Psychological Responses and Information Seeking Behaviors Influence Anxiety of the Public During the COVID-19 Pandemic in Mainland China: Survey Study

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Abstract

Background: The rapid spread of COVID-19 around the world has induced in considerable adverse influence on the mental health of the public. Measurement of anxiety, psychological responses and information seeking behaviors is crucial to protect and improve the mental health of the public.

Objective: This study aimed to evaluate the prevalence of anxiety and the associated factors among the public of mainland China during the COVID-19 pandemic.

Methods: From February 10 to April 8, 2020, the cross-sectional survey with convenience sampling was carried out online in mainland China. Anxiety was measure by Generalized Anxiety Disorder 7-item Scale (GAD-7). Psychological responses and information seeking behaviors were measured by self-developed questionnaire. Questionnaires were distributed to the public via the Wenjuanxing smart phone platform. Chi-square test and multivariable logistic regression analyses were conducted to explore the associated factors of anxiety.

Results: During the COVID-19 pandemic, the prevalence of anxiety (GAD-7 score ?7) among the public in China was 446/2484 (17.95%). Multivariable logistic regression showed that being fearful, being nervous, spending time consuming on the information about the COVID-19 pandemic increased anxiety. Conversely, being rational was associated less with anxiety.

Conclusions: High levels of anxiety among the public during the COVID-19 pandemic should be emphasized. Promotion of mental well-being should be provided to decrease the degree of anxiety.Governments and news media should take the responsibilities to control the sources and quality of health information in order to prompt positive psychological responses and healthy behaviors among the public. Future research on health of the public after prolonged anxiety from the COVID-19 pandemic is warranted.

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Key Words: Anxiety; COVID-19;Information Seeking Behavior

Introduction

In January 2020, COVID-19 was classified as a Public Health Emergency of International Concern (PHEIC) by the World Health Organization (WHO) [1,2]. COVID-19 spread rapidly to 208 countries or regions and became a detrimental global pandemic, resulting in more than 25 million people infected and more than 850 thousand deaths around the world [3,4]. The outbreak of COVID-19 caused considerable adverse impacts on daily life and mental health among the public, which demanded solutions [5-11].

The severe and unpredictable COVID-19 pandemic generated a mental health crisis with increases in disorders including anxiety and depression among the public [12-17]. A number of theoretical models have been developed to explore the relationship between anxiety and associated factors. The intolerance of uncertainty model states that intolerance of uncertainty and cognitive avoidance are positively related with negative psychological responses (e.g. stress, feeling upsetting, worried, fearful) and anxious [18-20]. Overestimated threats and intolerance of uncertainty raised from canceled plans, delayed work or study, scarcity of medical and life supplies were the common the reasons for anxiety [21-23]. According to the

avoidance model of worry and generalized anxiety as well as the emotional processing model, the perception of threat is closely associated with emotional processing [18,24-26]. Negative emotions can increase people's likelihood of suffering from mental disorders by the threat of infection [27]. Similarly, cognitive-behavioral models of health anxiety indicate that negative emotions, maladaptive attention processes and misinterpretations of health-related stimuli shape anxiety [27-31]. On the one hand, anxiety can be induced by psychological responses. On the other hand, anxiety can be taken into control through the effective regulations on psychological responses.

Mechanisms based in neurobiology and cognitive theory, positive psychological responses and psychological traits can reduce anxiety. For example hope can affects spontaneous anxiety via the influence of the medial orbitofrontal cortex (mOFC), which benefits emotional cognitive processing and protects individuals from anxiety[32-34]. The emotion dysregulation model of anxiety indicates that lack of emotion regulation has a positive correlation with anxiety [35,36]. Therefore, initiating emotion regulation is necessary for the public to cope with stress better [37]. Cognitive emotion regulation could promote resilience among people with anxiety or depression, providing potential targets for psychological interventions [38]. The COVID-19 pandemic has impacted the mental health of the public, which led to the great demand of emotion-related psychological intervention [39].

Various sources of information, including official media, social media, local government, community, etc., could influence the mental well-being of public. Recent research has found that excessive information seeking behaviors were closely related with mental disorders including anxiety and depression during the COVID-19 pandemic [40,41]. Individuals with anxiety tended to recognize less positive information and release more negative psychological responses [42]. The frequency and daily duration of social media usage occurred more frequently in areas with COVID-19 cases and was positively associated with mental distress, especially among the individual with high levels of fear [43]. The metacognitive model (MCM) pointed out that behaviors such as controlling behaviors, reassurance seeking, and checking behaviors were positively associated with anxiety [18,44,45]. Thus, excessive media consumption should be considered as a risk factor of anxiety during the COVID-19 pandemic.

Most researchers have worked on the pathogenic and epidemiological characteristics, epidemic trend, the effective prevention and treatment of COVID-19 [46-54]. However, studies focused on the relationship between information seeking behaviors and anxiety are sparse. Therefore, this study aims to evaluate anxiety and the associated factors including psychological responses and information seeking behavior among the public of mainland China during the COVID-19 pandemic. Our findings provide evidence-based suggestions on the regulation on psychological responses, psychological interventions and information management to reduce anxiety for the general public.

Methods

Participants, Procedure, and Ethics Statement

From February 10 to April 8, 2020, a cross-sectional survey with convenience sampling using a self-administrated questionnaire was conducted online in mainland China. The questionnaire was developed by the Environmental Health Institute in China Medical University on the Wenjuanxing platform, one of the most popular questionnaire websites in China. The questionnaire comprised questions based on the Generalized Anxiety Disorder 7-item Scale (GAD-7), psychological responses and information seeking behaviors during the COVID-19 pandemic. The questionnaire took about 20 minutes to complete.

This survey collected information from 2,501 adults from the general public in mainland China. The inclusion criteria were as follows: at least 18 years of age; able to read and write Chinese; able to use smart phones to accomplish the online questionnaire independently; able

to provide signed informed consent and participate voluntarily. Participants who met at least one of the following criteria were excluded: undergoing any therapy for psychological illness; having a history of any drug dependence; or having been diagnosed with diseases or impairments preventing them from accomplishing the questionnaire independently. Questionnaire with all blanks filled was considered valid. With a total of 2,484 participants offering valid answers, this survey resulted in a valid response rate of 99.32%. This study was conducted in accordance with the Helsinki Declaration as revised in 1989. The Ethics Committee of China Medical University approved the protocols of this study.

Demographic Characteristics of the Participants

This study collected demographic characteristics of the participants including gender (male, female), age, marital status (married, other), occupation, education, and monthly income. “Occupation” was classified into ‘government worker/ health care worker/ teacher lawyer/ journalist’, ‘student’ and ‘other (e.g. employee of enterprises, commercial personnel, soldier, etc)’. “Education” was classified into ‘college and below’, ‘bachelor’s degree’ and ‘master’s degree or above’. Monthly income was categorized into ‘≤5,000 yuan (≤US $725.19)’, ‘5,001-10,000 yuan (US $725.34 to $1,450.39)’, and ‘>10,000 yuan (>US $1,450.39)’.

Measurement of Anxiety

The Generalized Anxiety Disorder 7-item Scale (GAD-7), one of the most universal tools to measure anxiety, was used to assess anxiety during the COVID-19 pandemic [55]. Psychological problems related to anxiety in the last two weeks were collected using a 4-point Likert-type scale with choices including “not at all sure”, “several days”, “over the half of the days” and “nearly every day”, giving a total score between 0 and 21. The cutoff score of GAD-7 was 7 and above was considered as having anxiety [56-58]. The GAD-7 in this study has a Cronbach'α coefficient of .92.

Measurement of Psychological Responses

Psychological responses included “being fearful”, “being nervous”, “being confident”, “being hopeful” and “being rational” in the past 2 weeks. They were measured by “yes” or “no” questions.

Measurement of Information Seeking Behaviors

Information seeking behaviors were assessed by self-developed questions including four parts: can not stop searching information about the COVID-19 pandemic, concern about the COVID-19 pandemic, time spent on the information about the COVID-19 pandemic(<1h, 1-2h, ≥3h) and sources of information about the COVID-19 pandemic (social media and commercial media, central official media and local official media, basic-level government and community). Answers to the question “can-not stop searching information about the COVID-19 pandemic” were categorized as “agreed”, “not sure”, and “disagreed”. Being concerned about the COVID-19 pandemic and sources of information about the COVID-19 pandemic were assessed by “yes” or “no” questions.

Statistical Analyses

SPSS version 23.0 statistical software for Windows (IBM Corporation) was used to perform all the statistical analyses. Chi-square tests were applied to compare associations between anxiety and other variables. The GAD-7 scores were binary (anxiety or no anxiety) in multivariable logistic regression analysis to explore risk factors related with anxiety. The responses were not included in the analysis when more than 95% of individuals had the same response to the categorical independent variables. A two-tailed *P*-value < .05 was considered to be statistically significant.

Results

Demographic Characteristics and Anxiety Distribution of the Participants

The prevalence of anxiety among the general public was 446/2484 (17.95%). A total of 2,482 participants provided valid answers in this study. The demographic characteristics of the participants and results from the univariate analysis on anxiety are presented in *Table 1*. Participates were 34 years old on average. There were 1,550/2484 (62.40%) female participants and 418/1550 (26.97%) of them had anxiety. About half of the participants were married (1,240/2484, 49.92%). The percentage distribution of occupations including government worker/ health care worker/teacher, lawyer or journalist, students and the others (e.g.employee of enterprises, commercial personnel, soldier, etc.) were 515/2484 (20.75%), 954/2484 (38.44%) and 1,015/2484 (40.89%) respectively. Most of the participants had bachelor's degree (1,395/2484, 56.16%) or master's degree and above (800/2484, 32.21%). The 21.11% of participants whose educational level was college and below had significantly higher levels of anxiety. The distribution of monthly income was 995/2484 (40.45%), 884/2484 (35.59%) and 605/2484 (24.36%) for ≤5000, 5,001-10,000 and >10,000 respectively.

Psychological Responses

The distribution of anxiety scores according to psychological responses are shown in *Table 1*. The prevalence of anxiety was higher for participants who felt fearul (1,079/2484, 43.44%) or nervous (1546/2484, 62.24%) about the COVID-19 pandemic (*P<.001*). On the contrary, participants who reported that they felt confident (2,340/2484, 94.20%), hopeful (2,360/2484, 95.01%) or rational (2,282/2484, 91.87%) about the COVID-19 pandemic had lower prevalence of anxiety (*P<.001*).

Information Seeking Behaviors

The distributions of anxiety scores in information seeking behaviors during the COVID-19 pandemic are shown in *Table 1*. Participants who couldn't stop searching about the COVID-19 pandemic (1,474/2484,59.34%) or were concerned about the pandemic (1223/2484,49.24%) had significantly higher anxiety scores (*P<.001*). The more time the participants spent on searching for information about the COVID-19 pandemic, the higher their anxiety scores were (*P<.001*).

Participants who sought out information on COVID-19 through social media and commercial media (2,160/2484,86.96%) had higher anxiety scores than those did not (*P=0.001*). There were 408/2160 (18.89%) among them had significantly higher levels of anxiety than the corresponding control group.

Risk Factors of Anxiety during the COVID-19 Pandemic.

Table 2 shows the final results of the multivariable logistic regression analysis. Psychological responses including being fearful (odds ratio [OR]2.011, 95% confidence interval [CI] 1.562-2.590) or being nervous (OR 4.831, 95% CI 3.721-6.270) increased the risk of anxiety. Additionally, time spent consuming information about the COVID-19 pandemic also elevated the likelihood of suffering from anxiety(OR 3.400, 95% CI 2.402-4.813) . Whereas, being rational (OR 0.371, 95% CI 0.256-0.537) decreased anxiety. In the final multivariable logistic regression model and forest plot (*Figure 1*), the risk factors of depression included being male, being fearful, being nervous and time spent consuming information about the COVID-19 pandemic. Whereas, being rational was a protective factor for anxiety.

Table 1. Characteristics of the Public in China and Distribution of Anxiety during the COVID-19 Pandemic (N = 2,484)

Variables	Total [number(%)]	Anxiety [number(%)]	No Anxiety [number(%)]	X^2	*P*
Demographic characteristics					
Gender				**0.006**	**.957**
Male	934(37.60)	167(17.88)	767(82.12)		
Female	1550(62.40)	279(18)	1272(82.06)		
Age(years)				**2.017**	**.167**
≤35	1474(59.34)	278(18.86)	1196(81.14)		
>35	1010(40.66)	168(16.63)	842(83.37)		
Marital status				**0.076**	**.794**
Married	1240(49.92)	220(17.74)	1020(82.26)		
Other	1244(50.08)	226(18.17)	1018(81.83)		
Occupation				**3.995**	**.136**
Government worker/ health care worker/ teacher, lawyer, or journalist	515(20.75)	85(16.50)	430(83.50)		
Student	954(38.44)	160(16.77)	794(83.23)		
Other (e.g. employee of enterprises, commercial personnel, soldier, etc.)	1015(40.89)	201(19.80)	814(80.20)		
Education				**2.802**	**.246**
College and below	289(11.63)	61(21.11)	228(78.89)		
Bachelor	1395(56.16)	238(17.06)	1157(82.94)		
Master and above	800(32.21)	147(18.38)	653(81.63)		
Monthly income (¥[a])				**1.540**	**.463**
≤5000	995(40.05)	190(19.10)	805(80.90)		
5001-10,000	884(35.59)	150(16.97)	734(83.03)		
>10,000	605(24.36)	106(17.52)	499(82.48)		
Psychological responses					
Being fearful				**145.23**	**<.001**
Yes	1079(43.44)	308(28.54)	771(71.46)		
No	1405(56.56)	138(9.82)	1267(90.18)		
Being nervous				**326.56**	**<.001**
Yes	938(37.76)	336(35.82)	602(64.18)		
No	1546(62.24)	110(7.12)	1436(92.88)		
Being confident				**80.649**	**<.001**
Yes	2340(94.20)	380(16.24)	1960(83.76)		
No	144(5.80)	66(45.83)	78(54.17)		
Being hopeful				**47.581**	**<.001**
Yes	2360(95.01)	395(16.74)	1965(83.26)		
No	124(4.99)	51(41.13)	73(58.87)		
Being rational				**113.617**	**<.001**
Yes	2282(91.87)	354(15.51)	1928(84.49)		
No	202(8.13)	92(45.54)	110(54.46)		
Information seeking behaviors					
Can-not stop searching information about the COVID-				**37.246**	**<.001**

19 pandemic					
Yes	1474(59.34)	322(21.85)	1152(78.15)		
No	1010(40.66)	124(12.28)	886(87.72)		
Concern about the COVID-19 pandemic.				**37.305**	**<.001**
Yes	1223(49.24)	278(22.73)	945(77.27)		
No	1261(50.76)	168(13.32)	1093(86.68)		
Time spent consuming information about the COVID-19 pandemic.				**115.067**	**<.001**
<1h	906(36.47)	92(10.15)	814(89.85)		
1-2h	1007(40.54)	171(16.98)	836(83.02)		
≥3h	571(22.99)	183(32.05)	388(67.95)		
Sources of information about the COVID-19 pandemic.					
Social media and commercial media				**9.806**	**.001**
Yes	2160(86.96)	408(18.89)	1752(81.11)		
No	324(13.04)	38(11.73)	285(87.96)		
Central official media				**3.019**	**.094**
Yes	2105(84.74)	366(17.39)	1739(82.61)		
No	379(15.26)	80(21.11)	299(78.89)		
Local official media, basic-level government and community				**0.879**	**.363**
Yes	1508(60.71)	262(17.37)	1246(82.63)		
No	976(39.29)	184(18.85)	792(81.15)		

[a]1 ¥ = US $0.15

Table 2. The multivariable logistic regression analysis for exploring factors of depression among public in China during the COVID-19 pandemic

Variables	OR	95%CI
Demographic characteristics		
Gender (male vs female)	1.319	1.025-1.696
Age (years)	0.986	0.971-1.001
Marital status (married vs other)	0.908	0.622-1.325
Occupation		
Government worker/ health care worker/ teacher, lawyer, or journalist vs student	0.779	0.496-1.222
Other (e.g. employee of enterprises, commercial personnel, soldiers, etc.) vs student	1.048	0.704-1.560
Education		
College and below vs master and above	1.137	0.766-1.688
Bachelor vs master and above	0.852	0.652-1.114
Monthly income (¥[a])		
≤5000 vs>10,000	1.255	0.909-1.734
5001 to 10,000 vs>10,000	1.124	0.819-1.541
Psychological responses		
Being fearful (yes vs no)	2.011	1.562-2.590
Being nervous (yes vs no)	4.831	3.721-6.270
Being confident (yes vs no)	0.553	0.305-1.004
Being hopeful (yes vs no)	0.859	0.443-1.663
Being rational (yes vs no)	0.371	0.256-0.537
Information seeking behaviors		
Can-not stop searching information on COVID-19 (yes vs no)	1.046	0.794-1.379
Concern about the COVID-19 pandemic. (yes. vs no)	1.250	0.953-1.640
Time spent consuming information of COVID-19		
1-2h vs <1h	1.503	1.102-2.048
≥3h vs <1h	3.400	2.402-4.813
Sources of information about the COVID-19 pandemic.		
Social media and commercial media (yes vs no)	1.424	0.949-2.138
Central official media (yes vs no)	0.857	0.615-1.195
Local official media, basic-level government and community (yes vs no)	0.922	0.717-1.186

[a]1 ¥ = US $0.15

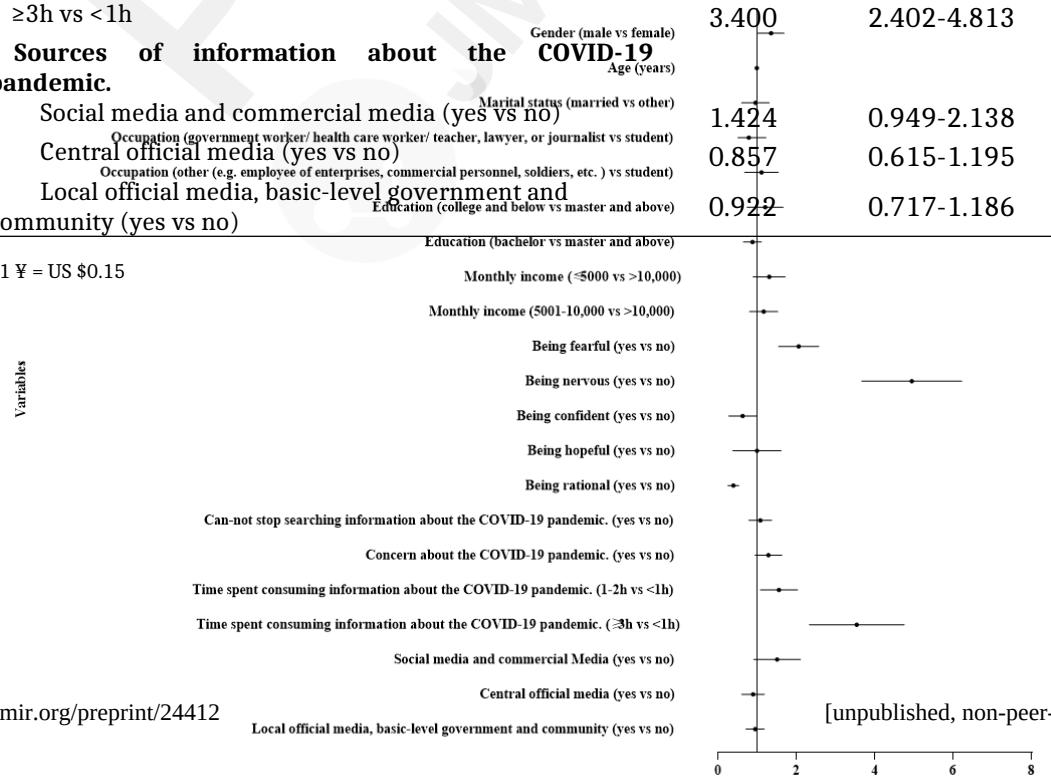

Figure1. The Forest Plot of Risk Factors of Anxiety

Discussion

Principal Findings

In this study, 17.95% of the public in China suffered from anxiety during the COVID-19 pandemic. The prevalence of anxiety during the COVID-19 pandemic was much higher than the prevalence before the pandemic among the general population (3.2% vs 8.1%) [59-60]. However, comparing the prevalence of anxiety during the outbreak of SARS (24.44% vs 35.00%), the prevalence of anxiety during the COVID-19 pandemic is slightly lower [61-62]. Since the outbreak of COVID-19, psychological studies concentrated on health professionals, children, senior citizens, or patients with COVID-19 rather than general population [63-65]. It is of vital importance to identity people with anxiety as early as possible and to provide advice on how to cope with anxiety including how to regulate psychological responses and excessive information seeking behaviors for the general population.

In our study, anxiety was closely associated with psychological responses including being fearful, being nervous, being confident, being hopeful and being rational. The participants who were fearful or nervous about the COVID-19 pandemic had a higher prevalence of anxiety than those who were not. The multivariable logistic regression analysis indicated that being fearful and being nervous were risk factors for anxiety. The public are exposed to a variety of stressors such as a perception of the severe risks of being infected by COVID-19, loneliness along with home quarantine, financial hardship caused by delay of work, and uncertainty of the pandemic. These stressors could result in negative emotions such as being fearul and being nervous, with overgeneralized fear as a burden to daily life and a characteristic of anxiety [66] . Being rational was found to be a protective factor of anxiety. Being rational can attenuate the prevalence of anxiety, which has also been found in previous studies indicating people who were more positive coped better with life stress and had decreased anxiety [67,68]. Additionally, people can improve their management of anxiety with rational-emotive behavioral interventions and cognitive behavioral therapies to improve psychological abilities including emotion regulation and stress management [69-72]. Therefore, initiating psychological responses and providing psychological interventions for the public could prevent the adverse impacts of negative psychological responses and improve protective effects from positive about psychological responses.

This study showed that consuming high levels of information about the COVID-19 pandemic was closely associated with anxiety. About half of the participants who reported that they could not stop searching information about the COVID-19 pandemic (1,474/2484,59.34%) or were very concerned about the COVID-19 pandemic (1,223/2484,49.24%) had a higher prevalence of anxiety than the corresponding group. Our results are consistent with recent studies, which found that anxiety was associated with increased the usage of smart phones, leading to the excessive exposure to COVID-19 news [40,43,73,74]. The public can actively search or passively receive health information about the COVID-19 pandemic via multiple sources of COVID-19 related information. Searching for health information could create anxiety, characterized by a fear of being infected by a serious disease [75-77]. Anxiety could also promote searching for health information [79,80]. Medical professionals should provide

suggestions for the public to search and receive health information rationally and from trusted sources [80-84].

It is also indicated in this study that the more time spent on consuming information about the pandemic, the more anxious the public become. In previous studies, the frequency and duration of searching for the health information could exacerbate stress, anxiety and perception of risks [83-86]. Notably, searching for health information is not only closely associated with anxiety, but also related with negative psychological responses such as anger and sadness, and psychological capabilities including self-esteem and tolerance of uncertainty [79,87-90]. Searching for health information online can be regarded as a source of anxiety and negative psychological responses. Additionally, sources of information about the COVID-19 pandemic are significantly associated with anxiety in this study, especially social media which was positively associated with anxiety. Excessively searching for health information on social media during the outbreak of traumatic events (e.g. public health emergencies, food safety incidents, terror attacks and natural disasters) can result in sleep disorders, anxiety, depression, post-traumatic stress disorder (PTSD) [91-96]. Social media provided platforms for the public to express their ideas and perspectives which were difficult for public to distinguish true information. Conversely, official media in China are more likely to report quality health information [40,97,98]. With the coverage of networks, social media and local communities, health information could be reported and spread timely during the outbreak of public health emergencies [99-101]. It is of great importance to ensure official sources provide accurate health information to convey important information and maintain public trust. Using official avenues for health information in China, it is an opportunity to encourage coping strategies and healthy behaviors rather than only focusing on the prevention of negative psychological responses [102].

Limitation

Several limitations should be acknowledged in this study. First, the data were collected using a self-administrated online questionnaire via smart phones, which limited the diversity of participants and may affected the authenticity of the answers. Second, this survey was conducted with convenience sampling, which limits the generalizability of the results to other populations. Finally, anxiety and the associated factors presented in this study were only limited to the first 4 months of the COVID-19 pandemic.

Conclusion

In conclusion, the Chinese public suffered from high levels of anxiety during the COVID-19 pandemic. Fear, nervousness, and more time spent consuming the information about the COVID-19 pandemic increased the risks of anxiety. Whereas, being rational decreased the risk of anxiety. On the one hand, psychological responses which caused adverse impacts on the public's mental health should be managed appropriately with immediate psychological interventions. On the other hand, psychological responses which have positive impacts on mental health of the public should be promoted using psychological training such as cognitive behavior therapy. Additionally, governments and news media should take the responsibilities to report and spread the information about the COVID-19 pandemic factually, fairly and immediately. The public should form a sense of control and judgment over health information. Therefore, early detection of mental disorders and psychological intervention should be

provided to the public and effective information management policies should be improved or established.

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Authors' Contributions

WZ and CZ contributed to the acquisition of data. KS contributed to the revision of the manuscript. FY, YJ, RM and CC contributed to the acquisition and interpretation of data. XY was responsible for the conception and design and contributed to the revision of the manuscript.

WZ and CZ have contributed to the work equally and should be regarded as co-frst authors.

Conflicts of Interest

None declared.

Abbreviations

OR: odds ratio

GAD-7: Generalized Anxiety Disorder 7-item Scale

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Supplementary Files

Figures

The forest plot of risk factors of anxiety.