# Investigation on the Mental Health Status of ICU Practitioners and Analysis of Influencing Factors during the Stable Stage of COVID-19 Epidemic in China

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## Abstract

**Objective:** To understand the impact of COVID-19 epidemic on the mental health status of ICU practitioners in China and to explore the relevant factors that may affect the mental health status of first-line medical workers.

**Methods:** The study covered most of the provinces in China, and a questionnaire survey was conducted based on the WeChat platform and the Wenjuanxing online survey tool. With the method of anonymous investigation, we chose ICU practitioners to participate in the investigation from April 5, 2020 to April 7, 2020. The respondents were divided into two groups according to strict criteria of inclusion and exclusion: those who participated in the rescue work of COVID-19 (COVID-19 group) and those who did not (non-COVID-19 group). The SCL-90 self-evaluation scale was used for the evaluation of mental health status of the subjects.

**Results:** A total of 3851 respondents completed the questionnaire and were included in the analysis. First, the overall mental health status of the investigated population, compared with the Chinese norm (n=1388), was reflected in 9 related factor groups of the SCL-90 scale, and significant differences were found in every factor in both men and women, except for the interpersonal sensitivity in men. Second, the overall mental health of the COVID-19 group was better than that of the non-COVID-19 group by the SCL-90 scale. Third, for the COVID-19 group, we have revealed several influencing factors for their mental health, and the statistical results showed that these factors had a significant influence on the mental health of the subjects in the COVID-19 group.

**Conclusion:** The mental health status of the ICU practitioners in the COVID-19 group is better than that of the non-COVID-19 group, which could be attributed to a strenghened mentality and awareness of risks related to occupational exposure and enforced education on preventive measures for infectious diseases before being on duty.

## Keywords

COVID-19• ICU practitioners • Mental health • SCL-90 • Intervening measure

## Introduction

2020 is disrupted by a sudden pandemic outbreak of the coronavirus disease 2019 (COVID-19), which is first reported in Wuhan, China [1], and it is becoming an emerging, rapidly evolving situation. According to the official website of the World Health Organization, over 5 million people have been confirmed to have a COVID-19 infection globally by the end of May 30, 2020 [2]. We have accumulated much knowledge about the COVID-19, including the virus information, clinical features, and diagnosis, but there is no effective treatment for now [3-5]. There have been extreme fear over the COVID-19 from the public, due to the strong infectivity, fast spread, and uncertainty of the disease manifestations [6], and harsh protective measures have been put in force in real-life practice. Surprisingly, post epidemic surveys have found that most patients who were diagnosed usually have only mild pain or moderate mental problems, including depression, anxiety, shame, and sadness [7]. However, medical health workers are the first-line fighters to treat patients with COVID-19, facing a high risk of infection every day. In order to combat the outbreak, they need to work overtime under a stressful mentality. In short, they are in a kind of persistent pressure that may exceed their coping ability [8]. Although it is said that attention should be paid to the mental health of medical workers during the campaign against COVID-19 [9,10], few reports have been done on the mental health of medical workers after the outbreak of COVID-19 in China. Zhang et al. conducted a survey on the psychosocial problems between medical and nonmedical health workers during the COVID-19 outbreak [11]. They found that medical health workers had psychosocial problems and risk factors for developing them.

In this study, we aim to understand the impact of COVID-19 epidemic on the mental health status of ICU practitioners in China, and to explore the relevant factors that may affect the mental health status of first-line medical workers.

## Methods

### Study design

This study was a cross-sectional online survey performed based on WeChat platform and Wenjuanxing (a platform providing functions equivalent to Amazon Mechanical Turk) from April 5 to April 7, 2020, which basically in the stable stage of COVID-19 epidemic in China.

### Study population

With the method of anonymous investigation, ICU practitioners from most of the provinces in China were recruited in the investigation. The respondents who completed all questions of the online survey were divided into two groups according to strict criteria of inclusion and exclusion: those who participated in the rescue work of COVID-19 (anti-COVID-19 group) and those who did not (non-anti-COVID-19 group).

**Inclusion criteria:** a. Critical care medical practitioners; b. Personnel in China; c. In-service personnel (with specific age and employment restrictions)

**Exclusion criteria:** d. Not open hours of the questionnaire, such as the test section; e. Exceeding time limit for questionnaire, 360-3600 seconds for anti-COVID-19 group, 150-3600 seconds for non-anti-COVID-19 group; f. Incomplete questionnaire.

### Measurements

Demographic data, i.e., gender, age, occupation (doctors, nurses and others), education status (community college, bachelor, master, and doctor), marital status (married, unmarried and other), professional title, department (ICU, surgical department, internal medicine, pneumology department, etc.), medical working time, having siblings or children, religious belief, participated in public health emergency treatment before or not and directly participate in COVID-19 anti-epidemic work or not were collected via survey questions. Symptom Check List-90-revised (SCL-90-R) [12] was used for the mental health status of the subjects, including somatization (SOM),

obsessive-compulsive (OC), interpersonal sensitivity (IS), depression (DEP), anxiety (ANX), hostility (HOS), phobic anxiety (PHOB), paranoid ideation (PAR), and psychoticism (PSY), which was a 90-item self-report scale with items rated on a 5-point Likert scale (from 0 "not at all" to 4 "extremely"). Subscale scores ≥ 2 indicate potential psychological issues [13]. The number of positive items refers to the number of except "No" answers in the 90 questions. The positive symptoms in the results were: the total score of SCL-90 was >=160.

### Statistical analysis

The measurement variables were expressed as mean ± standard deviation (SD), and the scores of SCL-90 factors between the ICU practitioners and the Chinese norm were compared by U test. Frequency (%) was used for counting variables, and the Chi-square or Fisher method was used for inter-group comparison. Logistic multivariate regression was used to analyze the influence factors the positive symptom of SCL-90 score, and the OR value was estimated. In the multivariate analysis, all features of patients were forced to be included in the model as independent variables, and on this basis, stepwise regression was carried out. The P-value stepwise regression was 0.05. The software of statistical analysis was SAS 9.3, both of which were tested bilaterally. When $P<0.05$, the difference was considered statistically significant.

## Results

### General characteristics of ICU practitioners during CO-VID-19 epidemic

Endosomal A total of 3851 ICU practitioners participated in this questionnaire survey. Among them, there were 1527 nurses (39.65%) and 2324 doctors (60.35%), most of whom were from the intensive care unit (74.68%). 1210 (31.42) people were directly involved in fighting the COVID-19 epidemic. The age, educational background, professional title, marriage, and other general characteristics of the respondents were shown in Table 1.

| Variable | Variable categories | n,(%) | Variable | Variable categories | n, (%) |
|---|---|---|---|---|---|
| Gender | Male | 1674 (43.47) | Department | Other | 975 (25.32) |
| | Female | 2177 (56.53) | | ICU | 2876 (74.68) |
| Age | ≤ 25 | 224 (5.82) | Occupation | Nurse | 1527 (39.65) |
| | 26-30 | 678 (17.61) | | Doctor | 2324 (60.35) |
| | 31-35 | 962 (24.98) | Marital status | Other | 76 (1.97) |
| | 36-40 | 794 (20.62) | | Unmarried | 639 (16.59) |
| | >40 | 1193 (30.98) | | Married | 3136 (81.43) |
| Highest education | Community college | 287 (7.45) | Medical working time | 0-5 years | 704 (18.28) |
| | Bachelor | 2569 (66.71) | | 11-15 years | 795 (20.64) |
| | Master | 844 (21.92) | | 6-10 years | 1013 (26.30) |
| | Doctor | 151 (3.92) | | Over 15 years | 1339 (34.77) |
| Do you have siblings | No | 761 (19.76) | Participated in public health emergency treatment before | No | 2663 (69.15) |
| | Yes | 3090 (80.24) | | Yes | 1188 (30.85) |
| Do you have children? | No | 921 (23.92) | Directly participate in COVID-19 anti-epidemic work | No | 2641 (68.58) |
| | Yes | 2930 (76.08) | | Yes | 1210 (31.42) |
| Professional title | Primary | 1261 (32.74) | Religious belief | No | 3621 (94.03) |
| | Intermediate | 1420 (36.87) | | Yes | 230 (5.97) |
| | Deputy senior | 777 (20.18) | | | |
| | Senior | 393 (10.21) | | | |

**Table 1**. General characteristics of ICU practitioners.

Table 2 showed the current working status of the workers directly participating in the fight against the COVID-19 epidemic. There were 995 (82.23%) who had finished the anti-COVID-19 work and in the succeeding period or back to work, and the other 215 (17.77%) were still in the rescue work, about two-thirds of the participants against the COVID-19 epidemic had worked for more than a month. More than half of the people were satisfied with their diet and accommodation during the epidemic, while only a minority (2.23%-3.22%) was dissatisfied. 65.45% believed that the training they had received in the prevention and treatment of infectious diseases was adequate in both theory and practice. In comparison, a minority (1.40%) believed that the theory was inadequate and poor inoperability. Moreover, the proportion who thought they were at high risk of infection at work reached 43.88%. The proportions of suspicious occupational exposure and infection caused by occupational exposure were 36.61% and 9.42%, respectively. During the anti-epidemic period, the weekly working hours were generally substantial, with about half of the staff working more than 40 hours per week, and 8.02% working more than 80 hours.

## SCL-90 score and positive symptom rate of ICU practitioners

The mean score of SCl-90 of the participants in this survey was 147.84 ± 58.45. Compared with the Chinese norm, the scores of 8 factors of somatization, obsessive-compulsive, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism of the male and female ICU practitioners were both higher than those of the norm (P<0.001). In terms of interpersonal relationship sensitivity, the comparison between male and female ICU practitioners and norm was different, with no significance was found between males (p=0.735). In contrast, the score of female ICU practitioners was still higher than the norm (p<0.001). The mean positive number among the 90 symptoms of ICU practitioners was 34.57 ± 27.90, which was also significantly higher than the Chinese norm population. The results were shown in Table S1.

According to the total score of SCL-90, the overall positive symptom rate of ICU practitioners was 32.49% (95% CI: 31.01-33.96). Unifactorial analysis revealed that women, intermediate education (bachelor's degree), intermediate working time (6-15 years), lower professional title, nurse occupation, being from intensive care unit, and those who did not directly participate in COVID-19 epidemic had higher positive symptom

rate (p<0.05), as shown in Table 3. The characteristics of ICU practitioners were taken as independent variables, and the factors affecting positive symptoms of SCL-90 score were selected by stepwise logistic multivariate analysis, including education background, professional title, department, whether they participated in the treatment of public health emergencies, and whether they directly participated in anti-epidemic work (Table 4). The risk of positive symptoms of the SCL-90 score increased by 98% (OR=1.98, 95% CI, 1.682-2.331) among those who did not directly participate in the anti-epidemic program. The symptoms of those who directly participated in the anti-epidemic program were all less severe in 9 factors, including somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism, as displayed in Table S2.

## The influence of working conditions on SCL-90 score during anti-COVID-19 epidemic

The overall positive rate of SCL-90 for the anti-COVID-19 epidemic ICU practitioners was 23.14% (95% CI: 20.76-25.52), and the lowest positive rate was 15.29% for the succeeding period. The more satisfied the diet and accommodation during the epidemic, the lower the positive symptom rate. During the period of fighting the epidemic, the longer the average weekly cumulative working hours, the higher the positive rate of symptoms, and the positive rate of working more than 80 hours per week reached 39.18%. The rate of positive symptoms was the highest (31.73%) within 2 weeks of participating in the anti-COVID-19 epidemic campaign, the rate was stable (about 20%) within 2-7 weeks, there was a small increase (25%) after 8 weeks. The rate of positive symptoms was significantly higher when surrounding colleagues had suspected occupational exposure or were infected by occupational exposure (p<0.001). The two kinds of people who thought their risk of being infected in the period was not high, and who thought they had received sufficient theories and practices of infectious disease protection and treatment training, had significantly lower positive symptom rate than others, as shown in Table 5. The work status of the ICU practitioners participating in the anti-epidemic campaign was taken as the independent variable. The factors influencing the positive symptom of SCL-90 score, including the current work status, diet, accommodation, surrounding colleagues' infection status, work infection risk, protection and treatment training, were screened by stepwise logistic multivariate analysis, as shown in Table 6.

| Variable | Variable categories | n,(%) | Variable | Variable categories | n, (%) |
|---|---|---|---|---|---|
| Whether satisfied with the diet during rescue period | Unsatisfactory | 39 (3.22) | Whether satisfied with the accommodation conditions during rescue period | Unsatisfactory | 27 (2.23) |
| | General | 416 (34.38) | | General | 310 (25.62) |
| | Satisfactory | 755 (62.40) | | Satisfactory | 873 (72.15) |
| Training on prevention and treatment of infectious diseases | Inadequate theory and poor operability | 17 (1.40) | Views on the risk of infection in the process of working | Unclear | 14 (1.16) |
| | The theory and operability are general | 207 (17.11) | | Low risk | 220 (18.18) |
| | Sufficient theory and weak operability | 194 (16.03) | | Medium risk | 445 (36.78) |
| | Sufficient theory and strong operability | 792 (65.45) | | High risk | 531 (43.88) |
| Is there any suspicious occupational exposure of colleagues around? | No | 767 (63.39) | Any colleagues who were infected by occupational exposure during work? | No | 1096 (90.58) |
| | Yes | 443 (36.61) | | Yes | 114 (9.42) |
| Average accumulated working hours per week during the rescue period | 1-40 hours | 591 (48.84) | Duty time of each shift in COVID-19 area during the period of rescue | Within 4 hours | 109 (9.01) |
| | 41-60 hours | 378 (31.24) | | 4-6 hours | 438 (36.20) |
| | 61-80 hours | 144 (11.90) | | 6-8 hours | 312 (25.79) |
| | Over 80 hours | 97 (8.02) | | 8-10 hours | 121 (10.00) |
| Accumulated working time of the first line of anti-epidemic | 1-14 days | 208 (17.19) | Current working status | 10-12 hours | 132 (10.91) |
| | 15-28 days | 229 (18.93) | | 12-24 hours | 98 (8.10) |
| | 29-42 days | 298 (24.63) | | Rescue work | 215 (17.77) |
| | 43-56 days | 263 (21.74) | | Suceeding | 484 (40.00) |
| | >56 days | 212 (17.52) | | Back to work | 511 (42.23) |

**Table 2**. The working status of those who directly participate in COVID-19 anti-epidemic work.

| Variable | Variable level | Positive symptom, n=1251(%) | negative symptom, n=2600(%) | Test method | Statistics (χ2) | p |
|---|---|---|---|---|---|---|
| Gender | Male | 512 (30.59) | 1162 (69.41) | chi square | 4.872 | 0.027 |
| | Female | 739 (33.95) | 1438 (66.05) | | | |
| Age | ≤25 | 75 (33.48) | 149 (66.52) | chi square | 5.716 | 0.221 |
| | 26-30 | 220 (32.45) | 458 (67.55) | | | |
| | 31-35 | 333 (34.62) | 629 (65.38) | | | |
| | 36-40 | 265 (33.38) | 529 (66.62) | | | |
| | >40 | 358 (30.01) | 835 (69.99) | | | |
| Highest education | Community college | 77 (26.83) | 210 (73.17) | chi square | 22.23 | <0.001 |
| | Bachelor | 894 (34.80) | 1675 (65.20) | | | |
| | Master | 247 (29.27) | 597 (70.73) | | | |
| | Doctor | 33 (21.85) | 118 (78.15) | | | |
| Marital status | Other | 29 (38.16) | 47 (61.84) | chi square | 1.971 | 0.373 |
| | Unmarried | 197 (30.83) | 442 (69.17) | | | |
| | Married | 1025 (32.68) | 2111 (67.32) | | | |
| Do you have siblings | No | 239 (31.41) | 522 (68.59) | chi square | 0.503 | 0.478 |
| | Yes | 1012 (32.75) | 2078 (67.25) | | | |
| Do you have children? | No | 303 (32.90) | 618 (67.10) | | | |
| | Yes | 948 (32.35) | 1982 (67.65) | chi square | 10.168 | 0.017 |
| Medical working time | 0-5 years | 218 (30.97) | 486 (69.03) | | | |
| | 11-15 years | 268 (33.71) | 527 (66.29) | | | |
| | 6-10 years | 363 (35.83) | 650 (64.17) | | | |
| | Over 15 years | 402 (30.02) | 937 (69.98) | | | |
| Professional title | Primary | 425 (33.70) | 836 (66.30) | chi square | 12.595 | 0.006 |
| | Intermediate | 491 (34.58) | 929 (65.42) | | | |
| | Deputy senior | 230 (29.60) | 547 (70.40) | | | |
| | Senior | 105 (26.72) | 288 (73.28) | | | |
| Occupation | Nurse | 531 (34.77) | 996 (65.23) | chi square | 6.045 | 0.014 |
| | Doctor | 720 (30.98) | 1604 (69.02) | | | |
| Department | other | 283 (29.03) | 692 (70.97) | chi square | 7.124 | 0.008 |
| | ICU | 968 (33.66) | 1908 (66.34) | | | |
| Religious belief | No | 1177 (32.50) | 2444 (67.50) | chi square | 0.011 | 0.917 |
| | Yes | 74 (32.17) | 156 (67.83) | | | |
| Participated in public health emergency treatment before | No | 861 (32.33) | 1802 (67.67) | chi square | 0.092 | 0.761 |
| | Yes | 390 (32.83) | 798 (67.17) | | | |
| Directly participate in COVID-19 anti-epidemic work | No | 971 (36.77) | 1670 (63.23) | chi square | 70.247 | <0.001 |
| | Yes | 280 (23.14) | 930 (76.86) | | | |

**Table 3**. The positive symptom ratio of SCL-90 score in ICU practitioners with different characteristics.

| Independent variable | Independent variable level (risk factor) | OR value | 95% CI min | 95% CI max | p |
|---|---|---|---|---|---|
| Highest education | Bachelor VS. Community college | 1.502 | 1.131 | 1.995 | 0.003 |
| | Doctor VS. Community college | 0.951 | 0.584 | 1.549 | |
| | Master VS. Community college | 1.285 | 0.934 | 1.766 | |
| Professional title | Primary VS. Intermediate | 0.962 | 0.813 | 1.14 | 0.012 |
| | Deputy senior VS. Intermediate | 0.789 | 0.647 | 0.962 | |
| | Senior VS. Intermediate | 0.679 | 0.52 | 0.885 | |
| Department | Other VS. ICU | 0.809 | 0.688 | 0.95 | 0.01 |
| Participated in public health emergency treatment before | No VS. Yes | 0.74 | 0.625 | 0.876 | <0.001 |
| Directly participate in COVID-19 anti-epidemic work | No VS. Yes | 1.98 | 1.682 | 2.331 | <0.001 |

**Table 4**. Multi-factor analysis of positive symptom of SCL-90 score of ICU practitioners.

| Variable | Variable level | Positive symptom, n=280(%) | Negative symptom, n=930(%) | Test method | Statistics | p |
|---|---|---|---|---|---|---|
| Current working status | Rescue work | 58 (26.98) | 157 (73.02) | chi square | 28.293 | <0.001 |
| | Succeeding | 74 (15.29) | 410 (84.71) | | | |
| | Back to work | 148 (28.96) | 363 (71.04) | | | |
| Whether satisfied with the diet during rescue period | Unsatisfactory | 20 (51.28) | 19 (48.72) | chi square | 61.599 | <0.001 |
| | General | 138 (33.17) | 278 (66.83) | | | |
| | Satisfactory | 122 (16.16) | 633 (83.84) | | | |
| Whether satisfied with the accommodation conditions during rescue period | Unsatisfactory | 11 (40.74) | 16 (59.26) | chi square | 75.183 | <0.001 |
| | General | 124 (40.00) | 186 (60.00) | | | |
| | Satisfactory | 145 (16.61) | 728 (83.39) | | | |
| Accumulated working time of the first line of anti-epidemic | 1-14 days | 66 (31.73) | 142 (68.27) | chi square | 15.402 | 0.004 |
| | 15-28 days | 52 (22.71) | 177 (77.29) | | | |
| | 29-42 days | 53 (17.79) | 245 (82.21) | | | |
| | 43-56 days | 54 (20.53) | 209 (79.47) | | | |
| | >56 days | 55 (25.94) | 157 (74.06) | | | |
| Average accumulated working hours per week during the rescue period | 1-40 hours | 109 (18.44) | 482 (81.56) | chi square | 22.985 | <0.001 |
| | 41-60 hours | 97 (25.66) | 281 (74.34) | | | |
| | 61-80 hours | 36 (25.00) | 108 (75.00) | | | |
| | Over 80 hours | 38 (39.18) | 59 (60.82) | | | |
| Duty time of each shift in COVID-19 area during the period of rescue | Within 4 hours | 23 (21.10) | 86 (78.90) | chi square | 9.177 | 0.102 |
| | 4-6 hours | 90 (20.55) | 348 (79.45) | | | |
| | 6-8 hours | 67 (21.47) | 245 (78.53) | | | |
| | 8-10 hours | 38 (31.40) | 83 (68.60) | | | |
| | 10-12 hours | 34 (25.76) | 98 (74.24) | | | |
| | 12-24 hours | 28 (28.57) | 70 (71.43) | | | |
| Is there any suspicious occupational exposure of colleagues around? | No | 149 (19.43) | 618 (80.57) | chi square | 16.249 | <0.001 |
| | Yes | 131 (29.57) | 312 (70.43) | | | |
| Any colleagues who were infected by occupational exposure during work? | No | 241 (21.99) | 855 (78.01) | chi square | 14.193 | 0.003 |
| | Yes | 39 (34.21) | 75 (65.79) | | | |
| Views on the risk of infection in the process of working | Unclear | 3 (21.43) | 11 (78.57) | chi square | 14.193 | 0.003 |
| | Low risk | 35 (15.91) | 185 (84.09) | | | |
| | Medium risk | 94 (21.12) | 351 (78.88) | | | |
| | High risk | 148 (27.87) | 383 (72.13) | | | |
| Training on prevention and treatment of infectious diseases | Inadequate theory and poor operability | 5 (29.41) | 12 (70.59) | chi square | 41.458 | <0.001 |
| | The theory and operability are general | 66 (31.88) | 141 (68.12) | | | |
| | Sufficient theory and weak operability | 70 (36.08) | 124 (63.92) | | | |
| | Sufficient theory and strong operability | 139 (17.55) | 653 (82.45) | | | |

**Table 5**. The proportion of positive symptoms with SCL-90 score among the people directly participate in COVID-19 anti-epidemic work.

| Independent variable | Independent variable level | OR value | 95% CI min | 95% CI max | P |
|---|---|---|---|---|---|
| Current working status | Rescue work VS. Back to work | 0.912 | 0.624 | 1.333 | <0.001 |
| | Suceeding VS. Back to work | 0.516 | 0.368 | 0.725 | |
| Whether satisfied with the diet during rescue period | Unsatisfactory VS. General | 855 (78.01) | 855 (78.01) | 855 (78.01) | 0.002 |
| | Satisfactory VS. General | 855 (78.01) | 855 (78.01) | 855 (78.01) | |
| Whether satisfied with the accommodation conditions during rescue period | Unsatisfactory VS. General | 0.546 | 0.212 | 1.406 | 0.002 |
| | Satisfactory VS. General | 0.52 | 0.359 | 0.754 | |
| Is there any suspicious occupational exposure of colleagues around? | No VS. Yes | 0.656 | 0.488 | 0.881 | 0.005 |
| Views on the risk of infection in the process of working | Unclear VS. Medium risk | 0.987 | 0.258 | 3.771 | 0.034 |
| | Low risk VS. Medium risk | 0.767 | 0.49 | 1.199 | |
| | High risk VS. Medium risk | 1.384 | 1.008 | 1.901 | |
| Training on prevention and treatment of infectious diseases | Inadequate theory and poor operability VS. Sufficient theory and strong operability | 1.114 | 0.36 | 3.447 | 0.01 |
| | The theory and operability are general VS. Sufficient theory and strong operability | 1.413 | 0.973 | 2.051 | |
| | Sufficient theory and weak operability VS. Sufficient theory and strong operability | 1.844 | 1.271 | 2.674 | |

**Table 6**. Multi-factor analysis of positive symptom of SCL-90 score of people directly participate in COVID-19 anti-epidemic work.

# Discussion

Previous studies have shown that COVID-19 has an adverse psychological influence on ordinary citizens during the Level I Emergency Response period through the SCL-90 [14]. Compared with the general public, medical health workers, including doctors and nurses working in front-line clinical positions, are the main force for hospitals to complete the task of medical security, but also face a higher risk of infection and intense mental pressure during the COVID-19 epidemic.

Compared to the mental health status of the Chinese norm, the ICU practitioners during the COVID-19 epidemic have higher rates of somatization, obsessive-compulsive symptoms, depression, anxiety, hostility, terror, paranoia, and psychosis based on SCL-90 score, in both men and women. In terms of interpersonal relationship sensitivity, no significance was found in men, but women were found to be sensitive. According to previous studies, results have indicated gender differences, where men tend to be less inter-personally sensitive than women [15,16], which may explain this result. The mean positive numbers among the 90 symptoms of ICU practitioners were also significantly higher than the Chinese norm population.

Unifactorial and logistic multivariate analysis both showed that educational background, professional title, department, and whether they directly participated in anti-epidemic work could likely have some impact on higher positive symptom rate. The risk of positive symptoms of the SCL-90 score increased by 98% among those who did not directly participate in the anti-epidemic program. Moreover, the symptoms of those who directly participated in the anti-epidemic program were all less severe in 9 factors. The reasons for the psychological distress of medical health workers might be related to the many aspects during COVID-19 epidemic, such as insufficient understanding of the virus, the lack of prevention and control knowledge and equipment, the long-term workload, the high risk of exposure to patients with COVID-19 [17,18], and the exposure to critical life events [19], such as death. However, from the results, we found that the mental health status of those who directly participated in the anti-epidemic was not more severe than those who did not, but was even better. This is not consistent with our hypothesis before the investigation. We assume this could be explained by the following explanations: First, during our investigation period, the domestic epidemic has been basically at a steady stage. Many front-line personnel have returned to their original posts, or even though they have worked in the front-line, the most severe stage has already passed, and their psychological state has been relaxed to varying degrees. Second, the mentality of those who voluntarily participated (most of whom were Party members) in the resue work was strong and well-prepared. Third, those medical works participated in the resue work got enough training about the knowledge of COVID-19 and received sufficient protection equipments. Indeed, no doctors (out of 40,000 medical personnel) from outside Hubei Province were infected with COVID-19 during their aid period in Hubei Province [20]; Finally, a strong sense of social responsibility and encouragement from the whole society and family became spiritual pillar which support them to overcome fears and hesitations and stay in a more healthy mental status. Other incentives or policies from government and institutions may act as a supporting factor in improving their mental health.

Many factors are affecting the positive symptom rate for participants in the epidemic. From the study, we found that the more the doctors are satisfied with the diet and accommodation, the less they develop positive symptoms rate. In addition, the average weekly cumulative working hours is also correlated with the positive rate of symptoms. These are in accord with the results we expected. The rate of positive symptoms was significantly higher when surrounding colleagues had suspected occupational exposure or were infected by occupational exposure. Medical health workers might worry about being infected due to a different workplaces involving different medical skills and medical conditions. In addition, multivariate analysis screened that many factors, including current work status, diet and accommodation conditions, surrounding colleagues' infection status, work

infection risk, protection, and treatment training, could influence the positive symptom of SCL-90 score.

# Conclusion

This study has some limitations. First, a cross-sectional design was applied to investigate the short term mental health influence of COVID-19; however, long term impact, especially post-traumatic stress disorder, might occur with the COVID-19 progression. Second, psychological assessment was only based on online surveys and self-reporting tools, and there may be some deviation. In conclusion, the overall mental health status of the ICU practitioners is worrying. In addition, among the ICU practitioners, the mental health status in the COVID-19 group is better than that of the non-COVID-19 group, and the reasons may vary. Moreover, for the medical workers in the COVID-19 rescue operation, we should select those who have enough related experience and give them adequate health protection training and better working conditions to empower resilience and psychological well-being.

# Acknowledgment

# Conflicts of Interest

None declared.

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