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ORIGINAL ARTICLE

Observational Study

Psychological impact of the COVID-19 pandemic on Chinese population: An online survey

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Abstract

BACKGROUND

The ongoing coronavirus disease 2019 (COVID-19) pandemic infiltrates every aspect of our life, including the psychological impact. China has experienced the first wave of this epidemic, and it is now affecting the global population.

AIM

This study aimed to investigate the prevalence and associated factors of post-traumatic stress disorder (PTSD) among the general Chinese population.

METHODS

A detailed questionnaire, comprising of 38 questions designed in both English and Chinese, was developed. The survey was conducted *via* WeChat, a multi-purpose messaging, social media, and mobile payment app, which is widely used by the Chinese population.

RESULTS

In total, 1082 individuals from 31 provinces, autonomous regions, and municipalities participated in the survey by filling the questionnaires through the WeChat app. 97.8% of the participants had an Impact of Event-Scale-Revised (IES-R) total score above 20, which is an indicator of PTSD. The IES-R total and all the three subscales, including intrusion, avoidance, and hyperarousal, are significantly

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correlated with age. In addition, age, profession, marital status, and level of education are significantly correlated with the degree of PTSD symptoms.

CONCLUSION
The COVID-19 epidemic has widely caused PTSD among the general Chinese population. These results bear important implications for regions struggling with the pandemic to implement effective interventions to cope with these mental health problems.

Key Words: COVID-19; Post-traumatic stress disorder; Impact of Event-Scale-Revised; China

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Core Tip: This study investigated the prevalence and associated factors of post-traumatic stress disorder (PTSD) in the general Chinese population. Overall, coronavirus disease 2019 has caused PTSD in the Chinese population. In addition, the severity of PTSD symptoms is related to age, profession, marital status, and level of education. These findings have significant implications for pandemic-affected regions in terms of implementing effective interventions to address these mental health issues.

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INTRODUCTION

Outbreaks of infectious diseases have constantly threatened human beings, affecting many aspects of society. Compared to other diseases, infectious diseases are more prone to causing public panic[1], and long-term exposure to such events bears a high risk of developing post-traumatic stress disorder (PTSD)[2-4]. The ongoing coronavirus disease 2019 (COVID-19) pandemic infiltrates every aspect of our life and threatens the global population. Control measures are universally implemented to mitigate the pandemic, whereas psychological problems emerge in infected patients and the general population[5].

The COVID-19 outbreak was sparked in December 2019 in Wuhan, China[6] and quickly spread to the rest of China and now all over the world. By implementing strict control measures, including city lockdown, travel ban, and within-population quarantine, the epidemic in China was finally under control by March. This epidemic and the implementation of control measures, in particular quarantine, are expected to have adverse effects on the general population's mental health[7], but primary research in this respect remains limited. Therefore, this study assessed the prevalence and associated factors of PTSD among the general Chinese population who have just experienced the first wave of the COVID-19 epidemic.

MATERIALS AND METHODS

Study population and sample size estimation

Chinese from the general public were invited to participate in this study. The study was conducted from March 26th to March 31st, 2021. The sample size was determined by calculating a representative sample size using the Raosoft website. In 2019, the population of China was estimated to be 1433783686, with a median age of 37. We used a 3% margin of error and a 95% confidence interval to estimate the sample size. Therefore, a total of 1068 participants are needed.

Study design

A detailed questionnaire comprising of 38 questions was designed in both the English and Chinese languages. The survey was conducted *via* WeChat, a Chinese multi-purpose messaging, social media, and mobile payment app. It is widely used in China, with monthly active users estimated to be one billion. In total, 1082 individuals from 31 provinces, autonomous regions, and municipalities participated in the survey by filling the questionnaires (Supplementary Table 1).

The psychological impact was evaluated using a validated scale, *i.e.*, Impact of Event-Scale-Revised (IES-R)[8,9]. IES is a self-report measure used to assess the frequency of intrusive and avoidant phenomena in response to a specific stressful life event[10]. Thus, IES-R is a measurement tool for PTSD to measure subjective response to traumatic events in response to: (1) Intrusion (intrusive thoughts, nightmares, intrusive feelings and imagery, and re-experiencing); (2) Avoidance (numbing of responsiveness, avoidance of feelings, situations, and ideas); and (3) Hyperarousal (anger, irritability, hypervigilance, difficulty concentrating, heightened startle).

It comprises 22 items, each with a Likert rating scale from 0 to 4 (0 not at all; 1 a little bit; 2 moderately; 3 quite a bit; 4 extremely). The maximum score is 88. A higher score indicates a greater concern for PTSD. The IES-R has been translated into Chinese, demonstrated extensive reliability and validity, and is used frequently in trauma research worldwide[11,12].

Statistical analysis

Descriptive and inferential statistics were calculated using SPSS version 20.0 for Windows (SPSS Inc, Chicago IL). Means were calculated to summarize continuous variables. For categorical variables, group proportions were calculated. The one-way analysis of variance (ANOVA) and independent *t*-test were employed to identify the effect of demographic factors on the psychological outcome measure (IES-R). A total score of IES-R > 20 was used to estimate the prevalence of PTSD symptoms. ANOVA was used for age, level of education, profession, marital status, and monthly income, whilst *t*-test was used for gender, ethnicity, and residence. All statistical tests were two-sided and a P value < 0.05 was considered statistically significant.

RESULTS

Demographic characteristics

A total of 1082 individuals completed the online survey. Except for 0.3% of overseas Chinese, 99.7% of the respondents are from 31 provinces and autonomous regions and municipalities across China, and they have presumably been placed in quarantine or confined to their homes during the COVID-19 epidemic. Slightly more participants were female (57%). In terms of ethnicity, 67.8% are Hans, and 32.2% are from other ethnicities. 47.6% of the participants are aged younger than 30. 60.9% live in urban areas, and 39.1% are from rural backgrounds. The detailed socio-demographic characteristics of the participants are presented in Table 1.

Furthermore, 103 out of 1082 respondents have reported health problems such as diabetes, cardiovascular diseases, hypertension, chronic respiratory disease, viral hepatitis, or cancer. In addition, 44.4% of respondents are experiencing economic losses, and 6.3% are physically affected due to the COVID-19 epidemic. Only 40.57% of participants reported that they have returned to the normal routine after control of COVID-19 in China (Table 1).

Psychological impacts of the COVID-19 epidemic

The total IES-R scores are significantly correlated with age, level of education, profession, and marital status, but not with gender, ethnicity, residence, and monthly income. Next, we assessed the three subscales of IES-R. The intrusion subscale is significantly correlated with age and marital status. Avoidance is significantly correlated with age, level of education, profession, and marital status. Hyperarousal is correlated with age and level of education (Table 2).

The mean IES-R total score is 42.48 (SD = 12.13). A score of > 20 was used to estimate the prevalence of PTSD. 97.8% of the participants have an IES-R score above 20 (Table 3). The IES-R total scores are significantly associated with age, profession, marital status, and income, but not with gender, ethnicity, residence, or education. The groups with older age (above 50) have significantly higher IES-R scores. The group over 60 years has a mean score of 47.82, followed by the group 50-59 years with a

Table 1 Demographic characteristics of the participants (*n* = 1082)

Characteristics	Frequency	Percentage (%)
Gender		
Male	463	42.80
Female	619	57.20
Age (yr)		
< 30	515	47.60
31-39	262	24.20
40-49	157	14.50
50-59	131	12.10
> 60	17	1.60
Ethnicity		
Han	734	67.80
Others	348	32.20
Residence		
Rural	423	39.10
Urban	659	60.90
Education		
Illiterate	1	0.10
Primary	12	1.1
Middle	169	15.60
Bachelor	675	62.40
Master	120	11.10
PhD	105	9.70
Profession		
Farmer	40	3.70
Teacher	185	17.10
Doctor	78	7.20
Government	84	7.80
Private	28	2.60
Students	408	37.70
Business	20	1.80
Others	239	22.10
Marital Status		
Married	568	52.50
Divorced	25	2.30
Single	489	45.20
Monthly income (RMB)		
< 3000	496	45.80
3001-5000	251	23.20
5001-10000	235	21.70
> 10000	100	9.20
Positive responses to different questions		

Have you, your family members, or your friends affected by COVID-19?	5	0.46
Are you back to your routine after the control of COVID-19 epidemic?	439	40.57
COVID-19 affected you physically	68	6.3
COVID-19 affected you economically	480	44.4
Diabetes	13	1.2
Cardiovascular diseases	10	0.9
Hypertension	31	2.9
Chronic respiratory disease	4	0.4
Viral hepatitis	4	0.4
Cancer	1	0.1
Other comorbidities	40	3.7

COVID-19: Coronavirus disease 2019.

Table 2 Correlation between Impact of Event-Scale-Revised subscales and demographic characteristics

		Gender	Age	Ethnicity	Residence	Education	Profession	Marital	Income
IES-R total	Pearson *r*	-0.02	0.17	-0.02	-0.04	-0.09	-0.09	-0.09	0.02
	Sig (2-tailed)	0.47	0.01[a]	0.53	0.17	0.05[a]	0.01[a]	0.01[a]	0.54
Intrusion	Pearson *r*	-0.01	0.15	-0.02	-0.03	-0.04	-0.06	-0.10	0.04
	Sig (2-tailed)	0.82	0.01[a]	0.50	0.34	0.17	0.06	0.01[a]	0.22
Avoidance	Pearson *r*	-0.04	-0.20	0.01	-0.04	-0.10	-0.13	-0.08	0.03
	Sig (2-tailed)	0.23	0.01[a]	0.88	0.16	0.01[a]	0.01[a]	0.01[a]	0.29
Hyperarousal	Pearson *r*	-0.1	0.10	-0.04	-0.04	-0.08	-0.05	-0.05	-0.03
	Sig (2-tailed)	0.71	0.01[a]	0.17	0.18	0.01[a]	0.09	0.10	0.32

[a]$P < 0.05$.
IES-R: Impact of Event-Scale-Revised.

mean value of 47.56. The IES-R scores vary tremendously (21-87) among different professions, and farmers, government officers, and people who work in private sectors have higher scores compared to other professions. Government employees have the highest IES-R scores (46.51 ± 12.02; mean ± SD; $P = 0.001$) (Table 3).

DISCUSSION

This study comprehensively assessed the prevalence and degree of PTSD among the general Chinese population affected by the COVID-19 epidemic by conducting an online survey. We further identified important factors associated with the development of PTSD. Mechanistically, we think both the devastation of the current pandemic and the implementation of stringent control measures significantly impact the general population's mental health. The negative consequences of the COVID-19 pandemic are penetrating every aspect of society, not only health, but also the economy, education, religion, and politics. These have immediate psychological effects on the general public. On the other hand, the implementation of heavy control measures, although desperately needed, has profound side effects on the population's physical and mental health. For example, psychological problems such as anxiety, panic disorder, and depression are frequently observed in people under quarantine or confined to their homes[7,13-15].

In this study, an IES-R score higher than 20 was used to estimate the prevalence of PTSD. The prevalence of PTSD is universal among the Chinese population, reaching 97.8%. The IES-R score is significantly higher among the older age groups. This

Table 3 Prevalence of post-traumatic stress symptoms according to participant demographics

Characteristics	Frequency (%) (*n* = 1082)			
	Range	mean ± SD	*t*	*P* value
Prevalence				
IES-R < 20		24 ± 2.2		
IES-R > 20		1058 ± 97.8		
Gender			0.71	0.48
Male	18-88	42.78 ± 12.48		
Female	18-87	42.25 ± 11.87		
Ethnicity			0.63	0.53
Han	18-88	42.64 ± 11.91		
Others	18-87	42.14 ± 12.59		
Residence			1.37	0.17
Rural	19-87	43.11 ± 12.52		
Urban	18-88	42.08 ± 11.87		
Age (yr)			9.81	0.001[a]
< 30	18-85	40.70 ± 12.69		
31-39	21-88	43.08 ± 11.99		
40-49	18-87	42.52 ± 11.19		
50-59	20-74	47.56 ± 9.36		
> 60	26-62	47.82 ± 11.78		
Education			2.1	0.06
Illiterate	34-34	34		
Primary	31-62	44.75 ± 8.84		
Middle	20-87	44.59 ± 12.19		
Bachelor	18-88	42.34 ± 12.23		
Master	18-85	42.28 ± 11.86		
PhD	21-84	40.02 ± 11.63		
Profession			4.63	0.001[a]
Farmer	21-87	46.25 ± 11.83		
Teacher	19-82	44.41 ± 10.68		
Doctor	18-74	40.42 ± 12.92		
Government	22-87	46.51 ± 12.02		
Private	28-87	46.00 ± 12.02		
Student	18-85	40.83 ± 12.62		
Business	18-59	39.00 ± 12.67		
Others	18-88	42.31 ± 11.48		
Marital status			5.25	0.005[a]
Married	18-88	43.42 ± 11.63		
Divorced	24-63	45.76 ± 11.51		
Single	18-85	41.23 ± 12.62		
Monthly income (RMB)			6.29	0.001[a]
< 3000	18-88	41.47 ± 12.64		

3001-5000	19-87	44.26 ± 11.34
5001-10000	20-87	43.99 ± 11.48
> 10000	18-78	39.47 ± 12.04

[a]$P < 0.05$.
IES-R: Impact of Event-Scale-Revised.

probably reflects that the Chinese populations are well-aware and have adequate epidemiological and clinical knowledge of COVID-19[16]. Because older people, especially when having comorbidities, are vulnerable and have a high COVID-19 fatality rate[17], government employees also experience significantly higher levels of distress compared to other professions. The Chinese central government has mobilized a strong force to contain the epidemic, and government workers have played essential roles. They are heavily involved in the implementation but are also responsible for the effectiveness and outcome of the control measures. Therefore, they face high risks of encountering COVID-19 and political reckoning, explaining their high degree of distress.

Respondents with lower education levels or lower income tend to have more distress. The possible explanation is that this population immediately suffers from economic losses and will face challenges in earning a livelihood. Compared with unmarried participants, the levels of psychological distress are significantly higher among married and divorced participants. Participants with family, especially children, to take care of are likely to worry more about the well-being of their family members.

Of note, this study has some limitations. Firstly, this study used self-reporting instead of diagnostic interviews for assessing psychiatric morbidity. Secondly, the use of online questionnaires has intrinsic limitations as recall, and social desirability biases cannot be excluded. Finally, in addition to PTSD, it would be beneficial to examine depressive disorder, adjustment disorder, psychosomatic disorder, substance use disorder, and antisocial behavior among the psychiatric problems associated with trauma and disasters[18,19].

CONCLUSION

In summary, the COVID-19 epidemic has universally caused PTSD among the general Chinese population. Furthermore, the degree of psychological distress is associated with age, profession, and socio-economic status. Therefore, our results alert the regions struggling with the pandemic to pay attention to the psychological impact and call on the authorities to implement effective interventions to cope with these mental health problems.

ARTICLE HIGHLIGHTS

Research background

The coronavirus disease 2019 (COVID-19) outbreak began in December 2019 in Wuhan, China, and quickly spread to the rest of China and, eventually, the rest of the world. China has been implementing strict control measures such as city lockdowns, travel bans, and within-population quarantine, and the epidemic has been brought under control by March. This epidemic and the implementation of control measures, particularly quarantine, are expected to impact the general population's mental health, but primary research in this area is limited.

Research motivation

COVID-19 has spread to become a pandemic and may become endemic. Unfortunately, knowledge gaps always exist about disease epidemics, potential risks, and the clinical spectrum.

Research objectives

This survey was designed and conducted to investigate the prevalence and associated risk factors of post-traumatic stress disorder (PTSD) among the general Chinese population.

Research methods

A detailed questionnaire, comprising of 38 questions written in both English and Chinese, was developed. The survey was conducted *via* WeChat, a multi-purpose messaging, social media, and mobile payment app widely used by the Chinese population. The 1082 people who participated in this survey belonged to 31 provinces, autonomous regions, and municipalities.

Research results

In total, 1082 people from 31 provinces, autonomous regions, and municipalities participated in the survey by filling questionnaires *via* the WeChat app. 97.8% of the participants had an Impact of Event-Scale-Revised (IES-R) total score above 20, which is the indicator of PTSD. The IES-R total and all three subscales, intrusion, avoidance, and hyperarousal, are significantly correlated with age. In addition, the degree of PTSD symptoms is correlated with age, profession, marital status, and level of education.

Research conclusions

We assessed epidemiological and clinical knowledge of COVID-19 among the general Chinese population and found that the epidemic has widely caused PTSD among the general Chinese population. These results have important implications for regions dealing with the pandemic to implement effective interventions to address these mental health issues.

Research perspectives

We emphasize the importance of launching health promotion programs to educate the general public and healthcare workers about infectious diseases in general to better prepare for future epidemics and pandemics.

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