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Research Article

Research on the Mental Health Status of Frontline Medical Staff during the Normalization of the COVID-19 Pandemic

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ABSTRACT

Objective: This study explored the relationship between personality characteristics and mental health in front-line medical staff in hospitals to establish an objective basis and reference for developing targeted mental health education and formulating relevant policies.

Methods: We used Symptom Checklist-90 (SCL-90) to investigate the mental health status of 150 front-line medical staff in Zhejiang Province coping with the Severe Acute Respiratory Syndrome Coronavirus Pneumonia 2 (SARS-CoV-2).

Results: The staff's average SCL-90 scores during the COVID-19 pandemic (overall, somatization, compulsion, depression, anxiety, hostility, terror, and psychosis) were significantly higher than for the general population. The primary influences (from high to low) were as follows: Experiencing any symptoms that might suggest COVID-19, fears of getting COVID-19 and spreading the infection to their families, whether they had received a physical examination recently, and whether they had completed higher education (all $P<0.05$). The higher-than-average levels of psychological distress among front-line medical staff dealing with COVID-19 are unsurprising, given the enormous physical and psychological pressures of pandemic conditions. However, supporting their mental health is critical to the public health response.

Conclusion: Therefore, it is necessary to establish a targeted mental health promotion mechanism to alleviate the psychological pressure on the front-line medical staff, promote their physical and mental health, and better respond to the epidemic in China.

Keywords: Front-line medical staff; Mental health; COVID-19; Severe Acute Respiratory Syndrome Coronavirus 2

Abbreviations: NCP: Novel Coronavirus Pneumonia; SARS: Severe Acute Respiratory Syndrome

INTRODUCTION

Novel coronavirus pneumonia is caused by the new Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). On January 30, 2020, the World Health Organization officially declared the disease a public health emergency of international concern; in March 2020, they officially named it "2019 Coronavirus Disease" (COVID-19) and declared pandemic conditions. The first reported case occurred in Wuhan, China, on December 12, 2019 [1,2]. Although SARS-CoV-2 is similar to the coronavirus SARS-CoV-1 and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV), the rapid increase in cases and human-to-human infection showed that SARS-CoV-2 is more infectious and is a COVID-19 strain never before found in humans [3,4]. Common COVID-19 symptoms include fever, cough, shortness of breath, and dyspnea. In more serious cases, pneumonia, severe acute respiratory failure, renal failure, and death can occur [5].

COVID-19 can cause physical injury to infected people, but it can also adversely affect mental health. During the COVID-19 pandemic, people's anxiety and depression levels increased significantly, and their sleep quality deteriorated [6,7]. Medical staff also experience these symptoms and additional psychological pressures because their workload and risk of infection have increased significantly [8]. Daily contact with infected patients increases health workers' anxieties about contracting SARS-CoV-2 and spreading the virus to their families. A survey of the psychological status of 1,995 Finnish medical workers during the COVID-19 pandemic showed that 40%

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showed mild to moderate anxiety, and 5% showed severe anxiety [9]. Another report on the mental health impact of COVID-19 on doctors in the United States showed that 67.6% of 1,356 doctors reported a moderate or high degree of emotional distress [10]. China reports that it has effectively contained the virus through timely government action, public cooperation, and the concerted efforts of medical professionals and medical support staff [11-13]. However, despite its strict prevention and control policies new cases are still arising, and there are many asymptomatic infected people in China. With the pandemic entering its third year, living with the threat of COVID-19 has become the new normal [14,15].

On December 7, 2022, the State Council zone spreading mechanism group announced further optimization of medical processes to improve the current medical service by optimizing the medical resources available. They were to ensure that maximizing order and safety in the medical service would not affect routine diagnosis and treatment and the acute management of positive patients. In autumn and winter, the number of patients with respiratory diseases increases. With the added risk introduced by the novel coronavirus infection, the frontline medical staff would be burdened by the task of managing it, with inevitable great psychological pressure. According to data statistics, as of December 12, 2022, there were more than 9.3 million confirmed cases in China, including over 14,000 new cases in a single day. Experts explained that with the first wave of the pandemic after the full release, the peak infection rate would reach 60 percent. In this case, the frontline medical staff would be exposed to a large number of novel coronavirus infections, causing them to worry about being infected due to occupational exposure, and worrying that if they do not work well, they may affect the whole team, thus generating great psychological pressure. In a short time, the number of cases has greatly increased; medical staff must work tirelessly with the consistent pressure of the need to provide treatment, and they may not be able to ensure adequate rest and sleep for themselves. Due to the closed-loop management requirements, some medical staff workers may be separated from their families for a long time, which may also increase their concerns about their family's health and wellness. Long shifts, intensive work, and constant readiness to deal with large-scale emergencies make the medical staff prone to psychological problems. These, in turn, are associated with many negative outcomes, such as reduced efficiency, loss of productivity, disability, and absenteeism [9]. In view of these adverse effects, it is necessary to conduct research to reveal the potential factors and mechanisms that may improve the mental health of medical personnel and maintain their productivity in the new era of COVID-19.

Previous studies have focused on the psychological changes in medical staff early in the pandemic and in high-risk areas. However, only a few have reported the psychological status of medical staff in low-risk areas and under the normalization of COVID-19. Therefore, we analyzed the mental health status of front-line medical staff under the normalization of COVID-19 and its influencing factors to provide an objective basis for developing prevention and intervention measures. Our insights into the relationship between the demographic characteristics and mental health of front-line medical staff should help the hospitals develop targeted mental health education and formulate appropriate support and management policies.

MATERIALS AND METHODS

Research design

This quantitative study used questionnaires to collect psychometric indicators.

Setting and sample

We used convenience sampling to collect information from 150 front-line medical staff of different levels of hospitals in Zhejiang Province, China, from December 8 to 22, 2022. There are three levels of hospitals in China: First-level hospitals have fewer than 100 beds, second-level hospitals have 101-499 beds, and third-level hospitals have more than 500 beds. The selection criteria for participants were as follows: (1) Front-line medical personnel and (2) Written informed consent.

Sample size calculation

Since this study's focus was the correlation between demographic characteristics and psychological stress, we used multiple linear regression analysis. The rule of thumb for calculating the sample size based on the number of predictor variables is that the ratio of N to P should be at least 10:1. To input 16 variables into the model with a sample size of 10-15 times that number, we required at least 160 participants since the follow-up loss rate is generally 10%. Therefore, we set the initial sample size at 176. After removing invalid data, our final sample was 150.

Data collection

The two trained investigators received collected data through online interviews with front-line medical staff in the hospitals. The researchers explained the research objectives and methods. They obtained the informed consent and cooperation of those who met the inclusion criteria through online interviews before collecting the research data through online questionnaires. The front-line medical staff who agreed to participate received a link to the questionnaire, which we instructed them to fill out immediately after accessing it. To ensure anonymity, no one except researchers could see the participants' IP addresses or any private information.

Study measures

This study used two questionnaires. The demographic questionnaire comprised 16 items: hospital level; department; occupation; sex; age; highest education; working years; technical title; marital status; parenting status; living situation; public health and emergency-response training; level of family support for front-line clinical work; fear level regarding contracting and spreading the infection to their families; anxiety level when experiencing COVID-19 related symptoms; and whether they had received a recent physical examination.

The second question was a 90-item, self-report psychometric instrument, the Symptom Checklist-90 (SCL-90), that assesses psychological symptoms of medical staff across multiple dimensions: somatization, obsessive–compulsive symptoms, interpersonal sensitivity, depression, anxiety, hostility, terror, paranoia, psychosis, and sleep/eating issues. Each item was scored with a five-point Likert scale (1= "no problem" to 5= "severe"). The total score of the scale is the sum of 90 scores. In previous studies, the homogeneity reliability of the SCL-90 total scale was 0.97, the

homogeneity reliability of each subscale was greater than 0.70, the retest reliability was greater than 0.7, and the content validity was greater than 0.80, showing good reliability and validity [16].

Statistical methods

After the logic test, we used IBM SPSS Statistics for Windows, Version 26.0 (Armonk, NY: IBM Corp.) for data analysis, considering $P<0.05$ statistically significant. We used the mean, Standard Deviation (SD), and frequency values to describe the participants' demographic data and the mean and SD to describe their SCL-90 scores. We used multiple regression analysis to analyze the relationships between the demographic data and their mental health (SCL-90 scores). The dependent variable was the total SCL-90 score; the independent variables were the 16 demographic characteristics. We used the stepwise method to enter and give the assignment method of the independent variable in the regression analysis

RESULTS

Demographic characteristics of front-line medical personnel

In this study, 180 questionnaires were collected online, 150 of which were considered valid, with an effective recovery rate of 83.33%. The detailed demographic information was showed in Table 1.

Table 1: Demographic data of clinical medical personnel (n=150).

Project	Example number	Constituent ratio (%)
Hospital level		
Grade 3 A	125	83.3
Grade III B et al	8	5.3
Secondary-level	14	9.3
Grade II B et al	3	2
The department		
Internal medicine	36	24
Surgery	35	23.3
Gynaecology and obstetrics	4	2.7
Paediatrics	2	1.3
ED	28	18.7
Critical care medicine	25	16.7
Section for outpatients	5	3.3
Operating room	2	1.3
Else	13	8.7
Occupation		
Doctor	43	28.7
Nurse	107	71.3
Sex		
Man	56	37.3
Woman	94	62.7
Age distribution (years)		
Under 25	4	2.7
26-35 Years old	84	56
36-45 Years old	41	27.3
Over 45 years old	21	14
Highest education		
Special school	2	1.3
Junior college	10	6.7
Undergraduate course	99	66
Master's degree or above	39	26
Working life		
5 Years and below	20	13.3
6-10 Years	51	34
11-15 Years	32	21.3
16-20 Years	21	14
More than 20 years	26	17.3
Technical title		
Elementary	63	42
Middle rank	52	34.7
Senior	35	23.3
Marital status		
Unmarried	33	22
Married	111	74
Dissociaton	6	4
Have children		
have	109	72.7
not have	41	27.3
Current living situation		
Live alone	35	23.3
With the family	112	74.7
Joint rent	3	2
Have participated in the training on responding to public health emergencies		
Yes	112	74.7
deny	38	25.3
Whether your family members support you to work on the clinical frontline		
Yes	142	94.7
Deny	8	5.3
Worried about the extent to which you and your family will be infected		
Severe	9	6
Moderate	60	40
Mild	40	26.7
Not have	41	27.3
COVID-19 related symptoms, suspected the degree of infection		
Severe	67	44.7

Moderate	45	30
Mild	22	14.7
not have	16	10.7
Have received recent medical observation		
Have	23	15.3
Not have	127	84.7

SCL-90 was compared with the national norm

The average score of SCL-90 overall and all the somatic, obsessive-compulsive disorder, depression, anxiety, antagonistic, horror, and psychiatric factors were significantly higher than the norm (P<0.05) (Table 2) [17].

Table 2: Comparison of various F (Factor) scores (X ± S).

Factor	Medical personnel (n=548)	China often model (n=1388)	t price	p price
Somatization	1.67 ± 0.99	1.37 ± 0.48	3.64	0
Obsession	1.98 ± 1.11	1.62 ± 0.58	4.022	0
Interpersonal relation	1.70 ± 1.03	1.65 ± 0.61	0.552	0.582
Depressed	1.71 ± 1.04	1.50 ± 0.59	2.492	0.014
Anxious	1.70 ± 1.06	1.39 ± 0.43	3.566	0
Hostile	1.65 ± 1.08	1.46 ± 0.55	2.17	0.032
Terrifying	1.61 ± 1.01	1.23 ± 0.41	4.603	0
Bigoted	1.58 ± 1.00	1.43 ± 0.57	1.864	0.064
Psychiatric sex	1.51 ± 0.94	1.29 ± 0.42	2.857	0.005
Other	1.79 ± 0.98			
Total average score	1.70 ± 0.99	1.44 ± 0.43	3.159	0.002

Analysis of the factors influencing the psychological status of the clinical medical staff

Multiple linear regression analysis was performed on the total mental health status score and the general data as independent variables; the details of the independent variable assignment methods are shown in Table 2. The results showed that the influencing factors affecting mental health status were, from high to low: the degree of infection when presenting COVID-19-related symptoms, the degree of concern for oneself and one's family members, the recent medical check-up, and the high level of education (P<0.05). The specific results are shown in Table 3 and 4.

Table 3: Values of the factors influencing the mental health status of clinical medical staff.

Project	How to assign value
Hospital level	Use other levels as a reference
The department	Take other departments as a reference
Occupation	Doctor =0; nurse =1
Sex	Female =0; male =1
Age	Under 25 years =1; 26-35 =2; 36-45 =3; over 45 =4
Highest education	Technical secondary school =1; junior college =2; undergraduate =3; master degree and above =4
Working life	5 years and below =1; 6-10 years =2; 11-15 years =3; 16-20 years =4; 20 years above =5
Technical title	Primary =1; intermediate =2; advanced =3
Marital status	Take the other marital status as a reference
Have children	With =0; without =1
Current living situation	Take other living conditions as a reference
Participated in training on dealing to public health emergencies	Yes =0; No =1
Whether your family members support you to work on the front line of clinical work	Yes =0; No =1
Worried about the extent to which you and your family will be infected	No =1; mild =2; moderate =3; severe =4
Suspected the degree of infection when you develop symptoms associated with COVID-19	No =1; mild =2; moderate =3; severe =4
Have received recent medical observation	With =0; without =1

Table 4: Results of multiple linear regression analysis of the factors influencing the mental health status of clinical medical staff.

Variable	B	Beta	t price	p price
Constant	43.729		0.064	0.949
The extent to which you are infected when you develop symptoms related to COVID-19	6.296	0.402	5.636	0
Worried about the extent to which you and your family will be infected	6.804	0.323	4.573	0
Have received recent medical observation	15.457	-0.146	-2.334	0.021
Highest education	9.458	0.133	2.099	0.038

Note: Pour: R^2 =0.441, F=28.556, P =0.000

DISCUSSION

Comparison of SCL-90 factor scores and national norm

COVID-19 is a serious infectious disease. Due to its strong infectivity, several people are afraid of it, and even talk about the "crown" color change. This effect reflects on the clinical medical staff. The results of this study showed that the average scores of SCL-90 overall and its somatization, OCD, depressive, anxiety, rival, terror, and psychotic factors were all significantly higher than the normal scores (all P<0.05). This study specifically highlighted that, due to the direct contact with COVID-19 patients, the clinical medical staff represents the population group at the highest risk of COVID-19 infection. At the same time, being those with the deepest understanding of the dangers of COVID-19, they were at

increased risk of suffering from anxiety, depression, and fear when they abruptly faced these sudden public health events. The medical staff experienced strong social stress, so their symptoms' scores on the rating scales were higher than normal, representing a need that prompted the attention of psychologists and team leaders. The clinical medical personnel will be able to better overcome the pandemic only following amelioration of their working conditions and an improved psychological quality for self-regulation and self-protection. The conclusions of this study are partially consistent with those from the assessment of the mental health status of the Severe Acute Respiratory Syndrome (SARS) frontline medical staff performed in 2003 [18].

Analysis of the factors influencing the mental health status of clinical medical personnel

The results of this study showed that the influencing factors affecting the mental health status were, from high to low: the degree of suspicion of being infected when the symptoms of COVID-19 appeared, the degree of concern for one's self and one's family members, a recent medical check-up, and the education level ($P<0.05$). The specific reasons are analyzed as follows. When presenting COVID-19 related symptoms, the health professionals' suspicion regarding the extent of the infection and their concern about their own and their families' infection, the impact of a recent medical check-up is easily understandable.

The main source of the spread of COVID-19 infection are the symptomatic and asymptomatic patients with novel coronavirus infection [19]. When treating and nursing patients, health professionals are in close contact with patients, and their risk of infection is high [20]. Therefore, medical staff is a high-risk group, facing huge psychological pressure. With the emergence of symptoms and the corresponding worry to develop the disease, the mental health status of the health professionals will rapidly deteriorate, greatly affecting their physical and mental health. This, in turn, will translate into a less efficacious treatment of the patients with coronavirus infection that are under their care; therefore, psychological intervention targeted at health professional's symptoms (related to the context of the COVID-19 pandemic) is warranted and systematic medical/psychological observation of the clinical medical staff is needed in order to relieve their psychological pressure and to promote their recovery as soon as possible.

Regarding the educational level variable in our study, the higher the SCL-90 score, the more the psychological problems of the medical staff. The reason for this trend may be related to the fact that higher-education professionals bear a heavier workload, in terms of professional medical work and technical requirements; competition is also fierce in their field. Highly educated medical professionals are often highly valued by their working unit and by society, they are at the core of hospital clinical, teaching and scientific research tasks. Especially during the pandemic outbreak, they are the pillar of their department, they must participate in the outbreak model, so the physical and mental pressure that they endure is substantially greater than that borne by a medical personnel with less responsibilities and lower- level positions. This is largely consistent with previous studies of mental health status at the time of similar events [19].

CONCLUSION

Catastrophic emergencies such as the COVID-19 pandemic are known to have harmful psychological consequences. However, the distress experienced by front-line medical staff is heightened by the workers' disproportionate exposure to infected people and the physical and psychological strains of long hours, overwork, lack of sleep, and bearing witness to others' suffering and death. Their psychological symptoms can be regarded as their personal interpretive, emotional, and defensive reactions, including their bodies' physical responses to needs or injuries. Under the normalization of COVID-19, front-line medical personnel face numerous obstacles in their work, daily lives, and physical and mental states. The constant vigilance and the need for isolation and disinfection mean that medical personnel must wear multilayer personal protective equipment that stresses them physically and can lead to hypoxia, resulting in physical and psychological symptoms. People handle the stressors of the pandemic in different ways, including venting, deflection, compensation, humor, relaxation, self-comfort, and rationality. This study's front-line medical staff participants in China showed higher-than-average levels of psychological distress. The SCL-90 psychological self-report showed that many adapted to the catastrophic emergency, evolving past the initial shock and fear to daily acceptance, calm, and coexistence or normalization. Nevertheless, they continued to report adverse psychological symptoms. Supporting health workers' mental health is critical to the public health response. We must maintain front-line medical personnel's mental health to enable them to perform their duties without risk to themselves or their patients. Identifying their particular concerns through psychological health monitoring is the first step toward establishing a positive, systematic, and scientific psychological protection system.

RELEVANCE TO CLINICAL PRACTICE

This study found that the front-line medical staff experienced more psychological problems under the normalization of COVID-19 than the general Chinese population due to the increasing number of confirmed cases and the lack of specific treatments. Health care managers need empirically derived guiding policies and psychological interventions to address this problem. For example, organized rotation and shift work can help medical staff arrange much-needed family and social time. Managers can help reduce job burnout, compassion fatigue, anxiety, and depression, by offering encouragement and support to front-line medical personnel and helping them solve practical problems. They need to provide ample time and opportunity for front-line medical staff to de-stress through mental health plans designed to address the psychological stressors to maintain clinical workers' effectiveness.

LIMITATIONS AND FURTHER RESEARCH

Two factors might limit the generalization of this study's results: its cross-sectional design and the convenience sampling method, which recruited only front-line medical staff from a single province. Future research should consider using a longitudinal design and a larger and broader sample to better understand the relationship between front-line health workers' demographic data and mental state.

ETHICAL CONSIDERATIONS

The Ethics Review Committee of Ningbo College of Health Sciences approved this study. The research team members approached the clinical front-line medical staff to explain the research objectives, research methods, and other relevant information. We explained

that their participation in the study was completely voluntary, and they could opt out at any time. Once we received the potential participants' online informed consent forms, we sent a questionnaire link for the online survey to 180 clinical front-line medical staff.

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AVAILABILITY OF DATA AND MATERIALS

The datasets generated and analyzed during the current study are not publicly available due to ethical restrictions and patient confidentiality but are conditionally available from the corresponding author on request. Aggregated data are provided in the paper tables.

AUTHORS' CONTRIBUTIONS

The authors were responsible for the paper as follows. Laiyou Li and Ning Sun: Conception, design, analysis, and data interpretation, drafting the manuscript, revising the manuscript, and approval of its final version; NS: Acquisition of data, project administration, manuscript revisions, and approval its final version; Shuping zhou and Chaoyan Fan: Formal analysis, manuscript revision, and final version approval; Hongyu Li and Shuang Yang: conception, manuscript revision, and final version approval; Jinmei Xu: Conception, design, funding acquisition, project administration, manuscript revision, and final version approval. All the authors have read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Permission to conduct the study and to obtain access for the purpose of gathering the data were obtained from by the Ethics Committee of Ningbo College of Health Sciences. Written, informed consent was obtained from all the participants, or from their legal guardians, or caregivers prior to enrolment in the study.

DISCLOSURE AND CONFLICT OF INTEREST

The authors declare that they have no involvement, financial or otherwise, that may potentially bias their work.

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