BY-NC

ORIGINAL PAPER

International Journal of Occupational Medicine and Environmental Health 2023;36(6):761–772
https://doi.org/10.13075/ijomeh.1896.02155

FACTORS INFLUENCING THE MENTAL HEALTH STATUS OF SUPPORT NURSES AND THEIR WORKLOAD DURING THE COVID-19 EPIDEMIC

ZHEN-JUAN DAI[1]*, SHEN-TING XU[2]*, FANG-YING XUE[2]*, JIAN-YING ZHOU[1], JIAN-QIN CHEN[2], and XUE-MIN WANG[2]

Shanghai Songjiang District Central Hospital, Shanghai, China

[1] Department of Nursing Care

[2] Department of Intensive Care Unit

Abstract

Objectives: The authors used the *National Aeronautics and Space Administration Task Load Index* (NASA-TLX) and general health questionnaire to analyze the factors influencing the mental health status and the workload of support nurses during the COVID-19 epidemic. **Material and Methods:** The authors conducted a cross-sectional survey of 349 support nurses in April–October 2022. Using QuestionStar, a powerful online survey tool, the authors administered surveys to the participants, collected data on the mental health status and workload of support nurses, and analyzed the influencing factors based on the collected data. **Results:** A total of 316 questionnaires were successfully collected, with an effective rate of 98.75%. The proportion of support nurses with mental health problems was 25% and the value of the NASA-TLX questionnaire was: M±SD 68.91±7.28 pts. Multi-factor analysis revealed that the number of children, family support, and nursing support location were the influencing factors of mental health status, while the multivariate analysis revealed that the presence of symptoms, nursing support location, support work type, and total 12-item *General Health Questionnaire* (GHQ-12) score were the influencing factors of the workload of support nurses. **Conclusions:** Compared to their counterparts in the plains, nurses working in isolated plateau regions who were caring for children and lacked family support, were more likely to have mental health issues. There was a positive correlation between the changes in GHQ-12 and NASA-TLX scores of the study participants. Compared to their counterparts in the plains and the tropical regions, nurses working in plateau regions had a heavier workload. As part of the follow-up measures to prevent and treat patients impacted by the COVID-19 epidemic, it is important to improve the mental health evaluation, consultation, and treatment of the support nurses to guarantee the high quality of the first-line support work. Int J Occup Med Environ Health. 2023;36(6):761–72

Key words:
COVID-19, mental health, epidemic prevention and control, general mental health questionnaire, NASA-TLX, support nurse

INTRODUCTION

In 2022, there were many outbreaks of the novel coronavirus (COVID-19) in various Chinese cities, including Shanghai, Hainan, Tibet, and Xinjiang. As one of the primary drivers of the medical teams, nurses were at the forefront of patient care and made up the bulk of the medical support staff. Due to their high patient contact, nurses had to spend the most amount of time in close proximity to the patients. The collection of nucleic acid samples, the administration of treatments in mobile cabins (temporary healthcare facilities setup for treating patients with COVID-19 during the different waves

* The authors contributed equally to this article.

Funding: this study was supported by Three Year Action Plan for the Construction of the Public Health System in Songjiang District, Shanghai (2023–2025) (project No. SJGW6-22).

Received: February 2, 2023. Accepted: October 10, 2023.

Corresponding author: Fang-Ying Xue, Shanghai Songjiang District Central Hospital, Department of Intensive Care Unit, 748 Zhongshan Middle Road, Songjiang District, Shanghai 201699, China (e-mail: xuefangying88@outlook.com).

of the virus, integrated with existing full-time healthcare facilities), and the provision of nursing support in designated hospitals (hospitals specifically designated for treating patients infected with the novel coronavirus) were all within their purview. Due to the varying severity of the epidemic from region to region, it was not possible to predict in advance the workload of the support nurses (refers to nurses deployed to provide emergency support for patients with COVID-19 during the novel coronavirus epidemic) or if the nurses would have any mental health issues throughout the support period.

To offer a reference for the selection of support nurses and nursing management throughout the support period, the authors employed the *National Aeronautics and Space Administration Task Load Index* (NASA-TLX) and the 12-item *General Health Questionnaire* (GHQ-12) to assess the mental health status and workload of nurses during the support period.

MATERIAL AND METHODS

Participants

Support nurses from medical teams in Shanghai, Hainan, Tibet, and Xinjiang, China, were selected at random for this cross-sectional study in April–October 2022 using a simple random sampling method. The inclusion criteria were as follow:

- registered nurse with a license to practice in China,
- worked as a support nurse during the COVID-19 outbreak in April–October 2022,
- worked as a support nurse for ≥1 month,
- responsible for the clinical care of patients during the support period.

The exclusion criteria were as follows:

- worked as a support nurse for <1 month,
- worked in an administrative capacity.

There were 349 NASA-TLX and GHQ-12 questionnaires sent out, and 320 were returned for a 91.69% recovery rate. After excluding 17 questionnaires due to being either incomplete or invalid, the effective rate rose to 98.75%, with 316 questionnaires returned. In all, there were 102 male participants accounting for 32.28% and 214 female participants accounting for 67.72%.

Research tool

Instead of having support nurses fill out the NASA-TLX and GHQ-12 separately, the authors combined the 2 into a single questionnaire. The authors kept the questions from both scales and added an introduction with instructions to answer the pertinent questions as well as to fill-in the general information of the participants. The general information included: gender, age, educational level, title, duration of service, marital status, number of children, family support, nursing specialty, support location, type of support work, existing support experience, and regional maladjustment/physical discomfort. Finally, the mental health status and workload index of the support nurses were calculated by tallying the responses to the questionnaires using the 2 scales.

NASA-TLX scale

The original purpose of this scale was to determine the load index of aerospace workers. More and more academics have been applying it to medical practitioners in recent years [1]. The research by Hoonakker et al. [2] demonstrates that NASA-TLX is the most reliable and effective questionnaire for measuring medical workload. Mohammedi et al. [3] found that when the NASA-TLX load index scale was applied to medical practitioners, the Cronbach's $\alpha = 0.897$. Liang et al. [4] performed Chinese localization and reliability and validity testing of NASA-TLX and the results show that its Cronbach's $\alpha = 0.707$, with reliability within a good acceptance range, and it is applicable to nurses in China. The NASA-TLX task load index scale has been used as an emerging measure of nurse workload [2,5], with 6 items in total: mental demand, physical demand, time demand,

self-performance, effort, and frustration; according to the study by Shoja et al. [6] the sum of the scores of the 6 items was defined as the total workload. The scale consists of 6 questions, each receiving a score from 0–20 pts with a total score of 120 pts.

GHQ-12

This is the most widely used mental health screening tool. Zhong et al. [7] showed that the application of the GHQ-12 for the determination of the mental health status of medical staff had high reliability and validity, with Cronbach's $\alpha = 0.887$, and could reflect the mental health status of medical staff better. The questionnaire is composed of 12 questions, with 6 questions being negatively scored and 6 questions being positively scored, with 4 options for each question. Based on the work of Goldberg et al. [8], the scores of the 4 options is set as 0–0–1–1 and the total score of the questionnaire is 12 pts. Participants with a score of ≥3 pts are defined as likely to have mental health problems [9]; a higher score indicates a worse mental health condition. To screen for mental health issues among support nurses, Li et al. [10] divided the 12 items in the GHQ-12 into 3 dimensions: social dysfunction, anxiety/depression, and loss of self-confidence.

Research methods

The QuestionStar online platform was used to disseminate and collect online questionnaires during the COVID-19 outbreak that occurred between April–October 2022. The support nurses answered the questionnaire by either clicking the link or scanning the QR code with their mobile devices. While protecting the identity of the respondents, the questionnaire could be filled only once based on the IP address of the device. The research participants were given the option of responding "yes" or "no" to each question. All questions were mandatory, to ensure the completeness of the questionnaire survey. Questionnaires that were submitted within 60 s were excluded to ensure the authenticity and effectiveness of the questionnaire.

Statistical methods

Statistical operations were performed using SPSS 21.0 software. Count data are expressed as cases and percentages, while measurement data are expressed as mean (M) ± standard deviation (SD). The χ^2 test, t-test, or univariate analysis of variance was used for single-factor analysis. Multivariate analysis was performed based on values that were significant in the univariate analysis ($p < 0.05$). Logistic regression analysis and linear regression analysis were adopted, and $p < 0.05$ indicated a statistical difference.

RESULTS

Univariate analysis of mental health status

Based on the GHQ-12, support nurses with GHQ-12 scores <3 pts were defined as having no mental issues and those with GHQ-12 scores ≥3 pts were defined as having mental issues. A total of 316 questionnaires were collected and based on the scores, 79 (25%) support nurses had mental health problems. The presence of mental health issues, along with other crucial data factors, were subjected to a univariate analysis. The results revealed that the mental health status of support nurses was associated with the number of children, family support, nursing specialty, support location, support work type, existing support experience, and presence of symptoms (Table 1).

Multivariate analysis of mental health status

Logistic regression analysis was performed on the values that were found to be statistically significant in the univariate analysis ($p < 0.05$). First, the authors assigned the variables (Table 2). With the presence of mental health problems as the dependent variable, the authors performed multi-factor non-conditional 2-category logistic regression

Table 1. Univariate analysis of mental health status of support nurses participating in a cross-sectional survey conducted in April–October 2022, China

Variable	Participants (N = 316)		χ^2	t	p
	with psychological health issue[a]	without psychological health issue[b]			
Sex [n (%)]			0.019	–	0.089
man	77 (75.5)	25 (24.5)			
woman	160 (74.8)	54 (25.2)			
Age [n (%)]			1.592	–	0.451
<30 years	102 (78.5)	28 (21.5)			
30–40 years	107 (73.3)	39 (26.7)			
>40 years	28 (70)	12 (30)			
Educational level [n (%)]			0.871	–	0.647
college and below	62 (77.5)	18 (22.5)			
undergraduate course	169 (73.8)	60 (26.2)			
master's degree or above	6 (85.7)	1 (14.3)			
Title [n (%)]			1.913	–	0.384
entry-level	154 (77)	46 (23)			
mid-level	64 (73.6)	23 (26.4)			
senior	19 (65.5)	10 (34.5)			
Length of service [n (%)]			2.014	–	0.365
≤10 years	137 (77.8)	39 (22.2)			
11–20 years	72 (72.7)	27 (27.3)			
>20 years	28 (68.3)	13 (31.7)			
Marital status [n (%)]			1.541	–	0.214
married	136 (77.7)	39 (22.3)			
single	101 (71.6)	40 (28.4)			
Number of children [n (%)]			62.934	–	<0.001
0 children	134 (85.4)	23 (14.6)			
1 child	93 (78.2)	26 (21.8)			
≥2 children	10 (25)	30 (75)			
Family support [n (%)]			151.056	–	<0.001
yes	221 (91.7)	20 (8.3)			
no	16 (21.3)	59 (78.7)			
Nursing specialty [n (%)]					
critical illness	65 (81.3)	15 (18.8)	9.512	–	0.023
internal medicine and surgery	60 (63.8)	34 (36.2)			
obstetrics and gynecology pediatrics	53 (81.5)	12 (18.5)			
infectious disease	59 (76.6)	18 (23.4)			

Table 1. Univariate analysis of mental health status of support nurses participating in a cross-sectional survey conducted in April–October 2022, China – cont.

Variable	Participants (N = 316)		χ^2	t	p
	with psychological health issue[a]	without psychological health issue[b]			
Support location [n (%)]			52.545	–	<0.001
plains	155 (85.2)	27 (14.8)			
plateau region	30 (42.3)	41 (57.7)			
tropical region	52 (82.5)	11 (17.5)			
Support job type [n (%)]			11.236	–	0.04
nucleic acid sampling	119 (81)	28 (19)			
mobile cabin treatment	91 (65.9)	47 (34.1)			
designated hospital	27 (87.1)	4 (12.9)			
Support experience [n (%)]			18.427	–	<0.001
yes	129 (86)	21 (14)			
no	108 (65.1)	58 (34.9)			
Symptoms[c] [n (%)]			17.199	–	<0.001
yes	63 (60.6)	41 (39.4)			
no	174 (82.1)	38 (17.9)			
NASA-TLX total (M±SD)	68.097±7.3	71.342±6.672	–	–3.491*	0.001

NASA-TLX – *National Aeronautics and Space Administration Task Load Index*.
[a] The GHQ-12 score <3 pts. [b] The GHQ-12 score ≥3 pts. [c] The uncomfortable physical feeling after entering a new environment, including a series of regional maladjustment/physical discomfort symptoms such as plateau reaction, gastrointestinal discomfort, and fever.

Table 2. Variable assignment of logistic regression analysis in support nurses participating in a cross-sectional survey conducted in April–October 2022, China

Variable	Assignment
Nursing specialty (dummy variable)	(0, 0, 0) – critical illness; (1, 0, 0) – internal medicine and surgery; (0, 1, 0) – obstetrics and gynecology pediatrics; (0, 0, 1) – infectious disease
Number of children	0 – 0, 1 – 1, 2 –≥2
Family support	0 – no, 1 – yes
Are there any symptoms	0 – no, 1 – yes
Any support experience	0 – no, 1 – yes
Support location (dummy variable)	(0, 0) – plain, (1, 0) – plateau, (0, 1) – tropical region
Supported job types (dummy variables)	(0, 0) – nucleic acid sampling, (1, 0) – mobile cabin treatment, (0, 1) – designated hospitals
Are there any mental health problems	0 – GHQ-12 score <3 pts, 1 – GHQ-12 score ≥3 pts

GHQ-12 – 12-item *General Health Questionnaire.*

analysis on the number of children, family support, nursing specialty, support location, support work type, existing support experience, and presence of symptoms. The results revealed that the number of children, family support, and support location influence mental health. Support nurses with children without family support working in the pla-

teau regions (refers to areas within China with an altitude of more than 1000 m, with relatively flat terrain) were more likely to have mental health problems than those working in the plains (refers to areas within China with flat or undulating ground mainly distributed across the 2 banks of rivers or near the ocean) (Table 3).

Table 3. Multivariate non-conditional 2-category logistic regression analysis in support nurses participating in a cross-sectional survey conducted in April–October 2022, China

Variable	OR (95%CI)	p
Nursing specialty		
critical illness	–	–
internal medicine and surgery	2.742 (0.802–9.367)	0.108
obstetrics and gynecology and pediatrics	0.750 (0.177–3.176)	0.696
infectious disease	0.873 (0.242–3.144)	0.836
Number of children		
0 children	–	–
1 child	0.097 (0.028–0.339)	<0.001
≥2 children	0.178 (0.051–0.622)	0.007
Family support		
yes	–	–
no	41.744 (16.461–105.857)	<0.001
Symptoms		
yes	–	–
no	2.549 (0.590–11.023)	0.21
Support experience		
yes	–	–
no	2.318 (0.979–5.490)	0.056
Support location		
plains	–	–
plateau region	7.318 (1.251–42.814)	0.027
tropical region	1.009 (0.265–3.842)	0.989
Support job types		
nucleic acid sampling	–	–
mobile cabin treatment	1.390 (0.503–3.840)	0.525
designated hospital	1.107 (0.176–6.948)	0.914
NASA-TLX total	1.030 (0.962–1.104)	0.393

NASA-TLX – *National Aeronautics and Space Administration Task Load Index.*

Univariate analysis of support nurse workload

The workload of support nurses was analyzed based on the NASA-TLX score. The results revealed that family support, support location, support job type, and the presence of symptoms may affect the workload of support nurses (Table 4).

Multivariate analysis of support nurse workload

The significant values of single factor analysis ($p < 0.05$) were analyzed using linear regression. With NASA-TLX score as the dependent variable, multivariate regression analysis was performed on the presence of symptoms, family support, support location, support work type, and GHQ-12 total score. The results revealed that the presence of symptoms, support location, support work type, and GHQ-12 questionnaire total score were the influencing factors of the workload of support nurses. These 4 variables explained the 14.4% variation in the NASA-TLX score (i.e., support nurse workload) (Table 5).

Scores of support nurses in each dimension of the GHQ-12 in different support locations and support work types

A univariate analysis of variance was performed on the scores of each dimension in the GHQ-12 for support nurses working in different support locations and based on different support work types. The results revealed that the scores of each dimension in different support locations were statistically different ($p < 0.05$) and the scores of the dimension of social dysfunction under different support work types were statistically different ($p < 0.05$) (Table 6).

Scores in each dimension of the NASA-TLX for support nurses in different support locations and different support work types

A univariate analysis of variance was performed on the scores of each dimension in the NASA-TLX based on different sup-

Table 4. Univariate analysis of workload of support nurses participating in a cross-sectional survey conducted in April–October 2022, China

Variable	NASA-TLX score (M±SD)	F/t	p
Sex		1.187	0.221
man	69.69±8.02		
woman	68.54±6.89		
Age		1.218	0.297
<30 years	69.6±7.22		
30–40 years	68.24±7.52		
>40 years	69.1±6.52		
Educational level		0.795	0.452
college and below	69.79±7.85		
undergraduate course	68.62±7.11		
master's degree or above	68.14±5.81		
Title		1.329	0.266
entry-level	69.13±7.57		
mid-level	67.95±6.75		
senior	70.24±6.68		
Length of service		1.403	0.248
≤10 years	69.30±7.07		
11–20 years	67.90±7.68		
>20 years	69.66±7.09		
Marital status		3.102	0.079
married	68.26±7.01		
single	69.71±7.55		
Number of children		0.586	0.557
0 children	68.61±7.29		
1 child	68.94±7.54		
≥2 children	70.00±6.46		
Family support		–12.572	0.013
yes	68.34±7.32		
no	70.73±6.88		
Nursing specialty		0.265	0.851
critical illness	69.51±7.05		
internal medicine and surgery	68.61±7.42		
obstetrics and gynecology pediatrics	68.89±7.00		
infectious disease	68.66±7.67		
Support location		28.619	<0.001
plains	67.28±6.64		
plateau region	74.21±6.27		
tropical region	67.63±7.38		
Support job type		8.51	<0.001
nucleic acid sampling	67.22±7.70		
mobile cabin treatment	70.70±6.07		
designated hospital	68.97±8.40		
Support experience		0.009	0.923
yes	68.87±7.57		
no	68.95±7.03		
Symptoms[a]		4.283	<0.001
yes	71.86±7.12		
no	67.46±6.93		

NASA-TLX – *National Aeronautics and Space Administration Task Load Index*.
[a] The uncomfortable physical feeling after entering a new environment, including a series of regional maladjustment/physical discomfort symptoms such as plateau reaction, gastrointestinal discomfort, and fever.

port locations and work types. The results revealed that there were significant differences in the scores of the physical and time demand dimension in different support locations ($p < 0.05$), and there were significant differences in the scores of the mental, physical, and time demands in different support work types ($p < 0.05$) (Table 6).

DISCUSSION

Mental health status of support nurses and its influencing factors

The mental strain on medical professionals was exacerbated by the COVID-19 pandemic [11]. Consistent with the findings of Nie et al. [12], the results of this study revealed that 25% of support nurses also struggled with mental health issues. In the context of the widespread spread of COVID-19, 25.1% of clinical nurses had mental health issues. When dealing with public health emergencies, medical personnel are vulnerable to experienc-

Table 5. Multivariate analysis results of factors affecting workload of support nurses participating in a cross-sectional survey conducted in April–October 2022, China

Variable	Coefficient of regression	Standardized regression coefficient	T	p
Constant	61.036		30.117	<0.001
Presence of symptoms	3.161	0.204	3.599	<0.001
Family support	0.589	0.034	0.508	0.612
Support location	1.119	0.123	2.002	0.046
Supported job types	2.128	0.192	3.259	<0.001
GHQ-12 total	0.737	0.182	2.640	0.009

GHQ-12 – 12-item *General Health Questionnaire.*
Adjust R^2 =0.144, F=10.444, p < 0.001.

Table 6. Score of each dimension in the 12-item *General Health Questionnaire* (GHQ-12) and in the *National Aeronautics and Space Administration Task Load Index* (NASA-TLX) for different support locations and work types in support nurses participating in a cross-sectional survey conducted in April–October 2022, China

Dimension	Support location			F	p	Type of work			F	p
	plains	plateau region	tropical region			nucleic acid sampling	mobile cabin treatment	designated hospital		
GHQ-12 [pts] (M±SD)										
low social function	0.54±0.90	1.70±1.00	0.52±0.84	45.374	<0.001	0.62±0.97	1.05±1.08	0.52±0.85	7.841	<0.001
anxiety and depression	0.25±0.52	0.59±0.71	0.25±0.44	10.339	<0.001	0.24±0.48	0.43±0.65	0.26±0.51	4.33	0.14
loss of self-confidence	0.25±0.54	0.70±0.70	0.27±0.63	15.821	<0.001	0.29±0.62	0.42±0.64	0.35±0.55	1.501	0.224
NASA-TLX [pts] (M±SD)										
mental demands	10.49±3.84	9.89±3.49	9.92±3.73	0.965	0.382	9.64±3.83	10.15±3.26	13.52±3.76	15.045	<0.001
physical demands	13.35±2.40	16.30±2.49	12.92±2.22	45.911	<0.001	13.52±2.67	14.46±2.71	13.51±2.50	4.807	0.009
time demands	10.71±2.57	15.83±2.09	11.65±2.62	109.709	<0.001	11.48±2.94	12.98±3.36	10.61±2.80	11.831	<0.001
self-expression	10.15±2.01	9.73±1.87	10.37±1.84	1.901	0.151	10.14±1.95	10.17±1.82	9.61±1.82	1.068	0.345
effort	10.47±2.10	10.46±2.04	10.75±2.40	0.416	0.66	10.46±2.19	10.66±2.07	10.23±2.25	0.634	0.531
degree of frustration	12.19±2.53	12.14±2.60	12.03±1.93	0.102	0.903	12.07±2.36	12.37±2.50	11.55±2.41	1.598	0.204

ing psychological breakdowns [13]. In the context of the work-family nexus, "family support" [14] refers to the encouragement and understanding that a person receives from his or her loved ones while at work. There is some evidence that family support helps individuals feel less fatigue at work and promotes a more positive emotional state [15]. However, when individuals experience work-family conflict, it can lead to negative effects such as psychological depression and emotional exhaustion. When there is an increase in the work-family conflict for nurses, they expend more energy and resources, which subjectively impacts their workload burden. The results of the multivariate analysis of mental health status in this study (Table 3) revealed that nurses with children and no family support working in plateau regions were more likely to have mental health problems than nurses working in the plains. Nurses with children and without family support were more likely to have mental health issues,

suggesting that these factors be taken into account when deciding to station support nurses in the plateau area.

The scores of each dimension in the GHQ-12 questionnaire for nurses working in the plateau region (Table 6) were higher than for those working in the plains and tropical regions (refers to areas within China lying below the Tropic of Cancer in the Northern Hemisphere). It is probably that all the respondents were nurses who had lived or are living in the plains for a long time. The maladjustment and uncertainty in the face of working in the plateau regions and regional cultural differences increased the psychological burden of nurses. The findings of Yang et al. [16] indicated that medical personnel had different mental health disorders, such as anxiety, fear, and mental tension when working in the plateau region, so attention should be paid to the psychological counseling of support nurses working in the plateau region [17].

According to the findings of this research, the social dysfunction dimension ratings of support nurses providing care in mobile cabins were greater than of those providing care in designated institutions or of those who were involved in nucleic acid specimen collection (Table 6). Despite the consistent focus on the mental health needs of patients and medical staff in the prevention and treatment of the COVID-19 epidemic in China, there is still a lack of psychological support in the actual treatment process, such as in the treatment of patients in mobile cabins, which places impetus on the needs of patients while ignoring the mental health needs of medical staff [18]. According to statistics [19], about 84% of health personnel working in mobile cabins were nurses. Nurses of suitable age and mental fortitude should be chosen and given sufficient resources and psychological support while planning nursing care [20]. It is recommended that the evaluation, consultation, and treatment of the mental health of support nurses working in mobile cabins be improved in the follow-up work on the prevention and treatment of the COVID-19 epidemic in order to discover their mental health problems and guarantee the normal, orderly, and high-quality development of the first-line health support work.

Workload status of support nurses and its influencing factors

Work pressure for nurses comes from high workloads [21], which may lead to issues including decreased motivation and compromised patient safety [22]. Numerous international organizations for nurses have adopted the NASA-TLX as their standard method for measuring nurse workload [2,5,23]. The NASA-TLX is a self-reporting measure of workload, with the "nurse" providing the data. This approach of measuring workload is more accurate and practical than others [24]. The value of the overall NASA-TLX questionnaire of the 316 support nurses involved in this study was M±SD 68.91±7.28 pts, lower than 71±16.13 pts for nurses in Iran. The main reason may be that the research by Shoja et al. [6] on the impact of COVID-19 on the workload of medical staff in Iran was during the early stage of the COVID-19 outbreak. Two years of anti-epidemic experience in China have led to a mature anti-epidemic strategy with regard to COVID-19, and nursing burden may be reduced as a result [25]. The results of multivariate analysis of support nurse workload in this study (Table 5), revealed that the 4 variables (presence of symptoms, support location, support job type, and total GHQ-12 score) explained the 14.4% variation in support nurse workload. An improved GHQ-12 score was followed by an improved NASA-TLX score. The NASA-TLX may be influenced by the feelings, tension, and worry of the support nurses since it is a subjective instrument for measuring workload. There is a need for further research on the precise process by which it is influenced.

The workload of nurses in the plateau regions (M±SD 74.21±6.27) was higher than that of nurses in the plains (M±SD 67.28±6.64) and tropical regions (M±SD 67.63±7.38).

Most of the nurses in the research had previously lived on the plains for a long time, thus the increased physical and time demands of nursing in the plateau areas may be attributable to their acclimatization to lower oxygen levels and slower movement at the altitude there. Due to the greater physical demands of working in the plateau regions, physically fit female nurses or male nurses should be given priority.

The emotional, physical, and time demands of the support nurses working in mobile cabins were greater than those of support nurses working in designated hospitals or who were involved in nucleic acid sample collection (Table 6). The work of nurses working in mobile cabins went beyond nursing care, and involved activities such as infection prevention and control. In addition to doing normal nursing tasks including observing patients' conditions, administering medications, and collecting specimens, they also dealt with unforeseen events and offered health education and more personal care for patients in the mobile cabins [26]. The mental, physical, and time demands of nurses working in the mobile cabin were higher than of those working in designated hospitals or involved in nucleic acid sample collection. This may be due to the complexity and uncertainty of the environment in the mobile cabin requiring nursing staff to possess stronger emergency response capability.

Limitations and suggestions

The modest degree of variance shown in the multi-factor analysis of workload of support nurses in this study suggests that there may be more factors at play in this area. Future research will further investigate the factors at play in increasing or decreasing the workload of nurses. The support sites selected in this study were divided into plateau regions, plains, and tropical regions, however, the geographical location could be further subdivided, for example, into South China and North China, and a larger sample size needs to be included in future studies. The mental health condition may improve or remain stable over time [27]. In this study, the mental health of the support nurses was not examined after the support work had concluded, and only the data during the support period were analyzed. To determine if the support task had any lasting effects on nurses' mental health and to detect the existence or absence of post-traumatic symptoms early, it is necessary to examine mental health before, during, and after support. However, more research is needed to determine how to distribute human resources in accordance with workload in order to direct the development of epidemic prevention work with specific data and to offer a reference basis for the standardization of COVID-19 epidemic prevention and control.

CONCLUSION

Compared to their counterparts in the plains, nurses working in isolated plateau regions who were caring for children and lacked family support, were more likely to have mental health issues. There was a positive correlation between the changes in GHQ-12 and NASA-TLX scores of the study participants. Compared to their counterparts in the plains and the tropical regions, nurses working in plateau regions had a heavier workload. The huge workload is one of the main factors causing psychological stress among medical personnel, and the existence of mental health problems may also increase the psychological workload of individuals. As part of the follow-up measures to prevent and treat patients impacted by the COVID-19 epidemic, it is important to improve the mental health evaluation, consultation, and treatment of the support nurses to guarantee the high quality of the first-line support work.

Author contributions

Research concept: Zhen-Juan Dai, Shen-Ting Xu

Research methodology: Fang-Ying Xue, Jian-Qin Chen

Collecting material: Xue-Min Wang
Statistical analysis: Shen-Ting Xu
Interpretation of results: Shen-Ting Xu, Fang-Ying Xue
References: Jian-Ying Zhou

REFERENCES

1. Jacobson CJ Jr, Bolon S, Elder N, Schroer B, Matthews G, Szaflarski JP, et al. Temporal and subjective work demands in office-based patient care: an exploration of the dimensions of physician work intensity. Med Care. 2011;49(1):52–58. https://doi.org/10.1097/MLR.0b013e3181f53542.
2. Hoonakker P, Carayon P, Gurses A, Brown R, McGuire K, Khunlertkit A, et al. Measuring workload of ICU nurses with a questionnaire survey: the NASA Task Load Index (TLX). IIE Trans Healthc Syst Eng. 2011;1(2):131–143. https://doi.org/10.1080/19488300.2011.609524.
3. Mohammadi M, Mazloumi A, Zeraati H. Designing questionnaire of assessing mental workload and determine its validity and reliability among ICUs nurses in one of the TUMS's hospitals. J Sch Public Health Inst Public Health Res. 2013;11(2):87–96.
4. Liang LL, Zhao L, Deng J, Ye XC. [Chinesization, reliability and validity test of National Aeronautics and Space Administration Task Load Index.] Chin Nurs Res. 2019,33(5):734–737. Chinese.
5. Tubbs-Cooley HL, Mara CA, Carle AC, Gurses AP. The NASA Task Load Index as a measure of overall workload among neonatal, paediatric and adult intensive care nurses. Intensive Crit Care Nurs. 2018;46:64–69. https://doi.org/10.1016/j.iccn.2018.01.004.
6. Shoja E, Aghamohammadi V, Bazyar H, Moghaddam HR, Nasiri K, Dashti M, et al. Covid-19 effects on the workload of Iranian healthcare workers. BMC Public Health. 2020 Nov 2;20(1):1636. https://doi.org/10.1186/s12889-020-09743-w.
7. Zhong XG, Liu YY, Pu JC, Gui SW, Tian L, Zhou W, et al. [Reliability and Validity of General Health Questionnaire-12 in Health Care Workers.] Chin Gene Prac. 2020;23(35): 4530–4534. Chinese.
8. Goldberg D, Willams P. A User's Guide to the General Health Questionnaire. London: NFER-Nelson Publishing; 1998. p. 279–282.
9. Wang JL, Yin WY, Zhang HL, Wang XC. [Study on the general mental health status and influencing factors of Chinese Medical Team members.] Zhonghua Liu Xing Bing Xue Za Zhi. 2019;40(5):574–579. https://doi.org/10.3760/cma.j.issn.0254-6450.2019.05.016. Chinese.
10. Li YM, Li YX. [The Factor Structure of the 12- item General Health Questionnaire: The Multi-group Analyses.] Psychological Exploration. 2015;35(4):355–359. Chinese.
11. Wang N, Li Y, Wang Q, Lei C, Liu Y, Zhu S. Psychological impact of COVID-19 pandemic on healthcare workers in China Xi'an central hospital. Brain Behav. 2021;11(3):e02028. https://doi.org/10.1002/brb3.2028.
12. Nie A, Su X, Zhang S, Guan W, Li J. Psychological impact of COVID-19 outbreak on frontline nurses: A cross-sectional survey study. J Clin Nurs. 2020 Nov;29(21–22):4217–4226. https://doi.org/10.1111/jocn.15454.
13. Low J G, Wilder-Smith A. Infectious respiratory illnesses and their impact on healthcare workers:a review. Ann Acad Singapore. 2005;34(1):105–110.
14. Li S, Jiang L. [An Analysis on Difficult Situation of Poverty Alleviation Practice of "First Secretary" Based on Role Theory.] Studies on Socialism with Chinese Characteristics. 2018;6:74–80. Chinese.
15. Zhou YK. [A study on the influence of work-family conflict and family support on job performance among village cadres.] J Guizhou Normal Univ (Soc Sci). 2023;3:32–46. Chinese.
16. Yang XH, Zhou L. [Disease characteristics and nursing points of troops' external training exercises in plateau and mountainous areas.] Nurs J Chin People's Liberation Army. 2005;22(4):99–100. Chinese.
17. Zheng XC, Wang ZM, Zhao L, Wang GB, Ding XY, Yang JG, et al. [Experience of nurses working in mobile cabin hospital under plateau environment: a qualitative research.] J Nurs Sci. 2016;31(19):65–67. Chinese.

18. Wang Y, Yu JH, Zhang YX, Ye XY, Xu YL, Zhang Y, et al. [A qualitative study on experience of nurses' delivering health care to patients with COVID-19 in Fangcang shelter hospital.] J Nurs Sci. 2020;35(13):48–51. Chinese.
19. Yuan XL, Le WB, Zhang YR, Chen L, Peng TT, Liang YG. [A study on the mental health level and influencing factors of medical staff in the shelter hospital during the COVID-19 epidemic in Shanghai.] Med J Chin People's Liberation Army. https://kns.cnki.net/kcms/detail/11.1056.R.20221013.1103.002.html. Chinese.
20. Zhang S, Sun X, Yang J, et al. [Comparative analysis of psychological status of cross? Domain supporting nurses and local nurses in public health emergencies.] Chin Nurs Res. 2021;35(18):3246–3250. Chinese.
21. Kiekkas P, Sakellaropoulos GC, Brokalaki H, Manolis E, Samios A, Skartsani C, et al. Association between nursing workload and mortality of intensive care unit patients. J Nurs Scholarsh. 2008;40:385–390. https://doi.org/10.1111/j.1547-5069.2008.00254.x.
22. McManus IC, Keeling A, Paice E. Stress, burnout and doctors' attitudes to work are determined by personality and learning style: a twelve year longitudinal study of UK medical graduates. BMC Med. 2004;2:29. https://doi.org/10.1186/1741-7015-2-29.
23. Tubbs-Cooley HL, Mara CA, Carle AC, Mark BA, Pickler RH. Association of Nurse Workload With Missed Nursing Care in the Neonatal Intensive Care Unit. JAMA Pediatr. 2019;173(1):44–51. https://doi.org/10.1001/jamapediatrics.2018.3619.
24. Hill SG, Iavecchia HM, Byers JC, Bittner AC, Zaklad AL, Christ RE. Comparison of four subjective workload rating scales. Human Factors. 1992;34(4):429–439.
25. Yao CL, Wei WL, Zhang JQ, Bi QR, Li JY, Khan I, et al. Traditional Chinese medicines against COVID-19: A global overview. World J Tradit Chin Med. 2022;8:279–313. https://doi.org/10.4103/2311-8571.353502.
26. Yu JH, Sun H, Zhan YX, Wang Y, Wang PH, Liu YL, et al. [Emergency nursing management measures to combat COVID-19 in Fangcang shelter hospital.] J Nurs Sci. 2020;35(9):1–3.Chinese.
27. Blanco C, Xu Y, Brady K, Pérez-Fuentes G, Okuda M, Wang S. Comorbidity of posttraumatic stress disorder with alcohol dependence among US adults: results from National Epidemiological Survey on Alcohol and Related Conditions. Drug Alcohol Depend. 2013;132(3):630–638. https://doi.org/10.1016/j.drugalcdep.2013.04.016.

This work is available in Open Access model and licensed under a Creative Commons Attribution-NonCommercial 3.0 Poland License – http://creativecommons.org/licenses/by-nc/3.0/pl/deed.en.