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Mental health burden for the public affected by the COVID-19 outbreak in China: Who will be the high-risk group?

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ABSTRACT

In December, 2019, an outbreak of respiratory illness caused by Coronavirus disease 2019 (COVID-19) emerged in Wuhan, China and spread rapidly to other parts of China and around the world. We aimed to identify high-risk groups whose mental health conditions were vulnerable to the COVID-19 outbreak. Data were collected from 7,236 self-selected participants measured by anxiety symptoms, depressive symptoms, and sleep quality. The overall prevalence of anxiety symptoms, depressive symptoms, and poor sleep quality were 35.1%, 20.1%, and 18.2%, respectively. People aged < 35 years reported a higher prevalence of anxiety symptoms and depressive symptoms than people aged ≥ 35 years. Healthcare workers have the highest rate of poor sleep compared to other occupations. Healthcare workers/younger people who spent a high level of time (≥ 3 hours/day) had a particular higher prevalence of anxiety symptoms than in those who spent less time (< 1 hours/day and 1-2 hours/day) on the outbreak. During the COVID-19 outbreak, healthcare workers and younger people were at an especially high-risk of displaying psychological impact when they spent too much time thinking about the outbreak. Continuous monitoring of the psychological consequences for high-risk population should become routine as part of targeted interventions during times of crisis.

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COVID-2019; mental health; anxiety disorder; depressive symptoms; sleep quality

Introduction

Since 8 December 2019, a cluster of acute respiratory illness, now known as Corona Virus Disease 2019 (COVID-19), occurred in Wuhan, Hubei Province, China (Paules et al., 2020; D Wang et al., 2020). Patients with COVID-19 have developed severe pneumonia, pulmonary oedema, or multiple organ failure and have died (Chen et al., 2020). As of 2 April 2020, a total of 82,735 COVID-19 cases in China have been confirmed and 3,327 Chinese died from the illness. Outside China, COVID-19 has affected more than 200 countries and regions worldwide (A total of 858,473 confirmed cases, and cumulative deaths reached 44,064) (World Health Organization, 2020a). On March 11, the WHO

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declared the COVID-19 outbreak could be characterized as a ‘Pandemic’ due to the virus spreads increasingly worldwide (World Health Organization, 2020b).

Since Zhong Nanshan (the renowned Chinese respiratory expert who discovered the SARS virus) confirmed that the COVID-19 can be transmitted from human to human, more than 40,000 medical staff gave up the Spring Festival holiday and voluntarily applied to fight the outbreak in Hubei Province. In addition to causing physical damage, COVID-19 can also cause a serious psychological impact on the Chinese public. People have shown fear and anxiety behaviors, causing a significant shortage of masks and health equipment around the country. Besides, most front-line healthcare staff worked more than 16 hours a day on average, causing them not to sleep enough. A 37-year-old Japanese government worker who was managing the isolated returnees from Wuhan, China was reported to have died from apparent suicide (The Japan Times, 2020).

COVID-19 was found to be a distinct clade from the betacoronaviruses related to human severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) (Zhu et al., 2020). Previous research showed that psychological impact could occur in both healthcare workers and SARS survivors during the outbreak of SARS (Lee et al., 2007; Lu et al., 2006; McAlonan et al., 2007). Depressive disorders were showed to be one of the most profound and wide range of psychological conditions on the public (Mak et al., 2009). Similar results have also been reported in the previous findings of MERS (Lee et al., 2018). Currently, there is still no known information on the mental health burden of the general public during the COVID-19 outbreak. To our knowledge, most of the current studies related to this outbreak mainly focus on identifying the clinical or epidemiological characteristics of the infected cases, there is no relevant research examining the mental health burden on the COVID-19 on the general public in China. Based on the previous research evidence, we have reason to speculate that the mental health condition of the public may also be affected during the COVID-19 outbreak.

Therefore, we conducted a web-based cross-sectional survey to examine the psychological impact on the COVID-19 on the Chinese public. We aimed to assess the mental health burden of the public during the COVID-19 outbreak and to identify the high-risk groups. Our findings may assist government advisors and healthcare professionals in providing targeted interventions for the public in the face of the COVID-19 outbreak expansion in China and the different parts of the world.

Methods

Study design and participants

A web-based cross-sectional survey based on the Internet Survey on Emotional and Mental Health (ISEMH), an ongoing, online psychological-related behavior survey of Chinese public, was used to collect data from participants regarding their COVID-19 knowledge, psychological characteristics, and amount of time focusing on COVID-19. The use of this web-based approach to data collection avoided any risk of the spread of SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2). This web-based survey of the COVID-19 was broadcasted on the Internet through the WeChat public platform and the mainstream media. All Chinese public using WeChat, Weibo, or other

social tools may see this survey, and answered the questionnaire by scanning the QR code of the questionnaire address or clicking the relevant link. This web-based questionnaire was completely voluntary and non-commercial.

Ethics statement

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of Huazhong University of Science and Technology Union Shenzhen Hospital. Electronic informed consent was obtained from each participant prior to starting the investigation. Participant could withdraw from the survey at any moment without providing any justification.

Data collection and quality control

Participants answered the questionnaires anonymously on the Internet from 3 February 2020 to 17 February 2020. All subjects reported their demographic data, COVID-19 related information, and three standardized questionnaires, which assessed their anxiety symptoms, depressive symptoms, and sleep quality. In order to ensure the quality of survey, we have set the response range of some items (e.g., some items needed to be answered in reverse) and encouraged participants to complete carefully through questionnaire explanations. In addition, we restricted each electronic device (by identifying the IP address) to complete the questionnaire once, so we can eliminate duplicate responses as much as possible. Finally, a total of 7,236 participants who completed the questionnaires were included in the analysis.

Variable Measurement

Demographic characteristics

Demographic variables included gender, age, and individual occupations. Occupations including (a) Healthcare workers, including doctors, nurses, and health-related administrators; (b) Enterprise or institution workers, including enterprise employees, national/provincial/municipal institution workers, and other relevant staff; (c) Teachers or students, including teachers or students from universities, middle schools, or elementary schools; and (d) Other occupations, including freelancers, retirees, and other relevant staff.

Anxiety symptoms

Chinese version of Generalized Anxiety Disorder-7 (GAD-7) scale was used to assess the subject's anxiety symptoms. The GAD-7 has been previously used in Chinese populations, and found to have good reliability (Cronbach's alpha = 0.90) (Tong et al., 2016; Wang et al., 2018). Total of seven items measured the frequency of anxiety symptoms over the past two weeks on a 4-point Likert-scale ranging from 0 (never) to 3 (nearly every day). The total score of GAD-7 ranged from 0 to 21, with increasing scores indicated more severe functional impairments of anxiety disorders (Spitzer et al., 2006). For the purpose of this study, we defined a GAD-total score of 9 points or greater as the presence of anxiety symptoms (Wang et al., 2018).

Depressive symptoms

We used the Center for Epidemiology Scale for Depression (CES-D) in Chinese version to identify whether participants had depressive symptoms (Zhang et al., 2010), and the Chinese version of this scale has been validated and extensively utilized in Chinese population (Zhang & Li, 2011; Zhang et al., 2010). Total of twenty items assess the frequency of depressive symptoms over the past two weeks on a 4-point Likert-scale ranging from 0 (rarely or none of the time) to 3 (most or all of the time). The score range of the CES-D is 0–60 points and higher scores indicated a more severe depressive symptom (Radloff, 1977). In this study, CES-D scores greater than 28 points indicated depressive symptoms.

Sleep quality

We used the Chinese version of the Pittsburgh Sleep Quality Index (PSQI) scale to assess the subject's sleep quality over the past two weeks (Liu et al., 1996). The Chinese version of PSQI has been demonstrated to be reliable and valid in Chinese population (Liu et al., 1996). The PSQI scale contains seven components including subjective sleep quality, sleep duration, sleep latency, habitual sleep efficiency, use of sleep medications, sleep disturbance, and daytime dysfunction, and the score for each component ranging from 0 to 3 points. The global PSQI score ranges from 0 to 21, with higher scores indicated a more severe sleep disorder (Buysse et al., 1989). In our study, a global PSQI score greater than 7 points indicated poor sleep quality.

Knowledge of the COVID-19 outbreak

The knowledge of the COVID-19 outbreak was evaluated by the following two items:

- (1) Times spent thinking about the COVID-19 outbreak, which measured the average time (in hours) the participants spent thinking about the COVID-19 outbreak information per day, by asking the participants: 'How much time (in hours) do you spend thinking about the COVID-19 information per day on average? (Including reading outbreak information on the mobile or TV news, discussing the progress of the outbreak with family and friends, etc.)';
- (2) Knowledge of the COVID-19 outbreak, which assessed based on the following six judgment questions about COVID-19 outbreak-related knowledge: (1) The incubation period of the virus does not exceed 14 days; (2) Inhalation of droplets from sneezing, coughing, or talking of an infected person could cause infection; (3) Contact with something contaminated by an infected person could lead to infection; (4) Contact with an asymptomatic person might also lead to infection; (5) Taking 'Shuanghuanglian Oral Liquid' could prevent infection of this disease; (6) There are already targeted drugs that could cure the disease. Of the above six questions, 1 point was given for correct answers, and no points were given for incorrect or uncertain answers. Participants with scores ≥ 5 points, equal to 4 points, and ≤ 3 points were considered to be 'Knowledgeable', 'Generally knowledgeable', and 'Not knowledgeable'.

Statistical analysis

All data were analyzed using SPSS version 24.0 (IBM Corp, Armonk, NY, USA). Descriptive statistics were conducted to describe the demographic characteristics and COVID-19-related knowledge in Chinese public. The prevalence of mental health burden stratified by gender, age, and occupations was reported in the general public and certain high-risk groups (such as healthcare workers and younger people), and Chi-square test (χ^2) was used to compare the differences between groups. *P*-values of less than 0.05 were considered statistically significant (2-sided tests). The alpha level for multiple comparisons were set by Bonferroni correction.

Results

Demographic characteristics

The characteristics of the participants are shown in Table 1. Of the total 7,236 samples analyzed, 3,284 (45.4%) were males and 3,952 (54.6%) were females, and the mean (standard deviation) age of the participants was 35.3 ± 5.6 years. Among these samples, 2,250 (31.1%) of participants were healthcare workers, 3,155 (43.6%) participants focused on the COVID-19 for 3 hours or more every day, and 5,702 (78.8%) participants scored

Table 1. Demographic characteristics of the general public (N = 7,236).

Variable	n (freq, %)
Total	7236 (100.0)
Gender	
Male	3284 (45.4)
Female	3952 (54.6)
Age (years, Mean\pmSD)	35.3 \pm 5.6
< 35	3155 (43.6)
\geq 35	4081 (56.4)
Occupation	
Healthcare workers	2250 (31.1)
Enterprise or institution workers	1809 (25.0)
Teachers or students	1404 (19.4)
Other occupations	1773 (24.5)
Times spent thinking about the COVID-19 outbreak^a	
<1 hour per day	1454 (20.1)
1–2 hours per day	2627 (36.3)
\geq 3 hours per day	3155 (43.6)
Knowledge of the COVID-19 outbreak	
Not knowledgeable	398 (5.5)
Generally knowledgeable	1136 (15.7)
Knowledgeable	5702 (78.8)
Anxiety symptoms	
No	4696 (64.9)
Yes	2540 (35.1)
Depressive symptoms	
No	5782 (79.9)
Yes	1454 (20.1)
Poor sleep quality	
No	5919 (81.8)
Yes	1317 (18.2)

Abbreviations: n, number; freq, frequency; SD, Standard deviation; COVID-19, 2019 Corona Virus Disease;

^aAverage time (in hours) spent thinking about the COVID-19 outbreak information per day.

in the highest category, ‘Knowledgeable’, regarding COVID-19 knowledge. The overall prevalence of anxiety symptoms, depressive symptoms, and poor sleep quality was 35.1%, 20.1%, and 18.2%, respectively.

Prevalence of mental health burden during COVID-19 outbreak stratified by gender, age, and occupations

The prevalence of mental health burden stratified by gender, age, and occupations is shown in Figures 1-3, respectively. No statistically significant difference was found in the prevalence of mental health burden by gender ($P > 0.05$, as shown in Figure 1). The prevalence of anxiety symptoms and depressive symptoms was significantly higher in participants younger than 35 years than in participants aged 35 years or older ($P < 0.001$, as shown in Figure 2). Compared with other occupations, healthcare workers (23.6%) reported the highest rate of poor sleep quality ($P < 0.001$, as shown in Figure 3).

Prevalence of mental health burden during COVID-19 outbreak in certain high-risk groups stratified by the times spent thinking about the COVID-19

The prevalence of mental health burden in healthcare workers and young people (aged <35 years) stratified by the times spent thinking about COVID-19 is shown in

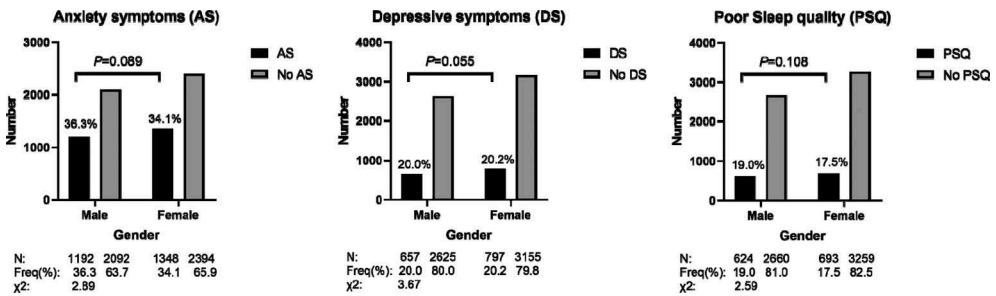


Figure 1. Prevalence of mental health burden during the COVID-19 outbreak in Chinese public, stratified by gender (N = 7,236). Abbreviations: N, number; Freq, frequency.

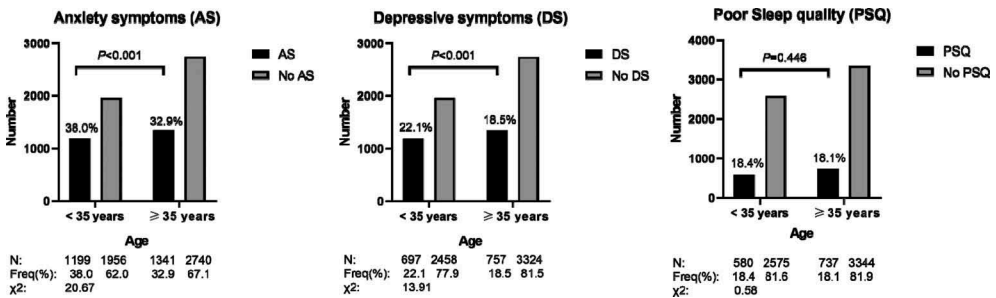


Figure 2. Prevalence of mental health burden during the COVID-19 outbreak in Chinese public, stratified by age (N = 7,236). Abbreviations: N, number; Freq, frequency.

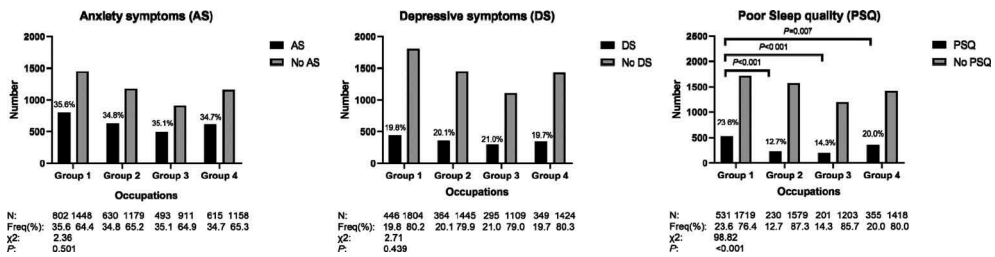


Figure 3. Prevalence of mental health burden during the COVID-19 outbreak in Chinese public, stratified by occupations (N = 7,236). Note: Group 1: Healthcare workers; Group 2: Enterprise or institution worker; Group 3: Teachers or students; Group 4: Other occupations. Abbreviations: N, number; Freq, frequency. The alpha level for paired comparison was set a $P = 0.0083$ after Bonferroni correction.

Table 2. The prevalence of anxiety symptoms, depressive symptoms, and poor sleep quality was significantly higher in healthcare workers who spent a high level of time (≥ 3 hours/day) on the COVID-19 than in those who spent less time (< 1 hours/day and 1–2 hours/day) on the outbreak ($P < 0.05$). Compared with younger people who spent less time focusing on the COVID-19 information, younger people who spent ≥ 3 hours a day thinking about the outbreak had a significantly higher prevalence of anxiety symptoms ($P < 0.001$).

Table 2. Prevalence of mental health burden during the COVID-19 outbreak in certain high-risk groups, stratified by the times spent thinking about the COVID-19.

Variables	Times spent thinking about the COVID-19			χ^2	P-value
	<1 hour/day (N = 1454)	1-2 hours/day (N = 2627)	≥ 3 hours/ day (N = 3155)		
Healthcare workers (N = 2250)					
Anxiety symptoms				78.17	<0.001
No	432 (19.2)	828 (36.8)	990 (44.0)		
Yes	296 (68.6)	593 (71.6)	520 (52.5)		
Depressive symptoms				18.03	<0.001
No	136 (31.4)	235 (28.4)	470 (47.5)		
Yes	358 (82.9)	692 (83.6)	754 (76.3)		
Poor sleep quality				7.36	0.025
No	74 (17.1)	136 (16.4)	236 (23.8)		
Yes	333 (77.1)	655 (79.1)	730 (73.8)		
Young people (aged <35 years, N = 3155)					
Anxiety symptoms				68.55	<0.001
No	823 (26.1)	1338 (42.4)	994 (31.5)		
Yes	577 (70.1)	859 (64.2)	516 (51.9)		
Depressive symptoms				6.11	0.047
No	246 (29.9)	479 (35.8)	478 (48.1)		
Yes	614 (74.6)	1053 (78.7)	748 (75.3)		
Poor sleep quality				4.31	0.116
No	209 (25.4)	285 (21.3)	246 (24.7)		
Yes	639 (77.6)	1019(76.2)	793 (79.8)		
Yes	184 (22.4)	319 (23.8)	201 (20.2)		

Abbreviations: n, number; freq, frequency.

Discussion

In 2019, a cross-sectional epidemiological survey conducted by the China Mental Health Survey (CMHS) showed that 5.0% and 3.6% of Chinese adults have symptoms of anxiety and depressive disorder in the past 12-month, respectively (Huang et al., 2019). Compared to their findings, our web-based cross-sectional study identified a significantly higher prevalence of mental health burden in the Chinese public during the COVID-19 outbreak. Healthcare workers and younger people were at particular high-risk of anxiety disorder, especially when they spent too much time thinking about the outbreak. Our findings would provide data support for accurately understanding the source of public's panic during the COVID-19 outbreak.

The data in this study suggested the public's levels of anxiety-related symptoms increase when a major infectious disease occurred. Similar to the psychological burden caused by SARS (Su et al., 2007), we found that one in three participants showed anxiety disorders, and this mood was not different between male and female during COVID-19 outbreak, which was different from previous research that women were more likely to have anxiety than men (Gao et al., 2020; Guo et al., 2016). Besides, nearly one in five participants had depressive symptoms and sleep problems, indicating that the uncertainty of the outbreak progression would cause greater psychological stresses on the general public. The possible reason for these mental burdens may be related to the 'hypochondriac concerns' (worry about being infected) (Furer et al., 1997) and feared that the epidemic was hard to control. In addition, due to the long-term home isolation, the lack of sufficient sunlight might lead to a decrease in serotonin levels, which was associated with emotional disorders such as anxiety or depression (Lambert et al., 2002).

Our findings showed that nearly one in four healthcare workers have sleep problems, which was significantly higher than other occupations. One possible reason is that many health workers are sent to the front to fight the sudden outbreak, the working intensity and time of healthcare workers will increase in the face of severe epidemic (e.g., SARS and MERS), resulting in them not having enough time to rest, and prone to chronic stress and psychological distress (Lee et al., 2018; Lu et al., 2006; McAlonan et al., 2007). In severe cases, PTSD symptoms may even occur, which is highly correlated with poor sleep (Kobayashi et al., 2007).

In the study, we found that younger people (<35 years) were more likely to develop anxiety and depressive symptoms during the COVID-19 outbreak than older participants (≥ 35 years). Our results were similar to those of a previous study in Taiwan during SARS outbreak (Su et al., 2007). More importantly, we found that times spent thinking about COVID-19 may be a potential risk factor for the psychological impact in certain high-risk groups. Healthcare workers who spent >3 hours a day thinking about the outbreak had a significantly higher prevalence of mental health burden than those who spent less time focusing on the outbreak. Similar results were also found in younger people. This may indicate that spending too much time focusing on the epidemic information during the COVID-19 outbreak may be harmful to the individual's mental health and that these negative effects would be more pronounced for the high-risk groups (e.g., healthcare workers and young people) who are already vulnerable to the epidemic. The manifestation of this panic mood may be related to the body's normal protective response to the stress caused by the epidemic (Mauder et al., 2003).

The Chinese government has taken many strong national measures in time to avoid further spread of the COVID-19 outbreak, including requiring uninfected people to isolate themselves at home, prohibiting all gathering activities, and forcing everyone to wear medical masks to enter public places. However, there is still lack of relevant research on the targeted intervention of the public's psychological burdens during the COVID-19 outbreak. We filled this research gap by analyzing the prevalence of psychological issue in the Chinese general public and examined the particular high-risk population. Some appropriate interventions are recommended as follows. First, the governmental organizations and various media outlets should further disseminate correct information to alleviate mental health burden among the people; Second, the national public health organization should establish an official, integrated, uniform mental health counseling platform to provide psychological counseling to people in need. Third, particular effect should be direct to vulnerable populations which include the suspected and diagnosed patients, younger people, and healthcare workers, especially physicians and nurses working directly with patients or quarantined people. Fourth, balance the spare time with other activities (e.g., exercise at home) and try to control the time of receiving outbreak information less than 2 hours a day, focus only on the necessary information (such as facts and data) and avoid receiving too many harmful rumors (Grein et al., 2000). Fifth, maintain normal work and rest as much as possible, exercise regularly to promote sleep quality, and do not pay too much attention to epidemic information before going to sleep.

Several limitations should be noted when interpreting the findings of our study. First, the data and relevant analyses presented here were derived from a cross-sectional design, it is hard to make causal inferences. Second, the study was limited to the COVID-19 outbreak, leading to the sampling of our study was voluntary and conducted by online system. Therefore, the possibility of selection bias should be considered, which may be caused by overestimating the prevalence because people who voluntarily choose to participate in the survey may be more aware of their mental health issues than those who did not participate. Third, due to the web-based study design, the representativeness of the sample cannot be guaranteed, which may affect the external validity of the research results.

Conclusion

In conclusion, we identified a major psychological impact of the Chinese public during the COVID-19 outbreak, and younger people and healthcare workers were at an especially high-risk of displaying psychological issues when they spent too much time thinking about the outbreak. Psychological first aids could be delivered by someone who understands the basic principles, training community volunteers in the future might be an effective and sustainable way to alleviate the mental stress of the general public during times of crisis.

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Disclosure statement

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