



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.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Letter to the editor

Psychological symptoms among frontline healthcare workers during COVID-19 outbreak in Wuhan



To the Editor:

The COVID-19 pandemic was caused by a novel coronavirus first discovered in Wuhan, Hubei province of China in December 2019. On January 23, 2020, the city of Wuhan with 11 million residents was placed on a city-wide quarantine, and by January 29, 2020, all 31 provinces in China announced the public health emergency. Psychological distress in the general population has been reported in China during the COVID-19 quarantine [1]. The healthcare system in Wuhan was quickly overwhelmed as tens of thousands of people with flu-like symptoms swarmed the hospitals. Frontline healthcare workers (HCWs) in Wuhan have been under tremendous pressure and risk of contracting COVID-19 since the beginning of the quarantine. As of February 12, 2020, 21,569 HCWs from other cities in China have been deployed to support emergency response efforts in Wuhan [2], while 1716 HCWs have contracted COVID-19 and 5 have died [3]. Two nurses

deployed to Wuhan described the situation as “more difficult and extreme than [they] could ever have imagined” and they were “suffering psychologically.” [4] These experiences are consistent with the reports on increased psychological symptoms and conditions in HCWs during and after the SARS epidemic [5–7]. However, few studies have examined psychological symptoms in frontline HCWs during an outbreak.

To examine the psychosocial impact of COVID-19 on frontline HCWs in Wuhan, we collected data between February 13–17, 2020 through a smartphone-based survey. Participants were frontline HCWs from two Wuhan-based hospitals ($n = 200$) and HCWs in the outreach team ($n = 110$) deployed to Wuhan from two outside hospitals. Participants reported their demographic characteristics, residence of origin, job type, prior experience with emergency response, whether family members or friends had contracted COVID-19 (Wuhan HCW only), psychological and material/supply preparedness, perceived ability to help patient (self-efficacy), sleep quality, perceived stress via

Table 1
Sample Demographics and Descriptive Statistics.

	Total ($n = 134$)	Local/Wuhan ($n = 60$)	Outreach/Non-Wuhan ($n = 74$)	<i>p</i>
	<i>M (SD)</i> or <i>N (%)</i>	<i>M (SD)</i> or <i>N (%)</i>	<i>M (SD)</i> or <i>N (%)</i>	
<i>Demographics</i>				
Age	36.00 (8.05)	37.65 (9.72)	34.66 (6.1)	*
Female	81 (60.5)	41 (68.3)	40 (54.1)	
Types of healthcare worker				
support staff	32 (23.9)	16 (26.7)	16 (21.6)	
nurses	55 (41.0)	20 (33.3)	35 (47.3)	
doctors	47 (35.1)	24 (40.0)	23 (31.1)	
Education				***
associate degree or below	43 (32.1)	36 (60.0)	7 (9.4)	
college degree	65 (48.5)	17 (28.3)	48 (64.9)	
postgraduate	26 (19.4)	7 (11.7)	19 (25.7)	
Marital status				
married	115 (85.8)	50 (83.3)	65 (87.8)	
not married	19 (14.2)	10 (16.7)	9 (12.2)	
Prior experience with emergency response				
yes	14 (10.4)	7 (11.7)	7 (9.5)	
no	120 (89.6)	53 (88.3)	67 (90.5)	
<i>Knowledge, training, and mental health</i>				
	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	
Lacking knowledge about emergency response	1.15 (0.79)	1.18 (0.95)	1.12 (0.64)	
Lacking knowledge about COVID-19	0.88 (0.67)	0.77 (0.70)	0.97 (0.64)	
Lacking psychological preparedness	2.26 (2.35)	3.08 (2.67)	1.59 (1.81)	***
Lacking material preparedness	3.25 (2.55)	4.50 (2.67)	2.24 (1.94)	***
Poor sleep quality	3.71 (2.93)	4.63 (2.95)	2.96 (2.70)	**
Perceived stress (PSS)	13.81 (6.34)	15.40 (6.69)	12.53 (5.77)	**
Depression (BDI-II)	5.76 (7.04)	7.27 (7.51)	4.54 (6.44)	*
Anxiety (BAI)	4.96 (8.13)	5.85 (7.50)	4.24 (8.59)	

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

<https://doi.org/10.1016/j.genhospsych.2020.03.011>

Received 20 March 2020; Received in revised form 24 March 2020; Accepted 31 March 2020

Available online 03 April 2020

0163-8343/ © 2020 Elsevier Inc. All rights reserved.

Perceived Stress Scale (PSS [8]), depression via Beck Depression Inventory-II (BDI-II [9]), and anxiety via Beck Anxiety Inventory (BAI [10]). Details about the procedure and measures are included in Appendix A. All procedures involving human participants were approved by the institutional review board at the Shanghai Mental Health Center.

Table 1 shows the demographic variables. The response rate was 30% for Wuhan/local HCWs ($n = 60$) and 67% for non-Wuhan/outreach HCWs ($n = 74$). Compared to Wuhan HCWs, outreach HCWs had higher education attainment, were more prepared psychologically and supply-wise, and were generally better adjusted in terms of having better sleep quality, lower perceived stress, and lower depressive symptoms (all $ps < .05$).

Appendix B shows the prevalence of elevated depressive (BDI-II scores ≥ 14) and anxiety symptoms (BAI scores ≥ 8): 12.7% and 20.1% of HCWs had at least mild depressive and anxiety symptoms, respectively. More than half (59.0%) had moderate to severe levels of perceived stress (PSS scores ≥ 14). Depressive and anxiety symptoms were more common among women, Wuhan HCWs, those who were less psychologically prepared, lacking psychological preparedness, lacking perceived self-efficacy help patients, and lacking family support, as well as those with poor sleep quality. After adjusting for age, gender, and residence of origin, logistic regression results show that a lack of perceived psychological preparedness, perceived self-efficacy to help the patients, family support; greater perceived stress; or having poor sleep quality were associated with both elevated depressive and anxiety symptoms. Lacking knowledge about COVID-19, higher education attainment, having family or friends infected the virus were also associated with elevated anxiety symptoms. Fear of getting infected for themselves and colleagues were ranked as the top sources of stress and anxiety. Getting medical and daily living supplies were top-ranked in terms of HCWs' current needs (Appendix C).

To our knowledge, this study is among the first to report the psychological symptoms of Chinese frontline HCWs in Wuhan during the COVID-19 pandemic. Consistent with prior evidence [5–7], our results suggest frontline HCWs in Wuhan during the peak of the outbreak were under moderate to severe stress and many reported elevated anxiety and depression. Wuhan HCWs (vs. outreach), demonstrated greater vulnerability for stress and depression. This study's limitations include relatively small sample sizes; using single-item ratings; low response rate for Wuhan HCWs; potential selection bias (e.g., responders might be healthier and experience more symptoms than non-responders); and lack of information on HCW work hours and workload. Nevertheless, our results suggest frontline HCWs should be closely monitored as a high-risk group for depression and anxiety, and given proper training (e.g., COVID-19 knowledge, stress management, self-care) before deployment; some require psychological interventions. Greater protection gear supplies, on-going monitoring and provision of psychological

support, strong family support may also increase frontline HCWs' resilience to stress and psychological symptoms during a public health emergency.

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.genhosppsy.2020.03.011>.

Declaration of competing interest

None.

References

- [1] Qiu J, Shen B, Zhao M, Wang Z, Xie B, Xu Y. A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: implications and policy recommendations. *General Psychiatry* 2020;33(2).
- [2] The Central Government of the People's Republic of China. National Health Commission of China: 189 teams with over 20,000 healthcare workers deployed to support Hubei. http://www.gov.cn/xinwen/2020-02/13/content_5478242.htm Published February 13, 2020. Accessed February 28, 2020.
- [3] Epidemiology Working Group for NCIP Epidemic Response. The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID19) in China. *Chinese Journal of Epidemiology* 2020;41(2):145–51.
- [4] Zeng Y, Zhen Y. RETRACTED: Chinese medical staff request international medical assistance in fighting against COVID-19. *Lancet Glob Health* 2020.
- [5] Maunder R, Hunter J, Vincent L, et al. The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. *CMAJ* 2003;168(10):1245–51.
- [6] Chong MY, Wang WC, Hsieh WC, et al. Psychological impact of severe acute respiratory syndrome on health workers in a tertiary hospital. *Br J Psychiatry* 2004;185:127–33.
- [7] McAlonan GM, Lee AM, Cheung V, et al. Immediate and sustained psychological impact of an emerging infectious disease outbreak on health care workers. *Can J Psychiatry* 2007;52(4):241–7.
- [8] Lee E-H. Review of the psychometric evidence of the perceived stress scale. *Asian Nurs Res* 2012;6(4):121–7.
- [9] Wang Z, Yuan C-M, Huang J, et al. Reliability and validity of the Chinese version of Beck Depression Inventory-II among depression patients. *Chinese Mental Health Journal* 2011;25(6):476–80.
- [10] Cheng SK-W, Wong C-W, Wong K-C, et al. A study of psychometric properties, normative scores, and factor structure of the Beck Anxiety Inventory-the Chinese version. *Chin J Clin Psych* 2002;10(1):4–6.

Jiang Du^{a,1}, Lu Dong^{b,1}, Tao Wang^c, Chenxin Yuan^a, Rao Fu^a,
 Lei Zhang^a, Bo Liu^c, Mingmin Zhang^c, Yuanyuan Yin^c, Jiawen Qin^c,
 Jennifer Bouey^{d,e,2,*}, Min Zhao^{a,2,**}, Xin Li^{c,2,***}
^aShanghai Mental Health Center, Shanghai, China
^bRAND Corporation, Santa Monica, CA, USA
^cShanghai East Hospital, Tongji University School of Medicine, Shanghai, China
^dRAND Corporation, Arlington, VA, USA
^eGeorgetown University, Washington, DC, USA
 E-mail addresses: jbouey@rand.org (J. Bouey),
drminzhao@smhc.org.cn (M. Zhao), lx1679@easthospital.cn (X. Li).

* Correspondence to: J. Bouey, RAND Corporation, 1200 South Hayes Street, Arlington, VA 22202, USA.

** Correspondence to: M. Zhao, Shanghai Mental Health Center, 600 South Wanping Road, Shanghai 200030, China.

*** Correspondence to: X. Li, Shanghai East Hospital, Tongji University School of Medicine, 150 Jipo Road, Shanghai, 200123, China.

¹ These first authors contributed equally to this article.

² These authors were co-principal investigators.