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. Therefore, psychological disorders in HCWs are also an important issue to be addressed. 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. 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. Another study conducted in Spain revealed that emotional exhaustion and secondary traumatic stress are associated with job stress and workload; moreover, the meta-analysis showed that one third of HCWs in China suffered from anxiety, stress, and depression. Additional research shows that the nurses exposed to COVID-19 patients experience long-lasting emotional distress. It has been reported that 8.4% public health workers in the United States has the suicidal ideation during the COVID-19 pandemic. Depression may be target areas of early intervention for reduction of suicidal ideation amongst healthcare workers during the COVID-19 pandemic.

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. Previous studies have shown that HCWs suffered from severe PTSD and PTSD symptoms during the severe acute respiratory syndrome (SARS) epidemic. 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. 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. 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. Short-term psychodynamic therapy varies in duration, usually lasting 12–24 sessions.

Moreover, some studies are based on the self-perception of mode 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 accessed 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. The HCWs 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), 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. 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 ± standard error (SEM) 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 $\chi^2$ test. Multifactor logistic regression modelling 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 was showed 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 ($X^2 = 17.579$, P < 0.001).
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 proportions 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 1 The Demographic Characteristic of All the Participants

| Variables                  | HHWC (n=93) | LHCW (n=75) | \( \chi^2 \) | P-value |
|----------------------------|-------------|-------------|--------------|---------|
| **Gender (%)**             |             |             |              |         |
| Male                       | 24 (25.8)   | 30 (40.0)   | 3.835        | 0.050   |
| Female                     | 69 (74.2)   | 45 (60.0)   |              |         |
| **Age (years) (%)**        |             |             |              |         |
| 18–30                      | 29 (31.2)   | 26 (34.7)   | 0.716        | 0.699   |
| 31–40                      | 53 (57.0)   | 38 (50.7)   |              |         |
| 41–60                      | 11 (11.8)   | 11 (14.7)   |              |         |
| **Education (%)**          |             |             |              |         |
| Bachelor                   | 57 (61.3)   | 44 (58.7)   | 0.119        | 0.730   |
| 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 (%)**            |             |             |              |         |
| Married                    | 75 (80.6)   | 51 (68.9)   | 3.195        | 0.202   |
| 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)     | 14 (18.7)   |              |         |
| **Coping style (%)**       |             |             | 1.615        | 0.204   |
| Negative coping            | 36 (38.7)   | 22 (29.3)   |              |         |
| Positive coping            | 57 (61.3)   | 53 (70.7)   |              |         |
| **Altruistic behaviors**   |             |             | 5.514        | 0.019   |
| Psychological resilience   | 64 (51.74)  | 62 (51.70)  | 1.382        | 0.240   |
| **Work risk (%)**          |             |             | 0.066        | 0.968   |
| Low risk                   | 39 (41.9)   | 30 (40.0)   |              |         |
| Moderate risk              | 37 (39.8)   | 31 (41.3)   |              |         |
| High risk                  | 17 (18.3)   | 14 (18.7)   |              |         |
| **Work stress (%)**        |             |             | 0.438        | 0.803   |
| Mild stress                | 34 (36.6)   | 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/Moderate, and Severe Among the Subgroups |
|-------------------------------------------------|----------------|-------------|-------------|-----------|----------------|
| No Symptoms                                     | Mild or Moderate | Severe | χ²  | P-value |
| Gender (%)                                      |                 |          |     |         |
| Male                                            | 50 (34.7)       | 4 (25.0) | 0 (0) | 7.029   | 0.030         |
| Female                                          | 94 (65.3)       | 12 (75.0) | 8 (100) |         |               |
| Age (%)                                         |                 |          |     |         |
| 18–30                                           | 45 (31.3)       | 7 (43.8) | 3 (37.5) | 2.331   | 0.675         |
| 31–40                                           | 81 (56.3)       | 7 (43.8) | 3 (37.5) |         |               |
| 41–60                                           | 18 (12.5)       | 2 (12.5) | 2 (25.0) |         |               |
| Education (%)                                   |                 |          |     |         |
| Bachelor                                        | 82 (56.9)       | 12 (75.0) | 7 (87.5) | 5.106   | 0.078         |
| Postgraduate                                    | 62 (43.1)       | 4 (25.0) | 1 (12.5) |         |               |
| Salary (*10,000 yuan, %)                        |                 |          |     |         |
| 3–8                                             | 30 (20.8)       | 5 (31.3) | 2 (25.0) | 2.023   | 0.731         |
| 8–15                                            | 72 (50.0)       | 7 (43.8) | 5 (62.5) |         |               |
| >15                                             | 42 (29.2)       | 4 (25.0) | 1 (12.5) |         |               |
| Marital (%)                                     |                 |          |     |         |
| Married                                         | 109 (75.7)      | 11 (68.8) | 7 (87.5) | 2.083   | 0.720         |
| Single                                          | 32 (22.2)       | 5 (31.3) | 1 (12.5) |         |               |
| Divorced                                        | 3 (2.1)         | 0 (0)    | 0 (0)    |         |               |
| Profession (%)                                  |                 |          |     |         |
| Nurse                                           | 53 (36.8)       | 10 (62.5) | 6 (75.0) | 9.566   | 0.048         |
| Doctor                                          | 76 (52.8)       | 4 (25.0) | 2 (25.0) |         |               |
| Other stuff                                     | 15 (10.4)       | 2 (12.5) | 0 (0)    |         |               |
| Exposure (%)                                    |                 |          |     |         |
| HHCW                                            | 76 (52.8)       | 11 (68.8) | 6 (75.0) | 2.911   | 0.233         |
| LHCW                                            | 68 (47.2)       | 5 (31.3) | 2 (25.0) |         |               |
| Coping style (%)                                |                 |          |     |         |
| Negative coping                                 | 48 (33.3)       | 7 (43.8) | 3 (37.5) | 0.704   | 0.703         |
| 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 (47.6, 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)  | 10.964  | 0.004         |

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Chen et al

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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, $X^2 = 15.871, P < 0.001$).

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

|                           | No Symptoms | Mild | Moderate | Severe | $\chi^2$ | P-value |
|---------------------------|-------------|------|----------|--------|----------|---------|
| **Gender (%)**            |             |      |          |        |          |         |
| Male                      | 43 (34.7)   | 9 (25.0) | 2 (0)    | 0      | 3.203    | 0.361   |
| Female                    | 85 (65.3)   | 18 (75.0) | 8 (100)  | 3      |          |         |
| **Age (%)**               |             |      |          |        |          |         |
| 18–30                     | 42 (32.8)   | 9 (33.3) | 3 (30.0) | 1 (33.3) | 1.228    | 0.975   |
| 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 (%)**         |             |      |          |        |          |         |
| Bachelor                  | 75 (58.6)   | 16 (59.3) | 7 (70.0) | 2 (100.0) | 3.607    | 0.307   |
| Postgraduate              | 53 (41.4)   | 11 (40.7) | 3 (30.0) | 0 (0)   |          |         |
| **Salary (*10,000 yuan, %)** |          |      |          |        |          |         |
| 3–8                       | 28 (21.9)   | 7 (25.9) | 1 (10.0) | 1 (33.3) | 3.359    | 0.783   |
| 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 (%)**           |             |      |          |        |          |         |
| Married                   | 95 (74.2)   | 21 (77.8) | 8 (80.0) | 3 (100.0) | 2.985    | 0.814   |
| Single                    | 31 (24.2)   | 5 (18.5) | 2 (20.0) | 0 (0)   |          |         |
| Divorced                  | 1 (1.6)     | 1 (3.7) | 0 (0)    | 0 (0)   |          |         |
| **Profession (%)**        |             |      |          |        |          |         |
| Nurse                     | 50 (39.1)   | 12 (44.4) | 4 (40.0) | 3 (100.0) | 8.521    | 0.202   |
| 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 (%)**          |             |      |          |        |          |         |
| HHHCW                     | 67 (52.3)   | 17 (63.0) | 7 (70.0) | 2 (66.7) | 2.170    | 0.538   |
| LHCW                      | 61 (47.7)   | 10 (37.0) | 3 (30.0) | 1 (33.3) |          |         |
| **Coping style (%)**      |             |      |          |        |          |         |
| Negative coping           | 48 (37.5)   | 10 (37.0) | 3 (30.0) | 1 (33.3) | 0.274    | 0.971   |
| Positive coping           | 80 (62.5)   | 17 (63.0) | 7 (70.0) | 2 (66.7) |          |         |
| **Altruistic Behaviors**  |             |      |          |        |          |         |
| HHHCW                     | 32 (24.0)   | 33 (25.0) | 41 (32.4) | 44 (30.5, 46) | 3.748 | 0.290 |
| LHCW                      | 65.5 (55.7) | 52 (48.5, 62) | 51 (44, 59) | 66 (54, 69) | 18.374 | 0.000 |
| **Psychological Resilience** |       |      |          |        |          |         |
| HHHCW                     | 4 (2.5)     | 3 (3.6)   | 5 (4.6)  | 8 (6.5) | 5.913    | 0.116   |
| LHCW                      | 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 HHHCWs 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 HHHCW 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).
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).
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 5 Severity of Insomnia Were Compared Based on Non-Symptomatic, Mild/Moderate, and Severe in Among the Subgroups

|                     | No Symptoms | Mild | Moderate | Severe | χ²  | P value |
|---------------------|-------------|------|----------|--------|-----|---------|
| **Gender (%)**      |             |      |          |        |     |         |
| Male                | 42 (33.1)   | 10 (32.3) | 2 (16.7) | 0      | 1.568 | 0.667   |
| Female              | 87 (66.9)   | 21 (67.7) | 5 (83.3) | 1 (100) | 3.216 | 0.781   |
| **Age (%)**         |             |      |          |        |     |         |
| 18–30               | 40 (30.8)   | 12 (38.7) | 2 (33.3) | 1 (100) | 3.216 | 0.781   |
| 31–40               | 72 (55.4)   | 16 (51.6) | 3 (50.0) | 0 (0)   | 0.995 | 0.3944  |
| 41–60               | 18 (13.8)   | 3 (9.7)  | 1 (16.7) | 0 (0)   | 0.995 | 0.3944  |
| **Education (%)**   |             |      |          |        |     |         |
| Bachelor            | 76 (59.4)   | 19 (59.4) | 5 (71.4) | 1 (100) | 0.995 | 0.3944  |
| Postgraduate        | 52 (40.6)   | 13 (40.6) | 2 (28.6) | 0 (0)   | 0.995 | 0.3944  |
| **Salary (10,000 yuan, %)** |       |      |          |        |     |         |
| 3–8                 | 27 (20.8)   | 8 (25.8)  | 2 (33.3) | 0 (0)   | 3.217 | 0.781   |
| 8–15                | 68 (52.3)   | 13 (41.9) | 2 (33.3) | 1 (100) | 3.217 | 0.781   |
| >15                 | 35 (26.9)   | 10 (32.3) | 2 (33.3) | 0 (0)   | 3.217 | 0.781   |
| **Marital (%)**     |             |      |          |        |     |         |
| Married             | 99 (76.2)   | 23 (75.0) | 5 (83.3) | 1 (100) | 4.840 | 0.565   |
| Single              | 28 (21.5)   | 8 (25.8)  | 2 (33.3) | 0 (0)   | 4.840 | 0.565   |
| Divorced            | 3 (12.3)    | 0 (0)     | 0 (0)    | 0 (0)   | 4.840 | 0.565   |
| **Profession (%)**  |             |      |          |        |     |         |
| Nurse               | 52 (40.0)   | 13 (41.9) | 3 (50.0) | 1 (100) | 6.469 | 0.373   |
| Doctor              | 67 (51.5)   | 12 (38.7) | 3 (50.0) | 0 (0)   | 6.469 | 0.373   |
| Other stuff         | 11 (8.5)    | 6 (19.4)  | 0 (0)    | 0 (0)   | 6.469 | 0.373   |
| **Exposure (%)**    |             |      |          |        |     |         |
| HHCW                | 69 (53.1)   | 19 (61.3) | 4 (66.7) | 1 (100) | 2.221 | 0.528   |
| LHCW                | 61 (46.9)   | 12 (38.7) | 2 (33.3) | 0 (0)   | 2.221 | 0.528   |
| **Coping style (%)**|             |      |          |        |     |         |
| Negative coping     | 43 (33.6)   | 12 (37.5) | 3 (42.9) | 0 (0)   | 1.072 | 0.851   |
| Positive coping     | 85 (66.4)   | 20 (62.5) | 4 (57.1) | 1 (100) | 1.072 | 0.851   |
| **Altruistic behaviors** |       |      |          |        |     |         |
| HHCW                | 32 (24, 40) | 36 (26.5, 40) | 30.5 (18.44) | 1.387 | 0.790   |
| LHCW                | 65 (53, 74) | 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   |
| 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 | 3.00 (1.55–5.80) | 0.00 |
| 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 | 1.78 (0.95–3.34) | 0.07 |
| Work risk | 0.51 (0.13–1.94) | 0.32 | 0.53 (0.22–1.28) | 0.16 |
| Gender |                             |       |                       |         |
| Profession |                             |       |                       |         |

**Abbreviations:** CI, confidence interval; OR, odds ratio; PTSD, post-traumatic stress disorder.
anxiety in the 58 HCWs 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).

| Table 7 Psychological Analysis Before and After Psychotherapy |
|---------------------------------------------------------------|
| Before | After | X²/Z | P value |
|--------|-------|------|---------|
| Gender |       |      |         |
| Male   | 22    | 22   |         |
| Female | 36    | 36   |         |
| Exposure |     |      |         |
| HHCW   | 32    | 32   |         |
| LHCW   | 26    | 26   |         |
| Anxiety (%) |     |      |         |
| No symptoms | 28 (48.3) | 44 (75.9) | 9.640 | 0.022 |
| Mild   | 18 (31.0) | 9 (15.5) |         |
| Moderate | 10 (17.2) | 4 (6.9) |         |
| Severe | 2 (3.4) | 1 (1.7) |         |
| Depression (%) |     |      |         |
| No symptoms | 27 (46.6) | 44 (75.9) | 11.345 | 0.010 |
| Minor  | 17 (29.3) | 7 (12.1) |         |
| Moderate | 10 (17.2) | 6 (10.3) |         |
| Severe | 4 (6.9) | 1 (1.7) |         |
| PTSD (%) |     |      |         |
| No symptoms | 35 (60) | 49 (84.5) | 8.463 | 0.015 |
| Mild   | 15 (25.9) | 6 (10.3) |         |
| Severe | 8 (13.8) | 3 (5.2) |         |
| Insomnia (%) |     |      |         |
| No symptoms | 33 (56.9) | 47 (81.0) | 9.483 | 0.024 |
| 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 (%) |     |      |         |
| Negative coping | 27 (46.6) | 15 (25.9) | 5.375 | 0.020 |
| Positive coping | 31 (53.4) | 43 (74.1) |         |
| Work risk | 5 (3, 6) | 3 (1, 4) | −4.090 | 0.000 |
| Work stress | 5 (4, 7) | 4 (3, 5) | −3.234 | 0.001 |

Abbreviation: PTSD, post-traumatic stress disorder.

Discussion

Natural disasters are associated with a high prevalence of mental instability, including PTSD, insomnia, anxiety, and depression. In terms of natural disasters, such as tsunami, in Japan, the results indicated that trauma, depression, and resilience were prominent among the survivors. 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.

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. 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, a 6-month follow-up on the psychological consequences of COVID-19 in healthcare 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 HHHCWs and the LHHCs, indicating a gradual improvement in the psychological status of most HHHCWs; (2) gradual adaptation to COVID-19, mental flexibility, and coping styles resulted in a nonsignificant difference in the levels of psychological symptoms between HHHCWs and LHHCs; (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 COVID-19 epidemic in China, approximately 42.9% of survivors still had PTSD, and 27% of survivors had depression 12 months after the MERS-CoV outbreak. Another study comprising 769 HCWs (SARS and non-SARS units) 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. Furthermore, a systematic review including 44 studies showed that 11–73.4% 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. In addition, the results of a self-administered questionnaire showed that the estimated prevalence of anxiety symptoms (23.1%), depression (33.6%), PTSD (70.9%), and comorbidities (44.7%) indicated that natural disasters had affected the incidence of mental illness among tsunami survivors.

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 HHHCW group. 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 HHHCW group and LHCW group, although the prevalence of these symptoms was still slightly higher in the HHHCW 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 risky public order activities. 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.

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. In addition, more severe symptoms of depression, insomnia, and anxiety were reported in nurses exposed to COVID-19 than in other HCWs. 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. Similarly, during the SARS epidemic in 2003, depression and (33%) PTSD were reported (38.5%) in nurses shortly after the disease outbreak. 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. 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. 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.

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 analyze 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. 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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