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A cross-sectional study of mental health status and self-psychological adjustment in nurses who supported Wuhan for fighting against the COVID-19

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Abstract

Aims and objectives: To evaluate the mental health status, stressors and self-adjustment of nurses in isolation wards at different periods in Wuhan, China.

Background: Mental health issues easily occurred among the frontline medical workers of a major epidemic. However, the stressors and psychological adjustments experienced by nurses have not been well described. This is crucial to improving clinical quality and nursing safety and ensuring nurses' physical and psychological health.

Methods: We performed a cross-sectional prospective study using the Self Reporting Questionnaire-20, stressor and self-adjustment questionnaire administered to frontline nurses in Wuhan at two time points: after they had worked in isolation wards for 7–10 days (T_1) and 2 months (T_2). This paper complies with the STROBE reporting guideline for cross-sectional studies.

Results: T_1 has 92 respondents, and T_2 has 86. The positive rates of mental health problems were 26.09% and 9.30%, respectively, showing significantly different in the two periods. The main factors influenced mental health were self-perceived stress and only child status. The most common stressors were as follows: a large infected population, high infectivity; concerned about family's health status; high mortality if not treated in time (T_1); and long duration of the epidemic, separate from family for a long time (T_2). In terms of self-adjustment, 97.83%(T_1)/88.04%(T_2) of nurses thought it was necessary, but 9(T_1) /5(T_2) chose to avoid addressing it, and 8(T_1) /5(T_2) utilised a professional psychological counselling hotline.

Conclusions: Mental health problems among frontline nurses fighting COVID-19 need special attention, so administrators should offer timely counselling and strengthen effective psychosocial support to improve their mental resilience.

Relevance to clinical practice: This study surveyed the mental problems and self-adjustment status among nurses working Wuhan during the outbreak of COVID-19, to provide administrators with a scientific basis to effectively intervene.

Ms. Chen and Ms. Sun contributed equally to this work and should be considered as equal first authors.

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KEYWORDS
Clinical, COVID-19, Infection Control, Mental Health, Novel coronavirus, Nurses, Psychological Adaptation, Psychological and Social Coping, Stress

1 | INTRODUCTION

The coronavirus disease 2019 (COVID-19) outbreak is now a pandemic, and a novel coronavirus was identified as the cause of the respiratory illness (Zhang et al., 2020). As of 24 April 2020, the official website of the World Health Organization reported 2,591,015 confirmed cases and 178,686 deaths worldwide, with 213 countries and regions affected (World Health Organization, 2020). SARS-CoV-2 is the third type of coronavirus that has infected humans in the past two decades, following the severe acute respiratory syndrome (SARS) outbreak in 2003 and the Middle East respiratory syndrome (MERS) outbreak in 2012; this emergency has put global public health agencies on high alert (Munster, Koopmans, van Doremalen, van Riel, & de Wit, 2020). Due to its sudden outbreak, rapid and widespread, high infectivity and the lack of specific treatments, SARS-CoV-2 has had a tremendous impact including great damage to economy, people's lives and public health (Jin et al., 2020). When the number of COVID-19 cases began to rise quickly, more than 30,000 medical workers from all over China came to Wuhan and other places in Hubei province to offer medical support, in an urgent mobilisation for public health crisis management (Li, Ge, et al., 2020).

As the largest group supporting Wuhan in the fight against COVID-19, nurses play important roles in infection prevention, infection control, isolation, containment and public health (Mo et al., 2020). Mental health problems can affect patients/survivors, quarantined groups, medical workers and family members of these individuals (Wang & Wang, 2020).In public health emergencies (e.g. SARS in 2003 and MERS in 2012), medical workers who fight on the frontline often need to cope with illness due to unknown causes and pathogens; the high risk of exposure, high work intensity and considerable pressure can cause mental health problems (Lee, Kang, Cho, Kim, & Park, 2018; Wu et al., 2009). These can persist over a long time, and some nurses even commit suicide (Jun, Tucker, & Melnyk, 2020). Nurses are under great stress when they are in close contact with affected patients, and psychological stress can lead to anxiety, depression, avoidance, insomnia, PTSD symptoms and other mental problems (Hao et al., 2020; Tan, Hao, et al., 2020; Xu & Zhang, 2020). In January 2020, Lai et al. surveyed 1,257 medical workers in 34 hospitals with a fever clinic or COVID-19 isolation ward and found that the incidence rates of depression, anxiety, insomnia and distress were 50.4%, 44.6%, 34.0% and 71.5%, respectively (Lai et al., 2020). Moreover, nurses, women, frontline medical workers and those medical workers who work in Wuhan suffered more severe mental health problems. From 7–14 February 2020, Huang et al. surveyed 230 frontline medical workers in designated COVID-19 hospitals and showed that the overall incidence rate of anxiety was 23.04%, with a higher burden for nurses compared to doctors (26.88% versus. 14.29%), and the incidence rate of stress disorders was 27.39% (Huang, Han, Luo, Ren, & Zhou, 2020).

Impact statement (What does this paper contribute to the wider global clinical community)

- This study surveyed the mental problems and self-adjustment status among nurses working Wuhan during the outbreak of COVID-19, to provide administrators with a scientific basis to effectively intervene.
- The results indicate improving their mental resilience through different psychosocial support measures could improve self-adjustment capability and enable them to effectively cope.

These mental health problems affect medical workers in terms of their attentiveness, comprehension, decision-making abilities and medical care quality and can have lasting effects on their overall health (Deng, Chen, Liu, Yuan, & Song, 2020; Kang et al.,2020a). The purpose of this study was to survey mental health status, stressors and self-adjustment in frontline nurses who came to work in Hubei province during the outbreak of COVID-19 at two time points and identify factors that influence mental health status. The results could help administrators offer appropriate psychological counselling and humanistic care for high-risk people to relieve mental stress and improve the quality of clinical care and the physical and psychological health of nurses.

2 | BACKGROUND

To address frequent mental problems among nurses, we need to identify high-risk groups in a timely manner and offer professional mental crisis interventions; on the other hand, emergency rescue nurses need to master some basic approaches for self-psychological adjustment (Cheng, 2018). To guide the scientific and standard implementation of COVID-19-related mental crisis interventions, on 26 January 2020, the Joint COVID-19 Prevention and Control Mechanism issued *Guidelines on Emergency Mental Crisis Intervention During the Outbreak of COVID-1 9*(Joint COVID-19 Prevention & Control Mechanism, 2020), which states that frontline medical workers and COVID-19-confirmed severe hospitalised cases are the number-one priority group who need crisis intervention, and frontline staff need to change shifts regularly, perform self-adjustment and ask for help when needed. On February 7, the National Health Commission published the *Guide for Psychological Adjustment in Response to the Outbreak of COVID-19* (National Health Commission of China, 2020) to help 10 separate groups including the elderly, children, adolescents, pregnant women and frontline workers, get out of "the predicament." On February 15, the National Health Commission issued *Notice on*

Several Measures to Improve Work conditions for Frontline Medical Workers and Care for the Physical and Psychological Health of Medical Workers, with a particular emphasis on the necessity to "intensify humanistic care for medical workers," "strengthen psychological crisis intervention and psychological counselling and relieve the mental stress of medical workers" (The National Health Commission, 2020).

A study conducted by van der Velden et al. concluded that if disaster rescuers have effective coping and self-adjustment strategies, then they will not be more resilient to mental problems and related symptoms in disaster scenarios (van der Velden, van Loon, Benight, & Eckhardt, 2012). Self-psychological adjustment is of the core skills for rescue nurses to improve their self-efficacy; it plays a critical role in coping with stress and can enable them to assist the rescue process in a sustained and stable manner. Mental resilience is the foundation of psychological adjustment and an individual's response to stress, and this self-protection potential can be enhanced through facilitation and training (Ai-hua, 2012). Taking effective psychological support measures can help frontline medical workers feel psychologically secure by relieving and stabilising fear, anxiety or sadness caused by the epidemic outbreak. They can also improve resistance and adaptability to crisis and prevent mental disorders. However, psychological adjustment of frontline nurses and changes in mental issues after adjustment in the current situation of the COVID-19 outbreak has not yet been reported.

3 | METHODS

This protocol is compliant with Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guideline for cross-sectional studies (Supplementary File 1).

3.1 | Design

A cross-sectional survey was conducted among frontline clinical nurses working at Peking University People's Hospital who supported the special isolation ward (for patients in severe condition) of a designated COVID-19 hospital in Wuhan, China.

3.2 | Participants and sample

The inclusion criteria were as follows: nurses who participated in the clinical care of confirmed COVID-19 patients, fought against the epidemic on the frontline for over a week and provided informed and voluntary consent to participate. Subjects were excluded if they did not complete the study.

The main objective of this study was to compare the incidence of psychological problems between the two groups. There were 92 nurses who participated in the study voluntarily and anonymously in T_1, with an incidence of 26.09%, and 86 nurses in T_2, with an incidence of 9.30%. At the α 0.05 level, 85.7% power of the current sample size showed a difference in the incidence of psychological problems between the two groups.

3.3 | Instruments

Data were collected using a questionnaire divided into three parts. Part one asked about general information consisting of 14 items, namely gender, age, educational background, marital status, number of children, whether the respondent was an only child, professional title, working years, position, whether the respondent has work experience in infectious disease wards, whether the respondent has work experience on the frontline of a major epidemic, whether the respondent has work experience in emergency departments, whether the respondent has work experience in intensive care units and whether the respondent feels under pressure on the frontline.

Part two was a mental state assessment using *The Self Reporting Questionnaire-20 (SRQ-20)* (Chen et al., 2009; Tito, Baptista, Da Silva, & Felli, 2017; Yun-ge, Yin, & Zhen, 2009). This questionnaire is included in *Disaster Mental Crisis Intervention Training Handbook*, and its Cronbach's alpha is 0.90 with a test–retest reliability of 0.93. The questionnaire has 20 items and includes assessments of anxiety, depression and somatic symptoms. All the items are answered with "yes" or "no," where "yes" is 1 point, and "no" is 0 points. The highest score is 20 points, and the threshold value of this questionnaire is 7 points, which means positive for mental health issues.

Part three was a self-reported stressor and incidence questionnaire and self-adjustment questionnaire, which were obtained by combining pertinent literature (Ai-hua & Zhi-wen, 2005; Hong-mei & Jing-li, 2004; Xin et al., 2004) and based on interviews with supported nurses. The 20-item stressor and incidence questionnaire has four dimensions: understanding of disease, social recognition and support, clinical work and logistical support. The extent of the influence on physical and psychological health was measured with a 5-point Likert scale, where "strongly disagree" is 1 point, and "strongly agree" is 5 points. A higher score indicates greater influence on physical and psychological health. The questionnaire was evaluated by six supervisors and a nurse practitioner, and the results showed that content validity for the questionnaire was 0.888. Before comprehensive survey administration, 20 frontline nurses were selected to complete a presurvey, and the Cronbach's α was 0.803. The self-adjustment questionnaire has 11 items answered with yes or no.

3.4 | Data collection

The questionnaire was converted into an electronic questionnaire form with a Quick Response (QR) code through the online survey tool Questionnaire Star (a professional online survey platform). The QR was sent to the WeChat group of the frontline support nurses. After obtaining the consent of the ward manager, we explained the objective, methods, notes and the collection data. We ensured that all data would be kept confidential, and the nurses could participate

TABLE 1 General information of respondents by group

Items	T_1 ($n = 92$) $\overline{X} \pm s/n$ (%)	T_2 ($n = 86$) n (%)	t/χ^2	p
Age (years)	33.32 ± 6.23	33.24 ± 6.06	0.077[a]	.939
Working years (years)	11.79 ± 6.87	11.78 ± 6.73	0.014[a]	.989
Educational background				
Junior college or below	24 (26.09)	22 (25.58)	0.006	.939
Undergraduate or above	68 (73.91)	64 (74.42)		
Marital status				
Married	55 (59.78)	53 (61.63)	0.063	.801
Single/divorced/widowed	37 (40.22)	33 (38.37)		
Number of children				
Yes	50 (54.35)	49 (56.98)	0.124	.724
No	42 (45.65)	37 (43.02)		
Are you an only child?				
Yes	35 (38.04)	34 (39.53)	0.042	.838
No	57 (61.96)	52 (60.47)		
Professional title				
Nurse	17 (18.48)	14 (16.28)	0.171	.918
Senior nurse	46 (50.00)	45 (52.33)		
Supervisor nurse or above	29 (31.52)	27 (31.39)		
Position				
Head nurse and above	9 (9.78)	8 (9.30)	0.012	.913
No	83 (90.22)	78 (90.70)		
Do you have experience in major epidemic support?				
Yes	11 (11.96)	10 (11.63)	0.005	.946
No	81 (88.04)	76 (88.37)		
Do you have work experience in infectious disease wards?				
Yes	4 (4.35)	6 (6.98)	0.579	.526
No	88 (95.65)	80 (93.02)		
Do you have work experience in ICUs?				
Yes	54 (58.70)	52 (60.47)	0.058	.810
No	38 (41.30)	34 (39.53)		
Do you have work experience in emergency departments?				
Yes	56 (60.87)	54 (62.79)	0.069	.792
No	36 (39.13)	32 (37.21)		

[a]Student's *t* test.

in the questionnaire survey voluntarily and anonymously by scanning the QR code. From February 2020–April 2020, we carried out two investigations after the nurses had worked in isolation ward for 7–10 days (T_1) and 2 months (T_2). Ninety-two and 86 questionnaires were collected in T_1 and T_2, respectively.

3.5 | Ethical considerations

Before the investigation, ethical approval was obtained from the Ethical Review Committee of Peking University People's Hospital (Approval number: 2020PHB071-01). Nurses who meet the inclusion and exclusion criteria participated in this study voluntarily and anonymously.

3.6 | Data analysis

SPSS® version 23.0 was used for data processing and analysis. Descriptive statistical methods were used to summarise the general information. The data are expressed as "mean ± standard deviation (*SD*)" or "medians and quartiles" or "frequency and percentage."

Continuous variables were compared with Student's *t* test or Mann–Whitney test. Chi-square tests were used to compare categorical variables. $p < .05$ was considered statistically significant.

4 | RESULTS

4.1 | Participant characteristics

T_1 surveyed a total of 92 nurses, 7 (7.61%) males and 85 (92.39%) females. The mean age of participants was 33.32 ± 6.23 years (95% CI: 32.02–34.61) in T_1 and 33.24 ± 6.06 years (95% CI: 31.95–34.54) in T_2. Participants had been engaged in clinical work for a mean of 11.79 ± 6.87 years (95% CI: 10.37–13.22) in T_1 and 11.78 ± 6.73 years (95% CI: 10.34–13.22) in T_2. Of them, 63(68.48%) reported feeling under pressure when supporting the frontline. T_2 surveyed 86 nurses in total, 6 (6.98%) male and 80 (93.02%) female, with 54 (62.79%) who reported feeling pressure. The 92 in T_1 and the 86 nurses in T_2 are all the part of 100 frontline nurses in the selected isolation ward, so the groups had some different, while differences between the two time points were not statistically significant ($p > .05$, Table 1).

4.2 | Mental health assessment

4.2.1 | Comparison of mental health status at different times

In T_1 survey, 24 respondents scored ≥ 7 points on the SRQ-20, accounting for 26.09%. In T_2 survey, 12 (9.30%) scored ≥ 7 points ($p > .05$). The decrease indicated that mental state improved over time worked on the ward (Table 2).

4.2.2 | Analysis of influencing factors on mental health status

In the T_1 survey, there were no statistically significant differences between age, working years, professional title, educational background, marital status, number of children or whether the respondent has work experience in infectious disease wards/intensive care unit/emergency departments. However, in the T_1 survey, four respondents with work experience in infectious disease wards are all tested negative; the positive rate of those who feel work pressure was high, and the differences were statistically significant (Table 3).

TABLE 2 Comparison of positive responses by group on the Self Reporting Questionnaire-20

	<7	≥7	χ^2	*p*
T_1	68	24	4.056	.044
T_2	74	12		

In the T_2 survey, six nurses with work experience in infectious disease wards are tested negative; and the positive rate of those who felt under work pressure and has the only child is higher, the differences were statistically significant (Table 3).

4.3 | Current situation of stressors and their incidence rates

In the T_1 survey, 63 (68.48%) nurses reported feeling under pressure, but this slightly decreased to 54 (62.79%) in the T_2 survey. The stressors total points were 65.63 ± 11.58 (95% CI: 63.23–68.03) in T_1 and 62.26 ± 10.38(95% CI: 60.03–64.48) in T_2. Further analysis revealed that top scoring items with the largest influences were as follows: a large infected population, high infectivity; concerned about family's health status; and high mortality if not treated in time (T_1) and long duration of the epidemic, separate from family for a long time (T_2). Those with the least influence were as follows: lack of support and understanding from family and relatives; lack of protective supplies; lack of social support and recognition for medical workers (T_1) and unfamiliar with special work environment, working routine and use of equipment (T_2). The differences between the groups in total points, understanding of disease dimension and clinical work dimension were statistically significant (Table 4).

4.4 | Current situation of self-adjustment

In terms of self-adjustment, the top five approaches in T_1 and T_2 are shown in Table 5. In the T_1 survey, nine chose avoidance, eight used a professional psychological counselling hotline, and two thought that adjustment was not necessary; in the T_2 survey, five respondents each selected these options. This suggests that their self-adjustment was better than T_1 since fewer choice avoidance, but the differences were not statistically significant. With regard to self-adjustment approach choices, the main approaches used after 7–10 days on the ward were confrontation, communication with family, learning about

TABLE 3 Mental health comparison of positive responses by group on the Self Reporting Questionnaire-20

	Classification	<7	≥7	χ^2	*p*
T_1	Do you feel under pressure when supporting the frontline?				
	Yes	41	22	8.089	**.004**
	No	27	2		
T_2	Are you an only child?				
	Yes	25	9	7.338	**.010** †
	No	49	3		
	Do you feel under pressure when supporting the frontline?				
	Yes	43	11	4.977	**.027** †
	No	31	1		

†Continuously corrected χ^2 test value.

TABLE 4 Comparison of stressor incidences between groups

Items	T_1 ($n = 92$)	T_2 ($n = 86$)	t/z	*p*
Total points	65.63 ± 11.58	62.26 ± 10.38	2.042[a]	**.043**
Understanding of disease	26.00(24.00,28.00)	25.00(22.00,27.00)	−2.413[b]	**.016**
Social recognition and support	9.00(7.25,11.00)	9.00(7.75,10.00)	−0.446 [b]	.656
Clinical work	23.00(20.00,26.00)	21.00(17.00,24.00)	−3.551 [b]	**.000**
Logistical support	9.00(6.00,12.00)	9.00(6.00,11.00)	−0.929 [b]	.353

[a]Student's *t* test.

[b]Mann–Whitney test.

the disease, communication with colleagues and teamwork, but after entering clinic for 2 months, more of them choose teamwork, learning about the disease and regular rest and appropriate exercise (Table 5).

5 | DISCUSSION

Our study found the rate of mental health problems among those who worked in isolation wards for 7–10 days (T_1) was 26.09%, but decreased to 9.30% after 60 days (T_2). This suggests that self-adjustment significantly improved mental health of healthcare workers, that is different from the findings of a longitudinal study for the general public during COVID-19 (Wang, Pan, Wan, Tan, Xu, et al., 2020). In the T_1 survey, the rate of mental health problems was similar to that reported by Huang et al. (2020), but lower than that in the study by Lai et al (Lai et al., 2020). In view of the facts that the survey performed by Lai and colleagues was conducted earlier in the pandemic when the numbers of suspected and confirmed COVID-19 cases rose rapidly, the high incidence of mental problems among medical workers was likely related to insufficient coping strategies. After single-factor analysis, we found that main factors that influenced mental health were self-perceived stress (both time points) and only child status (T_2) and those who have work experience in infectious disease ward are all negative in both T_1 and T_2. Both surveys revealed high incidence rates of stress (T_1, 68.48%; T_2, 62.79%). As early as 2003 when SARS broke out, Chua et al. reported that the incidence rate of mental problems among frontline medical works with high-risk positions was as high as 89%, and they experienced more stress than a healthy group (Chua et al., 2004). However, the authors also suggested that the positive effects of adaptive responses to stress and infection control training likely play protective roles during epidemic outbreaks, and a higher level of stress may be a predictive factor for the future incidence rate of mental illness. An only child may be worried about their parents being unattended and at risk of being infected with COVID-19. Mo et al. also found that only child status was a key factor that influenced the work stress of nurses in Wuhan, and this may be related to role conflict and an inadequate social support system (Mo et al., 2020). In addition, those who have work experience in infectious disease departments were less likely to have high rates of mental health issues. This finding is similar to other study which found that nonfrontline healthcare workers have higher rates of mental health issues than frontline healthcare workers (Chew et al., 2020; Tan et al., 2020). This may be because those who received more intensive infection-related professional training, or had experience treating similar diseases, or obtained psychological support, were more confident in protecting themselves and their patients (Abolfotouh et al., 2017; Shi et al., 2020).

Since mental health is closely linked with the level of self-perceived stress (Gu, Tan, & Zhao, 2019), we surveyed stressors and

TABLE 5 Self-adjustment approaches (frequency from high to low)

	T_1 ($n = 92$)		T_2 ($n = 86$)	
No.	Items	*n* (%)	Items	*n* (%)
1	Face up to mental conflict and keep a positive and optimistic attitude	72 (78.26)	Build a cooperative team, seek help from the organisation and assist in solving clinical problems	76 (88.37)
2	Strengthen communication with family and seek understanding and support	72 (78.26)	Strengthen knowledge about the disease	74 (86.05)
3	Strengthen knowledge about the disease	69 (75.00)	Face up to mental conflict and keep a positive and optimistic attitude	72 (83.72)
4	Communicate with colleagues and friends and share personal experiences	64 (69.57)	Strengthen communication with family and seek understanding and support	72 (83.72)
5	Build a cooperative team, seek help from the organisation and assist in solving clinical problems	63(68.48)	Regular rest and proper exercise	63 (73.26)

their incidence rates. The highest scoring items in T_1 were a large infected population, high infectivity; worried about family's health status; and high mortality if not treated in time. That in T_2 was long duration of the epidemic, separate with family for a long time. The results show that the characteristics of the disease itself are the biggest sources of stress and even panic in the face of a major epidemic. The fact that COVID-19 is human-to-human transmissible, associated with high morbidity, and potentially fatal may intensify the perception of personal danger (Lai et al., 2020). Moreover, the increasing numbers of suspected and confirmed cases also contribute to the pressures and concerns. In addition, due to separation from loved ones, concerns about the family's health also considerably affects nurses. The lowest scoring items were lack of support and understanding from family and relatives; lack of protective supplies; lack of social support and recognition for medical workers (T_1)/unfamiliar with the special work environment, working routine and use of equipment (T_2). This suggests that their families provided strong support for the work on the frontline, hospitals had sufficient protective supplies, and social support and recognition were high. Since all the rescue nurses were from other provinces, they became familiar with the environment and workflow after 2 months and felt less stress in that regard. The questionnaire total points; understanding of disease and clinical work dimensions were significantly improved at the second time point, indicating that 2 months of self-adjustment achieved marked results. Our analysis suggested that the reasons behind these changes were that administrators reinforced disease knowledge and infection-related training, reorganised nursing teams and implemented group-centred responsibility systems that enhanced teamwork, determined the duties of different positions and set up clear nursing procedures and norms. In addition, nurses also became familiar with nursing models for cases of varying severity and procedures for treating special diseases as they gained experience in isolation wards.

Our results also demonstrate that self-psychological adjustment is highly useful in coping with stress, and increasing psychosocial support and improving mental resilience are important ways to enhance self-adjustment capability. In the T_1 survey, 90 (97.83%) believed that psychological adjustment was necessary, but 9 (9.78%) chose avoidance and other less useful adjustment approaches, and 8 (8.70%) sought intervention from a professional psychological counselling hotline. Kang et al. also found that despite of a high rate of mental problems among frontline medical workers, those who are below the cut-off threshold with only mild mental health problems accounted for 70.3% (Kang & Ma et al., 2020b). This group was more motivated to take action and learn requisite skills and chose effective ways to adjust themselves or help others, which is a positive coping mechanism. In this study, the main self-adjustment approaches used by nurses after entering clinic for 7 to 10 days were confrontation, communication with family, learning about the disease, communication with colleagues and teamwork. At this point, there were still some obstacles to the implementation of coping skills. On the one hand, training courses are lacking for self-mental crisis interventions (Cheng, 2018); on the other, frontline medical workers rarely took the initiative to evaluate their mental health status or address issues during their shifts for various reasons, such as heavy workload and physical and mental fatigue (Li et al., 2020). Finally, undergoing professional psychological assessments and counselling are associated with the stigma of mental illness (Park, Lee, and infectious disease Park, & Choi, 2018; Yinhua et al., 2020) and make them hide their actual mental state. Many think that they are more afraid of their family or other people thinking they will bring the virus home than being infected themselves (Chen et al., 2020). Therefore, we propose that increasing psychosocial support and improving their mental resilience and coping skills to enhance self-adjustment capabilities are of more practical significance to frontline medical workers.

Some researchers argue that administrators should pay close attention to nurses' complaints, patiently listen, effectively guide them, encourage them to balance work and life, strengthen peer support, reduce pressure and stress, create a relaxing team atmosphere and help them understand and rationalise their psychological conflicts (Dehnavieh & Kalavani, 2020). In the isolation wards surveyed in this study, as the nurses worked the frontline for a longer time, the incidence rate of mental issues markedly decreased. This may be closely related to the group support strategy adopted by administrators. First, administrators reformed the nursing system and set fixed groups of doctors and nurses that consisted of 10–11 people. These were built on the basis of mutual complementation in specialties and seniority, and group members were led by head nurses. Since prolonged shift times may reduce work efficiency and increase the risk of medical errors (Melnyk et al., 2018), administrators broke six larger groups into nine smaller ones and shortened shifts from 6–4 hr. Leaders scheduled shifts flexibly and reasonably excused group members according to actual workloads and the physical conditions of members. This approached ensured medical service needs and sufficient rest time. Other studies have suggested that adequate sleep, nutrition and hydration are necessary to supporting effective healthcare professionals (Jun et al., 2020). Moreover, group leaders paid close attention to the discomforts of group members at work and in life to understand their physical and psychological status. They worked to strengthen peer support, promote teamwork and effective communication, conduct intragroup activities, adjust work atmospheres and establish counselling channels and outlets (e.g. exercise, relaxation training and do-it-yourself workshops) (Dehnavieh & Kalavani, 2020). McAlonan et al. also reported that when responding to a new infectious disease crisis, team cohesiveness is vital to ensure that members ask for help, reduce pressure and enhance coping skills and mental resilience (McAlonan et al., 2007). In our study, administrators launched small classes or online lectures intended for nurses according to their interests; enriched their leisure time; and enhanced professionalism in several aspects, including medical treatment, nursing, infection control and scientific research. It was also important to provide humanistic care for nurses' families, learn about the needs and difficulties of those with elderly parents or young children or who were only children. It is important for nurses to communicate via phone and WeChat on a regular basis, and they should be supported to meet all their physical and psychological health and living needs to minimise worries about family members.

Touching stories, letters home and diaries from the frontline were publicised on media to spread positive energy, enhance a sense of collective honour and offer strong support to defeat COVID-19. Finally, mental health professionals should offer guidance on coping strategies via professional consulting hotlines (Disease Control and Prevention Bureau) or online channels (lecture, group guidance, individual counselling, network platforms, psychological counselling hotlines, etc.) to boost healthcare workers' confidence in coping with the disease and their ability to deal with stress.

The T_2 survey showed that after nearly 60 days, 81(88.04%) of respondents felt that psychological adjustment as necessary, 5 (5.81%) chose avoidance or other unhelpful adjustment approaches, and 5 (5.81%) felt that their mental state required intervention from a professional psychological counselling hotline. These were improved from the T_1 results. With regard to self-adjustment approaches, more chose teamwork, learning about the disease and regular rest and proper exercise, which yielded good results. Zhou et al. argued that mental stress in medical workers may be caused by feeling deprivation when wearing protective suits, so targeted training may help frontline medical workers with compensation strategies to enhance sensory stimuli and encourage them to adopt self-mental adjustment methods according to their personal preferences and actual situations (Yinhua et al., 2020).Moreover, cognitive behavioural skills, stress-reduction strategies (mindfulness, deep breathing, gratitude), self-administered acupressure and emotional freedom techniques (derived from key principles within traditional Chinese medicine) may be effective strategies to improve mental health (Ho, Chee, & Ho, 2020; Wang, Pan, Wan, Tan, Xu, et al., 2020).

This was a prospective observational study based on the principles of voluntariness and anonymity to guarantee the rights of the respondents and authenticity of data. Unfortunately, this made it difficult for administrators to offer positive groups targeted psychological support. However, since administrators sought to improve their mental resilience and coping skills by offering group social support, the T_2 survey results are favourable. In addition, avoidance is a core symptom of trauma, so administrators should follow-up with those who choose avoidance in future studies. Another study found that discussion with and support from colleagues, administrators, trained peer supporters and priests improve mental health, but individuals with more severe symptoms require interventions from mental health professionals (Greenberg, Docherty, Gnanapragasam, & Wessely, 2020). Next, we specifically studied frontline nurses, who do not fully reflect the mental state of frontline doctors and administrators. Nonetheless, the nurses surveyed are quite representative since the proportion of nurses on COVID-19 medical teams is > 70% (Li, Ge, et al., 2020). Finally, since the sample size of this study was small, our results may not be generalisable and need to be further explored in a larger cohort.

6 | CONCLUSIONS

In summary, the results suggest that during the COVID-19 outbreak, frontline nurses working in isolation wards experience mental problems. Under the guidance of national policies, administrators should pay close attention to nurses' mental state, identify high-risk individuals with a general screening tool, offer psychological support and counselling according to their stressors and collaborate with expert teams to provide professional psychological service when necessary. These steps will enhance their mental resilience and self-adjustment capability, which will increase nurse efficiency and improve clinical safety.

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CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

AUTHOR CONTRIBUTION

Conceptualisation and design: Ling Wang; collection, analysis and interpretation: Huijuan Chen and Libing Sun; analysis and revision: Zhe Du; administrative and technical support: Liting Zhao. All of the authors approved the submitted version.

ETHICAL CONSIDERATIONS

Before the investigation, ethical approval was obtained from the Ethical Review Committee of Peking University People's Hospital (Approval number: 2020PHB071-01).

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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