

ORIGINAL ARTICLE

Willingness to participate in front-line work during the COVID-19 pandemic: A cross-sectional study of nurses from a province in South-West China

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Abstract

Aim: To explore the current status of Chinese nurses' willingness to work during the COVID-19 pandemic and the factors that influence them.

Background: The demand for front-line nurses continues to grow during the COVID-19 pandemic, but their willingness varies significantly. Therefore, it is crucial to explore nurses' willingness to report for front-line work.

Methods: A cross-sectional study of 1,310 nurses from six tertiary hospitals was conducted. The participants completed self-administered online questionnaires.

Results: A total of 90.5% of nurses reported that they would like to voluntarily participate in front-line work. Those with previous training, higher self-efficacy scores, and lower perceived risk and self-worth scores were more likely to participate in front-line work, while nurses, who had 11–15 years of work experience and were worried about their family and the lack of family support, were less likely to be involved in front-line work.

Conclusion: This study found that the vast majority of nurses were willing to participate in front-line work and affirmed the positive effects of previous infection prevention training, self-efficacy and self-worth.

Implications for Nursing Management: This research emphasizes the necessity of infection prevention training and provides evidence for further emergency workforce deployment and incentives.

KEYWORDS

COVID-19, disaster nursing, management, workforce issues

1 | INTRODUCTION

The COVID-19 pandemic has caused immeasurable losses to the global health care system and inevitably lead to a human resources crisis. A report in September 2020 showed that, in 44 countries with available data, more than 1,000 nurses were infected and died of COVID-19 (International Council of Nurses, 2020a). And it is estimated that an average of 7% of all COVID-19 cases

worldwide were health care workers (HCW) (International Council of Nurses, 2020b). A report released in March 2020 showed that 3,000 HCWs in Hubei were infected, 40% of whom were hospital-acquired (The People's Daily, 2020). As a result, the world's demand for front-line HCWs continues to grow. However, previous studies have shown that the willingness of HCWs to participate in the treatment of infectious disease is varied (23.1%–95.7%) (Aoyagi et al., 2015).

HCWs must respond quickly to any type of disasters. However, previous studies have found the general response rates of HCWs' willingness to work during an influenza pandemic tend to be lower than during other types of disasters (Al-Hunaishi et al., 2019; Hope, 2010). Indeed, during severe acute respiratory syndrome (SARS) and Ebola outbreaks, HCWs' willingness to work was relatively lower, ranging from 25.4% to 48.4% (Qureshi et al., 2005; Ko et al., 2004; Kim and Choi, 2016).

Factors influencing nurses' willingness to work during an infectious disease outbreak might be complicated. An integrative review summarized factors for participation, which included being male, being a physician or nurse, working in a clinical or emergency department, working full time, primary influenza education and training, prior experience of working during an influenza outbreak emergency, values and beliefs, availability of personal protective equipment (PPE) and confidence in the employer (Devnani, 2012). Another study also identified several factors, including not having children younger than three years, older children, full-time work, reduced family concerns, reduced fear of unemployment and vaccine availability (Charney et al., 2015). Furthermore, nurses may be at risk of being exposed to infections, stigma and other social issues during the outbreak, which can influence their willingness (Kollie et al., 2017).

Researchers predict that the outbreak of emerging infectious diseases will continue and become a significant global health crisis during the 21st century (Smith, 2006). Nurses are the core and crucial members of any medical team, and their willingness to participate in the treatment of infected patients is critical for an active response (Jackson et al., 2020). It is important to identify what motivates nurses to actively respond during an infectious disease emergency and address it immediately. Therefore, under this global crisis, it is necessary to explore the current status of Chinese nurses' willingness to work and the influencing factors during the COVID-19 pandemic. Understanding these factors will help us provide suggestions to improve workforce deployment and employee motivation during upcoming emergencies.

2 | METHOD

2.1 | Study design

A cross-sectional study, with a correlational design, was conducted. The data were collected through online surveys using the Chinese Wenjuanxing website (<https://www.wjx.cn/>).

2.2 | Study population and sample

The participants were chosen from six tertiary hospitals in four cities (Chengdu, Ziyang, Guang'an and Yibin) in the Sichuan Province, South-West China. The inclusion criteria were as follows: (1) 18–60 years old; (2) working as a registered nurse; (3) working in a clinical

department and directly in contact with patients during work; and (4) typically on duty during the period of investigation. The exclusion criteria were as follows: (1) nurses who were not regular staff members of the hospital, such as training nurses or student nurses; (2) nurses who worked in administrative or logistic positions without direct patient contact; and (3) nurses diagnosed with COVID-19. The researcher initially introduced the project by contacting the nursing manager of hospital continuing education or the head nurse in each of the six hospitals. After they agreed to participate in this study voluntarily, the survey link and the descriptive information were shared through a chat group on an instant messenger and made accessible to all participants. Data were collected from 22 February to 6 March 2020. A total of 1,321 participants completed the online questionnaire.

According to a previous study, the willingness of HCWs to work during SARS was 48.4% (Qureshi et al., 2005). Based on the sample size calculation formula for cross-sectional surveys (Charan and Biswas, 2013), with an absolute error of 5% and a type 1 error of 5%, it was estimated that the minimum number of samples required was 384. Considering a 20% non-response rate, a total of 461 participants were included in this study. Therefore, we confirmed that our study met the sufficient sample size for statistical analysis.

2.3 | Variables and measurement

Considering the lack of existing scales to measure nurses' willingness to work during an infectious disease outbreak, we developed a self-administrated questionnaire based on the extended parallel process model (Witte, 1992). This model was used to explain the message processing appraisals of threats and proposed that perceived efficacy (self-efficacy and response efficacy) and perceived threat (susceptibility, severity) are the core components of information process evaluation, which might explain the different responses. Referring to similar evidence from previous literature (Al-Hunaishi et al., 2019), we added the socio-demographic characteristics and other influencing factors. This questionnaire entitled *Investigation on willingness to participate in front-line work during the COVID-19 pandemic* consists of six parts: socio-demographic and professional information, attitude and belief about front-line work, self-efficacy, risk perception, responding behaviours, and perceived facilitators and barriers for reporting to work.

- (i) Socio-demographic and professional information included 17 items, including age, gender, professional background and previous training experience.
- (ii) Attitudes and beliefs of nurses included four items concerning their opinions on PPE, standardized protocols, nursing operations and treatment methods, and were evaluated on a 5-point Likert scale ranging from 'strongly disagree' (1) to 'strongly agree' (5).
- (iii) Self-efficacy comprised four items, one's confidence in professional knowledge, clinical nursing skills, protective skills and

TABLE 1 Participants' socio-demographic and professional characteristics

Variables	Total	<i>n</i> (%) / <i>M</i> (<i>SD</i>) of participants		<i>t</i>	<i>p</i> value
		Not willing	Willing		
Age	30.79 (6.64)	32.11 (7.97)	30.66 (6.47)	1.9768 ^a	.050
Gender					
Female	1,285 (98.1%)	122 (9.3%)	1,163 (88.8%)	0.006 ^b	.937
Male	25 (1.9%)	3 (0.2%)	22 (1.7%)		
Educational level					
Junior college or below	543 (41.4%)	60 (4.6%)	483 (36.9%)	2.442 ^b	.118
Undergraduate or above	767 (58.5%)	65 (5.0%)	702 (53.6%)		
Professional qualification					
Primary (registered nurses)	987 (75.3%)	91 (6.9%)	896 (68.4%)	0.682 ^b	.711
Middle (nurse in charge)	267 (20.4%)	29 (2.2%)	238 (18.2%)		
Senior (chief nurses)	56 (4.3%)	5 (0.4%)	51 (3.9%)		
Length of employment					
≤5	395 (30.2%)	35 (2.7%)	360 (27.5%)	10.977 ^b	.012 ^c
6–10	578 (44.1%)	46 (3.5%)	532 (40.6%)		
11–20	217 (16.5%)	23 (1.8%)	194 (14.8%)		
≥21	120 (9.2%)	21 (1.6%)	99 (7.6%)		
Department					
Respiratory infectious intensive care emergency	233 (17.8%)	15 (1.1%)	218 (16.6%)	3.180 ^b	.204
Surgical	201 (15.3%)	21 (1.6%)	180 (13.7%)		
Other	876 (66.9%)	89 (6.8%)	787 (60.1%)		
Marriage					
Unmarried	349 (26.6%)	30 (2.3%)	319 (24.4%)	1.853 ^b	.603
Married	928 (70.9%)	92 (7.0%)	836 (63.8%)		
Divorce	29 (2.2%)	2 (0.2%)	27 (2.1%)		
Widowed	4 (0.3%)	1 (0.1%)	3 (0.2%)		
Only child of your parents					
Yes	405 (30.9%)	46 (3.5%)	359 (27.4%)	2.240 ^b	.134
No	905 (69.1%)	79 (6.0%)	826 (63.1%)		
Children					
Yes	795 (60.7%)	80 (6.1%)	715 (54.6%)	0.636 ^b	.425
No	515 (39.3%)	45 (3.4%)	470 (35.9%)		
Number of children					
0	515 (39.3%)	45 (3.4%)	470 (35.9%)	0.640 ^b	.726
1	564 (43.1%)	57 (4.4%)	507 (38.7%)		
≥2	231 (17.6%)	23 (1.8%)	208 (15.9%)		
Whether family lives together					
Yes	1,083 (82.7%)	107 (8.2%)	976 (74.5%)	0.827 ^b	.363
No	227 (17.3%)	18 (1.4%)	209 (16.0%)		
Family member or friend diagnosed with COVID-19					
Yes	9 (0.7%)	1 (0.1%)	8 (0.6%)	<0.001 ^b	1.000
No	1,301 (99.3%)	124 (9.5%)	1,177 (89.8%)		
Infection prevention training					
Yes	1,134 (86.6%)	92 (7.0%)	1,042 (79.5%)	19.972 ^b	<.001 ^c
No	176 (13.4%)	33 (2.5%)	143 (10.9%)		

(Continues)

TABLE 1 (Continued)

Variables	Total	n (%) / M (SD) of participants		t	p value
		Not willing	Willing		
Public health emergencies training					
Yes	842 (64.3%)	72 (5.5%)	770 (58.8%)	2.681 ^b	.102
No	468 (35.7%)	53 (4.0%)	415 (31.7%)		
Participation in large non-communicative public health events					
Yes	88 (6.7%)	7 (0.5%)	81 (6.2%)	0.275 ^b	.600
No	1,222 (93.3%)	118 (9.0%)	1,104 (84.3%)		
Participation in large communicative public health events					
Yes	49 (3.7%)	3 (0.2%)	46 (3.5%)	0.690 ^b	.406
No	1,261 (96.3%)	122 (9.3%)	1,139 (86.9%)		
Have voluntary participation in front-line work					
Not yet	1,002 (76.5%)	119 (9.1%)	883 (67.4%)		
Yes	308 (23.5%)	6 (0.5%)	302 (23.1%)		
Isolation ward	293 (22.4%)	6 (0.5%)	287 (21.9%)		
Hubei	65 (5.0%)	0 (0.0%)	65 (5.0%)		

^aStudent's *t* test, ^bchi-square test, ^c $p < .05$

psychological adjustment, and was scored on the 5-point Likert scale (as above).

- (iv) Perceived threat evaluated two items on a 5-point Likert scale, from 'unlikely' (1) to 'certainly' (5): the nurses' risk perception and the life-threatening risk perceived after exposure.
- (v) There were six items for coping behaviour to explore whether the nurses presented physical, emotional and sleep symptoms, repeated hand washing and other reactions after the outbreak. Coping behaviour was measured using a 5-point Likert scale, ranging from 'never' (1) to 'always' (5).
- (vi) Facilitator factors (self-worth, family support, social acceptance and external support) and barrier factors (possible concerns raised in terms of personal health, family health, family responsibilities, professional skills and PPE) were rated on a 5-point Likert scale (as above).

2.4 | Validity and reliability

The content validity of the questionnaire was evaluated by an expert advisory committee comprising six nursing experts. The item-level content validity indexes (I-CVIs) for this questionnaire was 0.95, and the I-CVI of each item ranges from 0.83 to 1; the scale-level content validity index/universal agreement (S-CVI/UA) for this questionnaire was 0.92; and the scale-level content validity index/average (S-CVI/Ave) was 0.91. It is recommended that the I-CVIs, S-CVI/UA and the S-CVI/Ave should be above 0.75 (Polit et al., 2007), 0.8 and 0.9 (Davis, 1992), respectively, which implied a good validity. A pilot study was conducted with 65 participants, which outcome presents high reliability of Cronbach's alpha = 0.845. Cronbach's alpha for attitudes and beliefs was 0.953, self-efficacy was 0.934, perception of risk was

0.821, coping behaviour was 0.825, facilitators was 0.887 and barriers was 0.822, which exceed the recommended threshold of 0.7.

2.5 | Data analysis

In all tests, the significance level for all analyses was set at $p < .05$. Statistical analyses were performed using SPSS 23.0.

The description of the socio-demographic characteristics was performed using measures of mean and standard deviation for the quantitative normally distributed continuous variables, and using frequency and percentage for the qualitative variables.

Student's *t* test (for quantitative variables) and the chi-square test (for qualitative variables) were performed to evaluate the association between the willingness and the socio-demographic variables and dimensional variables, while multiple stepwise regression LR forward method was used to determine the significant factors influencing the willingness of nurses to participate in the front-line work.

3 | RESULTS

3.1 | Characteristics of the participants

In total, 1,321 electronic questionnaires were collected. Of these, 11 questionnaires were excluded because the data filling rate was less than 90% or there were obvious errors, such as the reported age was over 100 years. Thus, 1,310 questionnaires were analysed and the valid response rate of the questionnaire was 99.2%.

Socio-demographic statistics are presented in Table 1. The average age of the nurses who were willing to participate in front-line work

TABLE 2 Participants' willingness to participate in front-line work

Items	Total n (%)	
	Yes	No
Would like to participate in the following front-line work voluntarily when it is necessary.	1,185 (90.5%)	125 (9.5%)
Isolation ward in local hospital	1,147 (87.5%)	163 (12.5%)
Hubei support	1,017 (77.6%)	293 (22.4%)
Already participated in the following front-line work voluntarily.	308 (23.5%)	1,002 (76.5%)
Isolation ward in local hospital	293 (22.4%)	1,017 (77.6%)
Hubei support	65 (5.0%)	1,245 (95.0%)

was 30.66 (*SD* 6.47), lower than the average age of unwilling nurses, which was 32.11 (*SD* 7.97). The vast majority of the participants were female (98.1%), more than half had an education of bachelor's degree or above (58.5%), 75.3% had junior professional designations, and 44.1% had 6–10 years of work experience. Additionally, less than one-fifth (17.8%) of the participants worked in high-risk departments, such as intensive care units, emergency departments and department of infectious diseases. Regarding family-related background information, most participants (70.9%) were married, 69.1% were not an only child, 60.7% were raising at least one child, and 82.7% lived with their families. Only a few (0.7%) nurses reported that families or friends were diagnosed with COVID-19. In terms of experience, 86.6% of nurses reported receiving infection prevention training, and 64.3% reported previous public health emergency training. Furthermore, a few (6.7%) nurses reported that they had participated in non-communicable public health events, such as during the Wenchuan earthquake in 2008, and only 3.7% of nurses had participated in emergency responses to public health events.

3.2 | Descriptive results of willingness to participate in front-line work

As shown in Table 2, 90.5% of nurses reported that they were willing to participate in at least one form of front-line work. In particular, 87.5% of nurses were willing to work in the isolation ward of the local hospital, and 77.6% were willing to provide support in Hubei. Finally, 23.5% of nurses participated in at least one form of front-line work: 5.0% in Hubei and 18.5% in the local isolation ward. Of these, 65 nurses volunteered with the Hubei support. Among the 283 nurses who worked in the isolation ward of this hospital, most volunteered, and only 2.1% were unwilling to participate in front-line work.

3.3 | Comparison of the factors that influence the willingness of front-line workers

Regarding attitudes and beliefs, nurses who volunteered to participate in front-line work (17.54 ± 3.04) scored higher than unwilling nurses (15.90 ± 3.44) ($t = -5.657, p < .001$) and scored higher

in the subitems of PPE protection ($t = -5.521, p < .001$), standard nursing procedures ($t = -5.766, p < .001$), nursing measures ($t = -4.754, p < .001$) and effectiveness of treatments ($t = -5.196, p < .001$) (Table 3). In terms of self-efficacy, nurses who volunteered to participate in front-line work (16.27 ± 3.06) scored higher than unwilling ones (13.99 ± 3.20) ($t = -7.873, p < .001$) and scored higher in the subcategories related to expertise ($t = -7.227, p < .001$), nursing skills ($t = -7.716, p < .001$), protective skills ($t = -6.139, p < .001$) and confidence in emotional adjustment ($t = -6.492, p < .001$). In terms of perceived risk, unwilling nurses (6.61 ± 1.59) scored higher than nurses who volunteered to participate (5.55 ± 1.75) ($t = 6.975, p < .001$) and scored higher in terms of perceived risk ($t = 6.105, p < .001$) and life-threatening potential threat to their life ($t = 6.287, p < .001$). In terms of responding behaviours, unwilling nurses (12.54 ± 5.51) scored higher than those who volunteered (10.71 ± 4.24) ($t = 3.594, p < .001$), in particular, on the subitems suspicion of being infected ($t = 2.649, p = .009$), irritability ($t = 3.752, p < .001$), unhappiness ($t = 2.864, p = .005$), insomnia ($t = 2.929, p = .004$) and somatic discomfort ($t = 3.302, p = .001$) subcategories. For facilitators, the total score of nurses who volunteered to participate in front-line work (31.17 ± 6.11) was higher than that of unwilling nurses (29.76 ± 6.53) ($t = -2.432, p = .015$) and was higher in the three subitems of social recognition ($t = -5.836, p < .001$), social responsibility ($t = -7.596, p < .001$) and self-worth ($t = -7.964, p < .001$). For barriers, the total score for nurses who did not want to participate in front-line work was 29.69 ± 6.35 , which is higher than the score of voluntary nurses (25.47 ± 7.59) ($t = 6.925, p < .001$). The scores of unwilling nurses in the subitems of home care ($t = 6.625, p < .001$), concern for family safety ($t = 5.181, p < .001$), family support ($t = 7.156, p < .001$), clinical skills ($t = 4.252, p < .001$), professional knowledge ($t = 4.688, p < .001$), protective safety ($t = 6.252, p < .001$), inadequate protective equipment ($t = 4.507, p < .001$) and insufficient time off ($t = 4.413, p < .001$) subcategories were higher.

3.4 | Multiple logistic regression model

As presented in Table 1, the univariable analysis was performed for participants' socio-demographic and professional characteristics and

showed that nurses with different lengths of employment ($\chi^2 = 10.977$, $p < .05$) and experience of infection prevention training ($\chi^2 = 19.972$, $p < .001$) had differences in willingness to participate. The variables with significant differences in Table 3 were also included in the multiple logistic regression model and analysed using the LR method. As shown in Table 4, the final regression model showed that the factors affecting nurses' willingness to work at the front line were 11–15 years of experience (OR = 0.313; 95% CI 0.160–0.609), previous infection prevention training (OR = 0.472; 95% CI 0.29–0.766), self-efficacy (OR = 1.130; 95% CI 1.058–1.207), perceived risk (OR = 0.813; 95% CI 0.711–0.929), perceived self-worth (OR = 1.903; 95% CI 1.477–2.451), worries about family care (OR = 0.672; 95% CI 0.520–0.870) and worries about family support (OR = 0.714; 95% CI 0.559–0.913).

4 | DISCUSSION

In the current study, we investigated the willingness of 1,310 nurses from six tertiary hospitals in four cities of Sichuan Province. Results showed that a vast majority (90.5%) of nurses reported that they would like to voluntarily participate in front-line work, and up to 77.6% of nurses expressed their willingness to work in the Hubei Province. This is consistent with the results of Gan et al., (2020), 83.4% of the nurses voluntarily practised in Hubei during the pandemic. Globally, the willingness of nurses varies by region and country. A study in Qatar showed that 88.1% of nurses expressed their willingness to take care of patients diagnosed with COVID-19 (Nashwan et al., 2020). However, a Korean study showed that only 60% of health care staff were willing to work during an outbreak, while 12.5% were unwilling and 8% had considered quitting their jobs (Jang et al., 2020). A study in Nepal showed that up to 35.9% of HCWs reported unwillingness to work during the COVID-19 pandemic (Upadhyaya et al., 2020). This difference may be due to the different cultural contexts, where the Chinese emphasizes a deep commitment to taking collective action (Palko & Xiang, 2020).

The length of employment is one of the influencing factors for nurses to support the epidemic. Our study showed that compared with nurses who had worked for 21 years or more, nurses who had worked for 11–15 years are less willing to participate in front-line work. A previous study also showed that the year of employment is one of the main positive factors influencing the willingness to care for SARS patients (Qureshi et al., 2005). Although it is generally considered that nurses who had worked for 11–15 years had relatively rich work experience, it may be that nurses in this age group undertake substantial responsibility and burden in family care and children's education, which affects their willingness to participate.

Most nurses in our study (86.6%) were trained in infection protection and those with training experience were more willing to participate in front-line work. Several studies have reported that previous training experience has been identified as a significant influence on nurses' willingness to respond to disasters (Arbon et al., 2013; Burke et al., 2011). As a new type of respiratory virus, COVID-19 is primarily transmitted through close contact and droplets; therefore,

the people at the highest risk of infection are those who are in close contact with patients with COVID-19 and treat for COVID-19. Therefore, medical staff are required to master the skills and knowledge of PPE (World Health Organization, 2020). It is possible that previous training experience helped nurses to adopt infection prevention and control measures better and to apply their confidence and competence to work, thus making them more willing to engage in front-line work.

Additionally, nurses with higher scores of self-efficacy in knowledge, skills and psychological adjustment were more willing to participate in front-line work and those with a higher risk perception score were less willing to participate. Al-Hunaishi et al., (2019) found that self-efficacy was positively correlated with willingness to work in any type of disaster. Research on the care of Ebola patients also found that the higher the perceived risk, the lower the willingness to participate (Kim and Choi, 2016). Similarly, another survey of Israeli nurses found a significant correlation between self-efficacy, risk assessment and nurses' willingness to report to work during national emergencies (Melnikov et al., 2014). A study found that the respondents' willingness to work varied based on their risk assessment, with 92.3% reporting to work during the lowest risk but only 56.2% during the highest risk stage (Basta et al., 2009). Due to the lack of knowledge, experience and skills, the nurses may perceive a higher risk and the severe consequences of infection and, thus, do not voluntarily participate in front-line work. Therefore, targeted training programmes on knowledge, skills and psychological profiles should be employed to improve nurses' self-efficacy, reduce perceived risk and thus increase HCWs' willingness to participate in health care during a crisis.

In this study, the main perceived facilitators were not external evaluations, awards, promotions and specific help, but self-worth. This suggests that Chinese nurses favour exploring individual values and meanings to practise self-worth perceptions in their work, which may drive nurses' willingness to work during a crisis.

The main barriers perceived by nurses in this study focused on family care and support. This is similar to the results of a meta-analysis that found that the duty of childcare is significantly related to a decrease in willingness to work, among medical staff, during the influenza pandemic (Aoyagi et al., 2015). Child care and pet care have also been shown to be the main limiting factors for health care workers (Ogedegbe et al., 2012). Women of childbearing age dominate the occupational group of Chinese nurses. On the one hand, in the division of labour in a household, Chinese women tend to assume more family care and responsibilities (Luo and Chui, 2018); however, front-line work often results in a period of family separation, which naturally prevents them taking care of the family. On the other hand, in the absence of knowledge and understanding of COVID-19, family members may not support the front-line work of nurses due to safety concerns. Under the considerably increased workload and stress (Lucchini et al., 2020), nurses' perceived risk, duties related to treating patients and family responsibilities may trigger an intrinsic conflict of values (Ganz et al., 2019). Therefore, obtaining family support may be critical for ensuring that nurses can enter front-line work.

TABLE 3 Comparison of the factors that influence the willingness of front-line workers

Variables	M ± SD of participants		t	p value
	Not willing	Willing		
Attitude and belief	15.90 ± 3.44	17.54 ± 3.04	-5.657 ^a	<.001 ^b
I am confident the medical protective equipment will protect me the COVID-19	3.98 ± 0.96	4.41 ± 0.81	-5.521 ^a	<.001 ^b
I am confident I will be able to prevent myself from getting infected with the COVID-19 by following standard nursing protocols	4.01 ± 0.94	4.45 ± 0.79	-5.766 ^a	<.001 ^b
I believe that current nursing measures can improve the situation of patients with COVID-19	4.02 ± 0.89	4.38 ± 0.82	-4.754 ^a	<.001 ^b
I believe that the current treatment plan can treat COVID-19	3.90 ± 0.92	4.31 ± 0.82	-5.196 ^a	<.001 ^b
Self-efficacy	13.99 ± 3.20	16.27 ± 3.06	-7.873 ^a	<.001 ^b
I have sufficient professional knowledge to participate in the treatment of patients with COVID-19 pneumonia	3.40 ± 0.88	3.99 ± 0.84	-7.227 ^a	<.001 ^b
I have sufficient clinical nursing skills to participate in the treatment of patients with COVID-19 pneumonia	3.41 ± 0.87	4.05 ± 0.83	-7.716 ^a	<.001 ^b
I have sufficient protective skills to ensure safety during work	3.63 ± 0.86	4.12 ± 0.81	-6.139 ^a	<.001 ^b
I can regulate the negative emotions such as fear and anxiety that may occur while treating patients	3.54 ± 0.93	4.11 ± 0.87	-6.492 ^a	<.001 ^b
Perceived risk	6.61 ± 1.59	5.55 ± 1.75	6.975 ^a	<.001 ^b
If I participate in front-line work, I am more likely to be infected	3.30 ± 0.86	2.80 ± 0.96	6.105 ^a	<.001 ^b
If I am infected with the COVID-19, I am more likely to die.	3.31 ± 0.87	2.76 ± 0.94	6.287 ^a	<.001 ^b
Responding behaviours	12.54 ± 5.51	10.71 ± 4.24	3.594 ^a	<.001 ^b
Since the outbreak, I have a slight cough and some discomfort in my throat, I suspect I have been infected.	1.89 ± 1.08	1.62 ± 0.87	2.649 ^a	.009 ^b
Since the outbreak, I feel distraught and easily lose my temper. I cannot refrain from checking on information related COVID-19, repeatedly.	2.02 ± 1.19	1.62 ± 0.92	3.752 ^a	<.001 ^b
Since the outbreak, I have felt depressed and unhappy, with insufficient energy and decreased appetite.	1.68 ± 1.42	0.99 ± 0.78	2.864 ^a	.005 ^b
Since the outbreak, I have suffered from poor sleep, difficulty falling asleep, and have been waking up easily.	1.85 ± 1.16	1.53 ± 0.91	2.929 ^a	.004 ^b
Since the outbreak, I have to wash my hands and repeatedly disinfect to be at ease.	3.35 ± 1.34	3.11 ± 1.47	1.779 ^a	.760
Since the outbreak, I have had feelings of discomfort, such as a headache, dizziness, fatigue, and gastrointestinal discomfort.	1.75 ± 1.11	1.42 ± 0.76	3.302 ^a	.001 ^b
Facilitators	29.76 ± 6.53	31.17 ± 6.11	-2.432 ^a	.015 ^b
Social recognition	3.8 ± 0.93	4.27 ± 0.84	-5.836 ^a	<.001 ^b
Social responsibility	4.01 ± 0.85	4.51 ± 0.69	-7.596 ^a	<.001 ^b
Self-worth	3.95 ± 0.86	4.49 ± 0.70	-7.964 ^a	<.001 ^b
Promotion of professional qualification	3.43 ± 1.09	3.55 ± 1.15	-1.071 ^a	.284
Economic award	3.41 ± 1.07	3.40 ± 1.17	0.029 ^a	.977
A policy which benefits children's education	3.60 ± 1.09	3.50 ± 1.21	0.858 ^a	.391
Assistance with caring for the elderly	3.54 ± 1.12	3.50 ± 1.21	0.414 ^a	.679
Sufficient protective equipment	4.02 ± 1.01	3.95 ± 1.10	0.681 ^a	.496
Barriers	29.69 ± 6.35	25.47 ± 7.59	6.925 ^a	<.001 ^b
Worried about family care	3.99 ± 1.00	3.53 ± 1.21	6.625 ^a	<.001 ^b
Worried about spreading disease to family and friends	3.93 ± 1.05	3.41 ± 1.50	5.181 ^a	<.001 ^b
Worried about lack of family support	3.80 ± 0.99	3.11 ± 1.24	7.156 ^a	<.001 ^b
Worried about lack of clinical ability	3.69 ± 1.03	3.28 ± 1.16	4.252 ^a	<.001 ^b

(Continues)

TABLE 3 (Continued)

Variables	<i>M</i> ± <i>SD</i> of participants		<i>t</i>	<i>p</i> value
	Not willing	Willing		
Worried about lack of professional knowledge	3.71 ± 0.98	3.27 ± 1.13	4.688 ^a	<.001 ^b
Worried about protective safety during work	3.70 ± 0.97	3.12 ± 1.13	6.252 ^a	<.001 ^b
Worried about insufficient protective equipment	3.62 ± 1.02	3.14 ± 1.15	4.507 ^a	<.001 ^b
Worried about insufficient rest time	3.25 ± 1.06	2.79 ± 1.10	4.413 ^a	<.001 ^b

Note: ^aStudent's *t* test, ^b*p* < .05

TABLE 4 Multiple logistic regression analysis of factors associated with willingness to work

Variables	B	SE	Wald	df	<i>p</i>	OR	95% CI
Constant	2.624	0.943	7.743	1	.005 ^a	13.793	
Length of employment							
≤5 years	0.192	0.252	0.578	1	.447	1.212	0.739–1.987
6–10 years	−0.427	0.310	1.904	1	.168	0.652	0.356–1.197
11–15 years	−1.163	0.341	11.656	1	.001 ^a	0.313	0.160–0.609
Previous infection prevention training	−0.751	0.247	9.225	1	.002 ^a	0.472	0.290–0.766
Self-efficacy	0.122	0.034	13.198	1	<.001 ^a	1.130	1.058–1.207
Perceived risk	−0.207	0.068	9.193	1	.002 ^a	0.813	0.711–0.929
Self-worth	0.643	0.129	24.761	1	<.001 ^a	1.903	1.477–2.451
Worries about family care	−0.397	0.131	9.114	1	.003 ^a	0.672	0.520–0.870
Worries about family support	−0.337	0.125	7.228	1	.007 ^a	0.714	0.559–0.913

Note: Model parameters: ^a*p* < .05, chi-square = 158.140, *p* < .001, Cox and Snell *R*-square = 11.4%, Nagelkerke *R*-square = 24.3%.

4.1 | Limitations

This study had three limitations. First, studies on willingness to respond to disasters have been dominated by self-administered questionnaires and lack of standardized assessment tools. Therefore, we developed a questionnaire that showed good reliability and validity. Second, Wuhan city was locked down during the investigation, so we only used online questionnaires for safety reasons. Lastly, this project only implemented convenience sampling instead of randomized sampling due to the ongoing pandemic and has not been tested in other cultural contexts, thus might limit its generalizability of the findings to other populations and settings (Ferguson, 2004).

We suggest that future studies develop a standardized tool to measure willingness to work, while implementing randomized sampling. Furthermore, after been validated in different cultural contexts, we recommend conducting mixed-method research to explore the facilitators and barriers of the nursing staff's willingness to work at the front line.

5 | CONCLUSIONS

This study found that the vast majority of nurses were willing to participate in front-line work during the COVID-19 pandemic and

affirmed the positive roles of previous infection prevention training, self-efficacy and self-worth on nurses' involvement in the front line of the pandemic. Conversely, perceived risk, 11–15 years of working experience, worrying about family care and support, and other factors are likely to hinder nurses' involvement in front-line treatment. Therefore, it is necessary to support front-line nursing staff in terms of knowledge, skills, psychology, society and family to effectively organise and actively respond to public health emergencies.

6 | IMPLICATIONS FOR NURSING MANAGEMENT

This study provides scientific evidence for disaster preparation and workforce deployment in the follow-up response to public health emergencies. It is recommended that nursing managers continue to strengthen the infection prevention training of clinical nurses. Training programmes with various forms, such as virtual reality simulation, can be developed to enhance the nursing staff's protective skills. A variety of measures should be taken for front-line nursing staff regarding knowledge, skills and psychological adjustment, and to reduce their perceived risk. Additionally, we suggest that society should play an indispensable role by promoting professional value of nurses' medical teams and their sense of self-worth, helping them

gain the understanding and support of their families, helping front-line nursing staff to solve family care issues and motivating nurses to voluntarily participate in front-line work during emergencies.

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CONFLICTS OF INTEREST

All authors declare that they have no conflict of interest.

AUTHOR CONTRIBUTION

YL and XF designed the study. DZ and HX collected the data. YL and MZ analysed the data. YL, XF and NL wrote the manuscript. All authors reviewed the final manuscript.

ETHICAL APPROVAL

This research was approved by the hospital ethics committee of Biomedical Research (2020-1233). The participants received the website link through a chat group on an instant messenger, with details regarding the study provided through an introduction, after which they were asked to complete the informed consent. They completed the online survey via computers or mobile phones and knew that they could withdraw at any stage. The questionnaires were anonymous, and the participants were assured that the information that they provided will be used only for research purposes.

DATA AVAILABILITY STATEMENT

Data available on request from the authors.

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