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Public awareness and anxiety during COVID-19 epidemic in China: A cross-sectional study

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Abstract

Objective: The study aims to investigate public awareness of coronavirus disease 2019 (COVID-19) and measure levels of anxiety during the outbreak.

Method: A total of 2115 subjects from 34 provinces in China were evaluated. A questionnaire was designed, which covers demographic characteristics, knowledge of COVID-19, and factors that influenced anxiety during the outbreak to test public awareness and determine the impact of the outbreak on people’s lives. In addition, a generalized anxiety disorder (GAD) scale was utilized to assess anxiety levels during the outbreak. Lastly, the chi-square test and multiple logistic regression analysis were used to identify factors associated with levels of public anxiety.

Results: A majority of respondents reported high levels of awareness of COVID-19. A total of 1107 (52.3%), 707 (33.4%), 154 (7.3%), and 147 (7%) respondents exhibited no, mild, moderate, and severe levels of anxiety, respectively. Results of the chi-square test and multiple logistic regression analysis demonstrated that respondents (a) with no college education, (b) are unaware of neighbors who may have been infected, (c) who spent considerable time collecting information and browsing negative information related to the virus, (d) are unhealthy, and (e) displayed low levels of awareness of the transmission routes were highly likely to be anxious.

Conclusion: During the outbreak, the majority of people exhibited high levels of awareness and knowledge regarding preventive measures from COVID-19. The absence of psychological anxiety was observed in more than half of the respondents. Adaptive responses to anxiety and high levels of awareness about COVID-19 may have protected the public during the outbreak.

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Introduction

On December 30, 2019, four pneumonia cases of unknown etiology emerged in Wuhan, China [1]. After epidemic investigation and genetic sequencing, the Chinese Center of Disease Control and Prevention confirmed on January 7, 2020 that the virus is a novel coronavirus [2]. By January 23, 2020, a total of 835 cases were reported in China (549 cases from Hubei Province and 286 from 31 other provinces, municipalities, or special administrative regions) [1]. The government closed off Wuhan and declared a public health emergency from 10:00 on January 23, 2020. By 24:00 on February 14, 2020, the number of confirmed and suspected cases reached 66,576 and 8969, respectively, whereas mortality and recovery hit 1524 and 8216 nationwide, respectively [3]. Subsequently, infection cases have been reported in other countries, such as Japan, Thailand, and the United States [4,5]. The infection continued to spread worldwide [6]. On February 11, 2020, the World Health Organization named the novel coronavirus COVID-19 and issued a call to the international community to work together to respond to the public health emergency [7].

The COVID-19 outbreak posed an unprecedented threat to the community and presented a great challenge for the government [8]. As such, the government was required to improve public awareness of COVID-19. Previous studies demonstrated that the public may develop psychological problems due to the lack of knowledge about the public health emergency. Wang [9] found that 53.8% of respondents rated the psychological impact of the outbreak as moderate or severe, whereas, 16.5%, 28.8%, and 8.1% reported moderate-to-severe depressive symptoms, moderate-to-severe anxiety symptoms, and moderate-to-severe stress levels, respectively. A longitudinal study on mental health included 1738 respondents from 190 cities in China and noted moderate-to-severe levels of stress, anxiety, and depression in 8.1%, 28.8%, and 16.5% of the respondents, respectively, without significant longitudinal...
changes [10]. A study on immediate mental health status and psycho-
near immunity prevention measures of a Chinese workforce deduced that
10.8% of respondents met the criteria for post-traumatic stress dis-
order after returning to work. The respondents reported a low preva-
ence of anxiety (3.8%), depression (3.7%), stress (1.5%), and insomnia
(2.3%) [11]. Moreover, a case-control study with service and research
implications for immunopsychiatry included 76 patients and 109
healthy control subjects. The study found that severe worries about
physical health, anger and impulsivity, and intense suicidal ideation
were significantly higher in patients under psychiatric treatment com-
pared with healthy individuals [12]. A multinational, multicenter
study on psychological outcomes and physical symptoms associated
with the COVID-19 outbreak among 906 healthcare workers found
that 48 (5.3%), 79 (8.7%), 20 (2.2%), and 34 (3.8%) screened positive
for moderate-to-very severe depression, moderate-to-extremely severe
anxiety, moderate-to-extremely severe stress, and moderate-to-severe
psychological distress, respectively [13]. The literature indicates that
the public requires prompt psychiatric intervention when exposed to
major disasters with widespread injuries and loss of lives.

Psychological assistance is an indispensable measure during the
COVID-19 outbreak. Thus, the current study designed a questionnaire
to investigate public awareness of COVID-19 and its relationship with
anxiety. High levels of awareness of COVID-19 can prevent the public
from suffering psychological morbidity [14,15]. COVID-19 is a novel co-
noravirus. As such, the unknown surroundings may cause anxiety, espe-
cially among individuals in regions where the outbreak is severe. The
study aims to investigate public awareness of COVID-19, measure the
level of anxiety during the outbreak among public, and provide a refer-
ence for psychological assistance measures during public health
emergencies.

2. Materials and methods

2.1. Sample

All samples are derived from 34 provinces in China. The provinces
were divided into two regions, namely, severely and mildly infected re-
gions. The top 10 provinces with cumulative confirmed cases are lo-
cated in the severe outbreak region, whereas the rest of the provinces
belong to the mildly infected region. By 24:00 on February 14, 2020,
the provinces belonging to the severely infected region were Hubei
(54,406 positive cases), Guangdong (1294), Henan (1212), Zhejiang
(1162), Hunan (1001), Anhui (950), JiangXi (913), Jiangsu (604),
Chongqing (537), and Shandong (532). Given that the majority of cit-
ies have restricted travel in China during the outbreak, thus, including
the researchers in the restriction, the snowball sampling technique
was used to recruit respondents via social media platforms, such as
WeChat and QQ. The sampling method introduces significant bias com-
pared with probabilistic sampling. As such, limiting the survey to a
group of people with similar thinking could lead to serious bias [16].
However, snowball sampling is the only viable option in the unavail-
ility of other probabilistic sampling methods. The questionnaire was sent
to the respondents via email. They were invited to complete the ques-
tionnaire and recruit other people. Each email contained the question-
naire and an introductory letter that guaranteed anonymity during the
survey. A total of 3000 questionnaires were sent to respondents from
34 provinces, out of which 2177 were returned before February 14,
2020. The response rate was 72.5%.

2.2. Development of the questionnaire

The questionnaire consisted of four parts. Part 1 involved collection
data on general demographics, such as gender, age, education, and lo-
cation. Age was divided into four groups, namely, “less than 20 years,”
“21–30 years,” “31–40 years,” and “more than 40 years.” Education
was divided into three groups, namely, “no college education,”
“undergraduate,” and “postgraduate.” Lastly, location was divided into
two groups, namely, “severely infected region” and “mildly infected
region.”

Part 2 covered general awareness of COVID-19. Three items, namely,
clinical symptoms, transmission routes, and protective measures of
COVID-19 were designed. The participants who chose the correct op-
tions were considered to have high-level awareness of COVID-19. Each
item had multiple options. The options for clinical symptoms were
“fever,” “dry cough,” “myalgia or fatigue,” “runny nose,” “dyspnea,”
and “worsened conditions” [17]. The researchers assumed that if the
participants chose “fever,” “dry cough,” and “general fatigue,” then
they have high-level awareness of clinical features. Transmission routes
consisted of four correct (“talking to a positive case face-to-face,” “eat-
ing with a positive case,” “taking a bus with a positive case,” and “eating
wild animals”) and two wrong (“touching books from Wuhan” and
“using high-quality surgical masks from Wuhan”) options [18]. The par-
ticipants who chose any two right options and did not choose any of
the two wrong options were considered to have high-level awareness of
transmission routes. Protective measures consisted of five options
[19], namely, “staying at home,” “going out with masks,” “washing hands
frequently,” “eating cooked food,” and “not eating wild animals.”
The researchers assumed that if the participants selected “staying at
home,” “going out with masks,” and “washing hands frequently,” then
they have high-level awareness of protective measures.

Part 3 collected data on the factors that influenced the respondents’
anxiety during the outbreak, including the COVID-19 status of the peo-
ple around them, physical status, proportion of browsed negative infor-

dation, and time spent on reading information related to the virus [14].
The COVID-19 status of people around the respondents was categorized
as follows: “someone confirmed,” “someone suspected,” “no one con-

firmed and suspected,” and “unclear.” The variable for physical status
in the past 14 days included fever, myalgia, cough, dyspnea, coryza,
sore throat, and other chronic medical conditions. The respondents
were asked to rate their physical health status using three options,
namely, “healthy,” “sub-healthy,” and “unhealthy.” Browsed negative
information was considered distressing information regardless of accu-

racy. The respondents were asked to rate the proportion of browsed
negative information using three options, namely, “over 80%,” “approx-
imately 50%,” and “under 20%.” Time spent on information related to the
virus every day was rated as follows: “hardly any time,” “less than 30
min,” “30 min to 1 h,” “1 to 2 h,” and “more than 2 h.”

Part 4 used a generalized anxiety disorder (GAD-7) questionnaire to
determine the degree of anxiety of the respondents [20]. GAD-7 is a
widely validated test for measuring the anxiety level of people in
China [21,22]. The GAD-7 questionnaire consisted of seven items,
where each item is scored from 0 to 3. The GAD-7 scale score ranges
from 0 to 21. The scores were grouped into four, namely, 0–4 for mini-
mal anxiety, 5–9 for mild anxiety, 10–13 for moderate anxiety, and
14–21 for severe anxiety [23]. In addition, a question was added in
this part and respondents were told to choose the “3” option and ac-
cordingly provide their responses, otherwise, the questionnaire
was considered as invalid. After all the questionnaires were returned, the
reliability of all variables, awareness of COVID-19, and anxiety scale
were tested [24].

2.3. Statistical analysis

Data were analyzed using the Statistical Package for the Social Sci-
ences 22.0. A topic in the questionnaire was set, and the respondents
were asked to choose the only correct option. Otherwise, the question-
naire was classified as invalid. The chi-square test was used to examine
differences in demographic characteristics, knowledge about COVID-19,
and factors that influenced the respondents among the anxiety level
groups [21]. Variables with significant differences were included in
the multiple logistic regression model as independent variables. The
multiple logistic regression model was used to identify factors
associated with levels of public anxiety [21]. The dependent variable was public anxiety status; this collective term can be classified into the categories of “minimal,” “mild,” “moderate,” and “severe” levels of anxiety. Results with p-values of less than 0.05 were interpreted as statistically significant. For the reliability testing of the questionnaire, Cronbach’s α coefficient was used to measure internal consistency. Cronbach’s α values over 0.7 indicated reliability [25].

3. Results

3.1. General demographic characteristics

After eliminating the invalid questionnaires, a total of 2115 valid questionnaires were obtained with a passing rate of 97.1%. The number of invalid questionnaires was less than 5% of the total. Cronbach’s α values for awareness of COVID-19 and anxiety were 0.73 and 0.938, respectively. The benchmark for substantial reliability was reached for variables. Table 1 displays the characteristics of the sample (female: 59.1%; male: 40.9%). The age groups were distributed as follows: 63.8% (less than 20 years), 21.6% (21–30 years), 15.0% (31–40 years), and 12.8% (more than 40 years). In terms of education, 60.4% were undergraduates, without college education, and 25.7% of the respondents are postgraduates. Moreover, 51.1% of the respondents are undergraduates, without college education, and 25.7% of the respondents are postgraduates. A total of 51.1% of the respondents lived in provinces belonging to the severely infected region, whereas 48.9% lived in provinces under the mildly infected region.

3.2. General awareness of COVID-19

Table 2 displays the level of awareness of the respondents. For the mildly and severely infected regions, the rates for the high-level awareness of (a) clinical symptoms, (b) transmission routes, and (c) protective measures reached (a) 84.2% and 81.6% (χ² = 2.306, p = 0.129), (b) 57% and 56.7% (χ² = 0.025, p = 0.875), and (c) 89.5% and 92.5% (χ² = 5.94, p = 0.015), respectively. No significant difference in statistics was observed for the levels of awareness of clinical features and transmission routes, whereas a significant difference was noted for the cognitive degree of protective measures.

3.3. Factors that influenced respondents’ anxiety during the outbreak

In terms of people surrounding the respondents, 23 (1.1%), 52 (2.5%), 1870 (88.4%), and 170 (8.0%) were identified as “someone confirmed,” “someone suspected,” “no one confirmed and suspected,” and “unclear” (8.0%), respectively, during the COVID-19 outbreak. In terms of rating their physical status, 1305 (61.7%), 731 (34.6%), and 79 (3.7) rated themselves as “healthy,” “sub-healthy,” and “unhealthy,” respectively. Moreover, 501 (23.7%), 692 (32.7%), and 922 (43.6%) of the respondents browsed negative information in the following proportions: “over 80%,” “approximately 50%,” and “under 20%,” respectively. Regarding time spent on reading information related to the virus every day, 964 (45.6%), 662 (31.3%), 268 (12.7%), 204 (9.6%), and 17 (0.8%) reported durations of “1 to 2 h,” “30 min to 1 h,” “less than 30 min,” “more than 2 h,” and “hardly any time,” respectively.

3.4. Risk factors associated with high levels of anxiety during the COVID-19 outbreak

3.4.1. Single-factor analysis. Single-factor analysis

The average anxiety score for all respondents during the outbreak was 4.95. In terms of anxiety levels, 1107 (52.3%), 707 (33.4%), 154 (7.3%), and 147 (7%) respondents displayed no anxiety, mild, moderate, and severe levels of anxiety, respectively. The chi-square test was used to determine differences in anxiety levels among variables. Table 3 showcases the results. No significant difference was found between anxiety levels and the respondents according to gender, age, location, and awareness levels of clinical features and preventive measures. Meanwhile, statistical significance was found among anxiety levels, educational background, surrounding positive cases, physical status, proportion of browsed negative information, time spent on reading information related to the virus, and awareness level of transmission. Differences with p-values of <0.05 were considered statistically significant.

3.4.2. Multiple logistic regression analysis

The results of the chi-square test of statistically significant variables were used for multiple logistic regression analysis. Table 4 presents the variable assignment for multiple logistic regression analysis. The dependent variable was anxiety level, whereas the independent variables were educational background, time spent on reading information related to the virus, surrounding positive cases, proportion of browsed negative information, physical status, and awareness of transmission routes. The normal level of anxiety was used as the reference level. Table 5 provides the results of multiple logistic regression analysis. For mild and severe anxiety groups, the respondents with no college education were more likely to be anxious. In the severe anxiety group, respondents with knowledge about an individual as a confirmed case of COVID-19 were associated with significantly increased likelihood of anxiety. Being unclear about the COVID-19 status of the surrounding people was associated with significantly increased likelihood for all anxiety categories. In the moderate and severe anxiety groups, respondents who spent less than 1 h on information related to the virus were less likely to be anxious. Spending 1 to 2 h on information related to the virus was associated with significantly reduced odds of severe anxiety but increased odds of mild anxiety. Respondents under the severe anxiety group with low awareness of transmission routes were more likely to
be anxious. In the mild and severe anxiety groups, respondents with unhealthy physical status were more likely to be anxious. In all anxiety groups, the respondents who browsed less than 20% negative information every day were less likely to be anxious. Differences with p-values of <0.05 were considered statistically significant.

4. Discussion

The study deduced that a majority of the individuals had a high-level of awareness of COVID-19 due to multimedia publicity regarding the pandemic sponsored by governments and professionals. No significant difference was observed in the awareness of the symptom and transmission routes between respondents from the severely and mildly infected regions. Moreover, respondents in the severely infected region experienced increased awareness of prevention measures during the outbreak compared with those in the mildly infected region. In addition, the possibility of contacts with confirmed cases is greater. Thus, respondents should undertake more preventive measures. However, 43.2% of the respondents lacked sufficient awareness of transmission routes as evidenced by the response that touching products from Wuhan would increase the likelihood of being infected.

More than half of the respondents displayed no psychological anxiety. The anxiety scores of all respondents were approximately the same as the normative value of 4.9 of people without anxiety [20]. The scores indicated that the COVID-19 outbreak did not cause psychological anxiety for the majority of people. However, 33.4%, 7.3%, and 7% of the respondents exhibited mild, moderate, and severe levels of anxiety, respectively. The results suggested that anxiety level is associated with educational background, surrounding positive cases, time spent on reading information related to the virus, physical status, proportion of browsed negative information, and awareness of transmission routes. Furthermore, the study found that respondents who spent considerable time and browsed excessive negative information related to the virus every day displayed an increased likelihood of anxiety during the pandemic. Paying less attention to information about the pandemic may be associated with significantly reduced odds of anxiety. Therefore, governments and health authorities should provide accurate health information during the pandemic to reduce the impact of misleading information.

In addition to the two factors mentioned above, educational background, surrounding positive cases, physical status, and awareness of transmission routes are associated with anxiety. The results revealed that respondents with no college education had a greater likelihood of anxiety during the outbreak. In this regard, local agencies should provide information in simple languages to support those with no college education during the outbreak. The respondents who were not

| Variable                        | Minimal | Mild anxiety | Moderate anxiety | Severe anxiety | Total | \( \chi^2 \) | P     |
|---------------------------------|---------|--------------|------------------|----------------|-------|------------|-------|
| Gender                          |         |              |                  |                |       |            |       |
| Male                            | 455 (52.6%) | 276 (31.9%)  | 64 (7.4%)        | 70 (8.1%)      | 865   | 3.806      | 0.283 |
| Female                          | 652 (52.2%) | 431 (34.5%)  | 90 (7.2%)        | 77 (6.2%)      | 1250  |            |       |
| Age group                       |         |              |                  |                |       |            |       |
| <20                             | 150 (56.2%) | 82 (30.7%)   | 13 (4.9%)        | 22 (8.2%)      | 267   | 12.071     | 0.209 |
| 21–30                           | 709 (52.5%) | 446 (33%)    | 105 (7.8%)       | 90 (6.7%)      | 1350  |            |       |
| 31–40                           | 106 (46.5%) | 82 (36%)     | 23 (10.1%)       | 17 (7.5%)      | 228   |            |       |
| >40                             | 142 (52.6%) | 97 (35.9%)   | 13 (4.8%)        | 18 (6.7%)      | 270   |            |       |
| Education                       |         |              |                  |                |       |            |       |
| No college education            | 128 (43.5%) | 114 (38.8%)  | 20 (6.8%)        | 32 (10.9%)     | 294   | 16.131     | 0.013 |
| Undergraduate                   | 693 (54.3%) | 411 (32.2%)  | 93 (7.3%)        | 80 (6.3%)      | 1277  |            |       |
| Postgraduate                    | 286 (52.6%) | 182 (33.5%)  | 41 (7.3%)        | 35 (6.4%)      | 544   |            |       |
| Location                        |         |              |                  |                |       |            |       |
| Mildly infected region          | 546 (52.8%) | 328 (31.7%)  | 87 (8.4%)        | 74 (7.1%)      | 1015  | 5.531      | 0.137 |
| Severely infected region        | 561 (51.9%) | 379 (35.1%)  | 67 (6.2%)        | 73 (6.8%)      | 1080  |            |       |
| Awareness of clinical symptoms  |         |              |                  |                |       |            |       |
| Low                             | 201 (55.5%) | 104 (28.7%)  | 33 (9.1%)        | 24 (6.6%)      | 362   | 5.814      | 0.121 |
| High                            | 906 (51.7%) | 603 (34.4%)  | 121 (6.9%)       | 123 (7%)       | 1753  |            |       |
| Awareness of transmission route |         |              |                  |                |       |            |       |
| Low                             | 451 (49.4%) | 319 (34.9%)  | 61 (6.7%)        | 82 (9%)        | 913   | 14.086     | 0.003 |
| High                            | 650 (54.6%) | 388 (32.3%)  | 93 (7.7%)        | 65 (5.4%)      | 1202  |            |       |
| Awareness of preventive measures|         |              |                  |                |       |            |       |
| Low                             | 104 (54.7%) | 61 (32.1%)   | 10 (5.3%)        | 15 (7.9%)      | 190   | 1.774      | 0.412 |
| High                            | 1003 (52.1%) | 646 (33.6%)  | 144 (7.5%)       | 132 (6.9%)     | 1925  |            |       |
| Surrounding positive cases      |         |              |                  |                |       |            |       |
| Someone confirmed               | 11 (47.8%) | 5 (21.7%)    | 3 (13%)          | 4 (17.4%)      | 23    | 37.941     | <0.001|
| Someone suspected               | 23 (44.2%) | 16 (30.8%)   | 7 (13.3%)        | 6 (11.3%)      | 52    |            |       |
| No one infected                 | 1014 (54.3%) | 613 (32.8%)  | 127 (6.8%)       | 116 (6.2%)     | 1870  |            |       |
| Unclear                         | 59 (34.7%) | 71 (42.9%)   | 17 (10%)         | 21 (12.4%)     | 170   |            |       |
| Physical status                 |         |              |                  |                |       |            |       |
| Healthy                         | 746 (57.2%) | 390 (29.9%)  | 85 (6.5%)        | 84 (6.4%)      | 1305  | 49.161     | <0.001|
| Sub-healthy                     | 338 (46.2%) | 282 (38.6%)  | 62 (8.5%)        | 49 (6.7%)      | 731   |            |       |
| Non-healthy                     | 23 (25.1%) | 35 (44.3%)   | 7 (8.9%)         | 14 (17.7%)     | 79    |            |       |
| Time                            |         |              |                  |                |       |            |       |
| No time                         | 7 (41.2%) | 4 (23.5%)    | 2 (11.8%)        | 4 (23.5%)      | 17    | 68.439     | <0.001|
| <0.5 h                          | 154 (57.5%) | 81 (31%)     | 12 (4.5%)        | 19 (7.1%)      | 268   |            |       |
| 0.5 h–1 h                       | 393 (39.4%) | 198 (29.9%)  | 37 (5.6%)        | 34 (5.1%)      | 662   |            |       |
| 1 h–2 h                         | 450 (46.7%) | 374 (38.8%)  | 77 (8%)          | 63 (6.5%)      | 964   |            |       |
| >2 h                            | 103 (50.5%) | 48 (23.5%)   | 26 (12.7%)       | 27 (13.2%)     | 207   |            |       |
| The proportion of negative information |     |              |                  |                |       |            |       |
| Over 80%                        | 191 (38.1%) | 179 (35.7%)  | 61 (12.2%)       | 70 (14%)       | 501   | 112.301    | <0.001|
| Around 50%                      | 353 (31%) | 254 (36.7%)  | 51 (7.4%)        | 34 (4.9%)      | 692   |            |       |
| Under 20%                       | 563 (61.1%) | 274 (29.7%)  | 42 (4.6%)        | 43 (4.7%)      | 922   |            |       |

Time = time spent on information related to the virus.
surrounded by positive cases were less likely to be anxious. The possibility of contact with positive cases was limited, which greatly reduced the risk of infection. Moreover, the study observed that respondents presenting with fever, myalgia, cough, dyspnea, coryza, sore throat, and other chronic medical conditions had a greater likelihood of anxiety during the outbreak. They may be required to be quarantined or be admitted in the hospital for further investigation after presentation with possible COVID-19 symptoms. In terms of awareness of transmission routes, respondents with low-level awareness had a greater likelihood of anxiety during the outbreak. Thus, providing appropriate and repeated, yet simple, health education via the Internet and media is important for the government. Tran [26] investigated the coverage of increased COVID-19 health information by different sources accessed by health workers and community workers in Vietnam. The finding revealed that the majority of participants displayed knowledge about the “clinical and pathogen characteristics of COVID-19” and consumed COVID-19 information via the “Internet, online newspapers, and social networks.” Thus, re-designing training programs and communication activities is urgent for the effective dissemination of information related to the COVID-19 pandemic. Le [27] aimed to provide insight into the current level of awareness of the public about the pandemic and to identify associated factors among participants in Vietnam to recommend necessary interventions. The results revealed that the most requested information was the latest updated news on the pandemic followed by information about disease symptoms, and updated news on the outbreak. Thus, identifying group-specific demands would be helpful in providing accurate information and fulfill the needs of every population group.

Many studies have suggested that a public health emergency will influence public psychology and behavior. Vijaya [14] investigated the behavior and anxiety of Singaporeans during the severe acute respiratory syndrome (SARS) outbreak and found that over half of the respondents were anxious about the outbreak. Respondents with neighbors being quarantined to prevent the spread of SARS to the community experienced high levels of anxiety. In response, they adopted more appropriate personal hygiene measures and healthy lifestyle habits for prevention. Tam and Maunder [28,29] investigated the psychological and occupational impacts of the 2003 SARS outbreak among frontline healthcare workers. The authors found that the majority of healthcare workers experienced psychological morbidity during the outbreak. This observation was understandable due to the frequent physical contact of healthcare workers with patients. Tan [30] focused on the psychological impact of the COVID-19 pandemic on healthcare workers in Singapore and found that they were less likely to be anxious than those from previous disease outbreaks, such as SARS, as cited in the literature. As the pandemic continues, important clinical and policy strategies are required to support healthcare workers.

With the growing number of reports on the increasing mental health burden caused by the COVID-19 outbreak, efforts have been taken for developing preventive measures to enhance psychological intervention.

### Table 4
Variable assignment for multiple logistic regression analysis.

| Variable                                | Assignment                              |
|-----------------------------------------|-----------------------------------------|
| Anxiety levels                          | 1 = Normal, 2 = Mild anxiety, 3 = Moderate anxiety, 4 = Severe anxiety |
| Education                               | 1 = No college education, 2 = Undergraduate, 3 = Postgraduate |
| Surrounding positive cases              | 1 = Someone confirmed, 2 = Someone suspected, 3 = Unclear, 4 = No one confirmed and suspected |
| Time                                    | 1 = NO time, 2 = "<0.5 h", 3 = "0.5 h-1 h", 4 = "1 h-2 h", 5 = ">2 h" |
| Awareness of transmission route         | 0 = Low, 1 = High |
| Physical status                         | 1 = Healthy, 2 = Sub-healthy, 3 = Non-healthy |
| The proportion of negative information  | 1 = Over 80%, 2 = Around 50%, 3 = Under 20% |

### Table 5
Results of multiple logistic regression analysis.

| Variable                                | Anxiety level |
|-----------------------------------------|---------------|
|                                         | Mild anxiety   | Moderate anxiety | Severe anxiety |
|                                         | OR 95%CI P     | OR 95%CI P       | OR 95%CI P     |
| Education                               |               |                 |               |
| No college education                    | 1.457 (1.051–2.020) | 0.024           | 1.252 (0.692–2.666) | 0.457           | 1.992 (1.144–3.469) | 0.015 |
| Undergraduate                           | 0.988 (0.785–1.242) | 0.915           | 1.006 (0.673–1.506) | 0.975           | 0.963 (0.622–1.490) | 0.866 |
| Postgraduate                            | 1.000          | 0.979           | 2.186 (0.893–5.349) | 0.087           | 1.883 (0.702–5.055) | 0.205 |
| Surrounding positive cases              |               |                 |               |
| Someone confirmed                       | 0.787 (0.268–2.305) | 0.662           | 2.290 (0.612–8.573) | 0.219           | 3.469 (1.052–11.447) | 0.041 |
| Someone suspected                       | 1.099 (0.522–1.951) | 0.979           | 2.186 (0.893–5.349) | 0.087           | 1.883 (0.702–5.055) | 0.205 |
| Unclear                                 | 1.747 (1.206–2.530) | 0.003           | 1.912 (1.057–3.459) | 0.032           | 2.558 (1.449–4.514) | 0.001 |
| No one infected                         | 1.000          |                |                |
| Time                                    |               |                 |               |
| No time                                 | 1.162 (0.318–4.252) | 0.820           | 0.866 (0.160–4.676) | 0.867           | 1.300 (0.316–5.350) | 0.716 |
| <0.5 h                                  | 1.043 (0.670–1.623) | 0.853           | 0.268 (0.128–0.564) | 0.001           | 0.373 (0.192–0.728) | 0.004 |
| 0.5 h–1 h                               | 0.988 (0.669–1.460) | 0.953           | 0.318 (0.181–0.559) | <0.001          | 0.289 (0.162–0.515) | <0.001 |
| 1 h–2 h                                 | 1.660 (1.141–2.414) | 0.008           | 0.608 (0.366–1.009) | 0.054           | 0.472 (0.472–0.281) | 0.005 |
| >2 h                                    | 1.000          |                |                |
| Awareness of transmission route         |               |                 |               |
| Low                                     | 1.215 (0.998–1.480) | 0.053           | 1.024 (0.718–1.460) | 0.897           | 1.848 (1.285–2.658) | 0.001 |
| High                                    | 1.000          |                |                |
| Physical status                         |               |                 |               |
| Healthy                                 | 0.384 (0.281–0.667) | 0.001           | 0.416 (0.170–1.019) | 0.055           | 0.238 (0.113–0.502) | <0.001 |
| Sub-healthy                             | 0.607 (0.347–1.063) | 0.081           | 0.700 (0.282–1.734) | 0.640           | 0.313 (0.145–0.673) | 0.003 |
| Non-healthy                             | 1.000          |                |                |
| The proportion of negative information  |               |                 |               |
| Over 80%                                | 1.947 (1.506–2.517) | <0.001          | 4.301 (2.784–6.645) | <0.001          | 5.092 (3.312–7.830) | <0.001 |
| Around 50%                              | 1.578 (1.262–1.974) | <0.001          | 2.060 (1.329–3.195) | 0.001           | 1.429 (0.882–2.315) | 0.147 |
| Under 20%                               | 1.000          |                |                |

OR = odds ratio, CI = confidence interval, Time = time spent on information related to the virus.
for the public. On January 27, 2020, the National Health Commission in Mainland China issued the first comprehensive guidelines on emergency psychological crisis intervention in individuals affected by COVID-19 [31]. In Singapore, Chee [32] suggested that prompt and continuous psychological intervention was necessary for medical staff during high-mortality infectious disease outbreaks. Psychological interventions include cognitive behavior therapy and mindfulness-based cognitive therapy to treat anxiety during the COVID-19 pandemic.

The limitations of the research are as follows. First, the questionnaires were completed via WeChat or QQ. Thus, individuals without mobile phones were excluded. However, according to the Ministry of Industry and Information Technology, the total number of mobile phone users has reached 1.6 billion, and the penetration rate of mobile phone users has reached 114.4 per 100 people in China. Thus, the study overlooked individuals without mobile phones. [33] Second, the sample is not representative of China's demographic structure as 75% were under the age of 30 years, whereas 85% have a university education. People with no college education had little interest in participating in the survey, whereas older people in China may lack access to social media. Thus, the researchers were able to recruit only a few respondents with no college education and older people. Another limitation is snowball-sampling method, which could only recruit a group of people with similar thinking, and thus, lead to serious bias [16]. Future studies should adopt various survey methods to increase the representativeness of the sample and reduce bias. Third, the current study referenced published literature from previous disease outbreaks to design the questionnaire and did not use a standard questionnaire, which can lead to subjective bias. Finally, the survey was limited to the COVID-19 outbreak and overlooked other potential variables, such as preexisting anxiety or personality issues prior to the outbreak. Despite these limitations, the research examined residents around China directly or indirectly affected by the COVID-19 outbreak and demonstrated the effect of anxiety caused by COVID-19 on psychological health.

5. Conclusion

The research is cross-sectional in design and reflected the psychological anxiety of the Chinese people during the early stage of the disease outbreak. The study has several strengths, including a large sample recruited from different regions in China. It examined the relationship between anxiety and public knowledge about COVID-19 and other factors. More than half of the respondents did not report anxiety, whereas 33.4% indicated mild symptoms. Thus, the study infers that individuals are relatively resilient to the psychological impact of the virus and the measures employed by the Chinese government to contain the disease. Vijaya [14] demonstrated that timely public health education programs could alleviate anxiety, fear, stress, and other psychological symptoms to a certain extent. Moreover, people could successfully develop public confidence in the preventive measures undertaken by the government. The Chinese government has undertaken a series of powerful measures to control this outbreak. Specifically, the government strongly suggested that people should stay indoors as long as possible, wear surgical masks if going out, and adopt healthy lifestyles. However, the study found that 47.7% of the respondents experienced anxiety. Such respondents frequently spent considerable time browsing negative information related to the virus every day, are unhealthy, or fear contact with people and products from Wuhan. Thus, the government should urge people not to pay excessive attention to information about the pandemic but provide timely psychological assistance to people who are considered unhealthy. In addition, the government should aim to alleviate discrimination against people residing in severely infected regions and among those in other areas. The outbreak is ongoing, and predicting its end is difficult. Thus, although anxiety is alleviated and public confidence is built, people should be reminded to remain vigilant and refrain from becoming complacent because the virus continues to spread.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.comppsych.2021.152235.

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