

The psychological impact of COVID-19 outbreak on medical staff and the general public

Biao Chen

Department of Orthopedic Surgery, Zhongnan Hospital of Wuhan University, Wuhan 430071, China

Qing-xian Li

Department of Orthopedic Surgery, Zhongnan Hospital of Wuhan University, Wuhan 430071, China

Heng Zhang

Department of Gastroenterology, The Central Hospital of Wuhan, Tongji Medical College, Huazhong University of Science and Technology, Wuhan 430014, China

Jia-yong Zhu

Department of Orthopedic Surgery, Zhongnan Hospital of Wuhan University, Wuhan 430071, China

Yu-hang Wu

Applied Statistics, School of mathematics and statistics, Wuhan University, Wuhan 430072, China

Jie Xiong

The Mental Health Center of Wuhan, Wuhan 430022, China

Fu Li

The Mental Health Center of Wuhan, Wuhan 430022, China

Hua Wang (✉ whzkwlh@sina.com)

Department of Orthopedic Surgery, Zhongnan Hospital of Wuhan University, Wuhan 430071, China

Zhi-tao Chen (✉ chenzhitao830201@163.com)

Department of Gastroenterology, The Central Hospital of Wuhan, Tongji Medical College, Huazhong University of Science and Technology, Wuhan 430014, China

Research Article

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Abstract

Purpose: To assess the psychological effects of the novel coronavirus disease (COVID-19) on medical staff and the general public.

Methods: During the outbreak of COVID-19, an internet-based questionnaire included The Self-rating Depression Scale (SDS), Perceived Stress Scale (PSS-10), and Impact of Event Scale-Revised (IES-R) was used to assess the impact of the epidemic situation on the mental health of medical staff and general population in Wuhan and its surrounding areas.

Results: The results suggest that the outbreak of COVID-19 has affected individuals significantly, the degree of which is related to age, sex, occupation and mental illness. There was a significant difference in PSS-10 and IES-R scores between the medical staff and the general population. The medical staff showed higher PSS-10 scores (16.813 ± 4.87) and IES-R scores (22.40 ± 12.12) compared to members of the general population PSS-10 (14.80 ± 5.60) and IES-R scores (17.89 ± 13.08). However, there was no statistically significant difference between the SDS scores of medical staff (44.52 ± 12.36) and the general public (43.08 ± 11.42). In terms of the need for psychological assistance, 50.97% of interviewees responded that they needed psychological counseling, of which medical staff accounted for 65.87% and non-medical staff accounted for 45.10%.

Conclusion: During the ongoing COVID-19 outbreak, great attention should be paid to the mental health of the population, especially medical staff, and measures such as psychological intervention should be actively carried out for reducing the psychosocial effects.

Introduction

In December of 2019, a new acute respiratory disease, the novel coronavirus disease (COVID-19), originated in Wuhan, Hubei Province, China [1]. Subsequently, the disease spread rapidly across the globe, posing a great challenge to worldwide health care systems [2-4]. COVID-19 is a highly infectious disease with rapid transmission and short incubation period [1,5]. Many patients do not have typical clinical manifestations. Because the disease is mainly transmitted by close contact and respiratory droplets and easily transfers between individuals in the family and hospital settings, the health care workers and the patients' family members are high-risk groups [6,7]. As of February 11, 2020, China has confirmed 1716 cases of COVID-19 among medical personnel, accounting for 3.8% percent of all confirmed cases in the country, according to the State Council press release. Wuhan has 1102 confirmed cases among health care workers, accounting for 73.8% percent of the country's confirmed cases.

The fight against COVID-19 pneumonia is a serious challenge for medical staff, especially for those who work on the front line [8]. Hard work, lack of sleep, and shortage of medical staff make the challenges of dealing with the infection highly stressful [9]. It is likely that these combined factors may lead to increases in mental strain, depression, and physical and mental fatigue of medical workers. During the treatment and nursing of COVID-19 patients, some adverse psychological reactions such as fear,

depression, and social psychological disorder appeared. For the general population, the lack of understanding of the disease and strict prevention and control measures on the impact of life have exacerbated their psychological stress [10]. If these adverse psychological reactions are unable to be efficiently regulated and solved in time, the degrees of punitive physical and psychological harm may be difficult to estimate.

The Public Health Emergency of International Concern (PHEIC) recently called for an extraordinary public health response, similar to what was observed for SARS, H1N1, Zaire Ebolavirus, and Zika [11–14]. However, the COVID–19 outbreak targeted a large number of locations during a short period of time, resulting in increasing concerns about the speed and mode of transmission of the disease, particularly taking into consideration the large number of medical staff and the general population infected in Wuhan [15]. This situation has generated a significant psychological and emotional burden among the anti-COVID–19 medical staff and the general population, which poses a great challenge to government and healthcare systems worldwide [8,10]. This report administered questionnaires and surveys to medical staff and members of the general population in order to explore the effects of COVID–19 on mental health. The findings of this report provide a reference for incorporating humanistic care and psychological intervention into the rescue strategies and emergency response procedures to major public health events.

Methods

The study was approved by the Wuhan Central Hospital Ethics Committee. In order to reduce the potential spread of the virus during direct contact, the survey was administered by using the network questionnaire. All samples were taken randomly from the population living in Wuhan, China, and its surrounding areas from 23 January to 22 February 2020. We divided the population into medical staff group and non-medical staff group according to different occupations. A total of 1600 questionnaires were distributed and received 1493 questionnaires. The questionnaire, consisting of 160 multiple-choice questions and short answer questions, took about 20 minutes to complete.

The Self-rating Depression Scale (SDS), Perceived Stress Scale (PSS–10) and Impact of Event Scale-Revised (IES-R) scales were used to evaluate the impact of the epidemic on the mental health of medical staff and the general population during the epidemic period of COVID–19. Each item of SDS was divided into four grades according to the frequency of symptoms: no or little time, little time, considerable time, most or all time. The critical value of depression was 53, in which higher scores indicated greater depressive tendencies [16]. The PSS–10 stress scale is designed to measure the perceived subjective stress, and includes six negative description items and four positive feeling description items [17]. Each item is scored on a 1–5 scale: never, almost never, sometimes, often, always. The IES-R event impact scale is a self-reported measure designed to assess the current subjective distress caused by traumatic life events, consisting of 22 items, each with a 0–4 Likert rating scale, with the highest score being 88 [18].

Statistical Analysis

Categorical variables are described in terms of frequency and percentage, and continuous variables are described in terms of mean and standard deviation. Using the demographic information of interviewees as the independent variable, we conducted linear regression analyses on the variables SDS, PSS-10, and IES-R to determine whether the demographic variables explained variance in the scale outcomes. The Wilcoxon rank sum test was used to analyze the psychological test results of medical and non-medical staff to determine differences between the groups. All statistical analyses were performed using SPSS (24.0) and Matlab (R2019a). GraphPad Prism (v8.0) was used to create the artwork. In the above tests, $P \leq 0.05$ was considered to be statistically significant.

Result

1. Study Population Characteristics

A total of 1600 questionnaires were distributed and received 1493 questionnaires yielded valid data in this survey. Demographic information was presented in Table 1.

Table 1: Baseline characteristics of interviewees

Characteristics	Sample size	No (%)
Age, Range, y		
<18	13	0.87
18-25	572	38.31
26-35	467	31.28
36-45	296	19.83
46-55	119	7.97
56-65	25	1.67
>66	1	0.07
Gender		
Male	827	55.39
Female	666	44.61
Education		
Junior middle school or below	41	2.75
Technical secondary school/High school/Vocational high school	288	19.29
Junior college	841	56.33
Master's/Doctor's degree	323	21.63
Occupation		
Medical staff	422	28.27
No-medical staff	1071	71.73
If there are any suspected or confirmed COVID-19 cases		
Yes	327	21.90
No	1166	78.10
History of mental illness		
Yes	8	0.54
No	1485	99.46
Still working during the epidemic		
Yes	866	58.00
No	627	42.00
Participate in the frontline response		
Yes	301	20.16
No	1192	79.84

2. The relationship between basic information and psychological changes

To determine the relationship between demographic characteristics and scores on the IES-R, PSS-10 and related factors of the SDS score, we conducted linear regression analyses. Specifically, we examined the demographic variables of sex, age, education, history of mental illness, the presence of suspected or confirmed COVID-19 cases, occupation, whether the interviewee is still working during the epidemic, and whether the interviewee participated in the frontline response. The regression coefficients were shown in Table 2.

Table 2: Linear regression analysis of baseline characteristics and questionnaire scores

	IES-R		PSS-10		SDS	
	B (Std. Error) ^a	Beta ^b	B (Std. Error)	Beta	B (Std. Error)	Beta
Sex	4.35 (6.39)**	0.17	0.76 (2.57)*	0.07	3.18 (4.98)**	0.14
Age	1.56 (4.71)**	0.13	0.98 (6.82)**	0.19	-1.03 (-3.31)**	-0.09
Education	0.79 (1.64)	0.04	1.18 (5.65)**	0.16	-1.93 (-4.25)**	-0.12
History of mental illness	17.36 (3.88)**	0.10	4.38 (2.26)*	0.06	18.96 (4.52)**	0.118
Suspected/confirmed cases around	-4.28 (-4.61)**	-0.14	-1.38 (-3.42)**	-0.10	-4.38 (-5.04)**	-0.08
Occupation	-0.04 (-0.54)	-0.02	-0.04 (-1.07)	-0.03	0.02 (0.31)	0.01
Still working during epidemic	3.36 (4.51)**	0.13	0.49 (1.53)	0.04	2.36 (3.38)**	0.10
Participate in the frontline response	-4.15 (-4.32)**	-0.13	-0.33 (-0.80)	-0.02	-2.95 (-3.27)**	-0.10
R ²	0.19		0.15		0.13	
F-value	13.54**		10.04**		10.04**	

* $P < 0.05$, ** $P < 0.01$

^a Unstandardized Coefficients (Standard Errors)

^b Standardized Coefficients

The relationship between related factors and the three scales was shown in Fig. 1. In brief, gender and history of mental illness were positively correlated to IES-R, PSS-10 and SDS scores. There was a negative correlation between IES-R, PSS-10 and SDS scores in the presence of closing to COVID-19 patients or suspected patients. Age was positively correlated with IES-R and PSS-10, but negatively correlated with SDS. Education had no effect on IES-R score, which was positively correlated with PSS-10 score, while negatively correlated with SDS score. Working during the epidemic showed a positive correlation between IES-R and SDS score, and a statistical difference with PSS-10 score. There was a negative correlation between participate in the frontline response. However, there was no statistical difference on PSS-10. Other factors showed no statistical difference in the scores of IES-R, PSS-10, and SDS.

3. Differences between questionnaire scores of medical staff and the general public

The Wilcoxon rank sum test was conducted in order to determine difference in psychological scores between medical staff and members of the general public. There was no significant difference in SDS score between medical staff 44.52(12.36) and the general public 43.08(11.42), $P = 0.08$. The PSS-10 score of medical staff 16.81(4.87) was higher than that of general public 14.80(5.60), $P < 0.01$. Meanwhile, the IES-R score of medical staff 22.40(12.12) was also higher than that of general public 17.89(13.08), $P < 0.01$. The results were presented in Table 3.

Table 3: Wilcoxon rank sum test results for questionnaire score differences between medical staff and the general public

	Medical staff, mean (SD)	General public, mean (SD)	<i>P</i> -value
SDS	44.52 (12.36)	43.08 (11.42)	0.08
PSS-10	16.81 (4.87)	14.80 (5.60)	< 0.01
IES-R	22.40 (12.12)	17.89 (13.08)	< 0.01

Abbreviation: SDS: Self-rating Depression Scale; PSS-10, Perceived Stress Scale; IES-R, Impact of Event Scale-Revised scales.

4. Attitudes and needs of medical staff and the general public towards psychological counseling during the epidemic

Of the 1493 respondents, only 428 (28.67%) had access to psychological training and 761 (50.97%) needed psychological counseling. The relative risk ratio (RR) was defined as 1. In this study, it was found that medical staff (40 [9.47%]) had access to psychological training only 0.27 (95%CI 0.23 to 0.31; $P < 0.01$) times that of the general public (388 [36.23%]), while the demand for psychological counseling of medical staff (278 [65.87%]) was 1.46 (95%CI 1.33 to 1.61; $P < 0.01$) times that of the general public (483 [45.10%]). The results were presented in Table 4.

Table 4: Comparison of the needs of medical staff and the general public for psychological counseling

	<i>N</i> (%)	Medical staff (<i>n</i> =422), (%)	General public (<i>n</i> =1071), (%)	RR (95%CI)	<i>P</i> -value
Access to psychological training	428 (28.67)	40 (9.47)	388 (36.23)	0.27 (0.23~0.31)	< 0.01
Demand for psychological counseling	761 (50.97)	278 (65.87)	483 (45.10)	1.46 (1.33~1.61)	< 0.01

Discussion

The COVID-19 epidemic outbreaked in December 2019 in Wuhan, Hubei Province, China, and soon spread to many countries and regions around the world. To date, there have been many research reports on the basic and clinical treatment of COVID-19 cases [19–21]. However, there have been few investigations on the mental health of medical staff and the general population. It is therefore extremely important to fully understand the mental health of these populations, especially in the face of public health emergencies such as COVID-19. To this end, we conducted a series of mental health surveys for medical staff and the members of the general public.

In analyzing mental health scores of the population during the epidemic, we found a significant high level of psychological distress in the general public, which was more particularly prominent among women and those with mental illness. It is concerning that the additional psychological stress of COVID-19 may aggravate existing symptoms in patients with mental illness, which may subsequently develop more

serious consequences such as decreased immunity and potentially increase the incidence of underlying diseases, thereby increasing the risk of being infected by the virus. We also found that older adults were more likely to be affected, and effects were particularly prominent in non-medical personnel. The reason for this may be related to the comprehensive understanding of the epidemic situation, the public information of the society, and the ability of people to discern the truth [22]. This also explains some seemingly unexpected results. For example, we observed that people with suspected or diagnosed cases around them and those who participated in front-line work during the epidemic seemed to be better mental health, and these results were found mainly in medical staff. However, the psychological health of the general population who were still working during the epidemic was worse. This may be due to the increased risk of infection and excessive fatigue in the pandemic that caused a certain degree of panic among many non-medical staff. In general, our results suggested that the large-scale outbreak of COVID-19 affected individuals on a wide scale, the degree of which was impacted by age, sex, occupation, mental illness, and employment status.

In examining the mental status of medical and non-medical staff using three different scales of mental health, we observed that the epidemic appeared to have resulted in overwhelmingly negative attitude towards many events in life. Compared to the non-medical staff, vast majority of medical staff participating in the front-line epidemic prevention showed significantly higher PSS-10 scores. This phenomenon may reflect the responsibilities of medical staff and psychological stress of close contact with patients. On the other hand, it may also be that the majority of medical personnel with heavy protective gear working in isolation wards face a large degree of psychological shock from the overwhelming information emerging about the disease, which may exacerbate feelings of pessimism and anxiety about the event.

Following the outbreak of COVID-19, it was found through epidemiological investigations that the virus had higher infectivity and a longer incubation period compared to SARS [23]. These remarkable characteristics brought the entire community a huge psychological impact. The results of IES-R showed that an extended period of exposure to negative information related to the outbreak caused a considerable number of medical and non-medical staff to experience what might be similar to a post-traumatic stress response. The main manifestations of this were sleep disorders, anxiety caused by the mention of the epidemic, over-sensitivity and unconscious emergence to the relevant information of the epidemic. Traumatic stress came from a variety of factors, including the severity of the epidemic, developmental trends, duration, and control measures. In combination with the current status of the epidemic, we showed that people were fearful when they realized an epidemic was happening around them.

The results of the SDS depression scale showed no significant differences in scores between medical non-medical staff, although the impact of the incident caused by the epidemic resulted in some symptoms of depression. For medical staff, they were at the center of pathogen exposure and were very susceptible to virus infection, could place a strain on psychological endurance. At the same time, they stayed away from loved ones for long periods of time, leading to observable depressive symptoms. The

possibility of medical personnel becoming infected might negatively impact the confidence of the general public, and factors such as the increasing number of confirmed diagnoses and deaths and enforced isolation might lead decreasing mental health.

For medical staff, negative emotions were not conducive to their mental health status and might negatively affect the treatment of patients. For non-medical staff, especially patients, poor mental health might increase the risk of various diseases, such as digestive, endocrine, nervous system, and immune system diseases, thereby increasing the risk of viral infection by COVID-19 [24–26]. Therefore, effective psychological counseling and psychological intervention are necessary. From our results, it can be seen that since the outbreak, 28.67% of the interviewees received psychological counseling, of which 9.47% were medical personnel and 36.23% were non-medical personnel. In addition, 50.97% responded that they needed psychological counseling, of which medical staff accounted for 65.87% and non-medical staff accounted for 45.10%. These results suggested that of the considerable number of individuals who expressed need psychological assistance, medical staff accounted for the majority. We must therefore attach great importance to the mental health of medical workers and actively provide psychological counseling and psychological support to improve the overall quality of mental health in medical staff [27]. At the same time, society also ensure that psychological care is provided to the general public, including adequate health education to improve people's awareness of the disease and reduce public fears. Given our results, women and older adults should be the focus of attention, and they should be receiving widespread attention from mental health workers, hospital managers, and society.

There are some limitations in this study. First, the questionnaire survey time is selected for one month. Follow-up studies on the longer-term mental health effects of population need to be further explored. Secondly, the sample size of the questionnaire survey is limited. A larger samples survey can further reduce the bias.

Conclusion

In the wake of the COVID-19 outbreak, there has been widespread attention to the basic research and clinical treatment of the disease. However, equal attention should be also be paid to the mental health status of medical staff working in environments where the disease is present. Psychological consultation and support should be actively carried out in order to improve the overall mental health of medical staff. The results of this study also suggest that measures such as humanistic care and psychological intervention should be included in the rescue strategies and plans for emergency responses to major public health incidents in order to reduce the consequences of infection to the general population.

Declarations

The study was approved by the Wuhan Central Hospital Ethics Committee. All survey respondents were aware of the survey process and voluntarily accepted the investigation.

CRediT taxonomy:

Conceptualization: Biao Chen, Qing-xian Li; *Methodology:* Jia-yong Zhu, Yu-hang Wu; *Formal analysis and investigation:* Jia-yong Zhu, Qing-xian Li, Yu-hang Wu; *Writing - original draft preparation:* Biao Chen, Qing-xian Li, Jia-yong Zhu; *Writing - review and editing:* Heng Zhang, Jie Xiong, Fu Li; *Funding acquisition:* Hua Wang; *Resources:* Zhi-tao Chen; *Supervision:* Zhi-tao Chen.

Conflicts of interest

No conflicts of interest are declared by the authors.

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Figures

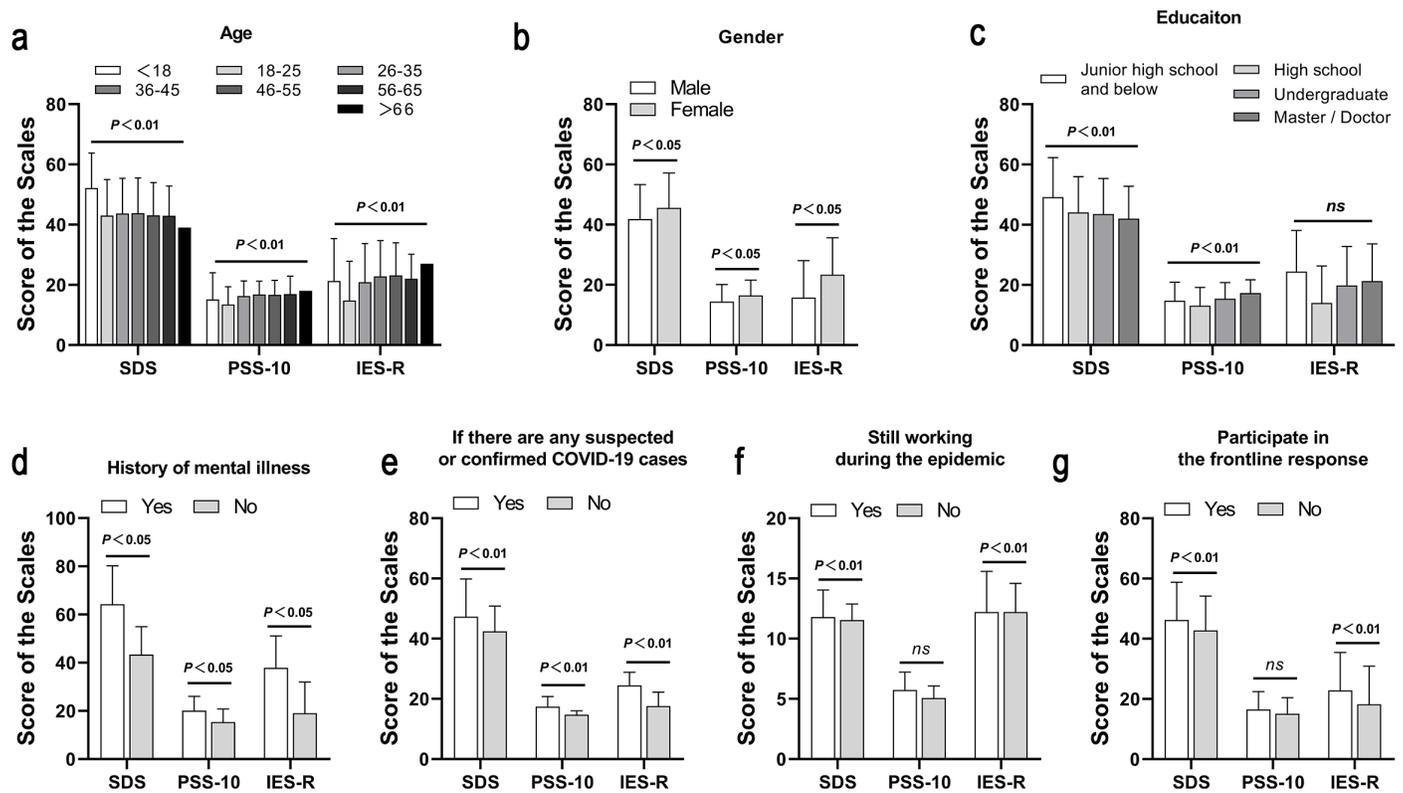


Figure 1

Relationship between baseline characteristics and psychological changes. Relationship between scores on the three scales [the Self-rating Depression Scale (SDS), the Perceived Stress Scale (PSS-10) and the Impact of Event Scale-Revised (IES-R) scales] and the demographic variables of sex (A), age (B), education (C), history of mental illness (D), the presence of suspected or confirmed COVID-19 cases (E), whether the interviewee is still working during the epidemic (F), and whether the interviewee participated in the frontline response (G). P-values indicate differences between groups. $P < 0.05$ was considered statistically significant.