Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Research paper

Psychological status and fatigue of frontline staff two months after the COVID-19 pandemic outbreak in China: A cross-sectional study

Ziwei Teng, Zirou Wei, Yan Qiu, Yuxi Tan, Jindong Chen, Hui Tang, Haishan Wu, Renrong Wu, Jing Huang*

National Clinical Research Center for Mental Disorders, and Department of Psychaitry, The Second Xiangya Hospital of Central South University, Changsha 410011, Hunan, China

1. Introduction

The 2019 coronavirus disease (COVID-19) epidemic, which is spreading domestically and internationally, was first reported in Wuhan, China. The virus has been named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by the World Health Organization (Anon, 2020g). On 30 January 2020, the WHO declared the COVID-19 outbreak a public health emergency of international concern (Anon, 2020c). According to data released by the National Health Commission of China (NHCC), as of 30 March, the number of confirmed cases in China was 82,505, with 545,324 in 200 other countries around the world. The number of deaths has increased to 3,313 in China and 31,591 in other countries. The total number of ill and dead people is much higher than in the case of SARS. Recently, the WHO reported that COVID-19 will coexist with us for a long time (Anon, 2020f). Therefore, we should be prepared for a long-term to fight with COVID-19 epidemic.

Previous studies have shown that during the outbreak of infection, there was a wide range of psychosocial effects on people at the individual, community, and international levels (Hall et al., 2008). The continuing epidemic of COVID-19 is inducing fear, and there is an urgent social need to determine people's mental health status in timely fashion (Xiang et al., 2020). Studies have shown that limited knowledge of COVID-19 and overwhelming news can lead to anxiety and fear in the public. Under quarantine measures, the general public population may also feel idle, despondent, and fidgety (Brooks et al., 2020). This fear, panic, and anxiety among the general population may increase the workload of frontline staff (Anon, 2020a). At the same time, the increasing number of confirmed and suspected cases including imported cases from abroad, exhaustion of personal protective equipment, and widespread media coverage may lead to a variety of psychological problems, such as depression, anxiety, and insomnia among frontline staff (Bao et al., 2020; Chan-Yeung, 2004; Shigemura et al., 2020). However, their mental health and fatigue are often overlooked.

Since travel to and from Wuhan was restricted on January 23th, frontline staff, which includes doctors, nurses, polices, volunteers, community workers, and journalists, have made a great contribution to effectively controlling the spread of COVID-19. The NHC reported that about 4 million urban and rural community workers are fighting on the frontlines of the COVID-19 epidemic prevention and manage 650,000 urban and rural communities. On average, six community workers man one community. Each community worker manages 350 people, with extremely heavy tasks. They were responsible for daily temperature measuring for all the people who came out of the community or returned to the community, visitor registration, sterilization, investigation of suspected cases, report and necessary isolation assistance. According to incomplete statistics, more than 40,000 medical personnel have come to Wuhan to fight COVID-19 (Anon, 2020d). They need to take care of infected patients, worry about becoming infected and spreading disease, and sometimes even answer public inquiries (Xiang et al., 2020). Volunteers buy essentials like vegetables for people at home. Police need to maintain social stability, prevent adverse events like violations of strict requirements. Market administrations crack down on crimes such as price gouging on protective equipment (Anon, 2020). These heavier workloads can cause fatigue, and excessive fatigue may lead to cerebrovascular emergencies.

One study showed that 17.3% of medical staff members had obvious mental symptoms during the SARS epidemic (Lu et al., 2006). An online survey found that a significant number of participants reported depression (50.4%), anxiety (44.6%), and insomnia (34.0%) during COVID-19 (Lai et al., 2020). When experiencing other emergencies, frontline staffs also showed mental health impairment. Borho et al. (2019) mentioned that 10.1% volunteers worked in refugee work had depressive symptoms. Police who have experienced the events of September the 11th reported severe psychological burden that 24.7% had depression, 5.8% had anxiety (Bowler et al., 2016). Feinstein et al. (2002) showed that 21.4% journalists confronted with extreme danger situations like in the war had major depression. However, there have been no research articles exploring the psychological and fatigue impact on COVID-19 in frontline staff besides healthcare workers in China.

Up to now, more than 300 front-line workers have died of fatigue.

* Corresponding author.
E-mail address: jinghuangserena@gmail.com (J. Huang).

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Table 1
Baseline characteristics of the 2614 study participants.

Variables	Total	Community workers	Health care workers	Volunteers	Market administrations	Others[a]
Total	2614	720	398	560	292	644
Gender						
Male	1161(44.4)	255(35.4)	96(24.1)	351(62.7)	122(41.8)	337(52.3)
Female	1453(55.6)	465(64.6)	302(75.9)	209(37.3)	170(58.2)	307(47.7)
Age (years)						
18–24	139(5.3)	42(5.8)	17(4.3)	34(6.0)	3(1.0)	43(6.7)
25–34	960(36.7)	297(41.3)	142(35.7)	224(40.0)	54(18.5)	244(37.9)
35–54	1433(54.8)	372(51.6)	222(55.8)	280(50.0)	219(75.0)	340(52.8)
55–64	82(3.1)	9(1.3)	17(4.3)	23(4.1)	16(5.5)	17(2.7)
≥ 65	0					
Residence						
Rural	214(8.2)	113(15.7)	36(9.0)	29(5.2)	9(3.1)	27(4.2)
Urban	2400(91.8)	607(84.3)	362(90.9)	531(94.8)	283(97.0)	617(95.8)
Education						
Below university	312(12.0)	61(8.5)	48(12.1)	74(13.2)	72(24.7)	57(8.9)
College	2215(84.7)	643(89.3)	342(85.9)	474(84.6)	213(72.9)	543(84.3)
Master's or doctorate	87(3.3)	16(2.2)	8(2.0)	12(2.1)	7(2.4)	44(6.8)
Physical or mental disease						
Yes	418(16)	115(16.0)	43(10.8)	86(15.4)	50(17.1)	124(19.2)
No	2196(84)	605(84.0)	355(89.2)	474(84.6)	242(82.9)	520(80.7)
Family income (RMB)						
< 10,0000	1587(60.7)	539(74.9)	229((27.5)	340(60.7)	166(56.8)	313(48.6)
≥ 10,0000	1027(39.3)	181(25.1)	169(42.5)	220(39.3)	126(43.4)	331(51.4)
Marital status						
Single	458(17.5)	125(17.4)	50(12.6)	127(22.7)	22(7.5)	134(20.8)
Married	2008(76.8)	548(76.1)	327(84.1)	403(72.0)	251(86.0)	479(74.4)
Others[b]	148(5.6)	47(6.5)	21(5.3)	30(5.4)	19(6.5)	31(4.8)

a: Includes commanders, police, and journalists.
b: Includes divorced and widowed.

At the same time, excessive fatigue may also lead to negative emotions and increased incidence of depression (Robinson et al., 2015). Poor mental state will affect frontline staff's decision-making, attention, and execution, which would hinder the fight against the COVID-19 epidemic and might even cause permanent physical and mental injury to frontline personnel (Liu et al., 2020). Therefore, it is extremely important to measure and monitor the fatigue and psychological status of the frontline staff.

2. Method

2.1. Participants

We adopted a cross-sectional survey design to assess the anxiety, depression, and fatigue status of frontline staff during the COVID-19 epidemic in China with an anonymous online questionnaire. The questionnaires were distributed, completed, and collected through an online survey platform (SurveyStar, Changsha Ranxing Science and Technology, Shanghai, China). This study adopted a snowball sampling strategy, wherein the online survey was initially distributed to community health workers who were encouraged to pass it on to others. Informed consent was provided on the first page, and the questionnaires could be started only after the consent of the respondent was given.

2.2. Questionnaire measurement of anxiety and depression

Depression in first-line staff was assessed by the Patient Health Questionnaire-9 (PHQ-9) (Kroenke et al., 2001). It includes 9 items grading from 0 to 3 points, corresponding to DSM-IV diagnostic criteria for depression. Overall, the total score of PHQ-9 is operationally categorized as follows: no depression (score 0–4), mild depression (5–9), moderate depression (10–14), and severe depression (≥ 15).

The Self-Rating Anxiety Scale (SAS) (Zung, 1965) was used to assess anxiety in the front-line staff. It was compiled by Zung in 1971 and has been widely used for anxiety assessment in a variety of groups. The SAS consists of 20 items scored on a 4-point scale, of which 5 items are reverse-scored. The sum of the scores of all items is the initial score, which is multiplied by 1.25 to yield the standard score. The evaluation criteria were no anxiety (score 0–49), mild anxiety (50–59), moderate anxiety (60–69), and severe anxiety (≥ 70).

2.3. Assessment of fatigue

The Fatigue Self-Assessment Scale (FSAS) (Medicine, 2019) was used to evaluate the fatigue of frontline workers. The FSAS was developed in China and shows good differentiability, reliability, and constitutional validity in assessing the type, degree, and characteristics of fatigue in various populations. The scale is divided into two parts and includes 23 items to assess the type and severity of fatigue (including three subscales of physical fatigue, mental fatigue, and the consequences of fatigue) and the characteristics of fatigue (including three subscales of responsiveness of fatigue to sleep/rest, situationality of fatigue, and time pattern of fatigue). The first 22 items are scored on five-point scales, and the last is a self-assessment score used to evaluate self-fatigue. The specific scoring standard used in this study is the fatigue evaluation standard proposed by the Chinese Society of Traditional Chinese Medicine.

2.4. Statistical analyses

The data were analyzed via Statistical Package for the Social Sciences (SPSS, version 23.0, Chicago, IL) software. The significance level was set at $p = 0.05$, and all tests were two-tailed. The chi-square test was used for qualitative variables, while the rank-sum test was used for quantitative variables. Multivariate analyses for anxiety, depression, and fatigue were performed with ordinal logistic regression, and Spearman correlations were used for correlation analysis.

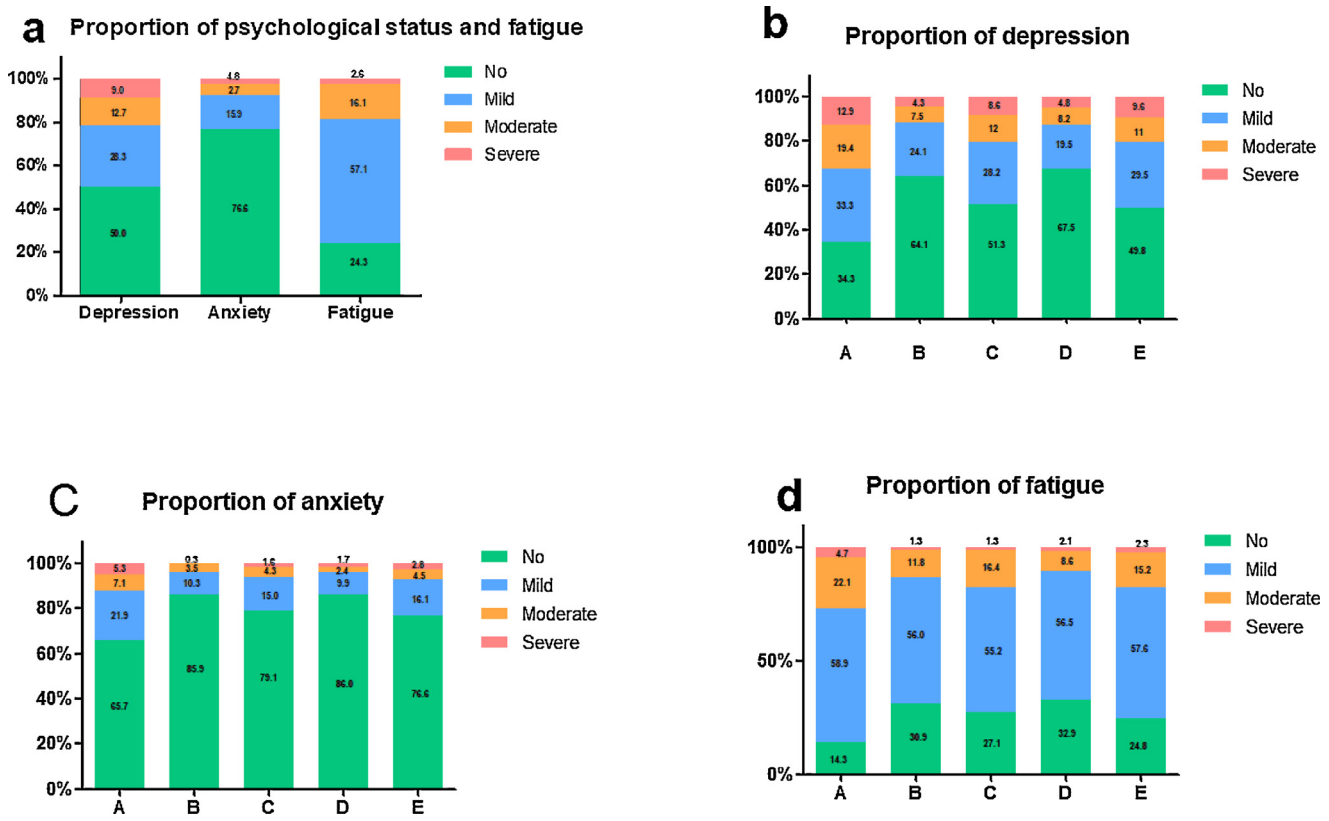

Fig. 1. Comparisons of neuropsychological features between groups. b-d. the proportions of depression, anxiety, and fatigue in each group. Colors indicate severity of neuropsychological status.
A: Community workers; B: Health care workers; C: Volunteers; D: Market administrators; E: Others

3. Results

3.1. Demographic characteristics

We received responses from 2,614 participants, including community workers (27.5%), health care workers (14.8%), volunteers (21.4%), market administrators (11.2%), and others (24.6%), the last including commanders, police, and journalists. More than half of the participants (55.6%) were women, and more than half were aged 35 to 54 years. Most were urban residents (91.8%), were married (76.8%), and had an educational level of a college degree or above (88%). The details of the demographic characteristics are presented in Table 1.

3.2. Severity and scores

As shown in Fig. 1 and Table 2, 50% (1307/2614) people scored above the PHQ-9 cut-off point, indicating widespread depression among the participants, with a sample mean score of 5.8 (SD = 5.1). Of these, 9.0% (234/2614) scored 15 or higher, suggesting severe depression. The SAS, used to assess anxiety levels, showed that 23.4% (612/2614) had a standardized score of ≥ 50 (42.1 ± 11.4), deemed as having anxiety, and 7.5% (196/2614) reported moderate or severe anxiety. A considerable proportion of the participants had symptoms of fatigue, 75.7% (1980/2614) and 18.7% (488/2614) were deemed to suffer from moderate or severe fatigue. The mean and standard deviation (M ± SD) of the scores on Physical fatigue, Mental fatigue, Consequences of fatigue, General fatigue, Fatigue response to sleep/rest, and Situationality of fatigue for all respondents were 20.1 ± 24.1, 23.6 ± 23.9, 21.3 ± 23.5, 21.9 ± 22.8, 18.6 ± 25.8, 40.1 ± 31.1, respectively (Table 2). Night was scored the highest for the time of fatigue.

Sleep was affected in 52.8% of the respondents, with the most common symptom being irregular sleep. The proportions of severe depression (12.9%), severe anxiety (5.3%), and severe fatigue (4.7%) were highest in community workers.

3.3. Risk factors and psychological impact

The multivariable logistic regression analysis shown in Table 3 found that, after controlling for confounders, being a woman was associated with more severe symptoms of anxiety (OR: 1.3; 95% CI, 1.0–1.6; $P < 0.05$) and mental fatigue (OR: 1.3; 95% CI, 1.0–1.5; $P < 0.05$). Compared to the 55–64-year-old group, the 18–24-year-old group was associated with more severe symptoms of depression (OR: 3.1; 95% CI, 1.5–5.9; $P < 0.05$), anxiety (OR: 2.4; 95% CI, 1.0–5.8; $P < 0.05$), and physical fatigue (OR: 2.3; 95% CI, 1.1–5.0; $P < 0.05$); the 25–34-year-old group had more severe symptoms of depression (OR: 3.3; 95% CI, 1.9–5.6; $P < 0.05$) and physical fatigue (OR: 2.3; 95% CI, 1.1–5.0; $P < 0.05$); and the 35–54-year-old group showed more severe symptoms of physical fatigue (OR: 1.9; 95% CI, 1.1–3.2; $P < 0.05$).

Compared with those having a family income of more than 100,000RMB (14,141.5 USD), family income less than 100,000RMB was associated with more severe symptoms of depression (OR: 1.2; 95% CI, 1.0–1.5; $P < 0.05$) and anxiety (OR: 1.6; 95% CI, 1.3–2.0; $P < 0.05$). Participation in epidemic prevention without family support was significantly associated with more severe symptoms of depression (OR: 6.1; 95% CI, 1.4–27.8; $P < 0.05$) and anxiety (OR: 3.9; 95% CI, 1.3–11.6; $P < 0.05$). The longer the participants worked or the less satisfied patients were with their services, the higher their scores for anxiety and depression (e.g., severe depression among more than 6 h vs less than 1h, OR: 1.6; 95% CI, 1.3–2.1; $P < 0.05$; severe depression by satisfaction vs dissatisfaction, OR: 9.4; 95% CI, 2.1–41.1; $P < 0.05$).

Worried about being infected and having a history of disease or sleep disorder are risk factors for anxiety, depression, and fatigue.

Table 2
Depression, anxiety, and fatigue in study participants.

Variables	Total	Community workers	Health care workers	Volunteers	Market administrators	Others[a]	χ^2	*P*
Depression	5.8 ± 5.1	7.6 ± 6.0	4.1 ± 4.6	5.6 ± 5.6	3.9 ± 5.1	5.8 ± 5.7	159.5	< 0.001
Anxiety	42.1 ± 11.4	45.8 ± 12.1	39.1 ± 9.7	41.5 ± 10.8	39.3 ± 10.8	41.9 ± 11.5	127.6	< 0.001
Sleep (multiple choice)								
Unchanged	1240(47.4)	231	202	280	186	341	110.1	< 0.001
Difficulty falling asleep	617(23.6)	238	79	118	46	136	52.9	< 0.001
Easily awakened at night	538(20.6)	180	90	97	45	126	18.4	0.001
Early awakening	522(20)	159	89	107	53	114	6.3	0.17
Dizziness	210(8)	68	16	57	11	58	22.1	< 0.001
Irregular sleep	863(33)	303	128	187	61	184	52.0	< 0.001
Nightmares	301(11.5)	119	35	56	26	65	25.1	< 0.001
Fatigue								
Physical fatigue	20.1 ± 24.1	29.1 ± 26.8	15.2 ± 20.4	18.4 ± 21.4	14.6 ± 21.5	20.2 ± 23.9	148.2	< 0.001
Mental fatigue	23.6 ± 23.9	30.4 ± 25.7	19.4 ± 21.7	21.1 ± 22.1	17.8 ± 21.0	23.4 ± 24.1	101.2	< 0.001
Consequences of fatigue	21.3 ± 23.5	228.3 ± 25.8	15.0 ± 18.8	20.1 ± 22.0	14.6 ± 21.0	21.3 ± 23.7	133.3	< 0.001
Total fatigue	21.9 ± 22.8	29.1 ± 25.0	16.4 ± 19.2	19.9 ± 20.8	15.5 ± 20.3	21.6 ± 22.9	138.2	< 0.001
Fatigue responds to sleep/rest	18.6 ± 25.8	24.7 ± 28.6	11.9 ± 20.1	18.3 ± 24.9	13.6 ± 23.0	18.6 ± 26.2	76.8	< 0.001
Situationality of fatigue	40.1 ± 31.1	46.6 ± 31.4	33.0 ± 29.1	40.6 ± 31.0	33.8 ± 30.6	39.3 ± 31.1	69.2	< 0.001
Time pattern of fatigue								
Early morning	2.7 ± 2.8	3.6 ± 3.1	1.9 ± 2.3	2.6 ± 2.8	2.1 ± 2.5	2.5 ± 2.6	106.3	< 0.001
Morning	3.1 ± 2.6	3.8 ± 2.8	2.4 ± 2.4	2.9 ± 2.6	2.7 ± 2.6	3.1 ± 2.6	93.0	< 0.001
Noon	4.4 ± 2.9	5.2 ± 2.9	3.4 ± 2.5	4.3 ± 2.9	4.0 ± 2.8	4.4 ± 2.8	109.5	< 0.001
Afternoon	4.4 ± 2.9	5.3 ± 2.8	3.5 ± 2.7	4.2 ± 2.9	3.7 ± 2.8	4.3 ± 2.7	116.2	< 0.001
Night	4.8 ± 3.2	5.8 ± 3.1	3.7 ± 2.9	4.8 ± 3.2	4.1 ± 2.9	4.8 ± 3.2	135.6	< 0.001

Table 3
Associations between personal variables and depression, fatigue, and anxiety during the COVID-19 outbreak.

Index	Depression	Anxiety	Mental fatigue	Physical fatigue
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Gender				
Male	Reference	Reference	Reference	Reference
Female	1.1 (0.9, 1.3)	**1.3(1.0, 1.6)**	**1.3(1.0, 1.5)**	1.1(0.9, 1.3)
Age (years)				
18–24	**3.1(1.5, 5.9)**	**2.4(1.0, 5.8)**	1.5(0.7, 3.3)	**2.3(1.1, 5.0)**
25–34	**3.3(1.9, 5.6)**	1.7(0.8, 3.5)	1.5(0.8, 2.7)	**2.3(1.3, 4.1)**
35–54	1.6(0.9, 2.7)	1.1(0.5, 2.2)	0.6(0.6, 2.0)	**1.9(1.1, 3.2)**
55–64	Reference	Reference	Reference	Reference
Residence				
Rural	Reference	Reference	Reference	Reference
Urban	0.8(0.6, 1.1)	0.7(0.5, 1.0)	0.9(0.6, 1.3)	1.1(0.8, 1.2)
Education				
Below university	Reference	Reference	Reference	Reference
College	**0.5(0.3, 0.9)**	0.7(0.3, 1.0)	0.8(0.4, 1.5)	0.7(0.4, 1.4)
Master's or doctorate	0.8(0.5, 1.4)	0.9(0.4, 1.5)	1.1(0.6, 1.9)	1.0(0.6, 1.8)
Physical or mental disease				
Yes	**4.2(3.3, 5.5)**	**3.0(2.3, 3.9)**	**4.2(2.8, 6.2)**	**3.2(2.3, 4.5)**
No	Reference	Reference	Reference	Reference
Family income (RMB)				
< 10,0000	**1.2(1.0, 1.5)**	**1.6(1.3, 2.0)**	1.0(0.8, 1.3)	1.0(0.8, 1.2)
≥ 10,0000	Reference	Reference	Reference	Reference
Marriage				
Single	Reference	Reference	Reference	Reference
Married	1.1(0.7, 1.7)	0.7(0.4, 1.3)	1.1(0.7, 1.9)	1.4(0.9, 2.3)
Others[b]	0.7(0.5, 1.0)	**0.6(0.3, 0.9)**	1.1(0.7, 1.6)	1.0(0.7, 1.5)
How long does it take each day to focus on epidemic related situations				
< 1 hour	Reference	Reference	Reference	Reference
1–3 hours	0.9(0.7, 1.1)	0.8(0.7, 1.2)	0.7(0.6, 1.0)	0.8(0.7, 1.1)
3-6 hours	1.1(0.8, 1.6)	1.3(0.9, 2.0)	**0.7(0.4, 0.9)**	**0.5(0.4, 0.8)**
> 6 hours	**1.6(1.3, 2.1)**	**1.4(1.0, 1.9)**	0.8(0.6, 1.1)	1.2(0.4, 0.8)
Worried about being infected				
No	Reference	Reference	Reference	Reference
Yes	**2.7(2.2, 3.4)**	**1.7(1.3, 2.4)**	**2.1(1.7, 2.7)**	**2.3(1.9, 2.9)**
Family supports your participation in epidemic prevention				
No	**6.1(1.4, 27.8)**	**3.9(1.3, 11.6)**	1.0(0.8, 1.3)	1.4(0.3, 6.6)
Yes	Reference	Reference	Reference	Reference
The people you serve are satisfied with your work				
Yes	Reference	Reference	Reference	Reference
No	**9.4(2.1, 41.1)**	**5.6(2.1, 15.1)**	> 1000	> 1000
Sleep difficulty				
Yes	**8.0(6.6, 9.7)**	**9.4(7.1, 12.5)**	**5.3(4.2, 6.6)**	**5.6(4.6, 6.9)**
No	Reference	Reference	Reference	Reference

Table 4
Correlations of demographic characteristics and fatigue with depression and anxiety in frontline staff.

Factors	Physical fatigue	Mental fatigue	Consequences of fatigue	General fatigue	Fatigue response to sleep/rest	Situationality of fatigue	Early morning	Morning	Noon	Afternoon	evening
Depression	0.7*	0.7*	0.7*	0.8*	0.5*	0.5*	0.4*	0.5*	0.4*	0.5*	0.4*
Anxiety	0.6*	0.6*	0.6*	0.6*	0.5*	0.4*	0.4*	0.5*	0.4*	0.4*	0.4*

* $p < 0.001$

Worried about being infected was associated with a greater psychological and physical impact of the outbreak, including more severe symptoms of depression (OR: 2.7; 95% CI, 2.2–3.4; $P < 0.05$), anxiety (OR: 1.7, 95% CI, 1.3–2.4; $P < 0.05$), mental fatigue (OR: 2.1; 95% CI, 1.7–2.7; $P < 0.05$), and physical fatigue (OR: 2.3; 95% CI, 1.9–2.9; $P < 0.05$) compared to those not worried about being infected. Having physical or mental disease was associated with more severe symptoms of depression (OR: 4.2; 95% CI, 3.3–5.5; $P < 0.05$), anxiety (OR: 3.0; 95% CI, 2.3–3.9; $P < 0.05$), mental fatigue (OR: 4.2; 95% CI, 2.8–6.2; $P < 0.05$), and physical fatigue (OR: 3.2; 95% CI, 2.3–4.5; $P < 0.05$). All subscales in the FSAS were significantly correlated with anxiety and depression (Table 4).

4. Discussion

This is the first study to investigate the mental health and fatigue of frontline staff fighting COVID-19. We investigated 2614 participants and found anxiety (23.4%), depression (50.0%), and fatigue (73.7%) to be common in frontline workers. Participants were divided into five groups (community workers, health care workers, volunteers, market administrators, and others) to compare the differences across professions, showing that the levels of depression, anxiety, and fatigue of community workers were much higher than in the other professions ($P < 0.01$). Binary logistic regression indicated that being a woman, young age, sleeping difficulty, and having lower income and family support were associated with severe mental state and proneness to fatigue. At the same time, our study further confirmed that fatigue is highly correlated with depression and anxiety.

In this study, most participants experienced depression and anxiety, and indeed more than 55.6% of frontline staff felt tired. These proportions of depression and anxiety of participants far exceed those found in surveys of general public mental health (Wang et al., 2020). This suggests that we should pay greater attention to the mental health of frontline staff. The psychological response of frontline staff to the epidemic of infectious diseases is complex. We found the level of depression, anxiety, and fatigue of community workers to be much higher than that of other occupations, while the level of health care workers was slightly lower in this survey. On the one hand, compared with medical staff, community workers lack professional medical knowledge and access to medical materials in epidemic emergencies. Their protection ability is very weak, so they easily feel fear, tension, or depression. On the other hand, the management scope of community staff is large, while their numbers are relatively small. They need to collect the health information of all community members, but as some members of the public do not cooperate with surveys, their workload is greatly increased (Anon, 2020e). However, medical staff usually work under high-intensity conditions (Rodrigues et al., 2018). Thus, when they are confronted with especially high-intensity work during an epidemic, their psychological capacity is greater. In one survey of medical staff in the early stages of the epidemic, depression and anxiety showed an incidence of 50.7% and 44.7%, respectively (Lai et al., 2020), while the figures in our survey were 34.6% and 13.3%, respectively, significantly lower than the former. We believe that this is because the current epidemic has been effectively controlled, epidemic prevention materials have been effectively supplemented (Anon, 2020b), medical staff have gained a deeper understanding of COVID-19 (Wu et al., 2020; Zhou et al., 2020), and there has been some benefit from a range of mental health measures adopted across China (Li et al., 2020). Second, we used the SAS anxiety questionnaire, while the former survey used the 7-item Generalized Anxiety Disorder scale (Lai et al., 2020).

Binary logistic regression analysis showed that the higher the level of family support, the greater the satisfaction of patients, and the better their sleep, the lower the depression, anxiety, and fatigue in front-line staff, which is consistent with research results in other fields (Wu et al., 2013). Therefore, the support of family and the public can effectively alleviate the mental status of frontline staff. In addition, frontline workers with lower annual family income are more likely to experience negative emotions, which is consistent with an earlier study (Jing Wang, 2020). Higher salary may give more security (Rubin et al., 2009), which should inspire government departments to improve the mental health of frontline workers by increasing wages, granting bonuses, or implementing other measures. It is worth noting that 76.7% of all participants were women, and women reported more severe symptoms of depression, anxiety, and fatigue. This result is consistent with previous studies showing that after traumatic events, acute mental disorders characterized by invasive memory are more common in women than in men (Kendler et al., 2001; McLean and Anderson, 2009). There is some evidence that fluctuations in ovarian hormone levels lead to changes in sensitivity to emotional stimulation in some stages of the menstrual cycle, which may be a basis of women's vulnerability to mental diseases (Soni et al., 2013). The higher scores of depression and anxiety in the youth group seem to confirm the results of previous studies: Young people tend to receive great amounts of information from social media, which can easily cause them to be depressed (Liu et al., 2020).

This study also revealed a positive correlation between fatigue, depression, and anxiety in frontline workers during the epidemic. Excessive fatigue may lead to negative emotions and promote depression, which is consistent with earlier studies (Corfield et al., 2016; Robinson et al., 2015). At the same time, there have been a few cases of martyrdom for work. Excessive fatigue may lead to sudden death, such as a cardiovascular and cerebrovascular emergency (Schnohr et al., 2015). Fatigue is an important reason for the decline of quality of life. It has been found that fatigue is one of the main causes of disability in Parkinson's patients and cancer patients (Bower, 2014; Kluger et al., 2016). This survey found that 16% of the respondents suffered from chronic physical and mental diseases, leading to increased experience with depression (OR: 4.2, CI: 3.3–5.5), anxiety (OR: 3.0, CI: 2.3–3.9), physical fatigue (OR: 4.2, CI: 2.8–6.2), and mental fatigue (OR: 3.2, CI: 2.3–4.5). Fatigue may further aggravate chronic diseases, so timely intervention and rest adjustment are needed.

In order to reduce the risk of negative psychological consequences of the COVID-19 epidemic and promote social stability, the National Health Commission of China has incorporated psychological crisis intervention into the overall deployment of disease prevention and issued more than 10 documents related to mental health (Li et al., 2020). Local governments have also taken corresponding measures, but most of them are for medical staff, patients, and patients' families; less attention has been paid to the mental health of community staff, volunteers, and market administrators. Thus, we suggest the implementation of measures regarding the following. First, there is a need for mental health

education. With the continuous development of network technology, frontline staff can access mental health videos, audio, or online lectures on WeChat. Second, psychological scale assessment is needed. Frontline staff members showing high scores for depression, anxiety, or fatigue should be given time to rest. Third, patients with severe depression and anxiety can avail themselves of online interventions or go to a local mental and psychological center for treatment. Fourth, some staff suggested that they lacked time and energy to take care of their children. Therefore, we could recruit college students at home to provide volunteer services to help their children with their homework or play games with them.

Our research can timely reflect the mental health and fatigue of current frontline workers. So, we can adjust their work arrangements in time, ensure rest and work efficiency, and reduce psychological problems. But the study has several limitations. First, it applied a snowball sampling strategy, which is not based on the random selection of samples, and thus the study population is not necessarily representative of the overall population. Second, as this is only a cross-sectional study, it cannot reveal trends of emotional change in frontline staff. Future research should be done longitudinally include tracking of the risk factors and mental health and fatigue after behavior and therapeutic intervention.

5. Conclusion

In this study of frontline staff fighting COVID-19 in China, a high incidence of depression, anxiety, insomnia, and fatigue was reported. Protecting the physical and mental health of frontline staff is an important part of public health measures to fight the COVID-19 epidemic. Effective strategies need to be implemented immediately to improve the mental health and fatigue of frontline staff, with community workers, women, the young, and those with physical and mental disease requiring particular attention.

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