



# Mental health status of frontline clinical nurses fighting the Omicron variant of COVID-19 – a cross-sectional survey in China

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## Abstract

**Introduction and Objective.** From March 2022, China has been in the rapid progressing stage of the Omicron outbreak. However, the mental status of clinical nurses against infection by the Omicron variant of COVID-19 has been not explored. Therefore, a nationwide online investigation with a larger sample size was conducted to explore the mental status of Chinese frontline clinical nurses, and its influencing factors using sound validated and reliable measurements.

**Materials and method.** A cross-sectional study was conducted, and 1,204 clinical nurses fighting the Omicron outbreak were recruited across various provinces of China.

**Results.** The mean age of the nurses was 30.43 (SD=6.59) years. The majority were female. The rates of these nurses with depression, anxiety, stress, and insomnia symptoms were 29.2%, 37.2%, 19.1%, and 48.8%, respectively. The variables of department, insomnia, fear with COVID-19, turnover intention, job burnout, work coping style, and public recognition of nursing, were significant factors influencing the mental status of clinical nurses.

**Conclusions.** The Chinese clinical nurses fighting the Omicron variant of COVID-19 had a similar level of depression and anxiety, a higher level of insomnia, and a lower level of stress, in comparison with nurses globally who experienced the initial period of the pandemic. Targeted investigation and interventions are urgently needed for Chinese frontline clinical nurses with high levels of anxiety, depression and insomnia, who fought against infection by Omicron. Much more professional advocacy is strongly recommended during control of the pandemic and recovery to consolidate the role and influence of nurses. The contribution and visibility of nursing should be recognized not only by the medical professionals, but by the public in general.

## Key words

nurses, China, COVID-19, mental health, Omicron

## INTRODUCTION

In November, 2021, a new variant of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), B.1.1.529, was identified in South Africa and Botswana, which was designated as Omicron, a variant of concern by the World Health Organization (WHO) [1]. The Omicron variant included more than 30 spike protein amino acid mutations that could be related with its elevated transmissibility, severity, and capacity for immune escape [2]. Only almost one month later, the Omicron variant had been found in 76 countries worldwide [3]. Since March 2022, China has witnessed a massive coronavirus outbreak due to the Omicron variant [4]. Initially, more than 62,000 people were infected across 31 provinces, the majority with the fast-spreading BA.2 Omicron variant, and the new outbreak plunged tens of millions of people into lockdown [5]. The National Health Commission announced that China would adhere to its dynamic zero-COVID strategy, which was in contrast with

the global trend towards easing restrictions and attempting to co-exist with the circulating virus [5]. These control measures for the Omicron variant of COVID-19 in China comprise physical containment strategies and social mobilization, epidemiological investigation, nucleic acid testing, and vaccination, which aims to tackle infections and prevent the virus from spreading through communities [3, 5]. As a result, since the Omicron outbreak in 2022, Chinese health professionals have experienced an extremely heavy workload, being responsible not only for routine work, but also for massive nucleic acid testing, administering vaccination, and looking after infectious patients with COVID-19.

According to previous evidence from 2019 – 2021, health professionals have been at particularly high risk of encountering mental ailments, and had experienced high incidences of insomnia, fear, anxiety, and depression amidst the early stages of COVID-19 pandemic [6, 7]. Moreover, a higher prevalence of mental health problems has been reported among nurses in comparison with doctors and other health professionals during infections [8, 9]. Actually, various cross-sectional researches from different countries have reported that COVID-19 negatively affected the psychological health of nurses [10–17]. For instance, a 2020 study in Wuhan found

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that 2,014 nurses taking care of patients with COVID-19 experienced mental health problems, mostly associated with burnout, anxiety, depression, and fear [18]. Moreover, nurses from Wuhan during the initial phase of COVID-19 reported severe levels of anxiety and depression, compared with other frontline health professionals [19]. Another study carried out in Portugal reported that 767 nurses had more depression, anxiety and stress symptoms than the general population during the initial pandemic outbreak of COVID-19 [20]. In November, 2021, a study in Poland involving 333 Polish professional nurses, described high scores for depressive symptoms, anxiety and stress among these nurses during the fourth wave of the COVID-19 pandemic [10]. A systematic review and meta-analysis highlighted a higher proportion of poor mental health outcomes among nurses, such as anxiety, stress, depression, and insomnia from various countries during the early stages of COVID-19 pandemic. The factors significantly associated with the mental health of nurses comprised caring for COVID-19 patients, being a female, low resilience, social support, fear of exposure to COVID-19, and having physical symptoms [19, 21].

Even though the profound impact of the COVID-19 outbreak on the mental health of nurses has been reported, all the evidence was from 2019 – 2021 [21]. In addition to initial report in 2020, few studies conducted in China were related to the frontline nurses who were in charge of nucleic acid testing, administering COVID-19 vaccination, and taking care of patients with COVID-19. Furthermore, the mental status of clinical nurses against infection of the Omicron variant of COVID-19 has been not explored in the existing documentation. Therefore, the current research was conducted to fill the research gap, and to explore the mental status of Chinese frontline clinical nurses, as well as identify the factors influencing the mental status of nurses at the rapid progressing stage of Omicron outbreak. The results obtained can assist in understanding psychological responses of nurses during the peak stage of the pandemic, and provide significant evidence for developing psychological interventions to high-risk groups of frontline clinical nurses.

## MATERIALS AND METHOD

**Study design and participants.** The cross-sectional study was conducted using the Sojump online survey platform in order to prevent close personal contacts during the pandemic. In April and May 2022, using convenience sampling, the participants were recruited online by the research team from various provinces of Guangdong, Shandong, Jilin, Heilongjiang, and Hunan provinces in China, which were experiencing a rapid progress of the Omicron outbreak. The survey link was widely distributed by researchers via posters, leaflets, WeChat, and QQ groups.

The inclusion criteria were: 1) clinical nurses actively involved in taking care of patients with COVID-19, in charging of nucleic acid testing, or administering COVID-19 vaccination; 2) working for a minimum of at least one month in the fight against the Omicron variant of COVID-19. Exclusion criteria were nurses diagnosed with a pre-existing psychiatric illness. The research received ethical approval from the Committee of XXX hospital and was in accordance with Helsinki guidelines. All participants were informed of the research purpose and process, and provided their informed consent before data collection.

**Measurements.** A baseline questionnaire was developed by the research team to collect data of the participants' age, years of work experience, gender, marital status, whether having a child or children, job position, educational level, professional title, department, and experience in the fight with the Omicron variant of COVID-19.

The Chinese version of the Depression Anxiety Stress Scale (short version DASS-21) was used to measure clinical nurses' mental health status [22, 23]. The DASS-21 includes a total of 21 items, and comprises three subscales with seven items each, which assesses depression, anxiety, and stress symptoms of individuals over the past week, respectively. The tool uses a four-point Likert scale and each item of score ranges from 0 – 3. The subscale scores were calculated by multiple two of the total sum of scores for the relevant seven items. The higher score indicates a higher severity of depression, anxiety, and stress. The severity rating index for each subscale of DASS-21 is described as follows:

- depression score  $\leq 9$ : normal status, 10–13: mild depression, 14–20: moderate depression, 21–27: severe depression,  $\geq 28$ : extremely severe depression;
- anxiety score  $\leq 7$ : normal status, 8–9: mild anxiety, 10–14: moderate anxiety, 15–19: severe anxiety,  $\geq 20$ : extremely severe anxiety;
- stress score  $\leq 14$ : normal status, 15–18: mild stress, 19–25: moderate stress, 26–33: severe stress,  $\geq 34$ : extremely severe stress.

The Chinese version of the DASS-21 has a Cronbach's alpha of 0.83 for the Depression subscale, 0.80 for the Anxiety subscale, 0.82 for the Stress scale, and 0.92 for the total scale [22]. In the current study, the Cronbach's alpha was 0.85, 0.84, 0.85, and 0.90 for depression, anxiety, stress, and total scale, respectively.

The Chinese version of the Insomnia Severity Index (ISI) was used to rate the nature and symptoms of respondents' sleep problem. ISI is a seven-item questionnaire using a five Likert-type scale (0–4) to screen insomnia. The total score of the tool ranges from 0 – 28, and the higher scores means the worse the insomnia. A total score of  $\leq 7$  was categorized as 'no insomnia', a score of 8–14 was considered as 'mild insomnia', a score of 15–21 was considered 'medium insomnia', and a score of 22–28 regarded as 'severe insomnia'. ISI is a reliable and valid instrument to detect cases of insomnia in the population [24]. The Chinese version ISI has acceptable reliability with Cronbach's alpha of 0.91 [25].

The participants' fear regarding the COVID-19 pandemic was measured by the Chinese version of Fear of COVID-19 Scale (FCV-19S). This scale includes seven items, and its answers are given via a five-point scale (1 = strongly disagree; 5 = strongly agree). The range for the total score is 7 – 35, and higher scores indicate a greater fear of COVID-19. It is reported that the FCV-19S is a good psychometric instrument to assess fear of COVID-19 during the pandemic period, and has been translated into at least ten languages with satisfactory reliability and validity [26]. The Chinese version of FCV-19S has good internal consistency reliability ( $\alpha = 0.92$ ), composite reliability (CR = 0.92), and validity correlation validity [27].

A non-proprietary single-item burn-out measure was used to instruct respondents to define burn-out for themselves, which was served as a reliable alternative for Emotional Exhaustion (MBI) [28]. Responses are scored on a five-category ordinal scale, where 1 = 'I enjoy my work. I have

no symptoms of burnout'; and 5 = 'I feel completely burnt-out and often wonder if I can go on. I am at the point where I may need some changes, or may need to seek some sort of help.' A score of  $\leq 2$  was considered as 'no symptoms of burn-out', while a score of  $\geq 3$  was categorized as 'one or more burn-out symptoms' [29, 30]. Furthermore, turnover intention of clinical nurses was likewise examined by a single item measure using a five-point Likert scale, ranging from 1 – 'strongly disagree' to 5 – 'strongly agree'. The participants also had to respond to the item: 'Given the current situation, I am more likely to leave my profession'. This single item measure of turnover intention has been previously used to assess professional turnover intention before and during the pandemic, and has shown sound psychometric properties [31, 32]. The participants were also asked to provide responses for the following items:

- 'Since the pandemic, I think I can positively cope with my work';
- 'Since the pandemic, I think my family can support my work';
- 'Since the pandemic, I think the public can realize the significance of nursing work'.

The range of possible responses for these items was coded from 1 – 'strongly disagree' to 5 – 'strongly agree'.

**Data collection.** Clinical nurses meeting the inclusion criteria were invited to complete the researchers' our online questionnaire, which was produced, distributed, and collected with the online survey tool 'Sojump' (<http://www.sojump.com>). 'Sojump' is a professional online survey platform (Shanghai Information Technology Co.,) which offers various services, including questionnaire design, data collection, and result reporting. One mobile IP was permitted to submit the answers only once to eliminate data duplication.

**Statistical analysis.** Data were exported from the Sojump system and analyzed by SPSS Statistics version 25 (IBM Corp., Armonk, NY, USA). Data in the research were expressed via mean (standard deviation, SD) for continuous variables normally distributed, using median (interquartile ranges, IQR) for continuous variables with non-normally distributed, and by percentage (frequency) for categorical variables. T-test, one-way analysis of variance (ANOVA) or non-parametric testing, such as Mann-Whitney U test and Kruskal-Wallis H rank sum test, were used to examine the differences in mental health status among study subjects with different characteristics. A stepwise multiple linear regression was performed to explore the factors associated with the depression, anxiety, and stress symptoms of clinical nurses. Linear correlation between the dependent variables and independent variables, multicollinearity and residual analysis were carefully checked for the multiple linear regression [33, 34]. The histogram, P-P plots and scatter-plots indicated whether the residuals satisfied normal distribution and homogeneity of variance. Beta and standard error (SE) were calculated. The statistically significant level was set as  $\alpha = 0.05$ , and all statistical analyses in the study were two-sided.

## RESULTS

**Profile of participants.** Overall, 1,296 responses were received, but 92 were excluded from data analysis due to incomplete data. Finally, a total of 1,204 questionnaires were included in the research. The mean age of participants was 30.43 (SD=6.59) years, with the age range of 18–58 years. The majority of nurses were female (91.2%), and most of them were married (52.8%), aged under 30 (49.8%), no children (52.7%), with a bachelor degree or above (76.8%). It is worth noting that the predominance of women in nursing is related to historical and cultural issues [35]. Regarding experience in the fight with the Omicron variant of COVID-19, 71.68% of participants were in charge of nucleic acid testing, 12.2% – administering COVID-19 vaccination, and 16.1% – taking care of patients with COVID-19. 56.0% of participants thought they could cope with their work positively, 66.11% though their family would support their work, and less than half – 46.8%, thought public could realize the significance of nursing work. In the research, 588 (48.8%) clinical nurses reported to have symptoms of insomnia, 389 (32.3%) nurses reported having burn-out symptoms, and 138 (11.5%) nurses had turnover intention.

The socio-demographic characteristics of these participants and their differences in mental health status of depression, anxiety, and stress were shown in Table 1. According to univariate analysis, the nurses' age, professional title, department, working experience, work coping style, family support for work, public recognition of nursing, turnover intention, and symptoms of insomnia and burnout, were significantly associated with their depression, anxiety, and stress scores ( $P < 0.05$ ).

### Depression, anxiety, stress and insomnia status of the participants.

Participants' depression, anxiety, stress and insomnia status were described in Table 2 and Figure 1. Of the 1204 clinical nurses who participated in this study, the rates of these nurses with depression, anxiety, stress and insomnia symptoms were 29.2%, 37.2%, 19.1%, and 48.8%, respectively. Of which, 16.6% had moderate or higher levels of depression, 30.3% had moderate or higher levels of anxiety, 10.8% had moderate or higher levels of stress, and 14.7% had moderate or higher level of insomnia.

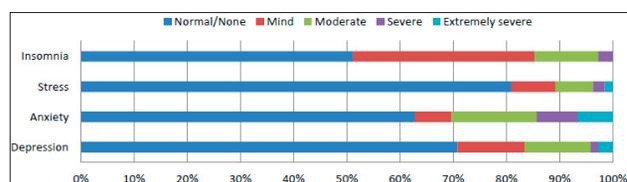


Figure 1. Participants' depression, anxiety, stress and insomnia level

### Factors associated with depression, anxiety, and stress among clinical nurses.

The scores of depression, anxiety and stress were regarded as dependent variable, respectively; and nurses' age, work experience, gender, marital status, whether having a child, job position, educational level, professional title, department, experience in fight with the Omicron variant, insomnia (ISI score), fear with COVID-19 (FCV score), work coping style, family support for work, public recognition of nursing, turnover intention, and job burnout, were entered as independent variables in the multiple linear regression model.

**Table 1.** Socio-demographic data of participants stratified by mental health status (n=1204)

Categories	N(%)	Depression			Anxiety			Stress			
		Z/H Value	P Value <sup>1</sup>	Z/H Value	P Value <sup>1</sup>	Z/H Value	P Value <sup>1</sup>				
Gender	Male	106 (8.80)	4.00 (0.00,10.00)	-0.794	0.427	4.00 (0.00,10.50)	-0.778	0.437	4.00 (0.00,12.50)	-1.255	0.209
	Female	1098 (91.20)	4.00 (0.00,10.00)			4.00 (0.00,12.00)			6.00 (0.00,14.00)		
Age (Years)	<20	11 (0.91)	0.00 (0.00,0.00)	11.312	0.010	0.00 (0.00,0.00)	8.941	0.030	0.00 (0.00,2.00)	11.344	0.010
Mean: 30.43±6.59	20–29	600 (49.83)	4.00 (0.00,10.00)			4.00 (0.00,12.00)			6.00 (0.50,14.00)		
Range: 17–58	30–39	472 (39.20)	4.00 (0.00,10.00)			4.00 (0.00,12.00)			8.00 (0.00,14.00)		
	≥40	121 (10.05)	4.00 (0.00,10.00)			4.00 (0.00,8.00)			8.00 (0.00,12.00)		
Work experience	<5 years	416 (34.55)	4.00(0.00,8.00)	8.293	0.016	4.00 (0.00,12.00)	2.576	0.276	6.00 (0.00,12.00)	5.961	0.051
Mean: 8.54±6.70	5–10 years	402 (33.39)	4.00(0.00,12.00)			4.00 (0.00,12.00)			8.00 (2.00,14.00)		
	>10 years	386 (32.06)	4.00 (0.00,10.00)			4.00 (0.00,10.00)			8.00 (0.00,14.00)		
Marital status	Single	555 (46.10)	4.00 (0.00,10.00)	4.984	0.083	4.00 (0.00,12.00)	0.751	0.687	6.00 (0.00,14.00)	2.707	0.258
	Married	636 (52.82)	4.00 (0.00,10.00)			4.00 (0.00,10.00)			8.00 (2.00,14.00)		
	Others	13 (1.08)	10.00 (1.00,16.00)			10.00 (0.00,14.00)			10.00 (1.00,16.00)		
Having a child / children	Yes	569 (47.26)	4.00 (0.00,10.00)	-0.514	0.607	4.00 (0.00,10.00)	-0.373	0.709	8.00 (2.00,12.00)	-1.165	0.244
	No	635 (52.74)	4.00 (0.00,10.00)			4.00 (0.00,12.00)			6.00 (0.00,14.00)		
Job position	Nurse	1096 (91.03)	4.00 (0.00,10.00)	2.336	0.311	4.00 (0.00,12.00)	5.120	0.077	6.00 (2.00,14.00)	1.890	0.389
	Head nurse	89 (7.39)	4.00 (0.00,10.00)			2.00 (0.00,10.00)			6.00 (0.00,12.00)		
	Head nurse above	19 (1.58)	2.00 (0.00,12.00)			2.00 (0.00,6.00)			10.00 (0.00,16.00)		
Educational level	Technical secondary school	41 (3.40)	6.00 (0.00,14.00)	0.138	0.933	8.00 (0.00,14.00)	0.262	0.877	8.00 (0.00,16.00)	0.427	0.808
	Junior college	238 (19.77)	4.00 (0.00,10.50)			4.00 (0.00,10.00)			6.00(2.00,14.00)		
	Undergraduate or above	925 (76.83)	4.00 (0.00,10.00)			4.00(0.00,12.00)			6.00(0.00,14.00)		
Professional title	Nurse	353 (29.32)	2.00 (0.00,10.00)	18.103	<0.001	4.00 (0.00,11.00)	11.963	0.008	6.00 (0.00,12.00)	10.679	0.014
	Senior nurse	488 (40.53)	4.00 (0.00,10.00)			6.00 (0.00,12.00)			6.00 (0.00,14.00)		
	Nurse-in-charge	327 (27.16)	6.00 (0.00,10.00)			4.00 (0.00,10.00)			10.00 (2.00,14.00)		
	Associate chief of nurse or above	36 (2.99)	2.00 (0.00,7.00)			2.00 (0.00,7.50)			6.00 (0.00,10.00)		
Department	Medical Dep.	228 (18.94)	2.0 0(0.00,9.50)	23.745	<0.001	4.00 (0.00,10.00)	20.164	<0.001	4.00 (0.00,12.00)	16.671	0.005
	Surgical Dep.	329 (27.33)	4.00 (0.00,10.00)			4.00 (0.00,12.00)			6.00 (2.00,12.00)		
	Gynecological and obstetrical Dep.	285 (23.67)	6.00 (0.00,10.00)			4.00 (0.00,10.00)			8.00 (2.00,14.00)		
	Pediatric Dep.	95 (7.89)	2.00 (0.00,10.00)			4.00 (0.00,12.00)			4.00 (0.00,12.00)		
	Emergency and ICU	103 (8.55)	8.00 (2.00,14.00)			6.00 (2.00,14.00)			10.00 (4.00,16.00)		
	Outpatient Dep.	164 (13.62)	4.00 (0.00,10.00)			2.00 (0.00,10.00)			6.00 (0.00,14.00)		
Experience in fighting the Omicron variant	In charging of nucleic acid testing	863 (71.68)	4.00 (0.00,10.00)	11.503	0.003	4.00 (0.00,12.00)	3.060	0.217	8.00 (2.00,14.00)	7.456	0.024
	Administering COVID-19 vaccination	147 (12.21)	4.00 (0.00,12.00)			6.00 (0.00,12.00)			8.00 (0.00,14.00)		
	Taking care of patients with COVID-19	194 (16.11)	2.00 (0.00,8.00)			4.00 (0.00,10.00)			4.00 (0.00,12.00)		
Whether having insomnia	Yes	588 (48.84)	8.00 (4.00,14.00)	-14.681	<0.001	10.00 (4.00,16.00)	-17.073	<0.001	12.00 (8.00,18.00)	-13.943	<0.001
	No	616 (51.16)	0.00 (0.00,4.00)			2.00 (0.00,4.00)			2.00 (0.00,6.00)		

Categories	N(%)	Depression			Anxiety			Stress			
		Z/H Value	P Value <sup>1</sup>		Z/H Value	P Value <sup>1</sup>		Z/H Value	P Value <sup>1</sup>		
I can positively cope with my work	Strongly disagree or disagree	181 (15.03)	0.00 (0.00,6.00)	135.076	<0.001	0.00 (0.00,6.00)	104.244	<0.001	0.00 (0.00,8.00)	142.515	<0.001
	General	349 (28.99)	8.00 (4.00,14.00)			8.00 (4.00,14.00)			12.00 (6.00,16.00)		
	Strongly agree or agree	674 (55.98)	2.00 (0.00,8.00)			4.00 (0.00,10.00)			6.00 (0.00,12.00)		
My family can support my work	Strongly disagree or disagree	177 (14.70)	0.00 (0.00,6.00)	73.675	<0.001	0.00 (0.00,6.00)	63.130	<0.001	0.00 (0.00,8.00)	84.634	<0.001
	General	231 (19.19)	8.00 (2.00,14.00)			8.00 (2.00,14.00)			12.00 (4.00,16.00)		
	Strongly agree or agree	796 (66.11)	4.00 (0.00,10.00)			4.00 (0.00,10.00)			6.00 (2.00,12.00)		
The public can realize the significance of nursing work	Strongly disagree or disagree	259 (21.51)	2.00 (0.00,8.00)	38.921	<0.001	2.00 (0.00,10.00)	40.987	<0.001	4.00 (0.00,12.00)	37.282	<0.001
	General	381 (31.65)	6.00 (2.00,12.00)			6.00 (2.00,14.00)			10.00 (3.00,14.00)		
	Strongly agree or agree	564 (46.84)	4.00 (0.00,8.00)			4.00 (0.00,10.00)			6.00 (0.00,12.00)		
I have turnover intention	Strongly disagree or disagree	765 (63.54)	2.00 (0.00,6.00)	225.427	<0.001	2.00 (0.00,6.00)	217.993	<0.001	4.00 (0.00,10.00)	218.694	<0.001
	General	301 (25.00)	8.00 (4.00,14.00)			10.00 (4.00,16.00)			12.00 (6.00,18.00)		
	Strongly agree or agree	138 (11.46)	10.00 (4.00,16.00)			10.00 (4.00,18.00)			14.00(6.00,22.00)		
Whether having job burn-out	No	815 (67.69)	2.00 (0.00,6.00)	-14.818	<0.001	2.00 (0.00,6.00)	-15.824	<0.001	4.00 (0.00,10.00)	-14.004	<0.001
	Yes	389 (32.31)	10.00 (6.00,16.00)			12.00 (6.00,16.00)			14.00 (10.00,20.00)		

<sup>1</sup> Mann-Whitney U test; Kruskal-Wallis H rank sum test

**Table 2.** Depression, anxiety, stress and insomnia status of the participants (n=1204)

Categories	Median (IQR)	Normal n (%)	Mild n (%)	Moderate n (%)	Severe n (%)	Extremely severe n (%)
Depression	4.00 (0.00, 10.00)	852 (70.8)	152 (12.6)	149 (12.4)	18 (1.5)	33 (2.7)
Anxiety	4.00 (0.00, 12.00)	756 (62.8)	83 (6.9)	193 (16.0)	93 (7.7)	79 (6.6)
Stress	6.00 (0.00, 14.00)	974 (80.9)	100 (8.3)	85 (7.1)	27 (2.2)	18 (1.5)
Insomnia	7.00 (3.00, 12.00)	616 (51.2)	411 (34.1)	145 (12.0)	32 (2.7)	/

**Table 3.** Multiple linear regression analysis results of depression scores (n=1204)

Categories	B value	SE	$\beta$ value	t value	P value
Constant	-9.307	2.455	—	-3.791	<0.001
Department <sup>1</sup> (Emergency and ICU)	0.219	0.098	0.048	2.240	0.025
Insomnia	0.473	0.033	0.379	14.275	<0.001
Fear of COVID-19	0.225	0.032	0.186	6.999	<0.001
Work coping style	-0.729	0.272	-0.113	-2.683	0.007
Turnover intention	0.833	0.184	0.121	4.526	<0.001
Job burnout	1.598	0.209	0.203	7.631	<0.001

<sup>1</sup>: Medical department as a reference group; ICU: Intensive care unit. R<sup>2</sup>=0.492, adjusted R<sup>2</sup>=0.485, F=67.594; P<0.001.

**Table 4.** Multiple linear regression analysis results of anxiety scores (n=1204)

Categories	B value	SE	$\beta$ value	t value	P value
Constant	-7.904	2.473	—	-3.196	0.001
Department <sup>1</sup> (Emergency and ICU)	0.205	0.098	0.044	2.078	0.038
Insomnia	0.521	0.033	0.413	15.627	<0.001
Fear of COVID-19	0.277	0.032	0.225	8.550	<0.001
Public recognition of nursing	-0.461	0.202	-0.074	-2.279	0.023
Turnover intention	0.685	0.185	0.098	3.695	<0.001
Job burnout	1.261	0.211	0.158	5.977	<0.001

<sup>1</sup>: Medical department as a reference group, ICU: Intensive care unit R<sup>2</sup>=0.499, adjusted R<sup>2</sup>=0.492, F=69.518, P<0.001

The six variables of departments insomnia, fear with COVID-19, work coping style, turnover intention, and job burnout, were statistically significant predictors of depression scores (t test;  $P < 0.05$ ), and explained 51.0% of variance in depression scores (Adjusted R<sup>2</sup> = 0.485, F = 67.59;  $P < 0.001$ ) (Ta. 3). The variables of department, insomnia, fear with

COVID-19, public recognition of nursing, turnover intention, and job burnout significantly affected the scores of anxiety and stress (t test;  $P < 0.05$ ), which explained 49.2% variance in anxiety scores (Adjusted R<sup>2</sup> = 0.492, F = 69.518;  $P < 0.001$ ) (Tab. 4), and 53.7% variance in stress scores (Adjusted R<sup>2</sup> = 0.537, F = 82.919;  $P < 0.001$ ) (Tab. 5).

**Table 5.** Multiple linear regression analysis results of stress scores (n=1204)

Categories	B value	SE	$\beta$ value	t value	P value
Constant	-7.792	2.565	—	-3.037	0.002
Department <sup>1</sup> (Emergency and ICU)	0.211	0.102	0.042	2.065	0.039
Insomnia	0.556	0.035	0.405	16.072	<0.001
Fear with COVID-19	0.299	0.034	0.224	8.879	<0.001
Public recognition of nursing	-0.488	0.210	-0.072	-2.324	0.020
Turnover intention	0.698	0.192	0.092	3.629	<0.001
Job burnout	1.881	0.219	0.217	8.597	<0.001

<sup>1</sup>: Medical department as a reference group; ICU: Intensive care unit  
R<sup>2</sup>=0.543, adjusted R<sup>2</sup>=0.537, F=82.919; P<0.001

## DISCUSSION

Since March 2022, China has been in the rapidly progressing stage of the Omicron outbreak [4]. However, the mental status of clinical nurses against infection of the Omicron variant of COVID-19 has been not explored in the existing documentation. Therefore, the current nationwide online investigation with a larger sample size was conducted to explore the mental status of Chinese frontline clinical nurses and its influencing factors, using sound validated and reliable measurements.

Some key findings are reported in the present study. First of all, about 29.2% of Chinese frontline clinical nurses had depression symptoms, and 37.2% had anxiety symptoms, which was similar to the results of a systematic review and meta-analysis during the initial pandemic outbreak of COVID-19 [21]. The meta-analysis, based on evidence from 2019–2020 from different countries, reported that the rate of depression and anxiety among nurses was 32.0% (N=12294) and 32.0% (N=13641), respectively. In terms of stress, 19.1% of participants in the current study experienced symptoms of stress, which was obviously lower than the meta-analysis findings with the corresponding data of 49.6% [21]. The possible reason was that in the early days of the COVID-19 epidemic, its novelty, highly infectious nature, and the associated morbidity and mortality rates indeed place unprecedented stress on clinical nurses [36]. However, as time went on, COVID-19 prevention and control entered a 'new normal', which was no longer as stressful as it had been previously for nurses. In this study, approximately 48.8% of participants suffered from symptoms of insomnia, much higher than the previous findings of a meta-analysis that reported 38.3% of nurses had insomnia, which was worthy of more concern and investigation. Another meta-analysis investigating the prevalence of sleep disturbances among Chinese healthcare professionals reported that the pooled rate was 39.2% (95% CI: 36.0% – 42.7%), which was lower than 48.8% in the current study [37].

The following conclusions could be drawn, that clinical nurses fighting the Omicron variant of COVID-19 had a similar level of depression and anxiety, a higher level of insomnia, and a lower level of stress, compared to nurses globally who also experienced the initial period of the pandemic. A previous study argued that nurses' depression, anxiety, and stress levels gradually decreased after one month of the COVID-19 outbreak, showing a pattern of adaptation to the situation and stabilization [38]. However, evidence

from the present study indicated that many of the clinical nurses still have exposed persistent depression, anxiety, and insomnia two years after the pandemic outbreak. Therefore, the targeted investigation and interventions for the mental health of frontline clinical nurses with high levels of anxiety, depression and insomnia, should still be required at the current stage of the pandemic.

Furthermore, the present study highlighted that the variables of the departments, insomnia, fear with COVID-19, turnover intention and job burn-out, were significant factors influencing the depression, anxiety, and stress of clinical nurses. These variables explained approximately 50% of the total variance in the scores of mental status, which indicated the good explanatory power of the model – much higher than the 10% – 20% explanatory variance achieved in other studies [10, 11]. Firstly, nurses working in emergency department and ICU were reported to have poor health status in the research, which was aligned with prior studies [35, 39]. Nurses in these departments were prone to encountering more stressful situations than other departments, such as in charge of critically ill COVID-19 patients, direct and intensive care, and a heavy work overload, which could be the cause of the onset of their mental illness [35]. Furthermore, poor sleep quality was identified in the research as negatively affecting the nurses' psychological health, which was similar to the results from a previous study [40].

Insomnia could lead to negative changes in cognitive and emotional processes, causing mental and behavioural variations characterized as being more irritable and emotionally labile. Moreover, the variables of fear with COVID-19, turnover intention, and job burn-out were verified as the significant factors influencing the depression, anxiety, and stress of clinical nurses in the current study. A previous study likewise reported that factors such as fear of exposure to COVID-19, overwhelming work, and professional turnover, largely contributed to the decline of the mental health of nurses [19, 41].

Since the Omicron outbreak in 2022, Chinese clinical nurses have experienced an extremely heavy workload, not only for routine work, but also for massive nucleic acid testing, administering vaccinations, and looking after patients infected with COVID-19, under the dynamic zero-COVID strategy [4, 5]. These situations of infection risk, physical and emotional exhaustion, responsibilities for people's health, and coping with fears and suffering in which Chinese clinical nurses are exposed, can lead to the occurrence of psychological stress, high insomnia, anxiety, and depression [35].

In addition to the five variables discussed above, work coping style was reported to affect the depression level of clinical nurses in the presented study. Evidence during the initial wave of the pandemic showed a similar pattern, namely, that clinical nurses with a positive attitude to coping with work exhibited more sustained mental and emotional well-being, and less psychological impairment, despite the burden of the pandemic [31, 32, 42]. Moreover, the significant influence of public recognition of nursing on the level of clinical nurses' anxiety and stress was a novel and important finding of the present study. This result suggests that a higher perception of public recognition towards nursing may potentially safeguard clinical nurses' mental and psychological health. An occupation is not only characterized as a means of material survival, but a

configuration of socialization and identity construction [35]. It is known that as the major proportion of frontline health professionals, clinical nurses have been playing a vital role in fighting with COVID-19 variant [21]. Much more professional advocacy is strongly recommended during the period of pandemic control and recovery to consolidate nurses' roles and influence, as the contribution and visibility of nursing should be recognized not only by the medical professionals, but by the public in general [43].

The current research is of significant, primarily because firstly it investigated the mental health status of Chinese clinical nurses who were fighting against the Omicron variant of COVID-19 across various provinces, under the dynamic zero-COVID strategy. However, some limitations need to be considered. Firstly, the research involved a cross-sectional survey, which only provided researchers with a snapshot of mental health status among clinical nurses at a single point in time, and cannot capture any dynamic changes in their depression, anxiety and stress level over time. Secondly, the online survey used convenience sampling, which could cause bias in participants' response. Caution is therefore needed when generalizing the findings. Thirdly, no impact was found of gender differences on the mental health of clinical nurses, which could have been caused by the predominance of women in the study. Fourthly, the approximately 50% explanatory variance indicated that some potentially unknown factors that may affect mental health status among clinical nurses could not have been accounted for in the study. Therefore, qualitative studies are strongly recommended in the future in order to explore more deeply the mental health status of frontline clinical nurses fighting the Omicron variant of COVID-19 and its influencing factors.

## CONCLUSIONS

The Chinese clinical nurses fighting the Omicron variant of COVID-19 had a similar level of depression (29.2%) and anxiety (37.2%), a higher level of insomnia (48.8%), and a lower level of stress (19.1%), compared to nurses globally during the initial period of the pandemic. The variables of departments insomnia, fear with COVID-19, turnover intention, job burn-out, work coping style, and public recognition of nursing, were significant factors influencing the mental status of the clinical nurses.

Targeted investigation and interventions are urgently need by Chinese frontline clinical nurses with high levels of anxiety, depression and insomnia, who are fighting infection by the Omicron variant of COVID-19. Much more professional advocacy is strongly recommended during the pandemic control and recovery to consolidate the nurses' roles and influence. The contribution and visibility of nursing should be recognized not only by the medical professionals, but by the general public.

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