Psychological impact of COVID-19 outbreak on frontline nurses: A cross-sectional survey study

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Abstract

Aims and objectives: This study aimed to portray the prevalence and associated factors of psychological distress among frontline nurses during COVID-19 outbreak.

Background: The COVID-19 outbreak has posed great threat to public health worldwide. Nurses fighting against the epidemic on the frontline might be under great physical and psychological distress. This psychological distress was predominantly described as sleep disturbance, symptoms of anxiety and depression, post-traumatic stress, inability to make decisions and even somatic symptoms.

Design: Cross-sectional study.

Methods: Frontline nurses from designated hospitals for COVID-19 patients were invited to complete an online survey by convenience sampling, and the survey included six main sections: the General Health Questionnaire, the Perceived Social Support Scale, the Simplified Coping Style Scale, the Impact of Event Scale-Revised, sociodemographic, occupation and work history. Multiple logistic analysis was used to identify the potential risk factors of psychological distress. The study methods were compliant with the STROBE checklist.

Results: Of the 263 frontline nurses, 66 (25.1%) were identified as psychological distress. Multiple logistic analysis revealed that working in emergency department, concern for family, being treated differently, negative coping style and COVID-19-related stress symptom were positive related to psychological distress. Perceived more social support and effective precautionary measures were negatively associated with psychological distress.

Conclusions: The study demonstrated that COVID-19 had a significant psychological impact on frontline nurses. Early detection of psychological distress and supportive intervention should be taken according to the associated factors to prevent more serious psychological impact on frontline nurses.

Relevance to clinical practice: This study highlighted that the frontline nurses were suffering from varying degrees of psychological distress, which needed early screening and supportive intervention for preventing more serious psychological impact on frontline nurses. Beside, more specific measurement should be combined with the GHQ-12 to assess the varying degrees of psychological distress in frontline nurses.
The current outbreak of the severe acute respiratory syndrome novel coronavirus (SARS-CoV-2) primary reported by Hubei Province of China has spread to the whole China and almost every country around the world. Based on the growing case of 2019-novel coronavirus disease (COVID-19), World Health Organization Emergency Committee declared a global health emergency on 30 January. By mid-March, about 80,000 people had been diagnosed with COVID-19 in China (National Health Commission of the People’s Republic of China, 2020), and a total of 1,716 healthcare providers were diagnosed with COVID-19 (The Central People’s Government of China, 2020). The coronavirus could be transmitted by many ways, direct transmission, contact transmission, aerosol transmission and even faecal-oral transmission (Peng et al., 2020). Its powerful transmission speed has caused many infections among healthcare workers and has had a huge impact on the whole country (Nishiura et al., 2020; Wu et al., 2020). The huge increase in the number of COVID-19 patients has posed a great challenge to hospitals and resulted in a severe shortage of medical supplies and medical staff, especially in the COVID-19 designated hospitals. The shortage of medical supplies during the epidemic also increased the risk of infection of COVID-19 among nursing staff (Wang, Zhang, & He, 2020). During the current outbreak of COVID-19, nurses working in the frontline [emergency department (ED), intensive care unit (ICU), infection department and other departments receiving COVID-19-infected patients] sometime needed to work overtime. Moreover, wearing a full set of protective equipment brought some inconvenience to drinking water, breathing and vision, which made the frontline feel a higher level of work intensity and easier to feel tired. The increased workload and physical burden of wearing personal protective equipment was threatening the health of nurses.

Poor psychological health among nurses might not only be detrimental to individual but also hinder professional performance and, in turn, the quality of nursing patients (Li et al., 2017; Sonoda, Onozuka, & Hagihara, 2018). Nursing for COVID-19 patients was a high-risk work, and any mistake in the process might lead to serious consequences, such as transmission of the novel coronavirus from patients to others in the hospital or disease condition deterioration of the COVID-19 patients. Thus, it was important for nurses working in frontline to maintain a good physical health as well as psychological health. For a long time, the physical health of nurses has been paid more attention, but the psychological health was usually neglected (Ghawadra, Abdullah, Choo, & Phang, 2019).

The psychological health of nurses was influenced by many factors. Previous studies reported that personal factors such as gender, age, educational level, marital status, having children or not, and personality might be correlated with the mental health among nurses (Cañadas-De la Fuente et al., 2018; Sadati, Hemmati, Rahnavard, Lankarani, & Heydari, 2016; Tehrani, Rakhshani, Shojaee Zadeh, Hosseini, & Bagheriyan, 2013). Additional, external factors including workload, work stress, work environment and training also played important role in influencing the mental health of nurse (Maharaj, Lees, & Lal, 2018; Molina-Praena et al., 2018). Some studies highlighted the positive influence of social support and family support on psychological health (Hamaideh, 2012; Kutluturkan, Sozeri, Uysal, & Bay, 2016). However, in previous public health crisis, a study reported that frontline nurses received intense stigmatisation from family, coworkers and the community (Hewlett & Hewlett, 2005). In addition, coping style was also reported to be related to mental health among nurses (Ilić, Arandjelović, Jovanović, & Nešić, 2017).

The psychological health status of nurses has been studied in previous studies, but has not been adequately explored among
nurses working on the frontline. Therefore, this study aimed to portray the prevalence and the risk factors of psychological distress among nurses working in the frontline during the outbreak of COVID-19. It was expected the results of this study to provide some useful information for making supportive strategies to improve the mental health of nurses in frontline during the epidemic.

3 | METHOD

3.1 | Study design and participant

This study was a cross-sectional study, and it was approved by the Medical Ethics Committee. The survey begun with an informed consent of the study, participants needed to read the informed consent and chose the “agree” option to start filling out the questionnaire, otherwise the questionnaire could not be filled out. All procedures performed in the study involving human participants were in accordance with the ethical standards of the hospital, national research committee and the 1964 Helsinki Declaration. The study methods were compliant with the strengthening the reporting of observational studies in epidemiology checklist (Appendix S1).

Nurses who were directly in contact with infected or suspected COVID-19 patients on the frontline were invited to participate in this online study by convenience sampling method. Frontline nurses were defined as working on the frontline department such as ED, fever clinic, isolation ward, ICU and infection department where infected or suspected patients stayed. The online survey was conducted in seven designated hospitals for COVID-19 patients in Guangdong Province. The nurse infected by novel coronavirus was excluded from the study, because there was few infected nurse in the designated hospitals and the inclusion of them might affect the consistency of the result.

3.2 | Variables and measurement

The online survey consisted of six main sections: social-demographic information, occupation and work history, the 12-item version of the General Health Questionnaire (GHQ-12) (Goldberg & Williams, 1991), which has been used frequently to measure recent psychological distress. The Chinese version (Yang, Huang, & Wu, 2003) of GHQ-12 has been proved to be a screening tool for psychological disturbance. A pilot study was conducted among nurses to assess the validity of the instrument. Participants were asked to rate the 12 symptom (e.g. nervous, distress, insomnia) they experienced recently, using a 4-point Likert scale (1 = not at all, 2 = same as usual, 3 = somewhat more than usual, and 4 = much more than usual). The response categories were coded by using the original scoring method. According to a previous study (Goldberg et al., 1997), a score >3 was used to identify the presence of psychological distress manifested as a break from normal functioning, such as anxiety or depression, loss of self-confidence and inability to make decisions. The Cronbach alpha coefficient for the GHQ-12 in this study was 0.81.

Coping style was assessed by the SCSS developed by Xie (1998). The scale consists of 20 coping cognitive and behavioural patterns relating to two domains: positive coping patterns (item 1 to item 12) and negative coping patterns (item 13 to item 20). Each item scores on a 4-point Likert scale from “not used” (0) to “used a great deal” (3). Participants with a higher positive coping score/negative coping score were more likely to take positive/negative coping patterns. The Cronbach alpha coefficient for positive coping dimension and negative coping dimension was 0.903 and 0.753, respectively.

The Impact of Event Scale: Revised version (IES-R) was used to evaluate intrusive thoughts related to COVID-19 and consequent avoidance behaviour (Daniel & Weiss, 2007). The Chinese version of IES-R (Wu & Chan, 2003) consists of 22 items dividing into three dimension: intrusion, avoidance and hyper arousal. Simple 5-point Likert method (scores 0–4) was adopted to assess the impact of life event in the past 7 days. Participants with a score greater than or equal to 20 were interpreted to be affected by traumatic event COVID-19 as suggested by previous studies (Hawryluck et al., 2004; Wu et al., 2009). The Cronbach alpha coefficient of the IES-R was 0.950 in this study.

The PSS was developed by Zimet in 1988 (Zimet, Dahlem, Zimet, & Farley, 1988). The Chinese version revised by Jiang (2001) was used to evaluate the social support perceived by the frontline nurses. The scale is comprised of 12 items relating to support from family, friends and others. Each item scores on a 7-point Likert scale from “not at all” (0) to “used a great deal” (7). A higher score indicated more social support the participants perceived. The Cronbach alpha coefficient of the PSSS was 0.957 in this study.

3.3 | Data collection and quality control

This was an online survey. First, the research group was in touch with the head nurses of the frontline department in the seven designated hospitals in Guangdong Province. The main researchers explained the procedure of the study to the head nurses and then send them a link to the electronic questionnaire by WeChat. The head nurses send the link to the nurses working in frontline by convenience sampling. Each participant completed the survey anonymously.
A restriction was set in the e-questionnaire link that a WeChat IP could only be used to fill out the questionnaire once to avoid repeating questionnaire. Meanwhile, a common-sense question that had nothing to do with the study purpose was placed in the survey to eliminate the possibility that the question might be answered unseriously. The questionnaire with a wrong answer of the common-sense question, and the whole answer time <240 s (the time was recorded automatically by the electronic questionnaire) was excluded.

3.4 | Data analysis

All the analyses were conducted using SPSS 23.0 (International Business Machines Corporation). Descriptive statistics were presented as frequency and constituent ratio, mean and standard deviation (SD) according to the data type. Psychological distress and the impact of COVID-19 were coded as dichotomous variables according to the evaluation method of the scale. Thus, the relationship between psychological distress and categorical variables (age, educational level, etc.) was analysed by chi-square test, the comparisons of coping styles and social support among nurses with different psychological status were used independent sample t test. Multiple logistic regression analysis was used to explore the potential associated factors of post-traumatic symptom and psychological distress, while adjusting for other identified explanatory variables. A p value <.05 was considered to be statistically significant.

4 | RESULT

From 03 February–11 February 2020, a total of 273 electronic questionnaires were collected, of which 10 questionnaires were excluded because of the wrong answer of the common-sense question or the answer time <240 s. Finally, 263 valid questionnaires were included in the analyses, the validity rate was 96.3%, and the response rate was estimated to be about 30% to 40%.

4.1 | The characteristics of the participants

Of the 263 participants, 202 (76.7%) were female and the majority (n = 236, 89.7%) were younger than 39 years of age. The most common (n = 189, 71.9%) educational qualification was undergraduate or above and the majority (n = 196, 74.5%) worked in the ED (Table 1).

| Variable               | Total n (%) | Without distress (n (%)) | With distress (n (%)) | χ²   | p   |
|------------------------|-------------|--------------------------|-----------------------|------|-----|
| Gender                 |             |                          |                       |      |     |
| Male                   | 61 (23.3)   | 5 (82.0)                 | 11 (18.0)             | 2.107| .147|
| Female                 | 202 (76.7)  | 147 (72.8)               | 55 (27.2)             |      |     |
| Age, years             |             |                          |                       |      |     |
| <30                    | 95 (36.1)   | 71 (74.7)                | 24 (25.3)             | 9.713| .010|
| 30–39                  | 141 (53.6)  | 112 (79.4)               | 29 (20.6)             |      |     |
| 40–59                  | 27 (10.3)   | 14 (51.9)                | 13 (48.1)             |      |     |
| Educational level      |             |                          |                       |      |     |
| College or below       | 74 (28.1)   | 53 (71.6)                | 21 (28.4)             | 0.591| .442|
| Undergraduate or above | 189 (71.9)  | 144 (76.2)               | 45 (23.8)             |      |     |
| Marital status         |             |                          |                       |      |     |
| Never married          | 99 (37.7)   | 80 (80.8)                | 19 (19.2)             | 5.292| .071|
| Married               | 164 (61.2)  | 117 (71.3)               | 47 (28.7)             |      |     |
| Department             |             |                          |                       |      |     |
| Emergency department   | 196 (74.5)  | 142 (72.4)               | 54 (27.6)             | 2.469| .116|
| Nonemergency department| 67 (25.5)   | 55 (82.1)                | 12 (17.9)             |      |     |
| Working years          |             |                          |                       |      |     |
| <1 year                | 27 (10.3)   | 25 (92.6)                | 2 (7.4)               | 5.824| .120|
| 1–3 years              | 33 (12.5)   | 26 (78.8)                | 7 (21.2)              |      |     |
| 4–9 years              | 89 (33.8)   | 65 (73.0)                | 24 (27.0)             |      |     |
| ≥10 years              | 114 (43.3)  | 81 (71.1)                | 33 (28.9)             |      |     |

Note: Without distress: GHQ-12 ≤ 3, with distress: GHQ-12 > 3.

TABLE 1 Socio-demographic characteristics of the frontline nurses and univariate analysis

*aIncludes three divorced or widowed respondents.
4.2 Work-related characteristics and concerns about COVID-19

In this study, 75.7% (n = 199) frontline nurses reported that the outbreak of COVID-19 changed their regular job duties and about half of them (n = 135, 51.3%) reported they were working overtime, fewer than half of the frontline nurses believed that the protective equipment provided by hospitals could offer them any effective protection, and 40.3% (n = 106) reported being treated differently during the current outbreak of COVID-19 because of working in hospital. Most of the participants showed varying degree of concern about themselves or their families being infected with COVID-19 (Table 2).

4.3 Coping styles, social support, the impact of COVID-19, and psychological distress

In this study, the score of positive coping style and negative coping style among all frontline nurses was 1.68 ± 0.60 and 0.97 ± 0.51, respectively. The PSSS score was 58.76 ± 13.41. The IES-R score was 28.05 ± 14.79, with 73.8% of the frontline experiencing stress symptoms because of COVID-19 outbreak. Of the 263 frontline nurses, 66 (25.1%) were identified as psychological distress according to the GHQ-12 score.

4.4 Univariate analysis

Chi-square test revealed that age, working overtime, precautionary measures effective, being treated differently because of working in hospital, concern for themselves or their families being infected with COVID-19 were correlated with psychological distress (Tables 1 and 2). Independent sample t test demonstrated that coping styles, social support and the impact of COVID-19 between frontline nurses with and without psychological distress were different (Table 3).

4.5 Multiple logistic regression model

The multiple logistic regression model of the impact of COVID-19 on frontline nurses was listed in Table 4. Participants with a IES-R score greater than or equal to 20 were interpreted to be affected by COVID-19, whether affected by COVID-19 was set as dependent variable, the variables associated with IES-R in chi-square test and the practical significant variables were selected to performed a multiple logistic regression analysis. Working years (OR = 1.536, 95% CI 1.120–2.106), concern for own (OR  = 4.481, 95% CI 2.383–8.427), positive coping style (OR = 0.3850, 95% CI 0.220–0.673) and negative coping style (OR  = 5.400, 95% CI 2.544–11.462) were the risk factors of COVID-19 related stress symptom.

| Variable | Total n (%) | Without distress | With distress | χ² | p    |
|----------|-------------|-----------------|---------------|----|------|
| Changes of regular job duties |             |                 |               |    |      |
| Yes      | 199 (75.7)  | 147 (73.9)      | 52 (26.1)     | 0.467 | .495 |
| No       | 64 (24.3)   | 50 (78.1)       | 14 (21.9)     |     |      |
| Working overtime |          |                 |               |    |      |
| Yes      | 135 (51.3)  | 92 (68.1)       | 43 (31.9)     | 6.737 | .009 |
| No       | 128 (48.7)  | 105 (82.0)      | 23 (18.0)     |     |      |
| Precautionary measures effective |       |                 |               |    |      |
| No or don't know | 142 (54.0)  | 94 (66.2)       | 48 (33.8)     | 12.450 | <0001 |
| Yes      | 121 (46.0)  | 103 (85.1)      | 18 (14.9)     |     |      |
| Being treated differently because of working in hospital | |                 |               |    |      |
| Yes      | 106 (40.3)  | 67 (63.2)       | 39 (36.8)     | 12.925 | <0001 |
| No       | 157 (59.7)  | 130 (82.8)      | 27 (17.2)     |     |      |
| Concern for own |          |                 |               |    |      |
| Not concerned | 45 (17.1)   | 43 (95.6)       | 2 (4.4)       | 30.922 | <0001 |
| A little concerned | 174 (66.2)  | 134 (77.0)      | 40 (23.0)     |     |      |
| Very concerned | 44 (16.7)   | 20 (45.5)       | 24 (54.5)     |     |      |
| Concern for family |       |                 |               |    |      |
| Not concerned | 21 (8.0)    | 21 (100.0)      | 0 (0.0)       | 21.326 | <0001 |
| A little concerned | 154 (58.5)  | 124 (80.5)      | 30 (19.5)     |     |      |
| Very concerned | 88 (33.5)   | 52 (59.1)       | 36 (40.9)     |     |      |

Note.: Without distress: GHQ-12 ≤ 3, with distress: GHQ-12 > 3.
The multivariate model of psychological distress was displayed in Table 5. Participants with a GHQ-12 score >3 were identified as the presence of psychological distress, with or without psychological distress was set as dependent variable, the variables associated with psychological distress in chi-square test were selected to performed a multiple logistic regression analysis. The multiple logistic regression analysis identified seven factors associated with the presence of psychological distress: working in ED (OR = 3.378, 95% CI 1.404–8.130), concern for family (OR = 2.171, 95% CI 1.294–3.643), being treated differently (OR = 2.045, 95% CI 1.072–3.891), the impact of event (OR = 1.084, 95% CI 1.052–1.117), negative coping style (OR = 1.587, 95% CI 0.712–3.538), perceived social support (OR = 0.960, 95% CI 0.936–0.984), precautionary measures effective (OR = 0.469, 95% CI 0.235–0.933).

## DISCUSSION

The study result revealed that 25.1% of the frontline nurses experienced psychological distress, evidenced by their score on the GHQ-12. Frontline nurses working on the ED, concern for family, being treated differently, affected by COVID-19 and tend to take negative coping style were more likely to have psychological distress. More social support and effective precautionary measures were helpful for avoiding psychological distress.

The prevalence of psychological distress among frontline nurses in this study was higher than the 6.7%–16.6% rate in general population in China (Yueqin et al., 2019; Zhang et al., 2020). A study on the impact of SARS on the mental health among hospital staff conducted in Canada showed that 29% of the hospital staff experienced psychological distress, with nurses having a higher prevalence of 45% (Nickell et al., 2004). It could be seen that the public health crisis, whether SARS or COVID-19, would cause great psychological impact on hospital staff, especially the frontline nurses. The frontline nurses were usually the main force in the battle against public health emergencies, and their psychological health was crucial to overcoming the epidemic. Moreover, the COVID-19 epidemic has spread to every country in the world now, all hospital staff around the world were fighting against the epidemic. Therefore, the relative high prevalence of psychological distress among frontline nurses during COVID-19 outbreak should attract the attention of nursing managers.

Social support has been usually considered as the important resource to alleviate mental distress and psychological barrier for nurses (Gu, Hu, Hu, & Wang, 2016; Karaca, Yildirim, Cangur, Ackgoz, & Akkus, 2019). The same result was also detected in the present study. Social support played a substantial role in improving...
psychological health by helping individual to reduce perceived severity of the problem and the adverse effects of stress (Fu et al., 2018). Social support includes spiritual and material support from family and outside the family. However, to avoid the potential risk of infection among family members, frontline nurses were quarantined or asked not to go home after work during the current epidemic. As a result, frontline nurses might perceive less support from their family, and workplace became a more important resource of social support during COVID-19 outbreak. Maunder et al. (2003) advised clinical psychologist to engage the frontline nurses in informal individual contacts, and provide nurses with some support and advice, such as relaxing skills and sleep tips. The use of technology, such as online peer support and social media was also recommended to provide social or emotional support to nurses (Webster, Oyebode, Jenkins, & Smythe, 2019).

As a material support, precautionary devices were crucial for the protection of frontline nurses. This study revealed that nurses were more likely to have psychological distress if they thought that the protective device could not protect them well. In the early stage of COVID-19 outbreak, there was a shortage of emergency medical supplies to some extent, especially the protective equipment such as protective clothing and masks (Wang et al., 2020). The lack of protective equipment supplies exacerbated the frontline nurses' concern and thus affected their mental health. However, it was not easy to provide adequate protective equipment in the short term because of insufficient production capacity. For improving the psychological health problem caused by inadequate protective equipment among frontline nurses, some hospitals have adjusted the schedule for nurses shift system, reducing the length of one shift to 4 or 6 hr, and arranging 4–6 shifts of nurses per day. In this way, the work intensity, psychological pressure of nurses and consumption of protective equipment were reduced to some extent.

In this study, nurses working in ED had a higher prevalence of psychological distress than nurses working in other departments. Emergency department is a rapidly changing and critical environment where patients have changing and unpredictable disease conditions (Lu et al., 2015). Due to the dynamic environment, ED nurses usually perceived higher level of work stress. Previous study reported that 7%–10% of emergency service personnel experienced distress and post-traumatic stress disorder (Rybojad, Aftyka, & Milanowska, 2019). During the current outbreak of COVID-19, ED nurses had to face an unpredictable number of potential or suspected patients. In such a high-risk environment, the ED nurse were more likely to experience psychological distress. In additional, 40.3% of the frontline nurses were treated differently in this study because of working in hospital where staff were at a higher risk of potential infection. It was also reported in another study that people were afraid to meet with nurse or doctor because they thought medical personnel would carry virus to them (Hewlett & Hewlett, 2005). To avoid potentially infecting, most of the frontline nurses were shunned by their families, friends and colleague. Thus, frontline nurses had to deal with not only the epidemic of COVID-19 but also their concern for their family and stigmatisation from public. It could also lead to psychological distress.

| Variable | Variable | B  | SE  | Wald | p    | OR  | 95% CI for OR |
|----------|----------|----|-----|------|------|-----|---------------|
| Department | Nonemergency department | Reference | | | | | |
| Emergency department | 1.217 | 0.447 | 7.400 | .007 | 3.378 | 1.404–8.130 |
| Concern for family | 0.775 | 0.264 | 8.613 | .003 | 2.171 | 1.294–3.643 |
| Being treated differently because of working in hospital | No | Reference | | | | | |
| Yes | 0.714 | 0.329 | 4.719 | .030 | 2.045 | 1.072–3.891 |
| IES-R score | 0.081 | 0.015 | 28.364 | <.001 | 1.084 | 1.052–1.117 |
| PSSS score | −0.041 | 0.013 | 10.436 | .001 | 0.960 | 0.936–0.984 |
| Precautionary measures effective | No or don't know | Reference | | | | | |
| Yes | −0.758 | 0.351 | 4.657 | .031 | 0.469 | 0.235–0.933 |
| Negative coping style | 0.462 | 0.409 | 3.276 | .049 | 1.587 | 0.712–3.538 |

Note: CI: confidence interval; Model parameter: $\chi^2 = 163.220, p < .001$, Cox and Snell $R^2 = 29.5\%$, Nagelkerke $R^2 = 43.6\%$. Psychological distress was measured by the 12-item version of the General Health Questionnaire; IES-R: measured by the Impact of Event Scale-Revised; PSSS: measured by the Perceived Social Support Scale.
Frontline nurses in this study were more likely to take positive coping behaviour, which was consistent with previous studies (Isa et al., 2019; Zhou & Gong, 2015). Moreover, the frontline nurses who were more likely to take negative coping behaviours were more likely to present psychological distress. Due to the increased workload and the psychological burden during the epidemic, frontline nurses might take some negative coping behaviour, such as hoping the problem would disappear, fantasizing a miracle happen, using alcohol or drug. Some nurses might even take avoidance behaviours, such as avoiding verbal, physical, and social contact with infected of suspected infected patients, to minimise the severity of the situation. However, negative coping behaviours might provide stress reduction in the immediate or short term but it did not address the cause of stress (Laranjeira, 2012; Schreuder et al., 2011). Thus, nurse managers should pay more attention to the negative emotion and behaviour among frontline nurses, take target intervention (workplace intervention, stress handling and consultation with psychologist) to improve the coping style for reducing psychological distress.

Previous research found that individuals were more likely to exhibit the event-associated stress symptom if they perceived a greater threat of the life event (Rybojad et al., 2019). In this study, it was found that the increased COVID-19 related stress symptom was linked to psychological distress among the frontline nurses. It was worth mentioning that 73.8% of the frontline nurses in this study felt subject stress resulting from COVID-19 according to the IES-R score, which indicated higher impact than SARS epidemic (Wu et al., 2009). Previous studies suggested that when the traumatic event caused impact on a person more than 6 months after an event, the impact was more likely to exist for long term (Anderson, Ziedonis, & Najavits, 2014; Blanco et al., 2013). Therefore, for frontline nurse fighting against COVID-19, early detection of post-traumatic symptom and effective intervention were very crucial to prevent further psychological distress.

It was worth mentioning that 73.9% of the frontline nurses reported changes of regular job duties and 68.1% of them reported working overtime. However, the result of logistic regression analysis found no impact of these factors on psychological distress among frontline nurses. During the epidemic, almost all hospital staff in the country were engaged in the intense fighting against the epidemic. Everyone wanted to contribute to the fighting, the overtime work or changes of regular job duties was acceptable to them and it was what they thought they should do (Jenaro, Flores, Orgaz, & Cruz, 2011). This might be the reason why working overtime or changes of work duties did not impact the psychological status among frontline nurses. Further research might be needed to understand the perception of frontline nurses about working overtime of overload.

5.1 | LIMITATION

The study had several limitations. First, the sample size was relatively small and the estimated response rate was relatively low (30%–40%), which might add to the possibility of response bias. Second, the main variables reported in this study were based on self-administered questionnaire. Third, the impact of COVID-19 on the psychological status among frontline nurses might be continuous, changeable and long term, the prevalence of psychological distress in current study might be underestimated, as the statistics were collected in the early stage of the epidemic. Finally, this study was a cross-sectional design, the interpretation of causal relationships between risk factors and the psychological distress was limited. Longitudinal study was needed to investigate the predictors of psychological distress among frontline nurses in the future.

6 | CONCLUSION

The study results demonstrated that a significant psychological impact of COVID-19 on frontline nurses in China. Working on ED, concern for family, being treated differently, affected by COVID-19 and negative coping style were the risk factors of psychological distress. Perceived more social support and effective precautionary measures were the protective factors of psychological health. Hence, it is important for hospitals and health care institutions to provide psychosocial support and intervention for the frontline nurses early to avoid further impact of the epidemic.

7 | RELEVANCE FOR CLINICAL PRACTICE

This study highlighted that the frontline nurses were suffering from varying degrees of psychological distress. It was influenced by internal factors and external factors, such as work environment, social support, and coping strategy. To avoid further psychological impact of COVID-19, early screening and supportive strategies were necessary for frontline nurses. Beside, more specific measurement should be combined with the GHQ-12 to assess the varying degrees of psychological distress in frontline nurses.

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CONFLICT OF INTEREST

Anliu Nie, Xiangfen Su, Shuzeng Zhang, Wenjie Guan and Jianfeng Li declare that they have no conflict of interest.

AUTHOR CONTRIBUTIONS

SX, GW and NA designed the study. ZS, GW and SX collected the data. NA and GW analysed the data. ZS, NA and SX wrote the manuscript.
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**SUPPORTING INFORMATION**

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

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