Investigation on the influencing factors of mental health of healthcare workers for aid in Hubei during the outbreak of the COVID-19

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Abstract

Background

The objective of this study is to understand the psychological health status and analyze the related factors of healthcare workers for aid in Hubei during the epidemic. 220 subjects were investigated by Self-Rating Scale of Sleep (SRSS), Generalized Anxiety Scale (GAD-7), and 9-item patient health questionnaire (PHQ-9).

Results

The average SRSS score of all subjects was significantly higher than the national norm ($p < 0.001$) and the influencing factors were gender, whether the patients died under the charge of nursing/treatment, the history of psychosis and whether their family members were infected with the COVID-19. The average GAD-7 score of all subjects was in a moderate anxiety level, and the main influencing factors were gender, years of work, history of psychosis, self-perceived health status and whether their family members were infected with the COVID-19. The average PHQ-9 score of all subjects was in mild depression level. The primary influencing factors were whether they nursed/treated severely ill patients during aid in Hubei and whether they had a history of psychosis.

Conclusions

During the outbreak of COVID-19, the symptoms of insomnia and anxiety of the healthcare workers for aid in Hubei were prominent. Moreover, male workers, those whose patients have died during their treatment, with previous anxiety disorders and whose family members infected with COVID-19 were facing more serious problems. Therefore, this special group needs to be strengthened follow-up psychological support individually.

1. Background

At the end of 2019, an outbreak of COVID-19 occurred in Wuhan, Hubei Province, China. The new type of virus is highly contagious. Currently, no effective preventive or curative therapeutic drug is available, which has led to massive public panic. When the virus was raging, a group of people risked infection when they applied to provide medical assistance in Hubei Province. Some people can choose to cancel, delay, or alter the way they work, but healthcare workers choose to take on more heavy work and fight against danger. Thus, this group of healthcare specialists in Hubei may have faced work pressure and tremendous mental pressure.

Relevant studies found that during the SARS outbreak in 2003, frontline healthcare workers experienced substantial mental pressure and work pressure [1-3]. Simultaneously, during the outbreak of the 2015 Middle East respiratory syndrome (MERS) Co-V, hospital workers in South Korea also experienced various negative emotions and stress [4]. Frontline medical workers reported a great deal of emotional stress related to their work during the novel swine-origin influenza A (H1N1) outbreak, which originated in Mexico in 2009, and during the Ebola outbreak, which originated in Guinea in 2013 [5]. However, during the outbreak of COVID-19 in Hubei Province, a large number of healthcare workers from other provinces and cities provided medical support. They were stationed at the centre of the outbreak for nearly two months, and this long-term separation from family members and having to adapt to a new place may have further increased the perceived pressure, as being

assigned to unfamiliar workgroups could reduce collegial interactions [6]. A related report suggested that healthcare workers were at the forefront of a 'special battle' against infectious diseases, thus placing them at a higher risk of infection [7]. Therefore, the potential risk may have further increased their mental burden.

The latest report on COVID-19 revealed that frontline healthcare workers are vulnerable to the emotional impact of COVID-19 [8]. However, until now, there has been little information on the mental health of healthcare workers who went to Hubei to provide assistance. Therefore, the purpose of this study is to conduct a mental health survey on this group through online questionnaires and to analyse the factors that may affect their psychological conditions. Identifying the characteristics of these healthcare workers and the factors impacting their mental health would be useful for developing psychological interventions.

2. Method

Subjects

From January to February 2020, the healthcare workers who went to Hubei Province to provide medical assistance were recruited. Questionnaires were distributed to these healthcare workers via an online system, and participation was voluntary. The participants completed the surveys independently under the instructions of the unified guidance using their mobile phones. The research received institutional review board (IRB) approval from West China Hospital. A total of 220 questionnaires were sent out, and 210 completed questionnaires were received, yielding a completion rate of 95.4%. *Measures* The research tool (scale) was a self-reported questionnaire, and the following survey items were completed according to the unified guidance. (1) **The questionnaire about demographic characteristics and related experiences with and opinions on COVID-19** assessed gender, age, marital status, education level, occupation and so on (see detailed items in Table 1). Participants' experiences regarding the epidemic were assessed by asking whether they nursed/treated seriously ill patients infected with COVID-19, whether the patients they treated had died, whether their family members had been infected with COVID-19, and whether they had a history of psychosis. Opinions on the epidemic were assessed by asking about the most demanding task and about what makes them most nervous/angry/sad about the epidemic. (2) **Self-perceived health status** was rated using a 5-point scale: 1 point indicates that their physical condition is very good; 2 points indicates that their physical condition is good; 3 points indicates that their physical condition is average; 4 points indicates that their physical condition is poor; 5 points indicates that their physical condition is very poor. (3) **The Self-Rating Scale of Sleep (SRSS)** [9] is composed of 10 items, and the response options for each item range from 1-5 points. The final score is the sum of each item, and the total score ranges from 10-50 points. Higher scores indicate more serious sleep problems. The national average score for this scale is 22.14 ± 5.48 [10]. (4) **The Generalized Anxiety Scale (GAD-7)** [11] consists of 7 items, and the response options for each item range from 0-3 points. The total score ranges from 0-21 points. Scores of 0-4 points indicate were no anxiety, 5-9 points indicate mild anxiety, 10-14 points indicate moderate anxiety, and 15-21 points indicate severe anxiety. (5) **The nine-item Patient Health Questionnaire (PHQ-9)** [12] is composed of nine items, and the response options for each item range from 0-3 points. The total score ranges from 0-27 points. Scores of 0-4 points indicate no depression; 5-9 points indicate mild depression; 10-14 points indicate moderate depression; 15-19 points indicate moderate and severe depression; and 20-27 points indicate severe depression. *Statistical analyses*

Data were analysed using SPSS statistical software. For each scale, the scores were summed. The mean scores were then used for comparisons between groups using a T-test or analysis of variance (ANOVA). First, the factors that may influenced SRSS, GAD-7, and PHQ-9 scores were identified by one-way ANOVA. Then, these factors were incorporated into a multiple linear regression model, and the relevant influencing factors of the total scores of the above three scales were analysed. A P-value of less than 0.05 was considered statistically significant.

3. Results

3.1 General Situation

3.1.1 Demographics

A total of 210 participants, including 105 men and 105 women, were surveyed. Among them, 147 were nurses (70%), and 63 were physicians (30%). The average age of all participants was 30.47 ± 4.53 years old. The average working years of all participants was 8.61 ± 4.37 years. The distribution of their education levels was as follows: 14 workers graduated from secondary school (6.7%), 77 graduated from junior colleges (36.7%), 105 graduated from undergraduate programs (50%), and 14 graduated from graduate schools (6.7%). The distribution of marital status was as follows: 98 unmarried (46.7%); 112 married (53.3%).

3.1.2 Epidemic-related Information

Among all the participants, 196 people had nursed/treated seriously ill patients in Hubei (93.3%); 140 people had experienced the death of patients during their nursing/treatment (66.7%); and 14 respondents reported that they had family members who were infected with COVID-19 (6.7%). Twenty-one people had a history of an anxiety disorder (10%). The self-reported physical health status of the participants was follows: 49 persons thought they were in excellent health (23.3%), 133 individuals considered themselves to be in good health (63.3%), and 28 individuals reported that they had average health (13.3%).

3.1.3 Views on the epidemic

The participants reported that the most significant help they needed during the epidemic included psychological support (46.7%), improved medical conditions (33.3%) and communication with their families (10%).

The top three sources of support among the participants were friends (161 persons chose this item), other family members (133 persons chose this item), and colleagues (131 persons chose this item).

The top three most stressful situations faced by all the participants during the epidemic were as follows (the question was multiple choice): a shortage of protective materials (147 persons chose this item), the number of deaths (126 persons chose this item), and an increased number of newly confirmed cases (119 persons chose this item).

For all the participants, the top three situations that made them the most angry during the epidemic were as follows (the question was multiple choice): irresponsible rumours (147 persons chose this item), weak early control of the pandemic (105 persons chose this item), and misunderstanding/noncooperation from patients (98 persons chose this item).

For all the participants, the top three situations that made them the most distressed during the epidemic were as follows (the question was multiple choice): vulnerable medical staff (147 persons chose this item), a shortage of protective materials (126 persons chose this item), and vulnerable patients (105 persons chose this item).

3.2 The SRSS score and its influencing factors

3.2.1 The SRSS score

The average SRSS score of all participants was 25.13 ± 6.41 points. The result was significantly different from the national average ($t=6.765$, $p<0.001$). This difference indicates that the sleep quality of medical workers in Hubei was worse than that of the general population.

3.2.2 Analysis of influencing factors related to sleep quality

The sleep quality scores of patients were compared based on different demographic characteristics and epidemic-related experiences. The results showed that there were statistically significant differences in sleep quality ($P < 0.05$) based on gender, whether the respondent had patients who died under their care, history of mental illness, whether their family members were infected with COVID-19 and self-perceived physical health. See Table 1 for details, which is located at the last page of this manuscript.

3.2.3 Multiple stepwise regression analysis of the factors related to the sleep quality among health care workers

Taking the total score of the SRSS as the dependent variable, factors that were statistically significant in the univariate analysis were used as independent variables in the multivariate analysis. In addition, factors such as age and working years, which possibly impact sleep quality, were also considered. The assignments of the factors are shown in Table 1. The results of the analysis indicated that gender, whether the respondent had patients who passed away under their care/treatment, whether participants had previously suffered from psychiatric-related diseases, and whether they had family members who were infected with COVID-19 during the outbreak ($P < 0.05$) are the primary factors that affect the patient's sleep quality. All the data are shown in Table 2. The F-value (8,201) is 25.235 ($P < 0.001$), which indicates that the fitted multiple linear progressive regression equation was statistically significant. After evaluating the regression equation model, the multiple correlation coefficient ($R = 0.708$) and the coefficient of determination ($R^2 = 0.481$) were calculated. Thus, these four independent variables can effectively explain the 48.1% of the variance in the sleep quality of the participants.

3.3 The GAD-7 score and its influencing factors

3.3.1 GAD-7 score

The average GAD-7 score of all participants was 12.37 ± 4.89 , which indicated moderate anxiety. This result indicates that healthcare workers who provided aid in Hubei may have prominent anxiety.

3.3.2 Analysis of influencing factors related to anxiety

The GAD-7 scores were compared based on different demographic characteristics and epidemic-related experiences. The results showed that there were statistically significant differences among different groups ($P < 0.05$) in terms of gender, marital status, educational background, title, whether they had nursed/treated seriously ill patients, whether they had a history of psychosis, whether their family members were infected with COVID-19 and their self-perceived health status. See Table 1 for details.

3.3.3 The multiple stepwise regression analysis of the factors related to the anxiety of healthcare workers

Taking the total score of GAD-7 as the dependent variable, the factors that were statistically significant in the univariate analysis were analysed as independent variables in the multivariate analysis. In addition, factors such

as age and working years, which possibly impact anxiety, were also considered. The assignments of the factors are shown in Table 1. The results of the analysis indicated that gender, working years, self-perceived health status, whether participants had previously suffered from psychiatric-related diseases, and whether their family members were infected with COVID-19 during the outbreak ($P < 0.05$) are the primary factors that affect the patient's level of anxiety. See table 3 for details. The F-value (8,201) was 21.395 ($P < 0.001$), which indicated that the fitted multilinear progressive regression equation is statistically significant. After evaluating the regression equation model, the multiple correlation coefficient ($R = 0.678$) and the coefficient of determination ($R^2 = 0.438$) were calculated. Thus, these five independent variables can adequately explain 43.8% of the variance in anxiety among the participants.

3.4 The PHQ-9 score and its influencing factors

3.4.1 The PHQ-9 score

The average PHQ-9 score of all participants was 8.90 ± 5.42 , which indicated mild depression. This suggests that healthcare workers who provided aid in Hubei may have a certain degree of depression.

3.4.2 Analysis of influencing factors related to depression

The PHQ-9 scores were compared based on different demographic characteristics and epidemic-related experiences. The results showed that there were statistically significant differences among different groups ($P < 0.05$) in terms of educational backgrounds, whether the respondent had nursed/treated seriously ill patients, and whether they had a history of psychosis. See Table 1 for details.

3.4.3 Multiple stepwise regression analysis of influencing factors related to depression among health care workers

Taking the total score of the PHQ-9 as the dependent variable, the factors that were statistically significant in the univariate analysis were analysed as independent variables in the multivariate analysis. In addition, factors such as age and working years, which possibly impact depression, were also considered. The assignments of the factors are shown in Table 1. The analysis results indicated whether participants had previously suffered from psychiatric-related diseases and whether they nursed/treated seriously ill patients during the outbreak ($P < 0.05$) are the primary factors that affect the participants' degree of depression. See table 4 for details. The F-value (6,203) is 6.769 ($P < 0.001$), which indicates that the fitted multilinear progressive regression equation is statistically significant. The multiple correlation coefficient ($R = 0.408$) and the coefficient of determination ($R^2 = 0.142$) were also calculated. Thus, these two independent variables can only explain 14.2% of the variance in depression.

4. Discussion

This study used an online questionnaire to assess the mental health status of healthcare workers who provided aid in Hubei during the COVID-19 outbreak. The relevant influencing factors that may affect the psychological conditions of the respondents were also examined to obtain guidance on how to develop psychological interventions for these workers after their return from Hubei.

A total of 210 healthcare workers were recruited in this study. Among them, the number of nurses was higher than that of doctors, which indicated that the shortage of nurses in the outbreak site was worse than that of doctors. Every day, nurses must perform the daily care for the patients. Only with the appropriate number of healthcare workers and effective collaboration can the work be optimized. In addition, 93.3% of the participants reported that they had nursed or treated seriously ill patients. Moreover, some healthcare workers also reported that they had family members who were infected. However, these workers had to continue to provide medical assistance even under great pressure, which may have contributed to their stress. Only 23.3% of the respondents reported that physical health was excellent. These phenomena indicate that China's medical workers are facing substantial work pressure. This suggests that more attention should be paid to the psychological health status of special populations.

Through this investigation, most of the healthcare workers thought that psychological support was necessary. These workers took the initiative to go to the epidemic site to provide support. Additionally, they were required to work in hospitals for a long time, and the rest of their time was spent in a hotel in isolation. These factors may have affected the mood of the workers. Good social support is positively correlated with mental health and social functions[13]. Providing psychological support and counselling at an early stage is essential and can effectively reduce the pressure of their work during such stressful periods. For example, the simplest method of psychological support is to provide workers more time to communicate with their families through the internet. The questionnaire used in this study was designed to give each participant feedback instantly, taking into account the importance of psychological factors to these particular groups, so that they can understand their current mental health level. In addition, based on their scores, the research team provided corresponding relaxation training videos and audio guidance, such as mindfulness breathing relaxation trainings or meditation trainings. Deng surveyed medical staff involved in the treatment of COVID-19 and found that proper mindfulness training can be effective in improving frontline workers' mental health[14]. At the same time, the hotline set up by the Fourth People's Hospital of Chengdu for psychological help is available. If participants feel that their psychological problems cannot be alleviated independently, they can call the hotline at any time. Professional psychotherapists will offer them a telephone consultation to help them improve their psychological condition.

The survey found that irresponsible disinformation makes the workers the most angry, as rumours tend to exacerbate public panic[15], which is bound to have more negative effects on epidemic prevention efforts. The opinion of our participants indicates that in the event of another public health emergency, the government may need to regulate the reporting guidelines of industries such as new media to minimize the spread of false information and to enhance the confidence of frontline medical workers.

The study found that those who cared for or treated patients who eventually died were more likely to have sleep problems. Additionally, those who had worked for more years and considered their health worse were prone to develop anxiety symptoms. Witnessing the death of a patient can lead to a certain amount of stress. Gao et al. found that the stress level of individuals who had seen death during an earthquake significantly increases[16]. Therefore, it is understandable when medical workers have insomnia after experiencing the death of their patients. The longer the participants have worked, the older they are. They have less energy than younger people. Hence, when facing such an intense level of work, they are more likely to suffer more anxiety. People who rated their health lower may be more likely to have a negative evaluation of their emotional state.

In addition, the survey found that males who had a history of anxiety disorders and whose family members had been infected with COVID-19 would have more sleep problems and anxiety symptoms. Men are more likely to take a repressive approach when facing changes in the environment and stress events. However, this approach does not lead to the decline of negative emotions. Conversely, the repressed negative emotions may be expressed via another form of physical discomfort, such as insomnia, which is one of the most common symptoms of anxiety. The above screening of the relevant factors suggests that psychological interventions should be tailored based on the worker's circumstances. For those with special experience, offering regular psychological support and additional guidance for their sleep habits should be considered. Only good sleep can ensure that workers have the full mental capacity to cope with medical work. At the same time, it may also be necessary to design short-term, fast-acting psychological assistance programmes for this particular group of people to relieve anxiety, including focus-solving therapy and music therapy.

Conclusions

Finally, through this study, we can discover that there is a specific lopsidedness in mental health level and sleep of healthcare workers in Hubei Province. When coming to the influencing factor, we also found that male workers, those whose patients have died during their treatment, with previous anxiety disorders and whose family members infected with COVID-19 were facing more serious problems. Therefore, this special group needs to be strengthened follow-up psychological support individually.

Declarations

Ethics approval and consent to participate:

The research has got the institutional review board (IRB) approval of West China Hospital, and all the subjects were recruited in the principle of voluntary.

Consent for publication:

Not applicable.

Availability of data and materials:

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests:

The authors declare that they have no competing interests.

Funding:

Not applicable

Authors' contributions:

Peng Zhou was a major contributor in writing the manuscript, and he also was responsible for recruited the subjects in this survey. Na Du was responsible for the corresponding part of this manuscript, and she designed the investigation. Yingjie OuYang and Dongmei Diao collected and analyzed the data, and they also translated this article to English. All authors read and approved the final manuscript.

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Tables

Table 1 The ANOVA of SRSS, GAD-7 and PHQ-9 ($\bar{x} \pm s$, $n=210$)

Group and Patients	Cases	means			SRSS	GAD-7	PHQ-9	SRSS	GAD	PHQ
		SRSS	GAD-7	PHQ-9	statistics	statistics	statistics	<i>P-</i>	<i>P-</i>	<i>P-</i>
								<i>value</i>	<i>value</i>	<i>value</i>
Depressed and Anxious	105	26.60±6.38	14.46±3.80	9.50±5.37	3.397a	6.832a	1.611a	0.001	0.000	0.109
	105	23.67±6.12	10.28±4.99	8.30±5.42						
	98	24.64±6.33	11.45±5.45	8.77±5.23	1.037a	2.576a	0.348a	0.301	0.011	0.728
	112	25.56±6.48	13.17±4.21	9.03±5.60						
Anxiety Disorder	147	25.52±6.96	12.03±5.42	9.27±5.68	1.351a	1.540a	1.477a	0.178	0.125	0.141
	63	24.22±4.82	13.16±3.25	8.06±4.69						
Seriously Ill	196	25.21±6.58	12.69±4.90	9.28±5.33	0.684a	3.736a	3.885a	0.495	0.000	0.000
	14	24.00±3.11	7.79±0.80	3.64±3.65						
Patients with Depression	140	25.90±6.28	12.69±4.77	9.17±5.60	2.481a	1.338a	1.008a	0.014	0.182	0.314
	70	23.60±6.44	11.73±5.11	8.37±5.03						
Patients with Anxiety Disorder	21	37.33±0.48	18.67±2.11	13.86±5.58	11.879a	6.871a	4.625a	0.000	0.000	0.000
	189	23.78±5.22	11.67±4.61	8.35±5.13						
Patients with Both Depression and Anxiety Disorder	14	28.50±3.63	16.00±3.11	8.36±5.18	2.049a	2.927a	0.391a	0.042	0.004	0.697
	196	24.89±6.50	12.11±4.90	8.94±5.45						
Patients with Depression and Anxiety Disorder and Bipolar Disorder	14	24.00±3.11	13.50±1.56	6.93±4.16	2.367b	14.208b	2.820b	0.072	0.000	0.040
	77	23.82±5.56	10.22±4.34	8.17±4.97						
Patients with Depression and Anxiety Disorder and Schizophrenia	105	26.27±7.34	14.20±5.04	9.92±5.74						
	14	25.00±6.41	9.29±1.94	7.29±5.28						

(1)	105	25.53±6.98	11.30±5.32	8.70±5.88	0.521b	10.428b	0.663b	0.595	0.000	0.516
	84	24.58±6.26	14.15±4.24	9.38±4.90						
	21	25.33±3.38	10.52±2.38	8.05±5.02						
I	49	24.21±6.24	11.24±5.53	8.41±5.56	4.201b	4.366b	0.911b	0.016	0.014	0.404
	133	26.29±6.78	12.31±4.38	9.28±5.45						
	28	27.50±5.83	14.61±5.44	8.23±5.03						

Note: a represents t value, b represents F value

Table 2 The Multiple stepwise regression analysis of influencing factors of SRSS

variable	Regression coefficients	Standard error of regression coefficient	Standardized regression coefficient	T-value	P-value
Gender	-1.652	0.740	-0.129	-2.233	0.027
Death	-2.163	0.925	-0.159	-2.339	0.020
History of psychosis	-11.871	1.194	-0.557	-9.946	0.000
Family-infected	-7.315	1.622	-0.285	-4.510	0.000
constant	69.850	5.927			

Table 3 The Multiple stepwise regression analysis of influencing factors of GAD-7

variable	Regression coefficient	Standard error of regression coefficient	Standardized regression coefficient	T-value	P-value
Gender		0.588	-0.298	-4.945	0.000
Work-year	-2.906	0.099	0.245	2.785	0.006
History of psychosis	0.274	0.948	-0.419	-7.192	0.000
Health	-6.817	0.469	0.317	5.514	0.000
Family-infected	2.588	1.288	-0.247	-3.753	0.000
Constant	-4.835	4.708			
	31.630				

Table 4 The Multiple stepwise regression analysis of influencing factors of PHQ-9

variable	Regression coefficient	Standard error of regression coefficient	Standardized regression coefficient	T-value	P-value
			-0.271	-3.920	0.000
History of psychosis	-4.877	1.244	-0.257	-3.619	0.000
Care of Seriously ill patients	-5.597	1.542			
constant	18.827	3.883			