ORIGINAL RESEARCH

Psychological Status and Job Burnout of Nurses Working in the Frontline of the Novel Coronavirus in China During the Delta Variant Outbreak: A Cross-Sectional Survey

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Purpose: Investigating psychological status and job burnout of nurses working in the frontline of the novel coronavirus in Zhangjiajie city in China during the Delta variant outbreak, comparing differences and analyzing factors of these two variables between the nurses from different nucleic acid testing (NAT) sites.

Patients and methods: This survey was conducted from August 1 to 31, 2021. The participants were 512 nurses, 198 nurses of whom were from temporary NAT sites in communities/towns in Zhangjiajie city, and the rest were from NAT sites inside hospitals. The psychological status and the job burnout were measured by the Symptom Checklist-90 (SCL-90) and the Maslach Burnout Inventory-General Scale (MBI-GS).

Results: The prevalence of the SCL-90 positive result and job burnout were 49.4% and 61.1%, respectively. The factors influencing the psychological status of nurses included the contact with COVID-19 patients or their body fluids and specimens, working seniority and the duration of working in the frontline of the novel coronavirus. The independent risk factors of nurses' job burnout included the following four factors. Firstly, the contact with COVID-19 patients or their body fluids and specimens (OR=150.95, 95% CI=(44.87,507.77), P<0.001). Secondly, five to nine years of working seniority (OR=8.91, 95% CI=(3.59,22.14), P<0.001). Thirdly, 10 to 19 days (OR=2.63, 95% CI=(1.19,5.82), P=0.017), 20 to 29 days (OR=161.31, 95% CI=(49.48,525.9), P<0.001). Lastly, more than 30 days (OR=92.05, 95% CI=(33.88,250.14), P<0.001) of working in the frontline of the novel coronavirus.

Conclusion: The prevalence of psychological problems and job burnout were at a high level among nurses working in the frontline of the novel coronavirus in different NAT sites. The nurses from NAT sites inside hospitals and temporary NAT sites in communities/ towns in Zhangjiajie city had an equal risk of developing psychological problems and job burnout. Interventions need to be immediately implemented to promote psychological well-being and decrease job burnout of nurses.

Keywords: psychological status, job burnout, specimen collection, nucleic acid testing, the novel coronavirus, the Delta variant

Introduction

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes coronavirus disease 2019 (COVID-19), has ravaged the world.[1] Globally, as of 4:14pmCET, 29 December 2021, 281,808,270 confirmed cases of COVID-19 have been reported by the World Health Organization (WHO), including 5,411,759 confirmed deaths, with a mortality of 1.92%.[2] The Delta variant, has the characteristics of a short incubation period, a quick velocity of propagation, and a high virus load.[3] It was first reported in India in December 2020, and began to spread to many

provinces and regions in China in May 2021.[4] On November 26, 2021, WHO identified the Omicron variant as a variant of concern, which may result in a higher transmission rate and considerable impact when compared to the Delta variant.[5]

The confirmed cases of the novel coronavirus in Dalian city were found to have an activity track in Zhangjiajie city from July 17 to July 23, and on July 29, the confirmed case of the novel coronavirus in Zhangjiajie city was found.[6] And then the novel coronavirus began to outbreak in Zhangjiajie city.[6] To quickly screen the people infected by the Delta variant in Zhangjiajie city, universal nucleic acid testing (NAT) was conducted urgently, and besides the NAT sites inside hospitals, many NAT sites were temporarily set up in the communities and the towns of Zhangjiajie city.

Previous studies have reported that psychological problems such as anxiety and depression were found in frontline nurses fighting against the COVID-19.[7–12] Poor sleep quality and stress are common during the COVID-19 crisis.[13] Approximately, 60% of both frontline healthcare workers and non-frontline healthcare workers have poor sleep quality combined with moderate-severe stress.[13] A multivariable logistic regression analysis showed that the depression in healthcare workers was significantly associated with the profession.[14] The anxiety in healthcare workers was significantly associated with their age, profession, and residence.[14] The stress in healthcare workers was significantly associated with their age.[14]

The job burnout of this population was also reported.[15] The nurses working in the frontline of the novel coronavirus from NAT sites inside hospitals and temporary NAT sites in communities/towns in Zhangjiajie city during the Delta variant outbreak may also have these problems. Because they faced the high risk of being infected by the Delta variant and the fear of infection and death. These factors might make them suffer from huge psychological stress and even cause a sense of job burnout. In addition, compared with the nurses from NAT sites inside hospitals in Zhangjiajie city, those from temporary NAT sites in communities/towns in Zhangjiajie city were exposed to more stress and their psychological problems might be more serious since they not only bear the high risk of infection but also suffer from the open-air and high-temperature environment. However, little is known about the differences in the psychological state and job burnout between these two groups of nurses.

Therefore, the present cross-sectional study aimed to investigate the psychological status and job burnout of nurses working in the frontline of the novel coronavirus in China during the Delta variant outbreak and compare the differences in these two variables between the nurses from NAT sites inside hospitals and temporary NAT sites in communities/towns in Zhangjiajie city We also aimed to characterize and identify some factors influencing the psychological status and job burnout of nurses, which may provide information for nursing managers to make strategies to improve the psychological health of nurses and their work efficiency.

Methods
Study Design and Participants
This cross-sectional survey was conducted from August 1, 2021, to August 31, 2021, following approval by the Ethics Committee of Xiangya Hospital (ethics approval number: 202005402) and participants' informed consent. The participants were nurses working in the frontline of the novel coronavirus from NAT sites inside hospitals and temporary NAT sites in communities/towns in Zhangjiajie city during the Delta variant outbreak. We went to the hospitals in Zhangjiajie city and selected nurses working in the frontline of the novel coronavirus from August 1, 2021, to August 31, 2021 by the snowball sampling method. There are some eligibility criteria about our participants: firstly, they were nurses working in the frontline of the novel coronavirus from NAT sites inside hospitals and temporary NAT sites in communities/towns in Zhangjiajie city from August 1, 2021, to August 31; secondly, they had all passed the training of NAT of the novel coronavirus and had more than 2 years of working experience; thirdly, they gave full informed consent prior to their participation. There are 105 items in the two questionnaires we used (MBI-GS and SCL-90), so our sample size should be at least 5 times of the number of items, that is, 525 participants. We received 554 questionnaires in total and excluded 42 ineligible responses. The valid response rate of the present study was 94.1% (512 out of 544).

The data was collected via Wen Juan Xing which is a professional online platform used for survey, voting, online registration, information collection, and online examination. Compared with the traditional survey method, it is fast, easy to use, cost-effective, and more suitable for the investigation during the outbreak of the Delta variant. The questionnaires

were uploaded to Wen Juan Xing on August 1, 2021, and then the questionnaire link was pushed by WeChat Moments and WeChat groups for 31 days. To ensure the scientificity and integrity of data, before pushing the link, we explained the purpose of this survey and the precautions for filling in the questionnaire to all participants by Tencent Video Conferencing. We also set that each WeChat ID could only answer the questionnaire once and all questions required to be answered before submission.

Measurements

Sociodemographic data were collected by a self-designed questionnaire, including gender, age, marital status, educational attainment, professional title, working seniority, and the duration of working in the frontline of the novel coronavirus. Participants were also asked whether they had direct contact with COVID-19 patients or patients' body fluids and specimens.

The psychological status of nurses was measured by the Symptom Checklist-90 (SCL-90), a 90-item self-report scale. The SCL-90 was developed by LR Derogatis in 1973 and was translated into the Chinese version by Wang Zhengyi in 1984.[16,17] It contains 10 dimensions, including Somatization (12 items), Obsessive-Compulsive (10 items), Interpersonal Sensitivity (9 items), Depression (13 items), Anxiety (10 items), Hostility (6 items), Phobic anxiety (7 items), Paranoid Ideation (6 items), Psychoticism (10 items), and seven additional items to assess disturbances in appetite and sleep. Each item was assigned a score ranging from 1 (no symptom) to 5 (serious symptom). The items with a score of 2 and above were deemed positive items. The higher the score, the worse the psychological status.

In the present study, we calculated and analyzed the total score of 90 items, the dimension scores, the Global Severity Index (GSI),[18] and the number of positive items of the SCL-90. The dimension score was calculated according to the formula: dimension score=the total score of the dimension/ the number of the dimension. The GSI equaled the total score divided by 90. The result was positive and further examination was required when the total score was more than 160, or any dimension score was more than 2, or the number of positive items was more than 43.[11]

The job burnout of nurses was measured by the Maslach Burnout Inventory-General Scale (MBI-GS),[19] which was one of the versions of MBI and could be used in any occupational population. It was translated into Chinese version by Li Chaoping in 2003,[20] with 15 items in total covering three dimensions: emotional exhaustion (5 items), cynicism (4 items), reduced personal accomplishment (6 items). It has good internal consistency reliability, whose Cronbach's alpha coefficient for emotional exhaustion, cynicism, reduced personal accomplishment is 0.88, 0.83, 0.82 respectively.[20] Each item consists of a 7-point Likert scale ranging from 0 (never) to 6 (every day). The scores of six items of reduced personal accomplishment were reversed. The higher the score, the higher the job burnout level.

In the present study, we calculated the dimension score and weighted sum score of job burnout. The former refers to the total score of each dimension, the latter was calculated according to the formula: Burnout= 0.4* emotional exhaustion +0.3* cynicism+0.3* reduced personal accomplishment.[21] The participants could be divided into three groups according to the weighted sum score of job burnout: no burnout (weighted sum score ranging from 0–1.49), moderate burnout (weighted sum score ranging from 1.50–3,49), and severe burnout (weighted sum score ranging from 3.50–6.00).[22] Participants with moderate or severe burnout were deemed to be a burnout case.

Statistical Analysis

Descriptive statistics were used to summarize participant characteristics. The SCL-90 scores, weighted sum score of job burnout, and the prevalence of job burnout. The One-sample t-test was used to compare the SCL-90 dimension scores of the subjects in the present study and these of Chinese nurses.[23] The Spearman correlation analysis was used to explore the correlation between SCL-90 scores and job burnout when the data is not normally distributed. The GSI in different populations was compared using the Wilcoxon rank-sum test for the two-group comparison and the Kruskal–Wallis H-test was used for multiple comparisons when the data is not normally distributed. The Chi-squared test was used to compare the prevalence of job burnout in different populations. The generalized linear model was used for multivariate analysis to identify the influencing factors of psychological status since the dependent variable (GSI) was not normally distributed. The gamma distribution was selected as the distribution of the dependent variable and the logarithmic function was selected as the link function. Backward: LR binary logistic regression was used to identify the risk factors of job burnout. All analyses were performed using SPSS V.22.0.

Results

Participant Characteristics

We received 554 questionnaires in total and excluded 42 ineligible responses. The valid response rate of the present study was 94.1% (512 out of 544). Among 512 respondents, 38.7% were nurses from temporary NAT sites in communities/towns in Zhangjiajie city, the rest were from NAT sites inside hospitals in Zhangjiajie city. The majority were women (86.1%) and had a bachelor's degree or above (82.8%). About half of the subjects were aged under 30 (48.8%) and got married (55.5%). 62.7% exhibited a junior professional title, and the largest working seniority group ranged between five to nine years (40.6%). 30.7% of the respondents reported having been working in the frontline of the novel coronavirus for more than 30 days, and the majority (88.7%) had direct contact with COVID-19 patients or their body fluids and specimens (Table 1).

Psychological Status, Job Burnout and the Correlation Between the Two Variables

In the present study, 49.4% of the subjects exhibited positive results of SCL-90. The GSI of the SCL-90 among 512 nurses working in the frontline of the novel coronavirus was (1.59 ± 0.43). Table 2 indicated the dimension scores of current samples and the comparison with the Chinese nurse. The difference in interpersonal sensitivity, depression, anxiety, hostility, and phobic anxiety was statistically significant (all P<0.01). Table 3 demonstrated the prevalence of three degrees of job burnout among respondents, and the proportion of the burnout case was 61.1%. Pearson correlation analysis illustrated that the GSI of SCL-90 and the dimension scores (except hostility score) were positively correlated with the weighted sum score and the dimension scores of burnout (all P <0.05) (Table 4).

GSI and the Prevalence of Job Burnout Among Nurses with Different Characteristics

As shown in Tables 5 and 6, The differences in GSI and the prevalence of job burnout were statistically significant between nurses working in the frontline of the novel coronavirus in different sites (both P<0.001). Statistical differences were found in GSI and the prevalence of job burnout among nurses with different educational attainment, professional title, working seniority, and the duration of working in the frontline of the novel coronavirus (all P<0.05). Statistical differences were also noted in GSI and the prevalence of job burnout between subjects who had direct contact with COVID-19 patients or their body fluids and specimens and those without contacts (P<0.001). Besides, statistical differences were found in the prevalence of job burnout among nurses of different ages (P<0.001). Given the positive correlation between GSI and the weighted sum score of burnout, we compared GSI among nurses with different job burnout results and found a statistical difference (P<0.001). The difference was also observed in the prevalence of job burnout among subjects with different SCL-90 results (P <0.001).

Influencing Factors of Psychological Status

Table 7 demonstrated the generalized linear model indicated the factors influencing the psychological status of nurses working in the frontline of the novel coronavirus included the history of direct contact with COVID-19 patients or their body fluids and specimens, working seniority, and the duration of working in the frontline of the novel coronavirus. A higher GSI (a worse psychological status) was observed for nurses who had direct contact with COVID-19 patients or their body fluids and specimens (B=0.133, 95% CI=(0.067, 0.199), P<0.001) and those with less than five years of working seniority (B=0.133, 95% CI=(0.039, 0.227), P=0.006) or with five to nine years of working seniority (B=0.096, 95% CI=(0.008, 0.184), P=0.033) compared with the nurses without contacts and those with more than 20 years of working seniority, respectively.

A lower GSI (a better psychological status) was noted for nurses working in the frontline of the novel coronavirus for less than 10 days (B=−0.199, 95% CI=(−0.268, −0.0130), P<0.001), 10 to 19 days (B=−0.251, 95% CI=(−0.305, −0.198), P<0.001), or 20 to 29 days (B=−0.202, 95% CI=(−0.253, −0.150), P<0.001) compared with those for more than 30 days.

Risk Factors of Job Burnout

Table 8 demonstrated the risk factors associated with job burnout among nurses working in the frontline of the novel coronavirus. A higher prevalence of job burnout was observed for nurses who had direct contact with COVID-19 patients

Table 1. Demographic Characteristics of the Participant Nurses (n=512)

Characteristics	Groups	N	%
The nurses from temporary NAT sites in communities/towns in Zhangjiajie city			
	Yes	198	38.7
	No	314	61.3
Gender			
	Female	441	86.1
	Male	71	13.9
Age, years			
	<25	59	11.5
	25–29	191	37.3
	30–34	150	29.3
	35–39	53	10.4
	≥40	59	11.5
Marital status			
	Single	209	40.8
	Married	284	55.5
	Divorced	19	3.7
Educational attainment			
	Junior college	88	17.2
	Bachelor	358	69.9
	Master	66	12.9
Professional title			
	Junior	321	62.7
	Intermediate	148	28.9
	Senior	43	8.4
Working seniority, years			
	<5	119	23.2
	5–9	208	40.6
	10–19	124	24.2
	≥20	61	11.9
Duration of working in the frontline of the novel coronavirus, days			
	1–9	65	12.7
	10–19	163	31.8
	20–29	127	24.8

(*Continued*)

Table 1. (Continued).

Characteristics	Groups	N	%
	≥30	157	30.7
Have you had direct contact with COVID-19 patients or their body fluids and specimens?			
	Yes	454	88.7
	No	58	11.3

Abbreviation: COVID-19, the coronavirus disease 2019.

Table 2. SCL-90 Dimension Scores ($\bar{x} \pm s$)

Subscale	Score(n=512)	Reference Score[16] (n=31,249)	t	P
Somatization	1.54±0.56	1.55±0.65	−0.339	0.735
Obsessive-Compulsive	1.72±0.56	1.67±0.92	1.892	0.059
Interpersonal Sensitivity	1.49±0.47	1.56±0.81	−3.258	0.001**
Depression	1.99±0.80	1.86±0.55	3.587	P<0.001
Anxiety	1.61±0.40	1.50±0.75	5.933	P<0.001
Hostility	1.62±0.45	1.46±0.33	7.943	P<0.001
Phobic anxiety	1.34±0.44	1.24±0.65	4.922	P<0.001
Paranoid Ideation	1.45±0.41	1.42±0.74	1.698	0.090
Psychoticism	1.30±0.37	1.31±0.59	−0.333	0.739

Note: **P<0.01.

Table 3. Prevalence of Job Burnout Among the Nurses

Degree	N	%
No burnout	199	38.9
Moderate burnout	291	56.8
Severe burnout	22	4.3
Total	512	100

or their body fluids and specimens (OR=150.95, 95% CI=(44.87,507.77), P<0.001), those with five to nine years of working seniority (OR=8.91, 95% CI=(3.59,22.14), P<0.001), and those working in the frontline of the novel coronavirus for 10 to 19 days (OR=2.63, 95% CI=(1.19,5.82), P=0.017), 20 to 29 days (OR=161.31, 95% CI=(49.48,525.9), P<0.001), or more than 30 days (OR=92.05, 95% CI=(33.88,250.14), P<0.001) compared with the nurses without contacts, those with more than 20 years of working seniority, and those working in the frontline of the novel coronavirus for less than 10 days, respectively.

Discussion

In the present study, the prevalence of positive results of SCL-90 among 512 nurses working in the frontline of the novel coronavirus was 49.9%, which was much higher than that (14.1%) reported by Cai et al,[11] indicating a bad psychological

Table 4. Correlations Between SCL-90 Scores and Job Burnout (Spearman Correlation Coefficient)

Items	Emotional Exhaustion	Cynicism	Reduced Personal Accomplishment	Weighted Burnout Sum Score
Somatization	0.28**	0.26**	0.264**	0.359**
Obsessive-Compulsive	0.2**	0.144**	0.208**	0.265**
Interpersonal Sensitivity	0.172**	0.107*	0.14*	0.202**
Depression	0.476**	0.544*	0.493*	0.604**
Anxiety	0.19**	0.114*	0.144*	0.215**
Hostility	0.071	0.007	0.018	0.069
Phobic anxiety	0.163**	0.143**	0.122**	0.200**
Paranoid Ideation	0.167**	0.101*	0.155**	0.198**
Psychoticism	0.183**	0.139**	0.167**	0.231**
Additional Items	0.222**	0.216**	0.229**	0.298**
GSI	0.363**	0.361**	0.393**	0.477**

Notes: **P<0.01; *P<0.05.
Abbreviation: GSI, Global Severity Index.

status. The difference may result from the difference in the research sample. The sample in the study by Cai consisted of health care workers fighting against the COVID-19 in Jiangsu province, including doctors, nurses, technicians, pharmacists, logistical personnel, and social workers, while the subjects of the present study were all nurses working in the frontline of the novel coronavirus in different NAT sites, some of who were from temporary NAT sites in communities/towns in Zhangjiajie city. Working in the frontline of the novel coronavirus in an open-air and high-temperature environment of communities and towns is more painful than working in hospitals.[10] The dimension scores in depression, anxiety, hostility, and phobic anxiety among 512 nurses were higher compare with those among Chinese nurses,[23] indicating psychological problems of depression, anxiety, hostility, and phobic anxiety. Nursing managers should pay attention to the psychological problems of nurses working in the frontline of the novel coronavirus and take appropriate strategies to improve nurses' psychological health.

The proportion of the burnout case was 61.1%, which was higher than that (54%) reported by a meta-analysis of 7, 996 nurses working in different health care departments covering 21 epidemiological studies.[24] This may be due to the pressure from the risk to be infected with COVID-19. Job burnout would affect work morale, quality of care, patient safety, and health care costs,[25] and it is even linked to suicide.[26,27] Besides, we found a positive correlation between the physiological status and burnout among nurses, indicating the effect of burnout on psychological health. Thus, interventions need to be implemented immediately to decrease the prevalence of burnout and improve work efficiency among nurses.

We observed a higher GSI for nurses who had direct contact with COVID-19 patients or their body fluids and specimens (B=0.133, 95% CI=(0.067.0.199), P<0.001) compared with those without contacts, which was consistent with that reported by Zhang et al and Deng.[12,28] This is not surprising as direct contact with the COVID-19 patients would increase the risk of being infected. The sense of uncertainty and out-of-control caused by the COVID-19 might increase the risk of developing psychological problems. Besides, direct contact with COVID-19 patients or their body fluids and specimens was an independent risk factor of job burnout for nurses (OR=150.95, 95% CI=(44.87,507.77), P<0.001). We did not find similar findings in other studies. Job burnout positively correlated with psychological status, thus, the effect of contact with COVID-19 on job burnout is likely mediated through its impact on the psychological status.

The present study demonstrated that compared with nurses with more than 20 years of working seniority, those with less than five years of working seniority (B=0.133, 95% CI=(0.039, 0.227), P=0.006) and with five to nine years of working seniority (B=0.096, 95% CI=(0.008, 0.184), P-0.033) exhibited a higher GSI, those with five to nine years of working seniority (OR=8.91, 95% CI=(3.59,22.14), P<0.001) showed a higher prevalence of job burnout. The nurses with more than 20 years of working seniority exhibited better psychological status and low lower job burnout, which may be due to the possibility of having rich experience in coping with public health emergencies and high job

Table 5. Comparison of GSI in Different Populations (n=512)

Items	Groups	GSI($\bar{x} \pm s$)	Z/H	P value
The nurses from temporary NAT sites in communities/towns in Zhangjiajie city			−4.494[a]	P<0.001
	Yes	1.66±0.43		
	No	1.55±0.43		
Gender			−0.131[a]	0.895
	Female	1.59±0.43		
	Male	1.61±0.49		
Age, years			9.047[b]	0.06
	<25	1.60±0.46		
	25–29	1.62±0.42		
	30–34	1.59±0.46		
	35–39	1.61±0.49		
	≥40	1.45±0.30		
Marital status			0.827[b]	0.661
	Single	1.61±0.43		
	Married	1.58±0.44		
	Divorced	1.53±0.34		
Educational attainment			8.623[b]	0.013*
	Junior college	1.57±0.52		
	Bachelor	1.61±0.42		
	Master	1.49±0.38		
Professional title			9.802[b]	0.007**
	Junior	1.61±0.43		
	Intermediate	1.61±0.47		
	Senior	1.42±0.31		
Working seniority, years			8.183[b]	0.042*
	<5	1.66±0.47		
	5–9	1.59±0.41		
	10–19	1.61±0.50		
	≥20	1.43±0.22		

(*Continued*)

Table 5. (Continued).

Items	Groups	GSI($\bar{x} \pm s$)	Z/H	P value
Duration of working in the frontline of the novel coronavirus, days			134.104[b]	P<0.001
	1–9	1.49±0.32		
	10–19	1.43±0.29		
	20–29	1.50±0.42		
	≥30	1.87±0.48		
Case that had direct contact with COVID-19 patients or their body fluids and specimens			−6.375[a]	P<0.001
	Yes	1.62±0.44		
	No	1.35±0.26		
Burnout case			−6.551[a]	P<0.001
	Yes	1.67±0.46		
	No	1.47±0.37		

Notes: [a]Z value; [b]H value; **P<0.01; *P<0.05.
Abbreviations: GSI, Global Severity Index; COVID-19, the coronavirus disease 2019.

Table 6. Comparison of the Prevalence of Job Burnout in Different Populations (n=512)

Items	Groups	Burnout Case (N)		Prevalence of Job Burnout (%)	c²	P value
		–	+			
The nurses from temporary NAT sites in communities/towns in Zhangjiajie city					12.455	P<0.001
	Yes	58	140	70.7		
	No	141	173	55.1		
Gender					2.823	0.093
	Female	165	276	62.6		
	Male	34	37	52.1		
Age, years					26.324	P<0.001
	<25	33	26	44.1		
	25–29	53	138	72.3		
	30–34	55	95	63.3		
	35–39	30	23	43.4		
	≥40	28	31	52.5		
Marital status					2.308	0.315
	Single	73	136	65.1		
	Married	118	166	58.5		
	Divorced	8	11	57.9		

(*Continued*)

Table 6. (Continued).

Items	Groups	Burnout Case (N)		Prevalence of Job Burnout (%)	c^2	P value
		−	+			
Educational attainment					10.208	0.006**
	Junior college	43	45	51.1		
	Bachelor	123	235	65.6		
	Master	33	33	50.0		
Professional title					11.883	0.003**
	Junior	114	207	64.5		
	Intermediate	58	90	60.8		
	Senior	27	16	37.2		
Working seniority, years					29.257	P<0.001
	<5	55	64	53.8		
	5–9	53	155	74.5		
	10–19	56	68	54.8		
	≥20	35	26	42.6		
Duration of working in the frontline of the novel coronavirus, days					178.687	P<0.001
	1–9	52	13	20.0		
	10–19	109	54	33.1		
	20–29	21	106	83.5		
	≥30	17	140	89.2		
Case that had direct contact with COVID-19 patients or their body fluids and specimens					66.269	P<0.001
	Yes	148	306	67.4		
	No	51	7	12.1		
The result of SCL-90					58.935	P<0.001
	Positive	143	116	44.8		
	Negative	56	197	77.9		

Note: **P<0.01.
Abbreviations: COVID-19, the coronavirus disease 2019; SCL-90, Symptom Checklist-90.

accomplishment. Cai et al indicated that health care workers with public health emergency experience showed better performance in mental health during the COVID-19.[11] Nurses with more than 20 years of work experience are usually mainstays or leaders of the department. This enabled them to have high self-esteem and a sense of accomplishment and low job burnout.

The most significant finding of the present study was that the psychological status and job burnout of nurses were also influenced by the duration of working in the frontline of the novel coronavirus. Compared with nurses who had been working in the frontline of the novel coronavirus for more than 30 days, those who had been working in the frontline of the novel coronavirus for less than 10 days (B=−0.199, 95% CI=(−0.268, −0.130), P<0.001), 10 to 19

Table 7. Generalized Linear Model of the Factors Influencing GSI

Factors	Groups	B	SE	95% Wald CI		Wald c^2	P value
				Lower	**Upper**		
The nurses from temporary NAT sites in communities/towns in Zhangjiajie city							
	Yes	0.01	0.0213	−0.031	0.052	0.237	0.627
	No	Reference					
Educational attainment							
	Junior college	0.047	0.0402	−0.032	0.126	1.362	0.243
	Bachelor	0.037	0.0324	−0.026	0.101	1.311	0.252
	Master	Reference					
Professional title							
	Junior	−0.037	0.0535	−0.142	0.068	0.483	0.487
	Intermediate	0.007	0.0459	−0.083	0.097	0.025	0.875
	Senior	Reference					
Case that had direct contact with COVID-19 patients or their body fluids and specimens							
	Yes	0.133	0.0337	0.067	0.199	15.478	P<0.001
	No	Reference					
Working seniority, years							
	<5	0.133	0.048	0.039	0.227	7.636	0.006**
	5–9	0.096	0.045	0.008	0.184	4.555	0.033*
	10–19	0.078	0.0404	−0.001	0.158	3.767	0.052
	≥20	Reference					
Duration of working in the frontline of the novel coronavirus, days							
	1–9	−0.199	0.0353	−0.268	−0.13	31.773	P<0.001
	10–19	−0.251	0.0274	−0.305	−0.198	84.465	P<0.001
	20–29	−0.202	0.0261	−0.253	−0.15	59.789	P<0.001
	≥30	Reference					
Burnout case							
	Yes	−0.004	0.0263	−0.055	0.048	0.022	0.882
	No	Reference					

Notes: **P<0.01; *P<0.05; The independent variables in the generalized linear model were coadded as follows: the nurses from temporary NAT sites in communities/towns in Zhangjiajie city (No=0, Yes=1), Educational attainment (Junior college=1, Bachelor=2, Master=3), Professional title (Junior=1, Intermediate=2, Senior=3), Case that had direct contact with COVID-19 patients or their body fluids and specimens (No=0, Yes=1), Working seniority (<5=1, 5–9=2, 10–19=3, ≥20=4), Duration of working in the frontline of the novel coronavirus (1–9=1, 10–19=2, 20–29=3, ≥30=4), Burnout case (No=0, Yes=1).
Abbreviations: GSI, Global Severity Index; CI, confidence interval; COVID-19, the coronavirus disease 2019.

days (B=−0.251, 95% CI=(−0.305, −0.198), P<0.001), or 20 to 29 days (B=−0.202, 95% CI=(−0.253, −0.150), P<0.001) exhibited a better psychological status. A higher prevalence of job burnout was observed for nurses who had been working in the frontline of the novel coronavirus for 10 to 19 days (OR=2.63, 95% CI=(1.19,5.82), P=0.017), 20 to 29 days (OR=161.31, 95% CI=(49.48,525.9), P<0.001), or more than 30 days (OR=92.05, 95% CI=

Table 8. Risk Factors of Job Burnout by Binary Logistic Regression

Variable	Groups	B	S.E.	Wald	P value	OR (95% CI)
Case that had direct contact with COVID-19 patients or their body fluids and specimens						
	Yes	5.017	0.619	65.701	P<0.001	150.95(44.87,507.77)
	No	Reference				
Working seniority, years						
	<5	0.014	0.499	0.001	0.978	1.01(0.38,2.7)
	5–9	2.187	0.464	22.172	P<0.001	8.91(3.59,22.14)
	10–19	0.174	0.495	0.123	0.726	1.19(0.45,3.14)
	≥20	Reference				
Duration of working in the frontline of the novel coronavirus, days						
	1–9	Reference				
	10–19	0.966	0.406	5.664	0.017*	2.63(1.19,5.82)
	20–29	5.083	0.603	71.076	P<0.001	161.31(49.48,525.9)
	≥30	4.522	0.51	78.619	P<0.001	92.05(33.88,250.14)

Note: *P<0.05.
Abbreviations: OR, odds ratio; CI, confidence interval.

(33.88,250.14), P<0.001) compared with those who had been working in the frontline of the novel coronavirus for less than 10 days. These suggest that the risk of psychological problems and job burnout of nurses is increasing with the extension of time spent on working in the frontline of the novel coronavirus. According to the Areas of Worklife (AW) model,[29] which explains job burnout in terms of person-job imbalances, job burnout occurs when the imbalances take place in workload, control, reward, community, fairness, and values. In the present study, the continued high workload might be the most relevant factor to explain that the prevalence of job burnout among nurses increased over time.

We initially hypothesized that the nurses from temporary NAT sites in communities/towns in Zhangjiajie city might exhibit a worse psychological status and a lower prevalence of job burnout than those from NAT sites inside hospitals in Zhangjiajie city. The reasons for this hypothesis were as follows: The nurses from temporary NAT sites in communities/ towns in Zhangjiajie city were faced with higher workloads and harsh work environment, which may cause more psychological problems and increase job burnout. But we did not find the difference in the psychological status and job burnout between the two groups. The reasons may be that they had a greater sense of control of the situation and higher personal accomplishment. Besides, the public and social media spoke highly of these heroes who put themselves in harm's way. They were regarded as the most admirable people in the new era. In a word, this finding suggests that the psychological status and job burnout of the two groups of nurses need equal attention.

The present study has some limitations. First, it was limited in scope. All participants were from the NAT sites in Zhangjiajie city, limiting the generalization of our findings to other regions. Besides, a cross-sectional design was applied although the longitudinal research is more conducive to exploring the changes of psychological status and job burnout of nurses. Finally, although the quality control procedure was used throughout the data collection and entry, potential information bias may have occurred given the survey based on self-reported data.

Conclusion

In conclusion, the prevalence of psychological problems (depression, anxiety, hostility, and phobic anxiety) and job burnout were at a high level among nurses working in the frontline of the novel coronavirus. The nurses from temporary NAT sites in

communities/towns in Zhangjiajie city and those from NAT sites inside hospitals in Zhangjiajie city had an equal risk of developing psychological problems and job burnout. The factors associated with nurses' psychological status and job burnout included working seniority, the history of direct contact with COVID-19 patients or their body fluids and specimens, and the duration of working in the frontline of the novel coronavirus. Interventions need to be immediately implemented to promote psychological well-being and decrease job burnout of nurses. Equal attention should be provided to nurses who put themselves in harm's way to support the temporary NAT sites in communities/towns and those who worked in the frontline of the novel coronavirus inside hospitals in Zhangjiajie city. Besides, special attention should be given to nurses with less than 10 years of working seniority, those who have worked in the frontline of the novel coronavirus continuously for more than 30 days, and those who had direct contact with COVID-19 patients or their body fluids and specimens.

Acknowledgments

Funding

Disclosure

The authors report no conflicts of interest in this work.

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