The mental health of neurological doctors and nurses in Hunan Province, China, during the COVID-19 outbreak

Xianjun Ning
Department of Neurology, Xiangya Hospital, Central South University
Fang Yu
Department of Neurology, Xiangya Hospital, Central South University
Qin Huang
Department of Neurology, Xiangya Hospital, Central South University
Xi Li
Department of Neurology, Xiangya Hospital, Central South University
Yunfang Luo
Department of Neurology, Xiangya Hospital, Central South University
Qing Huang
Department of Neurology, Xiangya Hospital, Central South University
Changqing Chen (13873117882@163.com)
Department of Neurology, Xiangya Hospital, Central South University

Research Article

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1 Background

After first emerging in Wuhan, China in December 2019, the 2019 novel coronavirus (2019-nCoV), now dubbed COVID-19, quickly spread throughout the world [1]. This new coronavirus has turned out to be much more infectious than severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV), which caused massive outbreaks [2, 3].

Recently, many clinical studies of the epidemiological and clinical characteristics of cases with COVID-19 have been published [4-6]. Unlike SARS, which mostly affected young and middle-aged people, the novel coronavirus tends to result in serious illness in elderly people, especially those with chronic diseases such as diabetes, hypertension, and cardiovascular and cerebrovascular diseases [6, 7]. The main initial clinical manifestations include fever, cough, and shortness of breath. However, some patients do not have major symptoms, developing atypical initial symptoms in the digestive system or nervous system, which makes correct diagnosis difficult [8]. Furthermore, a proportion of 2019-nCoV-positive patients, have nonspecific symptoms or even are asymptomatic, a state in which the virus can still spread and cause infection [9,10]. At present, our understanding of this novel coronavirus is incomplete. Respiratory droplets and person-to-person contact are defined routes of transmission for coronavirus infection, while transmission via the fecal-oral and the aerosol routes remains ambiguous [11-13].

Since the outbreak, a shortage of medical supplies has been a weakness in the prevention and control of the epidemic, that severely restricts the treatment of patients and threatens the safety of medical staff. An epidemiological study based on the first 72,314 cases of COVID-19 found on the Chinese mainland from the outbreak on December 31, 2019, to February 11, 2020, reported that at least 3000 medical workers had been infected with 2019-nCoV [14]. Medical protective supplies were mainly distributed to the appointed COVID-19 accepting hospitals, intensive care units, and fever outpatient departments. Medical personnel in general hospitals and other departments outside the front-line may be at high risk of infection because they do not have enough protective equipment.

Some studies have reported that several respiratory viruses, such as SARS-CoV, have the capacity to spread from the respiratory system to the central nervous system (CNS), causing encephalitis and other neurological diseases [15]. In clinical practice in departments of neurology, headache may be the main symptom of some neurological diseases, such as, cerebrovascular disease and central nervous system infection. If a COVID-19 patient visits a medical department of neurology with headache as the initial symptom without fever or respiratory discomfort, he or she could be underdiagnosed and become a main reservoir of infection. Medical workers could become infected through their contact with those patients in cases of inadequate medical protection.

Biological disasters have a high risk of spreading infection and increased mortality, which increases the fear of social contact, especially for health care staff who have close contact with infected patients during epidemic outbreaks [16]. It is believed that the prevention of mental health disorders should receive more attention to minimize the negative health impact of infectious diseases [17]. The experience with SARS indicated that the prevalence of psychiatric morbidity, such as fear and anxiety, was high among medical workers, patients, and even the general public [18, 19].

To date, the psychological impacts of COVID-19 have remained unknown. Mental health care for medical workers, whether working on the front line or not, should receive serious consideration. Thus, the aim of this study was to investigate the mental health of medical workers in departments of neurology during the outbreak of COVID-19 in Hunan province.

2 Methods

2.1. Participants

Self-administered electronic questionnaires were randomly distributed to medical workers from the departments of neurology in Hunan Province in early February 2020. Finally, effective questionnaires were returned from 317 doctors and 295 nurses. The protocol of this study was approved by the local Ethics Committee of Xiangya Hospital and all participants completed the self-reported questionnaire after providing informed consent.

2.2. Sociodemographic factors

Demographic characteristics such as age, sex, educational level, occupational title and marital status of the participants were collected in this study.

2.3. Attitudes toward the epidemic outbreak

In the electronic questionnaire, the following three questions addressed respondents' perceptions of COVID-19 during the outbreak: 1) Do you think the department of neurology is a high-risk place for COVID-19? 2) Are your current precautions adequate to prevent infection? 3) Are you willing to treat or care for patients with COVID-19?

2.4. Assessment of anxiety and depression

We adopted the Chinese edition of Zung's Self-Rating Depression Scale (SDS) and Zung's Self-Rating Anxiety Scale (SAS) to assess the degree of anxiety and depression. The widely used SAS and SDS scales are quick and convenient scales to evaluate anxiety and depressive symptoms of investigated subjects, and are valid and efficient for the Chinese population. Both scales contain 20 items, and are judged on a scale of 1 to 4 to assess all statements (rarely, sometimes, frequently, or always). The total crude score ranges from 20 to 80 points, and is then multiplied by 1.25 to obtain a standard scale. The cut-off standard score of SAS is 50 points, and a score ≥ 50 points indicates anxiety. Meanwhile, a standard SDS score ≥53 indicates positive depression screening. The higher the score, the higher the degree of anxiety or depression [20, 21].

2.5. Statistical analysis

Statistical analysis was performed using SPSS 26.0 (IBM SPSS, Chicago, IL, USA). The enumeration data are presented as the number (*n*) and percentage, and the measurement data are descripted as the mean (*SD*). Data were compared between groups using Student's *t*-test and the chi-square test. The single-sample *t*-test was used to compare the neurology staff's scale scoring with Chinese norm scoring [22]. Binary logistic regression analysis was performed to evaluate the independent risk factors of anxiety. Significant variables identified by univariate analysis were then entered into the regression models. Results were expressed as odds ratios (OR) with 95% confidence intervals (CIs). Two-tailed P values <0.05 was considered to indicate statistical significance.

3 Results

3.1. Sociodemographic characteristics and attitudes of neurological doctors and nurses

The 612 neurology staff members included 317 doctors and 295 nurses. The two groups differed with respect to sex, age, education level, marital status, and occupational title. Most nurses were female, with only six male nurses responding. With age stratified, 20.1% of all subjects above 40 years and 79.9% below or equal to 40 years, nurses were younger than doctors, with 90.5% of nurses below 40 years. The education levels were divided into undergraduate or lower and graduate or higher. The proportion of doctors with high education (54.6%) was higher than that of nurses (2.4%). The number of single nurses was much higher than that of single doctors. The proportion of senior occupational titles in doctors (41.6%) was higher than that in nurses (8.5%). Among all participants, 210 (34.3%) agreed, 108 (17.6%) disagreed, and 294 (48.0%) were uncertain that the department of neurology was a high-risk place for COVID-19. The proportion agreeing was higher in nurses than in doctors. Only a few (10.9%) medical workers in the neurology department thought that the protective measures were adequate to prevent infection, with no significant difference between doctors and nurses. This may be due to the fear of infection, for some medical workers were not willing to treat or care for infected patients, and we found that the proportion of doctors expressing unwillingness was higher than in nurses. (Table 1).

3.2. Anxiety and depression of participants

The average SAS standard score of participants was 41.33 ± 8.98, which was higher than the Chinese national norms. The average SDS standard score of participants was 41.96 ± 11.46, which was not different from the Chinese national norms (Table 2).

The prevalence of anxiety and depression among medical staff by basic characteristic is shown in Table 3. Female medical workers (18.4%) had a significantly higher proportion of anxiety than male (10.8%). Symptoms of anxiety and depression were more prevalent among neurological nurses, younger workers (≤ 40 years), and medical staff with junior titles. We also found that workers who thought that the protective measures were not enough to prevent infection were more likely to report anxiety-positive. The attitudes toward COVID-19 were not related to symptoms of anxiety or depression.

In further analysis, we used logistic regression analysis to identify the independent factors of anxiety and depression. Variables showing $P < 0.05$ in the univariate analysis were selected for entry into logistic regression analysis. The results of the bivariate analysis (Tables 4 and 5) indicated that medical workers who disagreed that the current protective measures were adequate to prevent infection were significantly more likely to report positive anxiety (OR = 2.004, 95% CI: 1.257 - 3.193). Symptoms of depression were significantly associated with age (OR = 0.441, 95% CI: 0.222 - 0.874, age > 40 years old compared with 40 years old or younger), indicating that young age may be a risk factor for depression.

4 Discussion

This is the first study to report the prevalence of anxiety and depression among neurological doctors and nurses in Hunan Province during the outbreak of COVID-19. Our study found that the SAS scores of the neurological staff was higher than the Chinese national norms, symptoms of anxiety and depression were more prevalent among neurological nurses than doctors. The shortage of protective equipment was the main factor influencing the anxiety of medical staff in the neurology department.

In dealing with this large-scale public health emergency, healthcare workers experienced both physical and psychological pressure. A retrospective clinical study of 138 hospitalized patients from

Zhongnan Hospital of Wuhan University found that novel coronavirus pneumonia caused by hospital-related transmission was common, 40 (29%) healthcare workers were presumed to have been infected in hospitals. Of these patients with nosocomial infections, 31(77.5%) were from the general wards, seven (17.5%) were from the emergency department, and two (5%) were from the intensive care unit (ICU) [4]. What is worse, at least 3000 medical workers across the Chinese mainland have been infected with novel coronavirus during the nationwide outbreak, according to the epidemiological characteristics of the outbreak of 2019 novel coronavirus disease (COVID-19) in China [14]. As the number of infected medical staff members increases, medical workers have been experiencing psychological disorders such as anxiety, depression, and sleep disturbances [23].

This SARS-like coronavirus has the ability to use the cell entry receptor, angiotensin-converting enzyme 2 (ACE2), and replicate in human cells of multiple human organs including nervous system [24, 25], leading to abnormally high blood pressure and increasing the risk of cerebral hemorrhage. In China, the presence of 2019-nCoV in the cerebrospinal fluid was confirmed by gene sequencing of a 56-year-old patient with COVID-19 in Beijing [26]. The neurological symptoms of patients with COVID-19 have been described in some studies. Some patients were admitted to the hospital with symptoms of sudden slurred speech, limb paralysis, headache, epilepsy, or confusion [27, 28]. As general wards away from the front line, departments of neurology, are also considered high-risk. In our study, 210 (34.3%) medical workers thought that the department of neurology was a high-risk place for COVID-19; the proportion of holding this attitude was greater in nurses than in doctors. Only 67 medical workers agreed that the current protective measures were adequate to prevent infection, accounting for 10.9% of the total. Volunteer medical workers have been recruited from other departments to assist the frontline medical personnel. Many of the neurological staff were willing to treat or care for infected patients, and the proportion holding this attitude was also higher in nurses than in doctors. We found that nurses and female medical workers were more likely to develop anxious symptoms; younger workers and those who had lower occupational titles were more prone to anxiety and depression. Our findings generally consistent with other study on COVID-19 and previous studies on SARS in 2003 [29, 30, 31], which reported that women and nurses reported more severe symptoms of anxiety and distress. Nurses play a critically important role in the battle against COVID-19; they have a higher risk of infection due to their close contact with patients during nursing work. According to the Shanghai Women's Federation, over 50% of doctors and over 90% of nurses fighting the virus in Wuhan were women [32]. In our study, almost half of the doctors were women, and 98% of the nurses were women. Women may be more prone to anxiety, possibly due to the high risk of infection, heavy pressure from family, and effects of female hormones. Moreover, 59% of all nurses had junior titles or below, indicating fewer work experiences. Similarly, medical workers aged below 40 years and having lower occupational titles faced mental health disorders of anxiety and depression, probably due to insufficient experience in dealing with this public health emergency.

The fear of uncertainty of the coronavirus transmission routes and the dissemination of negative information about the infection of medical staff have resulted in great anxiety among medical workers. We found that worry about the shortage of protective equipment was independently associated with anxiety. Younger age was an independent risk factor for depression. Since the outbreak, there has been a shortage of medical protective supplies such as medical protective clothing, N95 masks, medical masks, protective masks, and goggles that are urgently needed for the prevention and control of the epidemic, which has severely threatened the safety of health care workers. During the outbreak of COVID-19, primary protection measures were recommended in the neurology clinic and wards, while secondary protection measures were used for high-risk exposed personnel when dealing with suspected patients to alleviate the shortage of supplies [28].

Nonetheless, primary protective measures like surgical masks remained in seriously short supply in neurology departments. It is difficult for neurological workers to differentiate and screen patients with manifestations of the neurological system as the initial symptoms without fever and pulmonary disorders, which may lead to inadvertent exposure of medical staff to the virus.

Multifaceted interventions should also be undertaken to relieve anxiety and depression among medical workers in neurology department. First, preliminary checking and differentiating diagnosis of suspected cases should be firmly implemented to ensure the safety out of the front line. Second, employees in department of neurology should acquire in-depth knowledge of infection prevention to improve compliance with hand disinfection and personal protective measures. Third, with the opening of outpatient appointments, hospitals should also pay attention to the medical workers out of the frontline and provide adequate protective equipment to reduce their risk of infection. Fourth, we can learn from the experiences of the Second Xiangya Hospital in Hunan Province and establish such resources as online courses and psychological assistance hotline teams to guide medical workers in dealing with common mental health problems, and various group activities to help staff release stress [17]. Workers with psychological disorders can also use online psychological self-help intervention systems to reduce symptoms of anxiety and depression [23]. Fifth, our government should strengthen support for and safeguard the legitimate rights and interests of medical workers during epidemic control and in the future.

This study was several limitations. First, the participants were all from Hunan Province, limiting the generalization of our findings to other studies. Second, it's limited by its use of the SAS and SDS to measure symptoms of anxiety and depression, which was different from a clinical diagnosis. Third, the study was cross-sectional, and no cause-effect relationship can thus be established between the attitude toward COVID-19 and mental health disorders. Fourth, due to the limited time for designing the questionnaire, the attitude toward COVID-19 only includes three simple questions, lacking multi-dimensional measures.

5 Conclusion

During the fight against COVID-19 in Hunan Province, the shortage of protective equipment has led to the anxiety among medical staff in departments of neurology. Much more attention should be paid to the medical workers out of the frontline, including providing necessary protective equipment and psychological assistance.

Abbreviations

COVID-19 Coronavirus Disease 2019

SAS Zung Self-Rating Anxiety Scale

SDS Zung Self-Rating Depression Scale

2019-nCoV 2019 novel coronavirus

SARS-CoV Severe acute respiratory syndrome coronavirus

MERS-CoV Middle East respiratory syndrome coronavirus

CNS central nervous system

ACE2 angiotensin-converting enzyme 2

Declarations

Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. All subjects have signed the informed consent and the study protocol was approved by the Ethics Committee of Xiangya Hospital of the Central South University in China.

Consent for publication

Not applicable.

Availability of data and Materials

Generated Statement: The datasets generated for this study are available on request to the corresponding author.

Competing Interests

All authors declare no conflict of interest.

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Author Contributions

CQC designed the study. QH, XL and YFL were responsible for the data collection. FY, XJN wrote the manuscript. CQC and QH modified and revised the manuscript. All authors have read and approved the final version of the manuscript.

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Table 1 Demographic characteristics and attitudes toward COVID-19 of neurological doctors and nurses

Parameters	Total (*n* = 612)	Doctors (*n* = 317)	Nurses (*n* = 295)	*P* value
Sex				
Male	166 (27.1%)	160 (50.5%)	6 (2.0%)	**< 0.001**
Female	446 (72.9%)	157 (49.5%)	289 (98.0%)	
Age				
≤ 40 years	489 (79.9%)	222 (70.0%)	267 (90.5%)	**< 0.001**
> 40 years	123 (20.1%)	95 (30.0%)	28 (9.5%)	
Education level				
Undergraduate or lower	432 (70.6%)	144 (45.4%)	288 (97.6%)	**< 0.001**
Graduate or higher	180 (29.4%)	173 (54.6%)	7 (2.4%)	
Marital status				
Married	506 (82.7%)	277 (87.4%)	229 (77.6%)	**0.001**
Single	106 (17.3%)	40 (12.6%)	66 (22.4%)	
Title				
Senior	157 (25.7%)	132 (41.6%)	25 (8.5%)	**< 0.001**
Intermediate	208 (34.0%)	112 (35.3%)	96 (32.5%)	
Junior or lower	247 (40.4%)	73 23.0%)	174 (59.0%)	
Do you think the department of neurology is a high-risk place for COVID-19?				
Yes	210 (34.3%)	94 (29.7%)	116 (39.3%)	**0.002**
No	108 (17.6%)	71 (22.4%)	37 (12.5%)	
Uncertain	294 (48.0%)	152 (47.9%)	142 (48.1%)	
Are your current precautions adequate to prevent infection?				
Yes	67 (10.9%)	37 (11.7%)	30 (10.2%)	0.293
No	258 (42.2%)	141 (44.5%)	117 (39.7%)	
Uncertain	287 (46.9%)	139 (43.8%)	148 (50.2%)	

Are you willing to treat or care for patients with COVID-19?				
Yes	298 (48.7%)	142 (44.8%)	156 (52.9%)	**< 0.001**
No	100 (16.3%)	75 (23.7%)	25 (8.5%)	
Uncertain	214 (35.0%)	100 (31.5%)	114 (38.6%)	

Abbreviations: COVID-19: Coronavirus Disease 2019

Table 2. Standard SAS and SDS scores of neurological staff compared to Chinese national norms

	Standard score (n = 612)	Chinese national norm (n = 1338)	*t*	*P* value
SAS	41.33 ± 8.98	33.80 ± 5.90	20.742	**< 0.001**
SDS	41.96 ± 11.46	41.85 ± 10.57	0.246	0.806

Abbreviations: SAS: Zung Self-Rating Anxiety Scale; SDS: Zung Self-Rating Depression Scale.

Table 3. Prevalence of anxiety and depression among neurological workers by different characteristics

Parameters	**Numbers**	**Anxiety**	***P* value**	**Depression**	***P* value**
Sex					
Male	166 (27.1%)	18 (10.8%)	**0.025**	34 (20.5%)	0.115
Female	446 (72.9%)	82 (18.4%)		119 (26.7%)	
Age					
≤ 40 years	489 (79.9%)	88 (18.0%)	**0.027**	138 (28.2%)	**< 0.001**
> 40 years	123 (20.1%)	12 (9.8%)		15 (12.2%)	
Education level					
Undergraduate or lower	432 (70.6%)	77 (17.8%)	0.124	116 (26.9%)	0.101
Graduate or higher	180 (29.4%)	23 (12.8%)		37 (20.6%)	
Marital status					
Married	506 (82.7%)	86 (17.0%)	0.337	125 (24.7%)	0.711
Single	106 (17.3%)	14 (13.2%)		28 (26.4%)	
Occupation					
Doctor	317 (51.8%)	40 (12.6%)	**0.012**	64 (20.2%)	**0.004**
Nurse	295 (48.2%)	60 (20.3%)		89 (30.2%)	
Title					
Senior	157 (25.7%)	18 (11.5%)	**0.041**	25 (15.9%)	**0.006**
Intermediate	208 (34.0%)	31 (14.9%)		54 (26.0%)	
Junior or lower	247 (40.3%)	51 (20.6%)		74 (30.0%)	
Do you think the department of neurology is a high-risk place for COVID-19?					
Yes	210 (34.3%)	40 (19.0%)	0.126	61 (29.0%)	0.193
No	108 (17.6%)	11 (10.2%)		22 (20.4%)	
Uncertain	294 (48.0%)	49 (16.7%)		70 (23.8%)	
Are your current precautions adequate to prevent infection?					

Yes	67 (10.9%)	8 (11.9%)	**0.009**	17 (25.4%)	0.537
No	258 (42.2%)	56 (21.7%)		70 (27.1%)	
Uncertain	287 (46.9%)	36 (12.5%)		66 (23.0%)	
Are you willing to treat or care for patients with COVID-19?					
Yes	298 (48.7%)	44 (14.8%)	0.569	67 (22.5%)	0.300
No	100 (16.3%)	17 (17.0%)		25 (25.0%)	
Uncertain	214 (35.0%)	39 (18.2%)		61 (28.5%)	

Abbreviations: COVID-19: Coronavirus Disease 2019

Table 4. Logistic regression analysis of anxiety in medical staff

	***P* value**	**OR**	**95% CI for OR**
Sex	0.520	1.240	0.644 - 2.389
Age	0.383	0.703	0.319 - 1.552
Occupation	0.220	1.414	0.813 - 2.457
Title			
Senior	0.429	0.737	0.346 - 1.571
Intermediate	0.273	0.751	0.447 - 1.254
Junior or lower	Reference		
	P for trend = 0.508		
Are your current precautions adequate to prevent infection?			
Yes	0.983	0.991	0.434 - 2.262
No	0.003	2.004	1.257 - 3.193
Uncertain	Reference		
	P for trend = 0.008		

Sex: Female vs. male; Age: > 40 years vs. ⩽ 40 years; Occupation: nurses vs. doctors

Table 5. Logistic regression analysis of depression in medical staff

	P value	OR	95% CI for OR
Age	0.019	0.441	0.222 - 0.874
Occupation	0.102	1.406	0.935 - 2.113
Title			
Senior	0.562	0.826	0.434 - 1.574
Intermediate	0.804	0.947	0.617 - 1.454
Junior or lower	Reference		
	P for trend = 0.845		

Age: > 40 years vs. ≤ 40 years; Occupation: nurses vs. doctors

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