Evaluation of the mental health status of community healthcare workers during the COVID-19 outbreak

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Abstract
Coronavirus disease 2019 (COVID-19) has rapidly spread across China and many countries worldwide, and community healthcare workers at the front lines of disease control are under high physical and mental pressure. This study investigated the mental health status of community healthcare workers during the COVID-19 outbreak in Sichuan Province, China. This cross-sectional study, which was conducted from February 8 to 18, 2020, involved 450 healthcare workers in 18 community hospitals who had worked for more than 1 year. A self-designed demographic data questionnaire and Symptom Checklist 90 (SCL-90) were provided to the participants through links and quick response codes. The respondents completed and submitted the questionnaires online. Binary logistic regression was used to analyze multiple factors related to the SCL-90 scores of these community healthcare workers in China. For the 450 community healthcare workers who completed the study, the median scores in each SCL-90 factor were lower than the Chinese norms, and 119 (26.4%) participants were SCL-90 positive. Among them, 178 participants were doctors and had the highest scores on most SCL-90 factors except for obsessive compulsiveness, hostility, phobic anxiety, and psychotism (P < 0.05). The top 3 positive items for doctors working in the community were obsessive compulsiveness, others, and somatization, and those among nurses were obsessive compulsiveness, others, and hostility. Sex, type of workers, and occupational exposure risk to COVID-19 were independent risk factors for the mental health status of the community healthcare workers. Overall, the community healthcare workers experienced psychological problems during the COVID-19 outbreak in Sichuan Province, China. More attention should be paid to the mental health of these workers, and their mental status should be regularly assessed. Psychological interventions should be provided to those with serious mental problems through networks or telephone visits.

Abbreviations: I-S = interpersonal sensitivity, O-C = obsessive compulsiveness, P-A = phobic anxiety, P-I = paranoid ideation, SCL-90 = Symptom Checklist 90.

Keywords: community healthcare workers, COVID-19, mental health

1. Introduction
Coronavirus disease 2019 (COVID-19) has rapidly spread across China and many countries worldwide due to its strong infectivity and high incidence of crowd susceptibility. COVID-19 can spread via cough or respiratory droplets, contact with bodily fluids or contaminated surfaces, and aerosol propagation.[1,2] According to the guidelines by the National Health Commission of the People’s Republic of China, pneumonia caused by COVID-19 is included as a Group B infectious disease; however, the current guidelines indicate that COVID-19 is a Group A infectious disease, which is a category reserved for highly infectious pathogens, such as cholera and plague.[3] Currently, the main source of infection is those infected with the virus, and asymptomatic carriers may be infectious. Recent case analyses show that even after recovery from acute illness, patients can shed high amounts of the virus and infect others. The incubation time of SARS-CoV-2 is approximately 4.5 to 15.6 days.[3] On January 23, 2020, the Chinese government shut down Wuhan, suspending public transportation and subway services. The residents were required to wear masks in public places and quarantine at home.[4] As of January 26, 2020, 30 provinces initiated a level-1 public health emergency response to control COVID-19. Isolation, quarantine, social distancing, and community containment played a pivotal role in public health measures during the COVID-19 outbreak. Fever observation rooms have been established at stations, airports, and ports to detect the body temperature of passengers entering and leaving the area and implement observation/registration of those...
suspected of having COVID-19. In accordance with the law, the government is adopting compulsory measures to restrict all types of the congregation, such as limiting going out and partying, and people must wear masks outside to ensure public health safety during the outbreak.

The first batch of cases subsequently identified had no exposure to or any relationship with the Huanan Wholesale Market of Wuhan; thus, the person-to-person transmission was confirmed. Moreover, nosocomial infections in some healthcare workers were reported. In a case series of 138 patients treated in a Wuhan hospital, 40 patients were healthcare workers. Another patient undergoing surgery in a hospital in Wuhan infected 14 healthcare workers before fever onset. As of February 25, 2020, in total, 3387 healthcare workers had become infected, and 18 died. Outside of China, Singapore reported the first 25 locally transmitted cases, and 17 cases were likely related to occupational exposure.

During the COVID-19 outbreak, the primary care system has adopted actions, such as active monitoring and screening, initial screening of patients with fever, door-to-door follow-up and home isolation of close contacts and confirmed patients after discharge, investigation of suspected close contacts, transport of confirmed/suspected patients to designated, isolated hospitals, and so on. Because community-based professionals serve a large population in different workplaces, they are at a higher risk of occupational exposure than the general population. As of February 11, 2020, the government of Sichuan Province reported 436 confirmed cases with 1 death. The rapid spread of the disease, isolation, and overwhelming and sensational news headlines and images increase feelings of helplessness, fear, anxiety, depression, guilt, and nervousness. Nearly 4 million medical personnel involved in primary care in China play important roles in the prevention and control of the COVID-19 epidemic.

In general, there is a severe shortage of protective equipment, such as disposable surgical masks/N95 respirators, face shields, goggles, gowns, and gloves. Many healthcare workers at the front lines of hospitals and public health services are at risk of infection while caring for patients who are seriously ill, fearful, or bereaved. As a result of long working hours and high work intensity, their bodies and minds are under great pressure and burden. In addition to physical exhaustion, healthcare workers also experience psychological pressures, such as frustration, depression, helplessness, anxiety, and fear, similar to the general population. Recently, many studies have investigated public health; however, few studies explored the relationship between variables and mental health in community healthcare workers in mainland China. Medical staff working in the community have expended considerable effort during the COVID-19 outbreak; however, their roles are underappreciated, and limited attention is paid to their physical and mental health. The present study investigated the psychological crisis of community healthcare workers in mainland China at the front line of preventing COVID-19 spread in an attempt to attract more attention to these professionals and offer solutions to improve their mental health status.

2. Subjects and methods

2.1. Study design

A cross-sectional study design was applied.

2.2. Participant demographics

Convenience sampling was used. All healthcare workers who worked in a community hospital in Sichuan Province, China, between February 8 and 18, 2020, were initially considered for inclusion. Eighteen community hospitals in Sichuan Province were selected. Eight of these community hospitals were located in Chengdu (the capital city), and 10 were located in other cities in Sichuan Province. In total, 450 healthcare workers were invited to participate in the survey. The inclusion criteria were as follows: (1) signed a contract with the community; (2) engaged in frontline work and worked for the community for more than 1 year; (3) possessed a work license; and (4) agreed to participate in this investigation. Participants were excluded if they were taking drugs, such as anxiolytics or antidepressants.

2.3. Ethics committee approval and patient consent

The Ethics Committee of West China Hospital Sichuan University approved this study and its methods in February 2020 under approval number 2020(325). All participants provided signed informed consent.

2.4. Data collection

For the data collection, the following two questionnaires were given to each participant: a demographic data survey and Symptom Checklist 90 (SCL-90). The electronic questionnaires were provided to the participants through links and quick response codes. The respondents completed and submitted the questionnaires online. The database was built using EpiData 3.1 software (EpiData–Comprehensive Data Management and Basic Statistical Analysis System, EpiData Association, Odense, Denmark), and we double-checked and input the data.

2.4.1. Demographic data. The demographic data, including information regarding sex, age, work location, educational background, marital status, the presence of children, history of chronic disease, type of workers, type of contract, working years, job title, personal monthly income, family monthly income, participation in a public health emergency before COVID-19, and occupational risk of exposure to COVID-19 were collected based on a self-designed questionnaire. The assessment of the occupational exposure risk depends on the degree of working exposure to infected or suspected patients; for example, if a healthcare professional works at a fever clinic or epidemic area, his/her occupational risk of exposure to COVID-19 is very high.

2.4.2. Symptom Checklist 90. This study adopted the SCL-90, which was developed by Derogatis et al. and translated into Chinese by Wang et al. The Cronbach α coefficient of the factors of SCL-90 ranges from 0.77 to 0.99 indicating good reliability. The questionnaire includes 90 items divided into the following 10 factors: somatization, obsessive compulsiveness (O-C), interpersonal sensitivity (I-S), depression, anxiety, hostility, phobic anxiety (P-A), paranoid ideation (P-I), psychoticism, and others (sleeping and eating). The severity of each item is rated on a Likert 5-point scale ranging from 1 = not at all to 5 = most severe. The total score is the sum of the scores of the 90 items, and the average score of each factor equals the total score of the items included in the factor subscale divided by the number of items. If a factor’s average score is ≥2, it is positive. The number of positive items refers to the total number of items with a score ≥2 and the average score ≥2. The severity of each factor is calculated as follows: slight if ≥0.5, moderate if ≥1, severe if ≥1.5, and very severe if ≥2.
number of negative items refers to the total number of items with a score of 1. In the Chinese population, if the total score is >160, the number of positive items is >43, and if any factor’s average score is >2 points, the person is defined as SCL-90 positive and considered to possibly have mental health problems. A questionnaire with all 90 items completed is deemed valid.

2.5. Statistical analysis

SPSS software (Version 20.0, IBM Inc., Armonk, NY) was used for the statistical analyses. The quantitative data were compared with the Wilcoxon test, and the results are presented as the median and interquartile range (IQR). The qualitative data were compared with the χ²-test, and the results are presented as frequencies and percentages. Logistic regression was used to analyze the association between the SCL-90 scores and relevant factors, such as age, education, marital status, types of workers, working years, job title, manager position, contract, income, occupational risk of exposure to COVID-19, and prior participation in a public health emergency. The odds ratios and 95% confidence intervals (CIs) were calculated by logistic regression. A p-value <0.05 was considered significant.

3. Results

3.1. Demographic characteristics of the participants and SCL-90 scores

The data were collected from 18 community hospitals in Sichuan Province (8 in the capital city and 10 in other cities), and in total, 450 participants were included in this study, all of whom completed the survey (Figure 1). Among the study participants, 392 were female, 178 were doctors with a median age of 37.5 years, 201 worked in the provincial capital city Chengdu, and 275 (61.1%) had not previously participated in a public health emergency. The number of SCL-90-positive community healthcare workers was 119 (26.4%). The χ²-test was employed to compare the demographic data and number of SCL-90-positive staff. This analysis suggested that the type of workers and occupational risk of exposure to COVID-19 affected the number of SCL-90-positive personnel (P < 0.05). The doctors had a higher positive rate than the nurses and others, and healthcare workers under a high exposure risk had higher odds of being SCL-90 positive. No significant differences were observed in the other variables, as indicated in Table 1.

3.2. Comparison of SCL-90 scores with Chinese norms

In the comparison of the SCL-90 scores between healthcare workers during the COVID-19 outbreak and Chinese norms, the Wilcoxon rank-sum test showed that the healthcare workers had lower scores than ordinary Chinese workers with significant differences (P < 0.05). The factor interpersonal sensitivity (I-S) exhibited the largest deviation (Table 2).

3.3. Comparison of mental health status among different types of workers

The average SCL-90 scores of the doctors were 112.5 (IQR 97.00–138.25), with 42 positive item scores (IQR 14.00–87.00); both scores were significantly higher than those of nurses and others (P < 0.01) (Table 3). There were also significant differences among different types of workers with regard to somatization, I-S, depression, anxiety, P-I, and others (P < 0.05); again, the doctors exhibited higher scores than the nurses and others.

3.4. Comparison of the positive items of each factor among different types of workers

The χ²-test was applied to detect differences in the positive items of each factor among different types of workers. The doctors had significantly higher positive items related to somatization and others than the nurses and others (P < 0.05); the other factors were not significant (Table 4). The top 3 positive items among the doctors working in the community were O-C, others, and somatization; those among the nurses were O-C, others, and hostility; and those among others were O-C, hostility, and I-S/depression/others (Table 5).

3.5. Logistic regression analysis of multiple factors related to the SCL-90 scores

Binary logistic regression was used to analyze the SCL-90 scores of the healthcare workers. The factors included in the logistic model were sex, type of work, the presence of chronic disease, type of contract, personal monthly income, occupational risk of exposure to COVID-19, and participation in a public health emergency before COVID-19. We found that sex, type of work, and occupational risk of exposure to COVID-19 were independent risk factors among community healthcare workers for being SCL-90-positive (P < 0.05), which led to psychological problems (Table 6).

4. Discussion

COVID-19 is widespread and highly infectious. The main route of transmission is through respiratory droplets and contact, and the population is generally susceptible to COVID-19. While facing this public health emergency, healthcare workers not only work under high pressure and intensity but also cope with a tense relationship with patients.

The present study shows that healthcare workers experienced mental health problems during their fight against COVID-19 in...
Table 1
Demographic characteristics of the participants and SCL-90 scores.

| Variables                     | n (%)     | n (%)     | \(x^2\) | P    |
|-------------------------------|-----------|-----------|---------|------|
| Sex                           |           |           |         |      |
| Male                          | 58 (12.9) | 11 (19.0) | 1.910   | 0.167|
| Female                        | 392 (87.1)| 108 (27.6)|         |      |
| Age range, y                  |           |           |         |      |
| 18-25                         | 57 (12.7) | 12 (21.1) | 0.000   | 0.997|
| 26-35                         | 167 (37.1)| 50 (30.0) |         |      |
| 36-45                         | 134 (29.8)| 32 (23.9) |         |      |
| ≥46                           | 92 (20.4) | 25 (27.2) |         |      |
| City                          |           |           |         |      |
| Chengdu                       | 201 (44.7)| 57 (28.4) | 0.682   | 0.409|
| Other cities                  | 249 (55.3)| 62 (24.9) |         |      |
| Working duration, y           |           |           |         |      |
| 1-5                           | 85 (18.9) | 19 (22.4) | 0.592   | 0.442|
| 6-10                          | 113 (25.1)| 32 (28.3) |         |      |
| 11-15                         | 71 (15.8) | 18 (25.4) |         |      |
| 16-20                         | 54 (12.0) | 13 (21.1) |         |      |
| >20                           | 127 (28.2)| 37 (29.1) |         |      |
| Type of workers               |           |           |         |      |
| Doctors                       | 178 (39.6)| 62 (34.8) | 5.208   | 0.022|
| Nurses                        | 221 (49.1)| 45 (23.4) |         |      |
| Others                        | 51 (11.3) | 12 (23.5) |         |      |
| Education                     |           |           |         |      |
| Polytechnic school            | 35 (7.9)  | 9 (25.7)  | 0.130   | 0.718|
| College                       | 246 (54.7)| 65 (26.4) |         |      |
| Undergraduate                 | 166 (36.9)| 45 (27.1) |         |      |
| Postgraduate                  | 3 (0.7)   | 0         |         |      |
| Job title                     |           |           |         |      |
| Registered                    | 45 (10.3) | 8 (17.8)  | 0.111   | 0.740|
| Primary                       | 210 (46.7)| 50 (23.8) |         |      |
| Intermediate                  | 138 (30.7)| 46 (33.3) |         |      |
| Subsenior                     | 57 (12.7) | 15 (26.3) |         |      |
| Manager position              |           |           |         |      |
| None                          | 254 (56.4)| 70 (27.6) |         |      |
| Group leader                  | 36 (8.0)  | 7 (19.4)  | 0.821   | 0.365|
| Head nurse/doctor             | 92 (20.4) | 23 (25.3) |         |      |
| Others                        | 68 (15.1) | 19 (27.9) |         |      |
| Marital status                |           |           |         |      |
| Married                       | 371 (82.5)| 93 (25.1) | 2.106   | 0.147|
| Unmarried                     | 68 (15.1) | 22 (32.4) |         |      |
| Divorced                      | 9 (2.0)   | 3 (33.3)  |         |      |
| Widowed                       | 2 (0.4)   | 1 (50.0)  |         |      |
| Presence of children          |           |           |         |      |
| Yes                           | 344 (76.4)| 89 (25.9) | 0.245   | 0.620|
| No                            | 106 (23.6)| 30 (28.3) |         |      |
| History of chronic disease    |           |           |         |      |
| Yes                           | 36 (8.0)  | 14 (38.9) | 3.108   | 0.078|
| No                            | 414 (92.0)| 105 (25.4)|         |      |
| Type of contract              |           |           |         |      |
| Authorized strength contract  | 213 (47.3)| 65 (30.5) | 3.517   | 0.061|
| Fixed contract                | 217 (48.2)| 50 (23.0) |         |      |
| No fixed contract             | 20 (4.4)  | 4 (20.0)  |         |      |
| Personal monthly income, yuan |           |           |         |      |
| <3000                         | 78 (17.3) | 18 (23.1) | 0.553   | 0.457|
| 3000-4999                     | 233 (51.8)| 71 (30.5) |         |      |
| 5000-7999                     | 126 (28.0)| 27 (21.4) |         |      |
| 8000-9999                     | 10 (2.2)  | 1 (10.0)  |         |      |
| ≥10,000                       | 3 (0.7)   | 2 (66.7)  |         |      |
| Family monthly income, yuan   |           |           |         |      |
| <3000                         | 59 (13.1) | 14 (23.7) | 0.276   | 0.599|
| 3000-4999                     | 147 (32.7)| 37 (25.2) |         |      |
| 5000-7999                     | 135 (30.0)| 40 (23.6) |         |      |
| 8000-9999                     | 59 (13.1) | 14 (23.7) |         |      |
| ≥10,000                       | 50 (11.1) | 14 (28.0) |         |      |
| Occupational exposure\(^\d\)  |           |           |         |      |
| Low                           | 41 (9.1)  | 3 (7.3)   | 11.540  | 0.001|
| Moderate                      | 231 (51.3)| 50 (23.8) |         |      |
| High                          | 84 (18.7) | 30 (35.7) |         |      |
| Very high                     | 94 (20.9) | 31 (33.0) |         |      |
| Participation in public health\(^\d\) |           |           |         |      |
| Yes                           | 175 (38.9)| 55 (31.4) | 3.649   | 0.056|
| No                            | 275 (61.1)| 64 (23.3) |         |      |

\(^\d\) The number (percentage) of people who were SCL-90 positive.

\(^\d\) Occupational exposure = occupational risk of exposure to COVID-19.

\(^\d\) Participation in public health = participation in a public health emergency before COVID-19.
community hospitals in Sichuan Province, China, and that 26.4% of the community healthcare workers were SCL-90 positive. However, we found that the median scores of each SCL-90 factor were lower than the Chinese norms, as presented in Table 2, indicating that most participants had a good mental health status. Although another survey of healthcare workers in Wuhan showed that they had higher SCL-90 scores than the Chinese norms,[21] the findings indicated that the psychological status of healthcare workers in community hospitals in Sichuan Province was rather better than that of the healthcare workers in Wuhan. First, COVID-19 was more severe in Wuhan than in any other city in China, and medical staff members were subject to high physical and mental pressure. Second, healthcare workers in Sichuan Province may have better psychological resilience due to their experiences with treating patients after two strong earthquakes (Wenchuan magnitude 8 earthquake in 2008 and Mount Lu magnitude 7 earthquake in 2013). In addition, the healthcare workers in our study had lower scores in each factor of SCL-90.

### Table 2

**Comparison of SCL-90 scores during the COVID-19 outbreak and Chinese norms.**

| Factors      | This study (n=450, median) | Chinese norms (n=1388, median) | Z     | P     |
|--------------|-----------------------------|---------------------------------|-------|-------|
| Average      | 1.18                        | 1.44                            | −9.101| 0.000 |
| Somatization | 1.17                        | 1.37                            | −6.223| 0.000 |
| O-C          | 1.30                        | 1.62                            | −6.534| 0.000 |
| I-S          | 1.11                        | 1.65                            | −11.630| 0.000 |
| Depression   | 1.15                        | 1.50                            | −9.302| 0.000 |
| Anxiety      | 1.10                        | 1.39                            | −6.468| 0.000 |
| Hostility    | 1.17                        | 1.48                            | −8.369| 0.000 |
| P-A          | 1.00                        | 1.23                            | −5.250| 0.000 |
| P-I          | 1.00                        | 1.43                            | −11.843| 0.000 |
| Psychoticism | 1.05                        | 1.29                            | −8.543| 0.000 |

Average = average total score, I-S = interpersonal sensitivity, O-C = obsessive compulsiveness, P-A = phobic anxiety, P-I = paranoid ideation.

### Table 3

**Comparison of the total scores, factor scores, and positive item scores among different types of workers (n=450).**

| Dimension score | Doctors (n=178) Median (IQR) | Nurses (n=221) Median (IQR) | Others (n=51) Median (IQR) | H     | P     |
|-----------------|------------------------------|-----------------------------|----------------------------|-------|-------|
| Total           | 112.5 (97.00–138.25)         | 105 (94.00–120.50)          | 103 (94.00–120.00)         | 9.985 | 0.007 |
| Positive item   | 42 (14.00–87.00)             | 27 (8.00–56.50)             | 24 (8.00–55.00)            | 10.513| 0.005 |
| Somatization    | 1.25 (1.00–1.58)             | 1.08 (1.00–1.33)            | 1.08 (1.00–1.33)           | 11.592| 0.003 |
| O-C             | 1.50 (1.10–1.90)             | 1.30 (1.10–1.60)            | 1.30 (1.10–1.60)           | 5.777 | 0.056 |
| I-S             | 1.22 (1.00–1.56)             | 1.11 (1.00–1.33)            | 1.11 (1.00–1.33)           | 12.740| 0.002 |
| Depression      | 1.23 (1.00–1.62)             | 1.15 (1.00–1.38)            | 1.15 (1.00–1.31)           | 9.015 | 0.011 |
| Anxiety         | 1.20 (1.00–1.5)              | 1.10 (1.00–1.3)             | 1.10 (1.00–1.30)           | 8.580 | 0.014 |
| Hostility       | 1.17 (1.00–1.54)             | 1.17 (1.00–1.33)            | 1.17 (1.00–1.50)           | 5.285 | 0.071 |
| P-A             | 1.14 (1.00–1.43)             | 1.00 (1.00–1.29)            | 1.00 (1.00–1.29)           | 2.765 | 0.251 |
| P-I             | 1.17 (1.00–1.32)             | 1.00 (1.00–1.17)            | 1.00 (1.00–1.17)           | 8.396 | 0.015 |
| Psychoticism    | 1.10 (1.00–1.3)              | 1.00 (1.00–1.2)             | 1.00 (1.00–1.20)           | 4.360 | 0.113 |
| Others          | 1.29 (1.00–1.71)             | 1.14 (1.00–1.43)            | 1.29 (1.00–1.57)           | 9.847 | 0.007 |

I-S = interpersonal sensitivity, O-C = obsessive compulsiveness, P-A = phobic anxiety, P-I = paranoid ideation.

### Table 4

**Comparison of the positive items of each factor among different types of workers.**

| Factors      | Doctors n (%) | Nurses n (%) | Others n (%) | x²   | P     |
|--------------|---------------|--------------|--------------|------|-------|
| Somatization | 22 (12.4)     | 6 (2.7)      | 2 (3.9)      | 15.435| 0.000 |
| O-C          | 38 (21.3)     | 33 (14.9)    | 6 (11.8)     | 4.021 | 0.134 |
| I-S          | 19 (10.7)     | 15 (6.8)     | 3 (5.9)      | 2.391 | 0.303 |
| Depression   | 20 (11.2)     | 16 (7.2)     | 3 (5.9)      | 2.552 | 0.279 |
| Anxiety      | 11 (6.2)      | 8 (3.6)      | 1 (2.0)      | 2.357 | 0.308 |
| Hostility    | 18 (10.1)     | 19 (8.6)     | 4 (7.8)      | 0.385 | 0.825 |
| P-A          | 10 (5.6)      | 12 (5.4)     | 1 (2.0)      | 1.184 | 0.553 |
| P-I          | 12 (6.7)      | 8 (3.6)      | 1 (2.0)      | 3.106 | 0.212 |
| Psychoticism | 7 (3.9)       | 7 (3.2)      | 0            | 2.038 | 0.361 |
| Others       | 34 (19.1)     | 21 (9.5)     | 3 (5.9)      | 10.606| 0.005 |

I-S = interpersonal sensitivity, O-C = obsessive compulsiveness, P-A = phobic anxiety, P-I = paranoid ideation.
than ordinary Chinese citizens during the COVID-19 outbreak, as reported by Tian et al.\cite{22} This finding may be related to the experience and occupational education of medical staff, allowing them to have a more stable state of mind than normal people, especially under circumstances of public emergency events. Despite the different degrees of psychological problems, the healthcare workers in Sichuan Province had a better mental status than ordinary people.

In addition, we found that the type of workers was an independent risk factor for psychological problems among community healthcare workers in this study. Doctors had a higher occurrence rate of mental health symptoms than nurses and others, which is not consistent with the research findings reported by Wang et al.\cite{23} but consistent with those reported by Lu et al.\cite{24} and Chan and Huak.\cite{25} This finding may be related to community doctors having higher work exposure to the virus than any other staff in the community hospital during the COVID-19 outbreak, such as working at a fever clinic for a long time. After the severe acute respiratory syndrome (SARS) outbreak, the social status of nurses improved, and good social support had a positive effect on their mental health.\cite{26} Technicians and pharmacists also had no direct contact with patients, resulting in a lower occurrence rate of mental health symptoms. Thus, the psychological status of community physicians during the COVID-19 outbreak deserves more attention. We also found that sex was a risk factor for the mental health status of community healthcare workers, and women were more likely to experience mental health symptoms than men, which is consistent with several other studies.\cite{27, 28} This finding may be related to the characteristics of sex, whereby women must bear the pressure of both family and work.\cite{27} Indeed, more attention should be paid to the mental health and anti-stress ability of women working in community hospitals.

The occupational risk of exposure to COVID-19 was also an independent risk factor for psychological problems among the community healthcare workers. Community healthcare workers with different occupational risks of exposure to COVID-19 had different levels of mental health problems; as presented in Table 1, people working under low risk had the lowest occurrence rate of positive symptoms. The present recommendations classify exposure risk as 4 levels according to Dai et al.\cite{11} According to Dai’s research, positions at a very high-risk level include working at fever clinics in epidemic areas, transferring confirmed/suspected patients, and collecting throat swab samples from suspected patients. Positions at a high-risk level include working at clinics in nonepidemic areas, transferring close contacts, and performing follow-up visits with isolated close contacts and recovered patients. Working at an outpatient/inpatient department, pharmacy or laboratory has a moderate risk level. Screening for people returning to town and performing physical examinations of workers are low-risk positions. Similar to the study by Lee et al.\cite{29} who investigated healthcare workers during the Middle East respiratory syndrome (MERS) outbreak, staff who performed more MERS-related work had more severe mental health problems, even over time. During the COVID-19 outbreak, community healthcare workers are at the front line of disease prevention and control, and managers should pay attention to the psychological problems of those in these positions, especially persons in positions of high occupational exposure risk. More shifts and frequent breaks should be provided.

Wang et al.\cite{23} reported that the top 3 factors were O-C, depression, and somatization among doctors and O-C, hostility, and somatization among nurses, which slightly differs from our findings; this outcome may be due to differences in the survey sample characteristics. Measures should be selected according to specific characteristics to promote the mental health of community healthcare workers during the COVID-19 outbreak.

COVID-19 is a new, extremely contagious disease, and public health measures, such as early detection and quarantining patients, can be effective in containing the outbreak. Therefore, maintaining the mental health of people, especially medical workers, is important. Long and intensive work, great pressure and fear can trigger mental health disorders, such as anxiety,

### Table 5

**Top 3 positive items among different types of workers.**

| Type of workers | Ranked first factor n (%) | Ranked second factor n (%) | Ranked third factor n (%) |
|-----------------|---------------------------|---------------------------|---------------------------|
| Doctors         | O-C 38 (21.3)             | Others 34 (19.1)          | Somatization 22 (12.4)    |
| Nurses          | O-C 33 (14.9)             | Others 21 (9.5)           | Hostility 19 (8.6)        |
| Others          | O-C 6 (11.8)              | Hostility4 (7.8)          | I-S/depression/others 3 (5.9) |

I-S = interpersonal sensitivity, O-C = obsessive compulsiveness.

### Table 6

**Logistic regression analysis of the risk factors of the mental health status of community healthcare workers.**

| Variable          | B     | Std. error | Wald | P      | OR (95% CI) |
|-------------------|-------|------------|------|--------|-------------|
| Sex               | -1.150| 0.419      | 7.521| 0.006  | 0.317 (0.139, 0.720) |
| Type of workers   |       |            |      |        |             |
| Others            | Reference |          |      |        |             |
| Nurses            | 0.826 | 0.430      | 3.691| 0.055  | 2.285 (0.983, 5.308) |
| Doctors           | -0.461| 0.429      | 1.158| 0.282  | 0.630 (0.272, 1.461) |
| Occupational exposure | -0.333 | 0.137      | 5.868| 0.015  | 0.717 (0.548, 0.938) |
| Constant          | 1.023 | 0.107      | 91.603| 0.000  | 2.782       |

Occupational exposure = occupational risk of exposure to COVID-19.
depression, and posttraumatic stress disorder.\textsuperscript{16} Schwartz et al.\textsuperscript{40} reported that healthcare workers’ anxiety level increased following news of medical workers who were affected or died in 2003 during the SARS outbreak in Taiwan. In addition, a range of psychiatric morbidities was reported during the early phase of the SARS outbreak, including persistent depression, anxiety, panic attacks, psychomotor excitement, psychotic symptoms, delirium, and even suicide.\textsuperscript{31–33}

Furthermore, long exposure to many infected patients or suspected cases increases the risk of infection, which, in turn, worsens mental health problems. These at-risk groups should also be given adequate social and mental health support. To fight against COVID-19, effective actions must be taken. First, the Chinese government showed a clear attitude and exacted decisive measures for COVID-19 epidemic control, which strengthened the faith of healthcare workers. State media should respond to the concerns of public opinion, clarify the facts and publicize the truth in a timely manner to avoid panic caused by false news regarding the epidemic situation. Second, establishing and improving psychological coping mechanisms are urgent. A new Internet-based psychological crisis intervention model integrating physicians, psychiatrists, psychologists, and social workers into Internet platforms to provide psychological interventions to people who experienced mental health problems during the COVID-19 outbreak is necessary.\textsuperscript{34} Third, healthcare workers are encouraged to face their stress appropriately so that positive actions adopted to overcome the problem can be effective.\textsuperscript{35} Additionally, similar to the general population, healthcare workers working in community hospitals are vulnerable to disease and rumors. Jiang et al.\textsuperscript{36} even found that front-line healthcare workers had the same mental health status as patients with severe symptoms of COVID-19. A member of parliament in Singapore highlighted what he termed disgraceful actions against healthcare workers stemming from fear and panic,\textsuperscript{37} similar to actions in China. A nurse was forbidden from entering the community after a night shift because people thought that she might spread the virus to others. Medical personnel may lack awareness of the COVID-19 outbreak, and coupled with the lack of protective equipment, high work intensity, great pressure, easy overfatigue, nervousness, and anxiety, resistance can decline. Most community healthcare workers lack experience in the prevention and control of such a contagious disease.\textsuperscript{38} In our study, only 38.9% of the study participants had previously experienced a public health emergency; these people should receive more attention to solve their psychological crises.

The COVID-19 outbreak will be a long-term battle. These at-risk groups should also be given adequate social and mental health support, which are needed but sometimes overlooked. We should focus on the emergency response to community healthcare workers and build a stress response intervention system in the future. Furthermore, managers should pay more attention to community hospital staff’s mental health. It is necessary to provide vocational training and regular assessment. For those who have serious mental problems, psychological interventions should be provided through networks or telephone visits.

In summary, this study found that community healthcare workers experienced psychological problems during the outbreak of COVID-19 in China. Doctors had the highest occurrence rate of mental health symptoms compared with nurses and others. Furthermore, the mental health status of community healthcare workers was influenced by their sex and occupational risk of exposure to COVID-19. More attention should be paid to the mental health of these individuals, and this problem should be solved with effective actions.

5. Limitations

This study had several limitations that may have affected the outcomes. First, recruitment through convenience sampling limits the generalizability of the results. Second, the study data were obtained from a single province in southwestern China, resulting in a rather small sample size. The findings may have been more robust if we had obtained samples from more provinces.

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