

BMJ Open Mental health status of healthcare workers assisted in Hubei during the initial outbreak of COVID-19 and their influencing factors: a prospective cohort study

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ABSTRACT

Objectives The COVID-19 outbreak beginning in late 2019 has resulted in negative emotions among the public. However, many healthcare workers risked their lives by voluntarily travelling to the worst-hit area, Hubei Province, to support antipandemic work. This study explored the mental health changes in these healthcare workers and tried to discover the influencing factors.

Design A longitudinal online survey was begun on 8 February 2020, using the snowball sampling method, and this first phase ended on 22 February 2020 (T1). The follow-up survey was conducted from 8 February to 22 February 2021 (T2).

Setting Healthcare workers from outside of the Hubei area who went to the province to provide medical assistance.

Participants 963 healthcare workers who completed both surveys.

Measures Self-Rating Scale of Sleep (SRSS), Generalised Anxiety Scale (GAD-7) and 9-item Patient Health Questionnaire (PHQ-9).

Results There were no significant differences in the SRSS scores or in the GAD-7 scores between T1 and T2 ($t=0.994$, 0.288 ; $p>0.05$). However, the PHQ-9 score at T2 was significantly higher than the score at T1 ($t=-10.812$, $p<0.001$). Through multiple linear regression analysis, we found that the following traits could predict higher GAD-7 and PHQ-9 scores at T2: male sex, single marital status, occupation of nurse, lower professional technical titles, healthcare workers having a history of psychosis, treating seriously ill patients, having relatively poor self-perceived health, caring for patients who died and having family members who had been infected with COVID-19.

Conclusions The results indicate that the depression levels of these special healthcare workers increased in the long term, and the initial demographics and experiences related to the pandemic played an important role in predicting their long-term poor mental health. In the future, more appropriate psychological decompression training should be provided for these special healthcare workers.

INTRODUCTION

The COVID-19 outbreak beginning in late 2019 has been spreading for over 2 years.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The participants included in this study sample had some homogeneity in their roles in the assistance work, which could guarantee that the conclusions can be extended to this special group.
- ⇒ The prospective study design (1 year of follow-up of the same sample) could help us to understand the participants' long-term mental health changes compared with their initial data, which could also indicate the defeating work during the COVID-19 pandemic.
- ⇒ The study used the snowball sampling method and followed the voluntary principle to recruit subjects, which did not include the data of those who were not willing to expose their mental status considering the social influence.
- ⇒ The data were self-reported, and therefore, the participants' mental health could only represent the probability of anxiety and depression, and could not represent the diagnosis.

Reports have suggested that the pandemic has resulted in negative emotions among the public.^{1 2} Even before the outbreak, healthcare workers tended to have long working hours, substantial work stress and emotional fatigue, putting them at higher risk of mental disorders than others who work in non-healthcare areas.^{3 4} After the sudden outbreak of COVID-19, the shortage of personal protective equipment (PPE) and the need for professional skills exacerbated the stress that healthcare workers were already experiencing. Thus, negative mental health outcomes were anticipated.^{5 6} However, many healthcare workers risked their lives by voluntarily travelling to the worst-hit area, Hubei Province, to support antipandemic work. It was reported that there were 25 633 voluntary medical workers from outside the Hubei area

who offered medical assistance in the province beginning on 24 January 2020.⁷

To date, many studies have reported that the mental health of front-line healthcare workers has been impacted by the pandemic,^{8,9} with rates of anxiety and depression ranging from 12% to 23% and 15% to 27%, respectively.^{10,11} Other studies have investigated Chinese medical staff who had direct contact with COVID-19 patients and found that they were at high risk of psychopathology and experienced high rates of anxiety symptoms.^{11,12} However, these studies were all cross-sectional studies that were conducted during the initial phase of the outbreak. Mauner *et al* found that those who provided healthcare for SARS patients continued to experience substantial long-term psychological distress,¹³ and Matua *et al* also revealed that the impact on mental health caused by the Ebola pandemic persisted for a long time after the acute outbreak.¹⁴ Considering the pervasive and profound impact of large-scale outbreaks on the mental health of front-line healthcare workers,¹⁵ it is vital to conduct longitudinal surveys that could help us to understand the changes in their mental health and the profound impact of the ongoing pandemic.

After reviewing the latest studies that investigated the longitudinal changes in the mental health of healthcare workers, we found that most studies focused on the 1–4 months following the initial outbreak. They found that healthcare workers' self-perceived job performance deteriorated over time, and they presented with common mental disorders.^{16–18} Their poor psychological well-being was generally stable over time but sometimes increased.^{19,20} To the best of our knowledge, the longest time interval studied was 8 months postoutbreak, where researchers found that during repeated outbreaks in Japan, the psychological distress in healthcare workers remained elevated and at the same level as that in the first wave of the COVID-19 outbreak.²¹

The COVID-19 pandemic is showing signs of repeated outbreaks worldwide and of gradually becoming an ongoing battle for healthcare workers. It is important to understand the long-term impact on this population, especially for healthcare workers who voluntarily went to Hubei and were in contact with COVID-19 patients. Because the condition of the initial outbreak of COVID-19 was unknown, it might have become an obvious source of stress for these healthcare workers, and it was reported that a similar major disaster's impact on mental health might last for a long period of time.²² Therefore, we designed this longitudinal study to identify the changes in the mental health of healthcare workers 1 year after the first outbreak and to explore what factors in the initial phase could influence their subsequent mental health. These findings, in turn, may help guide the creation of a psychological crisis intervention system to deal with similar situations in the future.

METHODS

Design

This longitudinal online survey began on 8 February 2020, using the snowball sampling method, and the first

phase ended on 22 February 2020 (T1). The follow-up survey was conducted from 8 February to 22 February 2021 (T2, nearly 1 year after the first outbreak of COVID-19 in China). The snowball sampling method was used to distribute the questionnaires online. Because of the convenience of the network and to acquire the latest information of these subjects, we chose the WeChat platform to distribute the first questionnaires to a group of healthcare workers who travelled to Hubei to offer medical aid. We also encouraged those who completed the questionnaires to forward the link to other healthcare workers who also travelled to Hubei to provide medical assistance. Informed consent was obtained on the first page of our questionnaires, and only when the participant clicked the button to consent could he or she access the survey. If an individual did not agree to participate, the survey would close automatically. To acquire longitudinal data, we included an invitation at the end of the survey to participate in the follow-up survey. Those who agreed to participate in the follow-up survey needed to leave their WeChat account information, which was used to deliver the second survey. The research was reviewed and approved by the Institutional Review Board of the medical centre.

Participants

Only healthcare workers from outside of the Hubei area who went to the province to provide medical assistance were selected as our subjects. A total of 1260 participants returned valid questionnaires in the first survey. Among them, only 1098 provided their WeChat account information for the next survey. After we delivered the second survey link through WeChat, 963 subjects returned valid questionnaires. The rate of loss to follow-up was 23.6% (297/1260). There were no systematic differences in demographic characteristics among the subjects who dropped out at T2.

Measurements

All the questionnaires used in our research were self-reported. The specific scales included (1) demographics and experiences related to the pandemic questionnaire, including gender/sex, age, marital status, highest education level, professional technical title, occupation (physician or nurse), history of psychosis, self-perceived health conditions (one indicated a very good physical condition; two indicated good; three indicated average; four indicated poor; five indicated very poor), number of working years, whether the COVID-19 patients they had treated died, whether they nursed/treated seriously ill COVID-19 patients, and whether their family members had been infected with COVID-19. This questionnaire was completed only at T1; (2) the Self-Rating Scale of Sleep (SRSS),²³ which is composed of 10 items with scores of 1–5 points per item. The higher the score was, the worse the participant's sleep problems. According to the report, the Chinese national norm was 22.14±5.48;²⁴ (3) the Generalised Anxiety Scale (GAD-7)

Table 1 The distribution of demographic characteristic and pandemic experiences (n=963)

Variables and assignment	Means/N (%)
Gender	
Man (1)	521 (54.1)
Woman (2)	442 (45.9)
Ages (years)	30.33±4.48
Marriage	
Unmarried (1)	475 (49.3)
Married (2)	488 (50.7)
Widowed (3)	0
Highest education	
Secondary (1)	70 (7.3)
Junior (2)	351 (36.4)
Undergraduate (3)	484 (50.3)
Graduate (4)	58 (6.0)
Professional technical title	
Novice (1)	518 (53.8)
Middle (2)	361 (37.5)
Senior (3)	84 (8.7)
Occupation	
Nurse (2)	702 (72.9)
Physician (1)	261 (27.1)
History of psychosis	
Yes (1)	81 (8.4)
No (2)	882 (91.6)
Self-perceived health conditions	
Very good (1)	224 (23.3)
Good (2)	598 (62.1)
Average (3)	141 (14.6)
Poor (4)	0
Very poor (5)	0
Working years (years)	8.63±4.44
Whether the patients they treated had died	
Yes (1)	306 (31.8)
No (2)	657 (68.2)
Whether nursed/treated seriously ill patients with COVID-19	
Yes (1)	908 (94.3)
No (2)	55 (5.7)
Whether their family members had been infected with COVID-19	
Yes (1)	31 (3.2)
No (2)	932 (96.8)

and the 9-item Patient Health Questionnaire (PHQ-9),^{25 26} which are the simplest scales used to evaluate levels of anxiety and depression. The GAD-7 consists of 7 items that receive 0–3 points each. The cut-off points for mild/moderate/severe anxiety were 5, 10 and 15,

respectively. The PHQ-9 is composed of 9 items that receive 0–3 points each. The cut-off points for mild/moderate/moderately severe/severe depression were 5, 10, 15 and 20, respectively.

Statistical analysis

Descriptive statistics were computed for all variables. The mean scores were then compared among time points using paired t-test statistics. The χ^2 test was used to detect the differences in levels of anxiety and depression at different time points. Because the total GAD-7 and PHQ-9 scores were both close to a normal distribution, we used multiple linear regression with the stepwise method to screen the influencing factors for anxiety and depression. A p value of <0.05 was considered statistically significant. All statistical analyses were carried out using the Statistical Package for Social Science (V.11.0, IBM Corp).

Patient and public involvement

No patients were involved.

RESULTS

Demographic data

There were 963 subjects who completed both surveys, among whom 521 were male and 442 were female. The age range was 23–40 years old, with an average age of 30.33±4.48 years. Regarding marital status, 488 subjects were married, and 475 were unmarried. Among them, there were 702 nurses and 261 physicians (all of them were clinical physicians). The number of working years of all subjects ranged from 2 to 20 years, with an average of 8.63±4.44 years. Eighty-one subjects reported a history of psychosis, including 69 with anxiety disorder and 12 with depression (all psychosis should be diagnosed by psychiatrists). Other demographic details and experiences related to the pandemic are shown in [table 1](#).

The SRSS, GAD-7 and PHQ-9 scores at different time points

Overall, the mean SRSS score of all the subjects was significantly higher than the national norm of the SRSS (22.14±5.48) at both T1 and T2 (t=14.656, 14.064; p<0.001), indicating that the subjects' sleep quality was poor. The mean GAD-7 and PHQ-9 scores at T1 and T2 both indicated moderate anxiety and moderate depression among all the subjects.

When looking into the longitudinal changes in scores on these three scales, there were no significant differences in the SRSS scores or in the GAD-7 scores between T1 and T2 (t=0.994, 0.288; p>0.05), which means the sleep quality and the anxiety levels of the subjects did not show significant changes. However, the PHQ-9 score at T2 was significantly higher than the score at T1 (t=-10.812, p<0.001), which demonstrates that the depressive symptoms of the subjects had further deteriorated. The detailed data of the three scales are listed in [table 2](#).

Table 2 The disparity between the two time-points on the mean scores of SRSS, GAD-7 and PHQ-9 (n=963)

	T1 (mean±SD)	T2 (mean±SD)	T	P value
SRSS	25.20±6.48	24.91±6.12	0.994	0.320
GAD-7	13.04±3.87	13.03±3.80	0.288	0.774
PHQ-9	14.70±4.70	14.96±4.62	-10.812	<0.001

GAD-7, Generalised Anxiety Scale; PHQ-9, 9-item Patient Health Questionnaire; SRSS, Self-Rating Scale of Sleep.

The rates of different degrees of anxiety and depression at different time points

We used the χ^2 test to determine the differences in the rates of different degrees of anxiety and depression over time and found that there were no significant differences in the rates of mild, moderate and severe anxiety at the two time points ($\chi^2=1.399$; 1.528; 0.083, df=1, $p>0.05$). The rates of mild depression showed a significant decrease from T1 to T2 ($\chi^2=6.687$, df=1, $p=0.012$), and no significant change was found in the rates of other levels of depression ($\chi^2=0.052$; 3.823; 0.019, df=1, $p>0.05$). The detailed comparison results and the distribution of severity of anxiety and depression are listed in [table 3](#) and [figure 1](#).

Multiple linear regression analysis of long-term influencing factors of the GAD-7 and PHQ-9 total scores

To build the prediction model, we included all the demographic variables and experiences related to the

Table 3 The rates of different degrees of anxiety and depression symptoms among different time points (n=963)

	T1 % (n)	T2 % (n)	χ^2	P value
GAD-7				
No anxiety	0	0	-	-
Mild anxiety	21.7 (209)	19.5 (188)	1.399	0.260
Moderate anxiety	43.8 (422)	46.6 (449)	1.528	0.234
Severe anxiety	34.5 (332)	33.9 (326)	0.083	0.810
PHQ-9				
No depression	0	0	-	-
Mild depression	12.5 (120)	8.8 (85)	6.687	0.012
Moderate depression	50.1 (482)	49.5 (477)	0.052	0.855
Moderately severe depression	24.8 (239)	28.9 (277)	3.823	0.057
Severe depression	12.7 (122)	12.9 (124)	0.019	0.946

GAD-7, Generalised Anxiety Scale; PHQ-9, 9-item Patient Health Questionnaire.

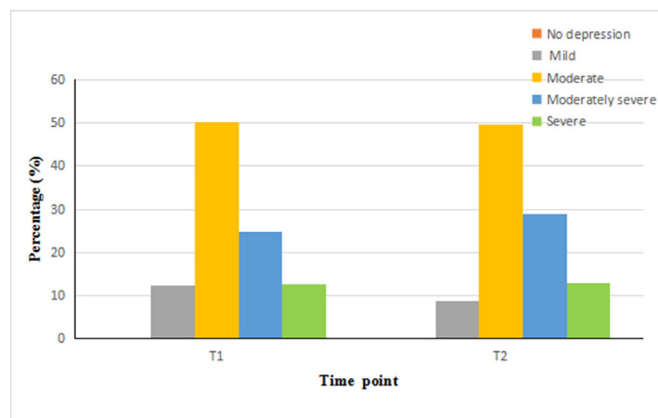
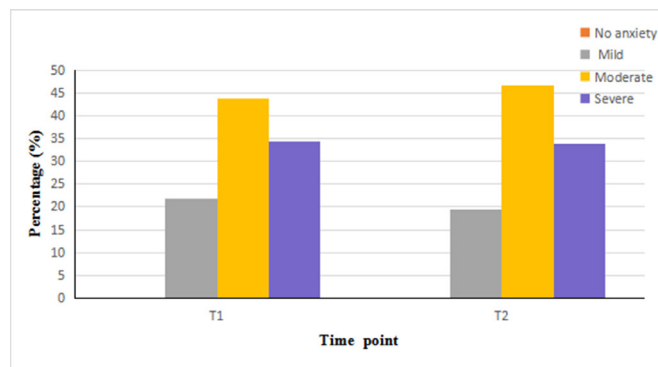


Figure 1 The distribution of severity of anxiety and depression over time. The first figure stands for the anxiety level, and the second one stands for the depression level.

pandemic as independent variables. The assignments of all variables are shown in [table 1](#). Because sleep quality is usually associated with anxiety and depression, we also considered the SRSS score at T1 as one of the independent variables.

Through multiple linear regression, we found that the following factors could predict higher GAD-7 and PHQ-9 scores at T2: male sex, unmarried marital status, the occupation of nurse, a lower professional technical title, having a history of psychosis, having nursed/treated seriously ill COVID-19 patients, having relatively poor self-perceived health conditions, having the patients they treated die and having family members infected with COVID-19. Subjects with fewer working years showed higher GAD-7 scores, and younger respondents showed higher PHQ-9 scores. The F values (11, 951) in the regression equation were 120.160 and 271.902 ($p<0.001$) for the GAD-7 and PHQ-9 scores, respectively. The adjusted R^2 values were 0.577 and 0.756, which means that the screened influencing factors could effectively explain 57.7% and 75.6% of the variance in the two models. The results of the influencing factors of the GAD-7 and PHQ-9 scores are listed in [table 4](#) and [table 5](#).

DISCUSSION

Through this longitudinal survey, we discovered that 1 year after the first outbreak of COVID-19, sleep quality

Table 4 The multiple linear regression analysis of influencing factors of GAD-7

Variable	Regression coefficients	SE of regression coefficient	Standardised regression coefficient	T	P value	95% CI
Constant	26.394	1.432		18.432	<0.001	(23.584 to 29.204)
Gender	-3.402	0.195	-0.446	-17.406	<0.001	(-3.786 to -3.019)
History of psychosis	-3.340	0.359	-0.244	-9.308	<0.001	(-4.044 to -2.636)
Whether nursed/treated seriously ill patients with COVID-19	-6.174	0.392	-0.377	-15.732	<0.001	(-6.945 to -5.404)
Self-perceived health conditions	2.234	0.158	0.359	14.169	<0.001	(1.925 to 2.544)
Whether the patients they treated had died	-2.195	0.240	-0.269	-9.142	<0.001	(-2.666 to -1.724)
Whether their family members had been infected with COVID-19	-2.700	0.537	-0.125	-5.030	<0.001	(-3.753 to -1.646)
Marriage	-0.732	0.222	-0.096	-3.292	0.001	(-1.168 to -0.296)
Occupation	1.731	0.301	0.202	5.748	<0.001	(1.140 to 2.322)
Professional technical title	-1.551	0.253	-0.265	-6.126	<0.001	(-2.047 to -1.054)
Working years	-0.091	0.029	-0.106	-3.165	0.002	(-0.147 to -0.035)

F (11, 951) = 120.160 (p<0.001), R=0.763, R²=0.577.

GAD-7, Generalised Anxiety Scale.

and anxiety levels remained stable among the 963 health-care workers who voluntarily went to Hubei to provide medical support, while their levels of depression showed an obvious increase compared with their condition in their first month of assistance. Initial demographic characteristics, including gender/sex, marital status, occupation, professional technical titles, psychosis history and their experiences with pandemic-defeating work might

predict the degree of anxiety and depression in the long term.

Notably, compared with the score at T1, the mean SRSS score showed no significant change 1 year after our subjects' assistance missions during the outbreak of COVID-19, both of which were significantly worse than that of the national norm, which demonstrates that the sleep quality of our subjects remains poor although they

Table 5 The multiple linear regression analysis of influencing factors of PHQ-9

Variable	Regression coefficients	SE of regression coefficient	Standardised regression coefficient	T	P value	95% CI
Constant	37.648	1.618		23.267	<0.001	(34.472 to 40.823)
Gender	-1.482	0.196	-0.160	-7.559	<0.001	(-1.866 to -1.097)
History of psychosis	-10.461	0.332	-0.629	-31.543	<0.001	(-11.112 to -9.811)
Whether nursed/treated seriously ill patients with COVID-19	-5.280	0.350	-0.266	-15.069	<0.001	(-5.967 to -4.592)
Self-perceived health conditions	1.930	0.150	0.255	12.879	<0.001	(1.636 to 2.224)
Whether the patients they treated had died	-2.232	0.220	-0.225	-10.164	<0.001	(-2.662 to -1.801)
Whether their family members had been infected with COVID-19	-4.217	0.510	-0.161	-8.272	<0.001	(-5.218 to -3.217)
Marriage	-1.480	0.216	-0.160	-6.858	<0.001	(-1.903 to -1.056)
Occupation	1.283	0.278	0.124	4.619	<0.001	(0.738 to 1.829)
Professional technical title	-2.221	0.292	-0.313	-7.608	<0.001	(-2.794 to -1.648)
Age	-0.350	0.043	-0.340	-8.129	<0.001	(-0.434 to -0.265)

F (11, 951) = 271.902 (p<0.001), R=0.871, R²=0.756.

PHQ-9, 9-item Patient Health Questionnaire.



have been back to their own workplace for a long time. One study investigating the impact of assistance work on healthcare workers discovered that poor sleep quality was still common 1 month after they arrived in Hubei during the COVID-19 outbreak,¹⁷ which was similar to our finding. However, no literature continues to study how their sleep quality changes one year later, and our results could make up the margin. The reason why their sleep quality was still poor over a long period of time might depend on the nature of their job, such as over-loaded work,²⁷ and the night-shift rules,²⁸ which can make their sleep poor, while the subsequent repeated outbreaks of COVID-19 in different scales in China keep them at high alert, which might also be related to their poor sleep quality.²⁸

With regard to the mean scores on the GAD-7 and PHQ-9, we found that the respondents' anxiety scores did not show significant changes from T2 to T1, while their depression scores increased significantly, and all of them had a moderate level of depression, which indicated that the mental health of these healthcare workers was still poor 1 year later, and that the pandemic's impact on this special group might persist for a long time. To our surprise, no respondents reported themselves as having no anxiety and/or depressive symptoms in either survey. Many studies have revealed that the prevalence of anxiety and depressive symptoms in medical staff working in the areas most affected by the COVID-19 pandemic was high;^{12 29-31} the prevalence of anxiety ranged from 23% to 34%, and the prevalence of depression ranged from 15% to 27% according to various meta-analyses.³²⁻³⁴ The reason for the obviously different prevalence of anxiety and depressive symptoms in our results might be due to the different tools used and the different stages in which the surveys were conducted.³⁵ The subjects in our study belong to a special group that faced an unknown new virus, and many of them may not have had previous experience with a serious pandemic; the complex COVID-19 facing environments in the new workplace and the strict closed-loop management during their time in Hubei might have caused more emotional stress.³⁶ Hence, it is not surprising that all of the healthcare workers showed some extent of anxiety and depressive symptoms in the initial phase.

However, after their return, we uniquely found that they continued to have high levels of anxiety and depression. López *et al* found that from the first measurement to the 4-month follow-up in their study, more healthcare workers presented anxiety and depression during the pandemic.¹⁶ Because there was no literature investigating the long-term impact of COVID-19 on healthcare workers, we could only refer to the experiences of past pandemics when setting up our research. We know that the symptoms of anxiety and depression were still common among healthcare workers within one to three years after the SARS outbreak.^{37 38} We could see the profound and persistent impact caused by that pandemic. However, there are differences between COVID-19 and SARS. COVID-19 has

been repeatedly ongoing, which might keep healthcare workers in a constant state of being alert or preparing for outbreaks, guarding against unexpected contacts, and facing the risk of infection or transmission to their family members,^{39 40} which could be torturous and exhausting. Therefore, the mental health of our subjects remained poor 1 year later. When looking at the depression score, it deteriorated further at T2, and more subjects reported moderately severe depression at T2, which indicates that the degree of depression worsened over time. One probable reason might be the delayed reaction caused by serious disaster-related events.^{41 42} Another reason might be the recession of anxiety. Healthcare workers with an overload of emotional pressure may become exhausted; as time passes, they do not have enough energy to worry and they gradually develop more severe depression.⁴³

According to our results, the long-term influencing factors for anxiety and depressive symptoms were similar regarding aspects of experiences related to COVID-19, including having nursed/treated seriously ill COVID-19 patients, having the patients they treated die and having family members infected with COVID-19, which could predict the prevalence of anxiety and depression in our subjects. Other reports also revealed that poorer mental health was associated with managing COVID-19 patients and family exposure to COVID-19.^{19 44}

Regarding demographic factors, we found that healthcare workers with a history of psychosis were more prone to show anxiety and depressive symptoms, which was similar to the findings of other studies.^{13 16 17} We also discovered that those who thought of themselves as having relatively poor health experienced more anxiety and depression, which was similar to the findings of Manara *et al*.⁴⁵ Another factor screened was gender/sex, and we found that male healthcare workers tended to report more anxiety and depressive symptoms, which was contrary to previous studies.^{46 47} The reason might be that the male healthcare workers are generally older, and their physical strength and energy recovery level would therefore not be as fast as that of young women. Thus, they are more prone to fatigue. In addition, women are considered to be more willing to express their feelings through language than men,⁴⁸ which might seem to be another kind of emotional release leading to less negative emotions being stored.⁴⁹

Individuals with other factors, including being unmarried, being a nurse and having a lower professional technical title, were prone to present greater anxiety and depression, which was in contrast to Cai *et al*'s report.⁵⁰ We all know that communication with family and companions are important sources of social support,⁵¹ but unmarried individuals do not have the support of spouses. Due to the large number of infected patients in Hubei Province, more nurses were required to care for them and to conduct clinical treatment activities, such as blood sampling, infusions and medication distribution. The great workload undoubtedly added more pressure for nurses than physicians, and the nurses were relatively

young with lower professional technical titles and less experience, making them vulnerable to distress.⁴⁴ Finally, we found that healthcare workers with fewer years of work were more likely to become anxious, and younger individuals were more likely to become depressed, which was similar to previous findings.^{13 44 46}

CONCLUSIONS

The COVID-19 outbreak beginning in late 2019 has been spreading for almost 2 years. After the sudden outbreak of COVID-19, the shortage of PPE placed additional stress on professional healthcare workers. However, there has been little information on the changes in the mental health of healthcare workers who went to Hubei to offer assistance. This is the first study investigating the longitudinal mental health of front-line healthcare workers who went to Hubei to assist other health professionals during the initial COVID-19 outbreak and 1 year later. We found that sleep quality and anxiety levels remained stable among healthcare workers, while their depression levels showed obvious increases. The initial demographic characteristics and experiences related to the pandemic played an important role in predicting the long-term mental health of these special healthcare workers.

Contributors ND was responsible for the overall content as the guarantor, and she was also in charge of supervising the process and providing expert opinions. PZ and ND organised the study design and analysed the data. Collaborators YX and Y-GL ensured that questions related to the accuracy or integrity of any part of the work were appropriately investigated and resolved. C-YL and TG participated in conducting the survey and typing the data. PZ wrote the first draft of the manuscript, and ND critically revised it. PZ, ND, YX, Y-GL, C-YL and TG approved the final version of the manuscript.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting or dissemination plans of this research.

Patient consent for publication Not required.

Ethics approval This study involves human participants and was approved by The Fourth People's Hospital of Chengdu. Because our study used the method of questionnaire investigation, not involved the information of patients and related intervention, we applied for the simple ethics approval procedure. The version of this file did not include the reference number. It only contained the signature of the commissioner and the official stamp of the institutional board. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request.

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