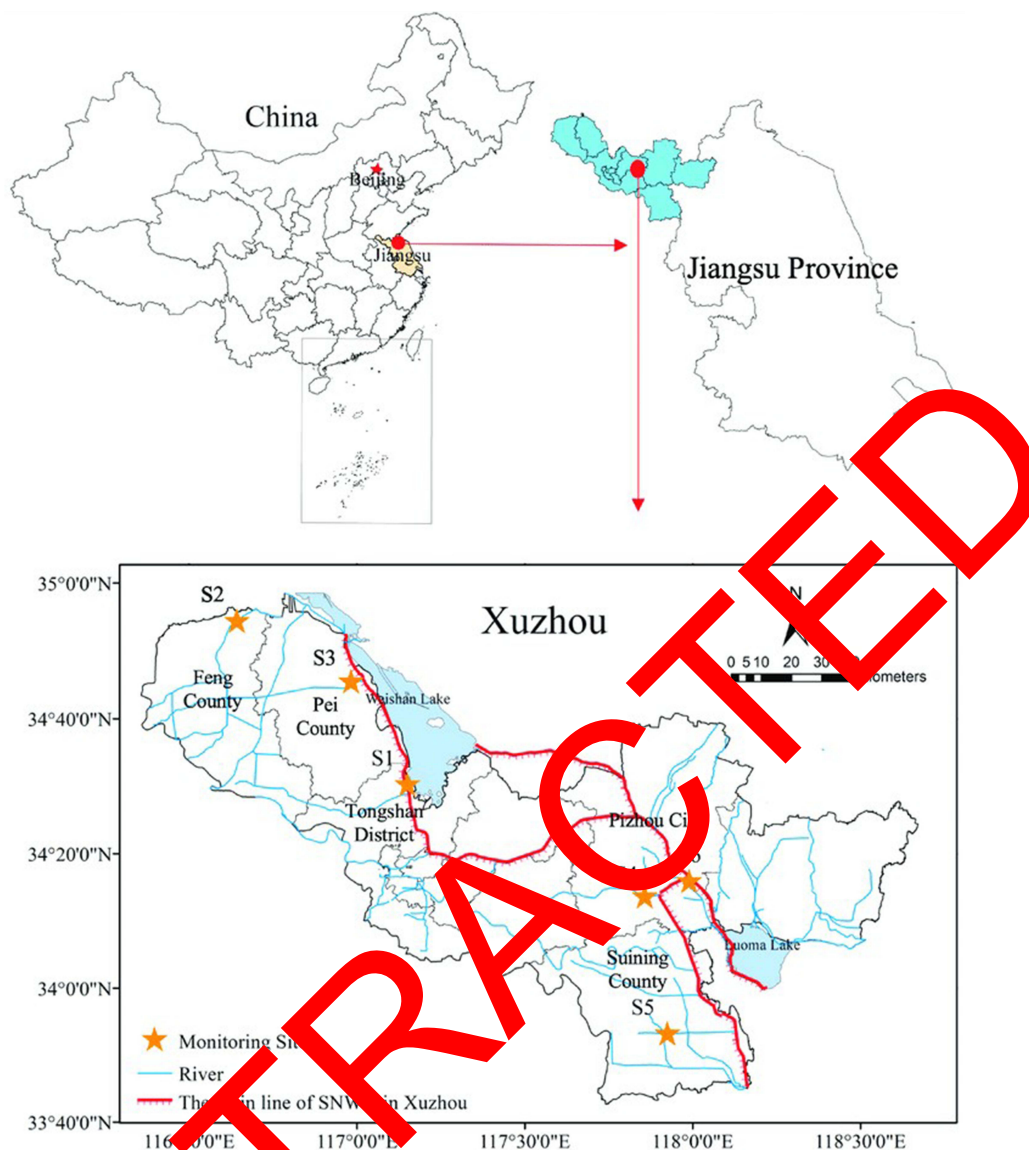


Figure 1 The study area MAP.

The proportion of HHCWs with mild (10.8%) and severe PTSD (7.5%) was comparable to the proportion of LHCWs with mild (6.7%) and severe PTSD (2.7%). There were no significant differences between the two groups ($P > 0.05$). The incidence of anxiety was 28.0% in the HHCW group and 18.7% in the LHCW group. There were no significant differences in the proportion of moderate (7.5% and 4.0%, respectively) and severe (2.2% and 1.3%, respectively) anxiety between the HHCWs and LHCWs ($P > 0.05$). Similarly, the prevalence of moderate and severe depression was 7.5% and 3.2% in the HHCW group and 4.0% and 1.3% in the LHCW group; there were no statistically significant differences between the two groups ($P > 0.05$). The prevalence of moderate and severe insomnia was 4.3% and 1.1% in the HHCW group and 2.7% and 0% in the LHCW group; there were no statistically significant differences between the two groups ($P > 0.05$).

Gender, Occupation, and Work Stress Were Associated with PTSD in HCWs

A total of 14.3% of all HCWs (18.3% of HHCWs and 9.3% of LHCWs) had PTSD at the 6-month follow-up after the COVID-19 epidemic. To further identify the risk factors for PTSD, the symptoms were classified as asymptomatic, mild, moderate, and severe based on the scale scores, and Chi-square tests were performed. The results showed that 53 (36.8%) nurses, 76 (52.8%) doctors, and 15 (10.4%) other staff members were asymptomatic. However, mild-to-moderate and

Table I The Demographic Characteristic of All the Participants

Variables	HHCW (n=93)	LHCW (n=75)	χ^2	P-value
Gender (%)			3.835	0.050
Male	24 (25.8)	30 (40.0)		
Female	69 (74.2)	45 (60.0)		
Age (years) (%)			0.716	0.699
18–30	29 (31.2)	26 (34.7)		
31–40	53 (57.0)	38 (50.7)		
41–60	11 (11.8)	11 (14.7)		
Education (%)			0.119	0.730
Bachelor	57 (61.3)	44 (58.7)		
Postgraduate	36 (38.7)	31 (41.3)		
Salary (*10,000 yuan,%)			7.551	0.023
3–8	15 (16.1)	22 (29.3)		
8–15	56 (59.1)	29 (38.7)		
More than 15	23 (24.7)	24 (32.0)		
Marital (%)			3.112	0.072
Married	75 (80.6)	51 (68.9)		
Single	17 (18.3)	21 (28.4)		
Divorced	1 (1.1)	2 (2.7)		
Profession (%)			17.579	0.000
Nurse	49 (52.7)	20 (26.7)		
Doctor	41 (44.1)	41 (54.7)		
Other stuff	3 (3.2)	4 (5.3)		
Coping style (%)			1.615	0.204
Negative coping	36 (38.7)	32 (42.7)		
Positive coping	57 (61.3)	43 (57.3)		
Altruistic behaviors	33 (26.42)	29 (38.67)	5.514	0.019
Psychological resilience	64 (51.74)	62 (51.70)	1.382	0.240
Work risk (%)			0.066	0.968
Low risk	35 (37.7)	30 (40.0)		
Moderate risk	37 (39.8)	31 (41.3)		
High risk	17 (18.5)	14 (18.7)		
Work stress (%)			0.438	0.803
Mild stress	40 (43.0)	28 (37.3)		
Moderate stress	40 (43.0)	29 (38.7)		
Severe stress	19 (20.4)	18 (24.0)		
PTSD (%)			2.911	0.233
No symptoms	76 (81.7)	68 (90.7)		
Mild	11 (10.8)	5 (6.7)		
Severe	6 (7.5)	2 (2.7)		
Anxiety (%)			2.170	0.538
No symptoms	67 (72.0)	61 (81.3)		
Mild	17 (18.3)	11 (13.3)		
Moderate	7 (7.5)	3 (4.0)		
Severe	2 (2.2)	1 (1.3)		
Depression (%)			5.372	0.147
No symptoms	61 (65.6)	61 (81.3)		
Mild	22 (23.7)	10 (13.3)		
Moderate	7 (7.5)	3 (4.0)		
Severe	3 (3.2)	1 (1.3)		
Insomnia (%)			2.221	0.528
No symptoms	69 (74.2)	61 (81.3)		
Mild	19 (20.4)	12 (19.0)		
Moderate	4 (4.3)	2 (2.7)		
Severe	1 (1.1)	0 (0)		

Abbreviation: PTSD, post-traumatic stress disorder.

severe PTSD symptoms had the highest prevalence in nurses, at 10 (62.5%) and 6 (75%) in the HHCWs and LHCWs, respectively. A total of 4 (25%) doctors had mild-to-moderate PTSD symptoms, and 2 (25%) had severe PTSD symptoms. Thus, nurses had a higher likelihood of exhibiting PTSD symptoms than doctors. The data showed no significant differences regarding age, salary, education, marital status, coping style, or psychological resilience ($P > 0.05$, Table 2). Furthermore, there was no significant difference between HHCWs and LHCWs. However, there were significant differences in gender, profession, and work stress among the non-symptomatic and symptomatic groups, including mild or moderate and severe symptomatic participants ($P < 0.05$, Table 2).

Psychological Resilience and Work Stress Were Associated with Anxiety in HCWs

A total of 23.8% of all HCWs (27.1% of HHCWs and 18.7% of LHCWs) had anxiety at the 6-month follow-up after the COVID-19 epidemic. There was no significant difference in anxiety levels between HHCWs and LHCWs at the 6-month follow-up ($P > 0.05$). The HCWs were divided into different groups based on the severity of their anxiety: the asymptomatic group, mild-to-moderate group, and severe group. The major inducing factors associated with anxiety are reported in Table 3.

Table 2 Severity of PTSD Were Compared Based on Non-Symptomatic, Mild to Moderate, and Severe Among the Subgroups

	No Symptoms	Mild or Moderate	Severe	χ^2	P-value
Gender (%)				7.029	0.030
Male	50 (34.7)	4 (25.0)	0 (0)		
Female	94 (65.3)	12 (75.0)	8 (100)		
Age (%)				2.331	0.675
18–30	45 (31.3)	7 (43.8)	3 (37.5)		
31–40	81 (56.3)	7 (43.8)	3 (37.5)		
41–60	18 (12.5)	2 (12.5)	2 (25.0)		
Education (%)				5.106	0.078
Bachelor	87 (56.9)	12 (75.0)	7 (87.5)		
Postgraduate	62 (43.1)	4 (25.0)	1 (12.5)		
Salary (*10,000 yuan, %)				2.023	0.731
3–8	30 (20.8)	5 (31.3)	2 (25.0)		
8–15	72 (50.0)	7 (43.8)	5 (62.5)		
>15	18 (12.5)	4 (25.0)	1 (12.5)		
Marital (%)				2.083	0.720
Married	109 (75.7)	11 (68.8)	7 (87.5)		
Single	32 (22.2)	5 (31.3)	1 (12.5)		
Divorced	3 (2.1)	0 (0)	0 (0)		
Profession (%)				9.566	0.048
Nurse	53 (36.8)	10 (62.5)	6 (75.0)		
Doctor	76 (52.8)	4 (25.0)	2 (25.0)		
Other stuff	15 (10.4)	2 (12.5)	0 (0)		
Exposure (%)				2.911	0.233
HHCW	76 (52.8)	11 (68.8)	6 (75.0)		
LHCW	68 (47.2)	5 (31.3)	2 (25.0)		
Coping style (%)				0.704	0.703
Negative coping	48 (33.3)	7 (43.8)	3 (37.5)		
Positive coping	96 (66.7)	9 (56.3)	5 (62.5)		
Altruistic behaviors	33 (24, 40)	33 (24.5, 35.5)	32.5 (20.5, 42)	0.028	0.986
Psychological resilience	64.5 (52, 74)	56 (47, 64)	54 (50.5, 63)	5.612	0.060
Work risk (%)	4 (2, 5)	5.5 (3, 7)	4 (3, 6)	4.678	0.096
Work stress (%)	4 (2, 6)	6 (5, 9)	6 (4, 7.5)	10.964	0.004

Table 3 Severity of Anxiety Were Compared Based on Non-Symptomatic, Mild/Moderate, and Severe in Among the Subgroups

	No Symptoms	Mild	Moderate	Severe	χ^2	P-value
Gender (%)					3.203	0.361
Male	43 (34.7)	9 (25.0)	2 (0)	0		
Female	85 (65.3)	18 (75.0)	8 (100)	3		
Age (%)					1.228	0.975
18–30	42 (32.8)	9 (33.3)	3 (30.0)	1 (33.3)		
31–40	70 (54.7)	14 (51.9)	6 (60.0)	1 (33.3)		
41–60	16 (12.5)	4 (14.8)	1 (10.0)	1 (33.3)		
Education (%)					3.607	0.307
Bachelor	75 (58.6)	16 (59.3)	7 (70.0)	2 (100.0)		
Postgraduate	53 (41.4)	11 (40.7)	3 (30.0)	0 (0)		
Salary (*10,000 yuan, %)					3.359	0.173
3–8	28 (21.9)	7 (25.9)	1 (10.0)	1 (33.3)		
8–15	63 (49.2)	15 (55.6)	5 (50.0)	1 (33.3)		
>15	37 (28.9)	5 (18.5)	4 (40.0)	1 (33.3)		
Marital (%)					2.985	0.814
Married	95 (74.2)	21 (77.8)	8 (80.0)	3 (100)		
Single	31 (24.2)	5 (18.5)	2 (20.0)	0 (0)		
Divorced	1 (1.6)	1 (3.7)	0 (0)	0 (0)		
Profession (%)					8.521	0.202
Nurse	50 (39.1)	12 (44.4)	4 (40.0)	3 (100.0)		
Doctor	67 (52.3)	10 (37.0)	5 (50.0)	0 (0)		
Other stuff	11 (8.6)	5 (18.5)	1 (10.0)	0 (0)		
Exposure (%)					2.170	0.538
HHCW	67 (52.3)	10 (37.0)	4 (40.0)	2 (66.7)		
LHCW	61 (47.7)	10 (37.0)	3 (30.0)	1 (33.3)		
Coping style (%)					0.274	0.971
Negative coping	48 (37.5)	10 (37.0)	3 (30.0)	1 (33.3)		
Positive coping	70 (54.7)	14 (51.9)	7 (70.0)	2 (66.7)		
Altruistic Behaviors	44 (34.4)	25 (37.5)	41 (32, 44)	44 (30.5, 46)	3.748	0.290
Psychological Resilience	65.5 (48.5, 75)	52 (48.5, 62)	51 (44, 59)	66 (54, 69)	18.374	0.000
Work risk (%)	4 (2, 6)	3 (3, 6)	5 (4, 6)	8 (6, 8.5)	5.913	0.116
Work stress (%)	4 (2, 6)	6 (4, 7)	6.5 (5, 9)	8 (6.5, 8.5)	15.871	0.001

The Chi-square tests and Z-tests showed no significant differences in age, gender, education, salary, marital status, coping style, altruistic behavior, and work risk among the different groups. However, the median values of 52 (48.5, 62), 51 (44, 59), and 66 (54, 69) for mild, moderate, and strong resilience, respectively, differed significantly across the groups (Table 3, $P < 0.001$). Furthermore, the data showed statistically significant differences in work stress among the groups (Table 3, $X^2 = 15.871$, $P < 0.001$).

Psychological Resilience and Work Stress Were Associated with Depression

A total of 30.0% of HCWs (34.4% of HHCWs and 20.0% of LHCWs) had depression at the 6-month follow-up after the COVID-19 epidemic. There was no significant differences in depression severity between the HHCW group and LHCW group ($P > 0.05$), indicating that most HCWs had recovered from depression at the 6-month follow-up. Based on the severity of depression, the HCWs were divided into three groups: the asymptomatic group, mild-moderate group, and severe group. Gender, age, education, salary, marital status, profession, exposure to COVID-19, coping style, altruistic behavior, and work risk were not associated with the severity of depression ($P > 0.05$); however, the data demonstrated that psychological resilience and work stress were closely associated with the severity of depression ($P < 0.001$, Table 4).

Table 4 Severity of Depression Were Compared Based on Non-Symptomatic, Mild/Moderate, and Severe in Among the Subgroups

	No Symptoms	Mild	Moderate	Severe	χ^2	P value
Gender (%)					6.211	0.102
Male	42 (34.4)	11 (34.4)	1 (10.0)	0 (0)		
Female	80 (65.6)	21 (65.6)	9 (90.0)	4 (100.0)		
Age (%)					13.443	0.054
18–30	39 (32.0)	11 (34.4)	1 (10.0)	4 (100)		
31–40	68 (55.7)	15 (46.9)	8 (80.0)	0 (0)		
41–60	15 (12.3)	6 (18.8)	1 (10.0)	0 (0)		
Education (%)					4.687	0.196
Bachelor	71 (58.2)	19 (59.4)	7 (70.0)	4 (100.0)		
Postgraduate	51 (41.8)	13 (40.6)	3 (30.0)	0 (0)		
Salary (*10,000 yuan, %)					5.009	0.500
3–8	30 (24.6)	4 (12.5)	1 (10.0)	2 (33.3)		
8–15	58 (47.5)	18 (56.3)	6 (60.0)	2 (33.3)		
>15	34 (27.9)	10 (31.3)	3 (30.0)	0 (0)		
Marital (%)					2.469	0.872
Married	92 (75.4)	25 (78.1)	8 (80.0)	2 (50.0)		
Single	28 (23.0)	6 (18.8)	2 (20.0)	2 (50.0)		
Divorced	2 (1.6)	1 (3.1)	0 (0)	0 (0)		
Profession (%)					8.405	0.210
Nurse	46 (37.7)	14 (43.8)	6 (60.0)	3 (75.0)		
Doctor	65 (53.3)	14 (43.8)	3 (30.0)	0 (0)		
Other stuff	11 (9.0)	4 (12.5)	1 (10.0)	1 (25.0)		
Exposure (%)					5.372	0.147
HHCW	61 (50.0)	21 (65.6)	7 (70.0)	3 (75.0)		
LHCW	61 (50.0)	10 (31.3)	3 (30.0)	1 (25.0)		
Coping style (%)					1.136	0.768
Negative coping	44 (36.1)	14 (43.8)	3 (30.0)	1 (25.0)		
Positive coping	78 (63.9)	18 (56.3)	7 (70.0)	3 (75.0)		
Altruistic behaviors	32.5 (26.40)	31 (96.5)	36 (34.44)	34 (22, 47.5)	3.548	0.315
Psychological resilience	52.5 (55, 7)	53.5 (47.5, 66.5)	52.5 (42, 57)	55 (50, 65.5)	17.903	0.000
Work risk (%)	4 (2, 5)	4 (3, 5.5)	5.5 (3, 6)	3.5 (1, 7)	2.175	0.537
Work stress (%)	7 (2, 6)	5 (4, 7)	7 (5, 8)	7 (2.5, 9)	11.989	0.007

Psychological Resilience, Work Risk, and Work Stress Were Associated with Insomnia

A total of 29.2% of all HCWs, 25.8% of HHCWs and 18.7% of LHCWs had insomnia at the 6-month follow-up after the COVID-19 epidemic. The analysis did not show any significant differences between the HHCW group and LHCW group, indicating that most HCWs had recovered from insomnia at 6 months after the outbreak (Table 5).

The Chi-square test and Z-test were applied to assess the factors possibly correlated with asymptomatic, mild, moderate, and severe insomnia. The data indicated that gender, age, education, salary, marital status, profession, exposure to COVID-19, coping style, and altruistic behavior were not associated with the severity of insomnia ($P > 0.05$); however, psychological resilience, work risk, and work stress were associated with the severity of insomnia ($P < 0.05$).

Common Risk Factors Associated with Anxiety, Depression, Insomnia, and PTSD

Logistic regression analysis was applied to identify the joint risk factors for moderate-to-severe PTSD, anxiety, depression, and insomnia. The results did not show a difference between HHCWs and LHCWs; however, they showed that work stress was a common inducer associated with moderate-to-severe PTSD, anxiety, depression, and insomnia. The analysis revealed that insomnia (odds ratio [OR] = 1.98, confidence interval [CI]: 1.04–3.78), depression (OR = 2.05, CI: 1.30–3.23), and anxiety (OR = 2.13, CI: 1.34–3.4) had lower ORs than PTSD (OR = 3.00, CI: 1.55–5.80), suggesting that HCWs were more likely to develop moderate-to-severe PTSD symptoms than other people (Table 6).

Table 5 Severity of Insomnia Were Compared Based on Non-Symptomatic, Mild/Moderate, and Severe in Among the Subgroups

	No Symptoms	Mild	Moderate	Severe	χ^2	P value
Gender (%)					1.568	0.667
Male	42 (33.1)	10 (32.3)	2 (16.7)	0		
Female	87 (66.9)	21 (67.7)	5 (83.3)	1 (100)		
Age (%)					3.216	0.781
18–30	40 (30.8)	12 (38.7)	2 (33.3)	1 (100)		
31–40	72 (55.4)	16 (51.6)	3 (50.0)	0 (0)		
41–60	18 (13.8)	3 (9.7)	1 (16.7)	0 (0)		
Education (%)					0.995	0.3944
Bachelor	76 (59.4)	19 (59.4)	5 (71.4)	1 (100.0)		
Postgraduate	52 (40.6)	13 (40.6)	2 (28.6)	0 (0)		
Salary (10,000 yuan, %)					1.17	0.76
3–8	27 (20.8)	8 (25.8)	2 (33.3)	0 (0)		
8–15	68 (52.3)	13 (41.9)	2 (33.3)	1 (100)		
>15	35 (26.9)	10 (32.3)	2 (33.3)	0 (0)		
Marital (%)					4.840	0.565
Married	99 (76.2)	23 (75.0)	5 (83.3)	1 (100)		
Single	28 (21.5)	8 (25.8)	2 (16.7)	0 (0)		
Divorced	3 (2.3)	0 (0)	0 (0)	0 (0)		
Profession (%)					6.469	0.373
Nurse	52 (40.0)	13 (41.9)	3 (50.0)	1 (100)		
Doctor	67 (51.5)	12 (38.7)	3 (50.0)	0 (0)		
Other stuff	11 (8.5)	6 (19.4)	0 (0)	0 (0)		
Exposure (%)					2.221	0.528
HHCW	69 (53.1)	12 (38.7)	1 (16.7)	1 (100)		
LHCW	61 (46.9)	12 (38.7)	2 (33.3)	0		
Coping style (%)					1.072	0.851
Negative coping	43 (33.6)	12 (37.5)	3 (50.0)	0 (0)		
Positive coping	72 (56.4)	20 (62.5)	4 (66.7)	1 (100)		
Altruistic behaviors	30 (24, 40)	25 (25, 40)	30.5 (18, 44)		1.387	0.790
Psychological resilience	65 (50, 64)	55 (50, 65)	50.5 (46, 68)		8.501	0.037
Work risk (%)	3 (2, 5)	4 (3, 6)	5.5 (5, 7)		10.103	0.018
Work stress (%)	4 (2, 6)	6 (5, 7)	5 (6, 9)		17.219	0.001

Health Status of the HCWs Before and After Psychotherapy

After the first psychological status evaluation of all HCWs during the COVID-19 epidemic in the previous paper conducted by the authors of this study (14), a total of 58 HCWs with high psychological evaluation scores voluntarily participated in psychotherapy. The psychological scores from the first evaluation during the COVID-19 epidemic and the scores from the 6-month follow-up were compared. Before psychotherapy, the prevalence of mild, moderate, and severe

Table 6 Logistic Regression Analysis for the Risk Factors Associated with Anxiety, Depression, Insomnia, and PTSD

	Anxiety		Depression		Insomnia		PTSD	
	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value
Psychological resilience	0.95 (0.93–0.98)	0.00	0.97 (0.95–0.99)	0.00	0.97 (0.95–1.0)	0.06		
Work stress	2.13 (1.34–3.4)	0.00	2.05 (1.30–3.23)	0.00	1.98 (1.04–3.78)	0.04	3.00 (1.55–5.80)	0.00
Work risk					1.78 (0.95–3.34)	0.07		
Gender							0.51 (0.13–1.94)	0.32
Profession							0.53 (0.22–1.28)	0.16

Abbreviations: CI, confidence interval; OR, odds ratio; PTSD, post-traumatic stress disorder.

Table 7 Psychological Analysis Before and After Psychotherapy

	Before	After	χ^2/Z	P value
Gender				
Male	22	22		
Female	36	36		
Exposure				
HHCW	32	32		
LHCW	26	26		
Anxiety (%)			9.640	0.022
No symptoms	28 (48.3)	44 (75.9)		
Mild	18 (31.0)	9 (15.5)		
Moderate	10 (17.2)	4 (6.9)		
Severe	2 (3.4)	1 (1.7)		
Depression (%)			11.345	0.001
No symptoms	27 (46.6)	44 (75.9)		
Minor	17 (29.3)	7 (12.1)		
Moderate	10 (17.2)	6 (10.3)		
Severe	4 (6.9)	1 (1.7)		
PTSD (%)			5.683	0.015
No symptoms	35 (60)	49 (84.5)		
Mild	15 (25.9)	6 (10.3)		
Severe	8 (13.8)	3 (5.2)		
Insomnia (%)			9.483	0.024
No symptoms	33 (56.9)	47 (81.0)		
Mild	18 (31.0)	9 (15.5)		
Moderate	6 (10.3)	1 (1.7)		
Severe	1 (1.7)	1 (1.7)		
Psychological resilience	57 (50, 68)	57.5 (50, 70)	-0.036	0.971
Coping style (%)			5.375	0.020
Negative coping	27 (46.6)	15 (25.9)		
Positive coping	31 (53.4)	43 (74.1)		
Work risk	5 (8.6)	3 (5.2)	-4.090	0.000
Work stress	4 (6.9)	4 (6.9)	-3.234	0.001

Abbreviation: PTSD, post-traumatic stress disorder.

anxiety in the 58 HCW was 31.0%, 17.2%, and 3.4%, respectively; after psychotherapy, the prevalence was 15.5%, 6.9%, and 1.7%, respectively. Therefore, the prevalence of anxiety significantly decreased after the treatment. Similarly, the prevalence of depression, PTSD, insomnia, work risk, work stress, and negative coping styles after psychotherapy was lower than before psychotherapy ($P < 0.05$, Table 7). In addition, the proportion of positive coping styles after treatment was higher than before treatment ($P < 0.05$).

Discussion

Natural disasters are associated with a high prevalence of mental instability, including PTSD, insomnia, anxiety, and depression.⁴¹ In terms of natural disasters, such as tsunami, in Japan, the results indicated that trauma, depression, and resilience were prominent among the survivors.⁴² Moreover, children with an adverse childhood experience after the 2011 earthquake or tsunami have a high risk of developing PTSD within the next 2 years.⁴³

As the COVID-19 pandemic was a bio-disaster with a profound psychological effect on health workers, the enormous stress caused might induce rapid psychological status changes among people.^{24,44,45} Detecting these alterations in the acute phase could enhance the understanding of coping strategies and increase the ability to improve subject quality of life.

In light of a previous publication,³⁰ a 6-month follow-up on the psychological consequences of COVID-19 in health care settings was conducted in the present study. The primary outcomes were as follows: (1) there were no differences in depression, anxiety, PTSD, and insomnia scores between the HHCWs and the LHCWs, indicating a gradual improvement in the psychological status of most HCWs; (2) gradual adaptation to COVID-19, mental flexibility, and coping styles resulted in a nonsignificant difference in the levels of psychological symptoms between HHCWs and LHCWs; (3) nurses were more likely to be affected by PTSD than other professional roles; (4) job risk and working stress in COVID-19 units were the leading risk factors for PTSD symptoms; (5) work stress was a joint significant inducer of depression, anxiety, insomnia, and PTSD; and (6) psychotherapy relieved symptoms in HCWs with high scores on psychological evaluations.

In a cross-sectional study conducted during the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) epidemic in 2015, approximately 42.9% of survivors still had PTSD, and 27% of survivors had depression 12 months after the MERS-CoV outbreak.⁴⁶ Another study comprising 769 HCWs (SARS and non-SARS unit) was conducted after 19 months. The HCWs in the SARS unit were reported to have higher PTSD and psychological distress than HCWs in the non-SARS unit.⁴⁷ Furthermore, a systematic review including 44 studies showed that 41–73.4% of HCWs experienced PTSD-type symptoms during the latest outbreaks of SARS, MERS-CoV, Ebola, and influenza A. These symptoms persisted for at least 1–3 years in 10–40% of HCWs.^{48–50} In addition, the results of a self-administered questionnaire showed that the estimated prevalence of anxiety symptoms (23.1%), depression (23.6%), PTSD (70.9%), and comorbidities (44.7%) indicated that natural disasters had affected the incidence of mental illness among tsunami survivors.⁴²

In contrast, the present study shows that only a small number of HCWs had symptoms such as PTSD (14.3%), insomnia (29.2%), anxiety (23.8%), and depression (30.0%) 6 months after the COVID-19 epidemic. However, incidence rates of 28.7% for PTSD, 63.8% for anxiety, 64.8% for depression, and 35.2% for insomnia were found in the HHCW group.³⁰ These results indicated that the mental status of HCWs was greatly improved after 6 months of recovery. There were no significant differences in PTSD, depression, anxiety, and insomnia between the HHCW group and LHCW group, although the prevalence of these symptoms was still slightly higher in the HHCW group. One important reason for this may be the psychotherapy undertaken by the HCWs after the COVID-19 epidemic. Many mental health problems, such as depression, anxiety, and PTSD, may have been existing among the HCWs before the COVID-19. The results indicated that after the COVID-19 epidemic there is a high percentage of people suffering from PTSD, while in HCWs the percentage is low. This is not surprising, as HCWs are prepared for this type of emergency. Similarly, policemen do not exhibit stress when they are exposed to serious risks to their safety during public order activities.⁵¹ In this study, psychotherapy significantly improved mental health symptoms after treatment, indicating the clinical significance of psychological support for HCWs.

In addition, as far as health care roles are concerned, nurses have a higher chance of developing psychological disorders than other professional roles. A recent study conducted among frontline nurses fighting COVID-19 in Wuhan and Shanghai reported that job stress (longer shift hours) was associated with considerable pressure during the COVID-19 epidemic in China.⁴² This may be supported by the fact that in Spain, the female gender was found to be a risk factor for adverse psychological effects during the emerging COVID-19 pandemic.⁴⁵ In addition, more severe symptoms of depression, insomnia, and anxiety were reported in nurses exposed to COVID-19 than in other HCWs.⁵³ The workload, night shifts, and greater exposure to high-risk patients after the COVID-19 outbreak possibly made nurses more prone to depression, anxiety, insomnia, and PTSD than doctors.⁵⁴ Similarly, during the SARS epidemic in 2003, depression and (33%) PTSD were reported (38.5%) in nurses shortly after the disease outbreak.⁵⁵ The results of the present study supported that nurses are a susceptible population during the COVID-19 pandemic. Therefore, nurses should receive more attention and support to relieve their mental symptoms during and after the COVID-19 pandemic.

The present study evaluated the effect of psychotherapy on HCWs with high psychological scale scores. The findings revealed a significant reduction in moderate-to-severe symptoms of anxiety, depression, PTSD, and insomnia as well as job risk, job stress, and negative coping styles. The results of the present study are consistent with the results of other studies on psychotherapy.

Online psychotherapy which is traditionally limited within psychiatric patients, now is also useful for other mental disorders, even healthcare providers and clinicians.^{56–58} The most evidence-based treatment is cognitive behavioral therapy (CBT), especially Internet CBT that can prevent the spread of infection during the pandemic. Zhang et al has concluded that the CBT are useful and efficacious for both psychiatric and medical conditions, and they proposed that

Moodle could be used as a cost effective method for Internet CBT.⁵⁹ Besides, it is reported that Internet CBT can treat psychiatric symptoms such as insomnia.⁶⁰ The present study also demonstrated the temporal effect of COVID-19 on depression, anxiety, PTSD, and sleep disturbance. The temporal effect specifies a gradual symptom reduction from the baseline, reflecting a greater psychological resilience. The psychological adaptation of HCWs in the COVID-19 ward may be related to improvements in knowledge of the disease over time, increase in experience managing COVID-19 patients, reduction in perceived negative emotions, and maintenance of positive coping behaviors.⁶¹

The present study has several limitations. First, this is a single-center study and the size of the HCW sample may be too small to represent the whole population, therefore a multi-center study should be conducted to further analysis the mental health of HCWs. Second, this study did not report the time framework of all HCWs in the COVID-19 ward, which is a really important complement to analysis the mental health of HCWs. Third, we do not explore suicidal ideation within HCWs which perhaps the subject of a future study, with the relevant reference emphasizing the practical implications of using such a scale such as Beck's Suicidal Ideation Scale.⁶² Finally, the study was performed in a non-core epidemic area in China, and the COVID-19-induced stress may be lower than in core epidemic areas, promoting mental health recovery within a short time period. So it is possible that percentage bias occurred. Future studies would be improved if more HCWs from different province in China included. However, the current study had strength; this is the first study compare the mental health of high-risk health care workers (HHCWs) and low-risk HCWs (LHCWs) who were respectively exposed to COVID-19 wards and non-COVID-19 wards by following up on mental disorders in HCWs in China for 6 months.

Conclusion

This survey on the mental health of HCWs caring for COVID-19 patients showed the recovery of mental health symptoms, such as PTSD, depression, anxiety, and insomnia, in HHCWs and LHCWs at 6 months after the COVID-19 epidemic in a non-core epidemic area in China. Psychotherapy improved the mental status of HHCWs after COVID-19. The mental health of HCWs is an integral part of the public health response to the COVID-19 outbreak. Therefore, targeted interventions need to be implemented immediately to promote the mental health of HCWs exposed to COVID-19, especially nurses and female HCWs.

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References

1. Kontis V, Bennett S, Rashid T, et al. Magnitude, demographics and dynamics of the effect of the first wave of the COVID-19 pandemic on all-cause mortality in 21 industrialized countries. *Nat Med*. 2020;26(12):1919–1928. doi:10.1038/s41591-020-1112-0
2. Hwang TJ, Rabheru K, Peisah C, Reichman W, Ikeda M. Loneliness and social isolation during the COVID-19 pandemic. *Int Psychogeriatr*. 2020;32(10):1217–1220. doi:10.1017/S1041610220000988
3. Liu LT, Li J, Peng GY, et al. Analysis of similarities and differences between coronavirus disease 2019 and severe acute respiratory syndrome. *World J Tradit Chin Med*. 2020;6(2):7.
4. Salas RN, Shultz JM, Solomon CG. The climate crisis and covid-19 - A major threat to the pandemic response. *N Engl J Med*. 2020;383(11):e70. doi:10.1056/NEJMp2022011
5. Magnavita N, Soave PM, Antonelli M, One-Year Prospective A. Study of work-related mental health in the intensivists of a COVID-19 hub hospital. *Int J Environ Res Public Health*. 2021;18(18):9888. doi:10.3390/ijerph18189888
6. Wang C, Chudzicka-Czupala A, Tee ML, et al. A chain mediation model on COVID-19 symptoms and mental health outcomes in Americans, Asians and Europeans. *Sci Rep*. 2021;11(1):6481. doi:10.1038/s41598-021-85943-7
7. Wang C, Tee M, Roy AE, et al. The impact of COVID-19 pandemic on physical and mental health of Asians: a study of seven middle-income countries in Asia. *PLoS One*. 2021;16(2):e0246824. doi:10.1371/journal.pone.0246824

8. Lee Y, Lui LMW, Chen-Li D, et al. Government response moderates the mental health impact of COVID-19: a systematic review and meta-analysis of depression outcomes across countries. *J Affect Disord.* **2021**;290:364–377. doi:10.1016/j.jad.2021.04.050
9. Ceban F, Nogo D, Carvalho IP, et al. Association between mood disorders and risk of COVID-19 infection, hospitalization, and death: a systematic review and meta-analysis. *JAMA Psychiatry.* **2021**;78(10):1079–1091. doi:10.1001/jamapsychiatry.2021.1818
10. Renaud-Charest O, Lui LMW, Eskander S, et al. Onset and frequency of depression in post-COVID-19 syndrome: a systematic review. *J Psychiatr Res.* **2021**;144:129–137. doi:10.1016/j.jpsychires.2021.09.054
11. Magnavita N, Tripepi G, Di Prinzio RR. Symptoms in health care workers during the COVID-19 epidemic. A cross-sectional survey. *Int J Environ Res Public Health.* **2020**;17(14):5218. doi:10.3390/ijerph17145218
12. Azoulay E, Cariou A, Bruneel F, et al. Symptoms of anxiety, depression, and peritraumatic dissociation in critical care clinicians managing patients with COVID-19. *Am J Respir Crit Care Med.* **2020**;202(10):1388–1398. doi:10.1164/rccm.202006-2568OC
13. Guo WP, Min Q, Gu WW, et al. Prevalence of mental health problems in frontline healthcare workers after the first outbreak of COVID-19 in China: a cross-sectional study. *Health Qual Life Outcomes.* **2021**;19(1):103. doi:10.1186/s12955-021-01743-7
14. Nguyen AN, Le XTT, Ta NTK, et al. Knowledge and self-protective practices against COVID-19 among healthcare workers in Vietnam. *Front Public Health.* **2021**;9:658107. PMID: 34778159; PMCID: PMC8580945. doi:10.3389/fpubh.2021.658107
15. Le XTT, Nguyen QT, Onyango B, et al. Perception toward exposure risk of COVID-19 among health workers in Vietnam: status and correlated factors. *Front Public Health.* **2021**;9:589317. doi:10.3389/fpubh.2021.589317
16. Ho RC, Tran BX, McIntyre RS. The impact of COVID-19 pandemic on global mental health: from the general public to healthcare workers. *Ann Acad Med Singap.* **2021**;50(3):198–199. doi:10.47102/annals-acadmedsg.202189
17. Chew NWS, Lee GKH, Tan BYQ, et al. A multinational, multicentre study on the psychological outcomes and associated physical symptoms amongst healthcare workers during COVID-19 outbreak. *Brain Behav Immun.* **2020**;88:559–565. doi:10.1016/j.bbi.2020.04.049
18. Tan BYQ, Chew NWS, Lee GKH, et al. Psychological impact of the COVID-19 pandemic on health care workers in Singapore. *Ann Intern Med.* **2020**;173(4):317–320. doi:10.7326/M20-1083
19. Tan YQ, Wang Z, Yap QV, et al. Psychological health of surgeons in a time of COVID-19: a cross-sectional survey. *Ann Surg.* **2021**. doi:10.1097/SLA.0000000000004775
20. Pham QT, Le XTT, Phan TC, et al. Impacts of COVID-19 on the life and work of healthcare workers during the nationwide partial lockdown in Vietnam. *Front Psychol.* **2021**;12:563193. doi:10.3389/fpsyg.2021.563193
21. Magill E, Siegel Z, Pike KM. The mental health of frontline health care providers during pandemic: a rapid review of the literature. *Psychiatr Serv.* **2020**;71(12):1260–1269. doi:10.1176/appi.ps.202000274
22. Vizheh M, Qorbani M, Arzaghi SM, Muhidin S, Javanmard Z, Esmaili M. The mental health of healthcare workers in the COVID-19 pandemic: a systematic review. *J Diabetes Metab Disord.* **2020**;19:1–12.
23. Serafini G, Parmigiani B, Amerio A, Aguglia A, Sher L, Amore M. The psychological impact of COVID-19 on the mental health in the general population. *QJM.* **2020**;113:531–537. doi:10.1093/qjmed/hcaa201
24. De Kock JH, Latham HA, Leslie SJ, et al. A rapid review of the impact of COVID-19 on the mental health of healthcare workers: implications for supporting psychological well-being. *BMC Public Health.* **2020**;21(1):1–14. doi:10.1186/s12889-020-10070-3
25. Moreno-Jimenez JE, Blanco-Donoso LM, Chico-Fernandez V, Beltrán-Hernández S, Moreno-Jimenez B, Garrosa E. The Job Demands And Resources Related to COVID-19 in predicting emotional exhaustion and secondary traumatic stress among health professionals in Spain. *Front Psychol.* **2021**;12:564036. doi:10.3389/fpsyg.2021.564036
26. Dong F, Liu HL, Yang M, et al. Immediate psychosocial impact on healthcare workers during COVID-19 pandemic in China: a systematic review and meta-analysis. *Front Psychol.* **2021**;12:55460.
27. Ranieri J, Guerra F, Perilli E, et al. Prolonged COVID-19 outbreak and psychological response of nurses in Italian healthcare system: cross-sectional study. *Front Psychol.* **2021**;12:608173.
28. Bryant-Genevier J, Rao CY, Lopez-Londoño B, et al. Symptoms of depression, anxiety, post-traumatic stress disorder, and suicidal ideation among state, tribal, local, and territorial public health workers during the COVID-19 pandemic - United States, March-April 2021. *MMWR Morb Mortal Wkly Rep.* **2021**;70(48):1685–1685.
29. Sahimi HMS, Mohd Daud TI, Chan LF, Sha SA, Rahman FHA, Nik Jaafar NR. Depression and suicidal ideation in a sample of Malaysian healthcare workers: preliminary study during the COVID-19 pandemic. *Front Psychiatry.* **2021**;12:658174. doi:10.3389/fpsyg.2021.658174
30. Chen H, Wang B, Wang Y, et al. Prevalence of posttraumatic stress symptoms in health care workers after exposure to patients with COVID-19. *Neurobiol Stress.* **2020**;22:100261. doi:10.1016/j.ynstr.2020.100261
31. Lin CY, Peng W, Wu Y, Chang J, Chan CH, Yang DY. The psychological effect of severe acute respiratory syndrome on emergency department staff. *Emerg Med.* **2007**;20(1):15–17.
32. Reynolds DL, Gray JR, Deamond SL, Moran MK, Gold W, Styra R. Understanding, compliance and psychological impact of the SARS quarantine experience. *Emerg Infect Dis.* **2008**;136(7):997–1007. doi:10.1017/S0950268807009156
33. McAlonan GM, Lee AM, Cheung V, et al. Immediate and sustained psychological impact of an emerging infectious disease outbreak on health care workers. *Can J Psychiatry.* **2007**;52(4):241–247. doi:10.1177/070674370705200406
34. Mak IW, Chu J, Pan PC, Yiu MG, Chan VL. Long-term psychiatric morbidities among SARS survivors. *Gen Hosp Psychiatry.* **2009**;31(4):318–326.
35. Lee AM, Wong JG, McAlonan GM, et al. Stress and psychological distress among SARS survivors 1 year after the outbreak. *Can J Psychiatry.* **2007**;52(4):233–240. doi:10.1177/070674370705200405
36. Lancee WJ, Maunder RG, Goldbloom DS. Coauthors for the impact of SS. prevalence of psychiatric disorders among Toronto hospital workers one to two years after the SARS outbreak. *Psychiatr Serv.* **2008**;59(1):91–95. doi:10.1176/ps.2008.59.1.91
37. Hooper JJ, Saulsman L, Hall T, Waters F. Addressing the psychological impact of COVID-19 on healthcare workers: learning from a systematic review of early interventions for frontline responders. *BMJ Open.* **2021**;11(5):e044134.
38. Humer E, Haid B, Schimbock W, et al. Provision of psychotherapy one year after the beginning of the COVID-19 pandemic in Austria. *Int J Environ Res Public Health.* **2021**;18(11):5843.
39. Abbass AA, Kisely SR, Town JM, et al. Short-term psychodynamic psychotherapies for common mental disorders. *Cochrane Database Syst Rev.* **2014**;2014(7):CD004687.

40. Costantini L, Pasquarella C, Odone A, et al. Screening for depression in primary care with patient health questionnaire-9 (PHQ-9): a systematic review. *J Affect Disord.* **2021**;279:473–483. doi:10.1016/j.jad.2020.09.131
41. Makwana N. Disaster and its impact on mental health: a narrative review. *J Family Med Prim Care.* **2019**;8(10):3090–3095.
42. Kar N, Krishnaraaj R, Rameshraj K. Long-term mental health outcomes following the 2004 Asian tsunami disaster: a comparative study on direct and indirect exposure. *Disaster Health.* **2014**;2(1):35–45. doi:10.4161/dish.24705
43. Inoue Y, Stickley A, Yazawa A, et al. Adverse childhood experiences, exposure to a natural disaster and posttraumatic stress disorder among survivors of the 2011 Great East Japan earthquake and tsunami. *Epidemiol Psychiatr Sci.* **2019**;28(1):45–53. doi:10.1017/S2045796017000233
44. Esterwood E, Saeed SA. Past epidemics, natural disasters, COVID19, and mental health: learning from history as we deal with the present and prepare for the future. *Psychiatr Q.* **2020**;91(4):1121–1133. doi:10.1007/s11126-020-09808-4
45. Rodriguez-Rey R, Garrido-Hernansaiz H, Collado S. Psychological impact and associated factors during the initial stage of the coronavirus (COVID-19) pandemic among the general population in Spain. *Front Psychol.* **2020**;11:1540. doi:10.3389/fpsyg.2020.01540
46. Park HY, Park WB, Lee SH, et al. Posttraumatic stress disorder and depression of survivors 12 months after the outbreak of Middle East respiratory syndrome in South Korea. *BMC Public Health.* **2020**;20(1):605. doi:10.1186/s12889-020-08726-1
47. Maunder RG, Lancee WJ, Balderson KE, et al. Long-term psychological and occupational effects of providing hospital healthcare during SARS outbreak. *Emerg Infect Dis.* **2006**;12(12):1924–1932. doi:10.3201/eid1212.060584
48. Preti E, Di Mattei V, Perego G, et al. The psychological impact of epidemic and pandemic outbreaks on healthcare workers: rapid review of the evidence. *Curr Psychiatry Rep.* **2020**;22(8):43. doi:10.1007/s11920-020-01166-z
49. Goulia P, Mantas C, Dimitroula D, Mantis D, Hyphantis T. General hospital staff worries, perceived sufficiency of information and associated psychological distress during the A/H1N1 influenza pandemic. *BMC Infect Dis.* **2010**;10:322. doi:10.1186/1471-2334-10-322
50. Liu X, Kakade M, Fuller CJ, et al. Depression after exposure to stressful events: lessons learned from the severe acute respiratory syndrome epidemic. *Compr Psychiatry.* **2012**;53(1):15–23. doi:10.1016/j.comppsy.2011.02.003
51. Garbarino S, Magnavita N, Elovainio M, et al. Police job strain during routine activities and a major event. *Occup Med.* **2011**;61(6):395–399. doi:10.1093/occmed/kqr058
52. Zhang Y, Wang C, Pan W, et al. Stress, burnout, and coping strategies of frontline nurses during the COVID-19 epidemic in Wuhan and Shanghai, China. *Front Psychiatry.* **2020**;11:565520. doi:10.3389/fpsyg.2020.565520
53. Lai J, Ma S, Wang Y, et al. Factors associated with mental health outcomes among healthcare workers exposed to coronavirus disease 2019. *JAMA Netw Open.* **2020**;3(3):e203976. doi:10.1001/jamanetworkopen.2020.3976
54. Zhang C, Yang L, Liu S, et al. Survey of insomnia and related social psychological factors among medical staff involved in the 2019 novel coronavirus disease outbreak. *Front Psychiatry.* **2020**;11:306. doi:10.3389/fpsyg.2020.00306
55. Su TP, Lien TC, Yang CY, et al. Prevalence of psychiatric morbidity and psychological adaptation of the nurses in a structured SARS caring unit during outbreak: a prospective and periodic assessment study in Taiwan. *J Psychiatr Res.* **2007**;41(1–2):119–130. doi:10.1016/j.jpsychires.2005.12.006
56. Humer E, Stippl P, Pieh C, Pryss R, Probst T. Experiences of psychotherapists in remote psychotherapy during the COVID-19 pandemic: cross-sectional web-based survey study. *J Med Internet Res.* **2020**;22(11):e20246. doi:10.2196/20246
57. Humer E, Stippl P, Pieh C, Schimbock W, Probst T. Psychotherapy via the internet: what programs do psychotherapists use, how well-informed do they feel, and what are their wishes for continuous education? *Int J Environ Res Public Health.* **2020**;17(21):8182. doi:10.3390/ijerph17218182
58. Ho CS, Chee CY, Ho RC. Mental health strategies to combat the psychological impact of coronavirus disease 2019 (COVID-19) beyond paranoia and panic. *Ann Acad Med Singap.* **2020**;49(3):155–160. doi:10.47102/annals-acadmedsg.202043
59. Zhang MW, Ho RC. Moodle: the cost effective solution for internet cognitive behavioral therapy (I-CBT) interventions. *Technol Health Care.* **2017**;25(1):163–165. doi:10.3233/THC-161277
60. Soh HL, Ho RC, Ho CS, Tam WW. Efficacy of digital internet behavioural therapy for insomnia: a meta-analysis of randomised controlled trials. *Sleep Med.* **2020**;75:315–325. doi:10.1016/j.smrv.2020.06.020
61. Munawar K, Choudhry FR. Exploring stress coping strategies of frontline emergency health workers dealing Covid-19 in Pakistan: a qualitative inquiry. *Am J Infect Control.* **2020**;49(3):286–291. doi:10.1016/j.ajic.2020.03.015
62. Baertschi M, Costanza A, Cazzato A, Weber K. The dimensionality of suicidal ideation and its clinical implications. *Int J Methods Psychiatr Res.* **2019**;28(1):e1755. doi:10.1002/mpr.1755

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