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Impact of coronavirus disease 2019 on the mental health of university students in Sichuan Province, China: An online cross-sectional study

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ABSTRACT: Coronavirus disease 2019 is an emerging public health problem threatening not only the life but also the normal psychology of people. University students' mental health is the focus in the field of higher education. The coronavirus disease 2019 pandemic has brought into attention the mental health problems of this vulnerable group. The aim of this study was to assess the impact of coronavirus disease 2019 on the mental health of university students in Sichuan Province, China. We conducted a cross-sectional study from April 2020 to May 2020. The participants responded to an online questionnaire that included informed consent, basic information, 20-item Self Reporting Questionnaire (SRQ-20), and Self-Rating Anxiety Scale (SAS). We received 521 effective responses. The results included the following: 19.0% of respondents reported distress, and 31.5%, 8.1%, and 5.8% of them reported mild, moderate, and severe anxiety, respectively; respondents aged ≤ 22 years, medical students, and those who were in general health reported more distress than others; and medical students and those who paid more attention to pandemic information reported more anxiety than others. Findings suggest that the mental health of university students should be monitored during pandemic, especially for younger students, medical students, students in general health status, and those who paid too much attention to the news of the pandemic. Due to the limited sample representativeness, we must be cautious when generalizing these findings to other regions of China or other countries.

KEY WORDS: Coronavirus disease 2019, COVID-19, mental health, university student, China.

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INTRODUCTION

Coronavirus disease 2019 (COVID-19) is the infectious disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which is a respiratory pathogen and has great communicability and pathogenicity (World Health Organization, 2020a). The symptom-onset date of the first patient with COVID-19 identified was 1 December 2019 (Huang *et al.* 2020a). On 30 January 2020, the World Health Organization (WHO) announced that the COVID-19 pandemic constituted a public health emergency of international concern (World Health Organization, 2020c). Following the WHO declaration, some unprecedented measures have been adopted to control the COVID-19

transmission in countries around the globe, including lockdown in some cities (Heymann *et al.* 2020), closure of entertainment venues, malls, and shops, expect pharmacies and grocery stores (Al-Hanawi *et al.* 2020), the establishment of workplace protective measures (World Health Organization, 2020b), and other unconventional methods. Medical measures are at a peak, including continuous epidemiological analysis and risk assessment for COVID-19 (World Health Organization, 2020b), isolation of infected people and suspected cases (Wang *et al.* 2020a), expansion of medical resources (Wu *et al.* 2020), and organizing an expert panel to provide consultation tours for asymptomatic persons under concentrated medical observation (Joint Taskforce on COVID-19 Prevention & Control, China State Council, 2020). COVID-19 prevention and control efforts are being supported by international organizations, for example WHO, which have been coordinating a global response to the pandemic in various ways.

The COVID-19 pandemic is having a significant impact on the country, society, and people, affecting the industry and economy, as well as people's work, daily life, and studies (Chen *et al.* 2020; Zhong *et al.* 2020). One of the many affected sectors is education (United Nations Educational, Scientific & Cultural Organization, 2020). As China has around 33 million students on college and university campuses (Tang *et al.* 2020), the prevention and control measures against COVID-19 in colleges and universities have been widely concerned by the government and the public. In response to COVID-19 pandemic, on 27 January 2020, the Ministry of Education of China promulgated 'the Notice on the Extension of School Opening in the Spring of 2020' (Ministry of Education of China, 2020). Then, from 21 February 2020 to 26 April 2020, all kinds of schools and universities were completely closed; from 27 April 2020, they were gradually partially opened, and not fully opened until 10 October 2020 (United Nations Educational, Scientific & Cultural Organization, 2020). As a result, most of the universities have suspended face-to-face teaching, forcing students to move to web-based learning. For students, this is an experience of experiencing an emergency with an imperceptible agent, leading to great uncertainty and significant adverse consequences for mental health (Odriozola-González *et al.* 2020).

In regard to mental health care, an acute public health event can act as a stressor. A stressor refers to a type of environmental stimulus that leads to a specific psychological and physiological response in an individual, which threatens the individual's important needs

and coping ability (Konstantinou & Konstantinou 2020; Li & Hasson 2020). The key characteristics and unknown details of the event itself can increase people's uncertainty about the causes of the public health event and the means to deal with it; thus, they are prone to experiencing stress manifesting as anxiety, fear, and other emotions (Main *et al.* 2011). At the same time, severe psychological stress can cause sleep disorders, physical discomfort, and other consequences in individuals (Gao *et al.* 2020; Huang *et al.* 2020b). University students are in a critical period of their lives, forming an outlook on the world, life, and values; therefore, public events of a large scale could have complex and profound multiple effects on their physical and mental health (Al-Hazmi *et al.* 2018; Huang *et al.* 2003). As early as the SARS pandemic in 2003, many reports revealed the psychological changes that university students underwent during the pandemic period. Huang *et al.* (2003) investigated the psychological state of students during that period, and their results showed that the rate of anxiety symptoms was 9.5% and that of depression symptoms was 29.6%. Loh *et al.* (2006) conducted a study on the impact of SARS on the medical students of a private medical university and reported that the junior students expressed a significantly greater degree of anxiety compared to senior students with regard to attendance, personal protection in the hospital, and in meeting people coughing in public places. Gao *et al.* (2004) reported that 17.86% students were afraid of SARS pandemic. During the present COVID-19 pandemic, many university students in most countries are compelled to complete their studies at home, which has changed their normal life and learning style. Similar to the SARS pandemic in 2003, we believe that COVID-19 pandemic may also have a major impact on the psychology of university students; therefore, it is critical to pay attention to the psychological state of university students during this difficult period. Keeping in mind the mental health status of university students, measures to provide humanized support, especially psychological support and intervention to alleviate their stress during the COVID-19 crisis and confinement, are challenges that need to be solved urgently (Odriozola-González *et al.* 2020). This cross-sectional study aimed to explore the mental health status of university students, and the underlying factors influencing their mental health issues during COVID-19 pandemic, and to provide guidance for healthcare professionals, university personnel, and policymakers in the formulation and implementation of psychological support, and intervention

strategies during such emergencies in the present and future.

METHODS

Design and sample

A cross-sectional study involving an online questionnaire was performed from April 2020 to May 2020. To compare differences between the different majors among university students in Sichuan Province, China, samples were stratified according to their major (i.e. medical and non-medical). Comprehensive universities, which are multi-disciplinary ones (Hou & Li 2016), situated in Sichuan Province, mainland China, were eligible to participate in this study. A total of 11 comprehensive universities in Sichuan (7 undergraduate universities and 4 junior colleges) were involved in the study. Only students aged ≥ 18 years studying in the above-mentioned universities were eligible to fill in the questionnaire. In this study, a total of 9 basic information items and 2 questionnaire dimensions were covered, giving rise to 11 variables. According to the Kendall sample estimation method, the sample size should be 10–20 times the number of variables (Wang 1990). Consequently, the estimated minimum sample size was calculated to be 110–220 (plus 20% = approximately 132–264 participants). Ultimately, 541 students participated in the survey.

Study instrument

The online questionnaire, entitled ‘Investigation on the Psychological Status of University Students During the COVID-19 pandemic’, covered 4 parts.

1. Informed consent includes survey and questionnaire introduction, and 2 informed consent questions ((1) Would you like to participate in this survey? (2) Are you willing to use the survey materials for academic research?). Those who agreed to participate in the survey and use the survey materials for academic research by researchers were only allowed to fill in the rest of questionnaire.
2. Basic information (9 items) includes major, gender, age, nationality, education level, place of residence, medical condition of the place of residence, current health status, and frequency of paying attention to pandemic information.
3. 20-item Self Reporting Questionnaire (SRQ-20) (1 dimension): The SRQ-20 is a part of the mental

health problems assessment and monitoring toolkit released by the WHO. A modified and validated Chinese version of the SRQ-20 with a Cronbach's alpha (α) of 0.830 was used (Jiang *et al.* 2010). The response for each question was scored as 0 (no) or 1 (yes). The total score of the SRQ-20 measurement tool ranged from 0 to 20 points and was interpreted as follows: normal (total score ≤ 7) or distressed (total score > 7).

4. Self-Rating Anxiety Scale (SAS) (1 dimension): The SAS is a rating instrument for anxiety disorders, with good reliability and validity, compiled by William W.K. Zung in 1971 (Zhang 2005; Zung 1971). A modified and validated Chinese version of the SAS with a Cronbach's alpha (α) of 0.931 was used (Tao & Gao 1994). The responses for questions 1–15 were scored 1 (a little of the time), 2 (some of the time), 3 (good part of the time), or 4 (most of the time), and the responses for questions 16–20 were scored 4 (a little of the time), 3 (some of the time), 2 (good part of the time), or 1 (most of the time). The total gross score of the SAS measurement tool ranged from 20 to 80 points, and the total standard score was calculated by the total gross score multiplied by 1.25. The total standard scores were interpreted as follows: normal (total standard score < 50), mild ($50 \leq$ total standard score < 60), moderate ($60 \leq$ total standard score < 70), and severe (total standard score ≥ 70).

Data collection

First of all, we used Wenjuanxing (similar to SurveyMonkey) to make the online questionnaire and generate a questionnaire link. Then, relying on our researchers' networks, the questionnaire link was sent to universities' managers and asked them to send it to the students' WeChat groups via WeChat (similar to WhatsApp), QQ groups via QQ (similar to WhatsApp), and personal or school Weibo (similar to Twitter) accounts. Students can use mobile phone, computer, tablet, and other communication tools to open the link and fill in the questionnaire. Finally, the researchers downloaded all the completed questionnaires through Wenjuanxing. No monetary compensation or gift was given to the surveyed students.

Data analysis

Statistical analysis was performed using SPSS software version 25.0 (IBM, Chicago, IL, USA). The original

scores of the SRQ-20 and the SAS were not normally distributed and thus were presented as medians (Ms) with inter-quartile ranges (IQRs). The categorical data, which stemmed from the counts of each level for symptoms of distress and anxiety, were expressed as numbers (No.) and percentages (%). The Mann–Whitney U-test and the Kruskal–Wallis H test were conducted to compare the severity of each symptom among two or more groups. Logistic regression analysis was employed to assess the risk factors for symptoms of distress and anxiety, and the association between risk factors and mental health outcomes was reported as odds ratios (ORs) and 95% confidence intervals (CIs). Two-tailed *P* values < 0.05 were considered statistically significant.

Ethics

This study followed Strengthening the Reporting of Observational Studies in Epidemiology (STROBE), provided online informed consent instructions/options for all participants, and guaranteed the anonymity and confidentiality of participation and their rights to withdraw freely at any time. Permission for the study was granted by the Chengdu University, Sichuan Province, China.

RESULTS

Participant characteristics

A total of 541 questionnaires were returned with an effective return rate of 96.3%, among which, 521 were analysed. Twenty questionnaires with invalid contents accounting for 20% of the total questionnaire contents were considered as invalid and eliminated from the present analysis. The mean age of the respondents was 22.02 ± 1.761 years, and 320/521 (61.4%) respondents were aged ≤ 22 years. A majority of the respondents were non-medical students (309/521 [59.3%]), females (404/521 [77.5%]), undergraduates (427/521 [82.0%]), living in an urban setting (267/521 [51.2%]), paying attention to pandemic information at least 1–5 times a day (362/521 [69.5%]), with an average medical condition of the place of residence (272/521 [52.2%]), with good health status (376/521 [72.2%]), and of Han nationality (505/521 [96.9%]) (Table 1).

The severity of mental health outcomes and associated factors

The median (IQR) score on the SRQ-20 was 1.00 (0.00–5.00) for all respondents, and the highest (easily

TABLE 1 Basic information of respondents

| Characteristic | No. (%) | | |
|---|-------------|-------------|------------|
| | Total | Non-medical | Medical |
| Overall | 521 (100.0) | 309 (59.3) | 212 (40.7) |
| Gender | | | |
| Female | 404 (77.5) | 217 (70.2) | 187 (88.2) |
| Male | 117 (22.5) | 92 (29.8) | 25 (11.8) |
| Age, year | | | |
| ≤ 22 | 320 (61.4) | 210 (68.0) | 110 (51.9) |
| > 22 | 201 (38.6) | 99 (32.0) | 102 (48.1) |
| Nationality | | | |
| Han | 505 (96.9) | 301 (97.4) | 204 (96.2) |
| Others | 16 (3.1) | 8 (2.6) | 8 (3.8) |
| Education level | | | |
| Junior college student | 54 (10.4) | 38 (12.3) | 16 (7.5) |
| Undergraduate | 427 (82.0) | 241 (78.0) | 186 (87.8) |
| Postgraduate | 40 (7.6) | 30 (9.7) | 10 (4.7) |
| Place of residence | | | |
| Urban | 267 (51.2) | 157 (50.8) | 110 (51.9) |
| Rural | 254 (48.8) | 152 (49.2) | 102 (48.1) |
| Medical condition of the place of residence | | | |
| Good | 144 (27.6) | 93 (30.1) | 51 (24.1) |
| Average | 272 (52.2) | 155 (50.2) | 117 (55.2) |
| Fair | 92 (17.7) | 56 (18.1) | 36 (17.0) |
| Poor | 13 (2.5) | 5 (1.6) | 8 (3.7) |
| Current health status | | | |
| Good | 376 (72.2) | 243 (78.6) | 133 (62.7) |
| General/fair | 145 (27.8) | 66 (21.4) | 79 (37.3) |
| Frequency of paying attention to pandemic information | | | |
| > 10 times a day | 87 (16.7) | 66 (21.4) | 21 (9.9) |
| 6–10 times a day | 69 (13.2) | 39 (12.6) | 30 (14.2) |
| 1–5 times a day | 362 (69.5) | 202 (65.4) | 160 (75.5) |
| Never | 3 (0.6) | 2 (0.6) | 1 (0.4) |

tired) and the lowest (poor appetite/easily frightened) item scoring rates were 27.8% and 8.8%, respectively. 19.0% of respondents had distress (total score > 7) (Table 2). Respondents aged ≤ 22 years, junior college students, medical students, and those with poor medical condition of the place of residence, and general health status were reported to experience more distress symptoms (e.g. respondents aged ≤ 22 years vs > 22 years: 72/320 [22.5%] vs 27/201 [13.4%]; $P = 0.010$; junior college students vs undergraduates and postgraduates: 18/54 [33.3%] vs 76/427 [17.8%] among undergraduates and 5/40 [12.5%] among postgraduates; $P = 0.013$; non-medical vs medical students: 50/309 [16.2%] vs 49/212 [23.1%]; $P = 0.048$) (Table 4).

The median (IQR) score on the SAS for all respondents was 46.00 (40.00–56.00). A considerable proportion of respondents had anxiety (236/521 [45.3%]),

TABLE 2 Distress measurement by the SRQ-20

| Item | No. (%) | |
|--|-----------------------------|------------|
| | No | Yes |
| 1. Do you often have headaches? | 461 (88.5) | 60 (11.5) |
| 2. Is your appetite poor? | 475 (91.2) | 46 (8.8) |
| 3. Do you sleep badly? | 426 (81.8) | 95 (18.2) |
| 4. Do your hands shake? | 467 (89.6) | 54 (10.4) |
| 5. Are you easily frightened? | 475 (91.2) | 46 (8.8) |
| 6. Do you feel nervous, tense or worried? | 420 (80.6) | 101 (19.4) |
| 7. Is your digestion poor? | 467 (89.6) | 54 (10.4) |
| 8. Do you have trouble thinking clearly? | 450 (86.4) | 71 (13.6) |
| 9. Do you feel unhappy? | 389 (74.7) | 132 (25.3) |
| 10. Do you cry more than usual? | 459 (88.1) | 62 (11.9) |
| 11. Do you find it difficult to enjoy your daily activities? | 416 (79.8) | 105 (20.2) |
| 12. Do you find it difficult to make decisions? | 409 (78.5) | 112 (21.5) |
| 13. Is your daily work suffering? | 388 (74.5) | 133 (25.5) |
| 14. Are you unable to play a useful part in life? | 443 (85.0) | 78 (15.0) |
| 15. Have you lost interest in things? | 451 (86.6) | 70 (13.4) |
| 16. Do you feel that you are a worthless person? | 442 (84.8) | 79 (15.2) |
| 17. Has the thought of ending your life been on your mind? | 465 (89.3) | 56 (10.7) |
| 18. Do you feel tired all the time? | 447 (85.8) | 74 (14.2) |
| 19. Do you have uncomfortable feelings in your stomach? | 440 (84.5) | 81 (15.5) |
| 20. Are you easily tired? | 376 (72.2) | 145 (27.8) |
| Total | [M (IQR), 1.00 (0.00–5.00)] | |
| Total score ≤ 7 | 422 (81.0) | |
| Total score > 7 | 99 (19.0) | |

IQR, inter-quartile range; M, median; SRQ-20, 20-item Self Reporting Questionnaire.

among which mild ($50 \leq$ total standard score < 60), moderate ($60 \leq$ total standard score < 70), and severe (total standard score ≥ 70) cases were 31.5%, 8.1%, and 5.8%, respectively (Table 3). Medical students and respondents paid attention to pandemic information with a frequency of > 10 times a day were reported to experience more anxiety symptoms (e.g. non-medical vs medical students: 123/309 [39.8%] vs 113/212 [53.3%]; $P = 0.027$) (Table 4).

Risk factors of mental health outcomes

Logistic regression analysis showed that, similar to the findings in univariate analysis for the severity of symptoms, being a medical student was associated with symptoms of distress and anxiety (distress among medical students: OR, 1.617; 95% CI, 1.002–2.600; $P = 0.049$; anxiety among medical students: OR, 1.753;

95% CI, 1.209–2.542; $P = 0.003$). Being above 22 years of age was associated with a lower risk of distress compared to being 22 years or below (OR, 0.509; 95% CI, 0.301–0.859; $P = 0.011$). Compared to having good health status, having general health status was associated with a higher risk of distress (OR, 1.983; 95% CI, 1.193–3.297; $P = 0.008$). Paying attention to pandemic information with a frequency of >10 times a day was associated with a higher risk of anxiety than other frequencies (6–10 times a day, OR, 0.486; 95% CI, 0.250–0.944; $P = 0.033$; 1–5 times a day, OR, 0.480; 95% CI, 0.293–0.787; $P = 0.004$) (Table 5).

DISCUSSION

Severity of mental health outcomes

The COVID-19 pandemic has already shown adverse psychological symptoms (Lai *et al.* 2020; Wang *et al.* 2020b). According to the social psychology survey report released by the Chinese Academy of Social Sciences (CASS) in February 2020, people were generally worried about COVID-19, and a high proportion of people had bad emotions, such as fear, anger, sadness, and panic (Social Psychology Research Center *et al.*, 2020). In this study, we recruited 521 respondents to investigate mental health symptoms that were observed among university students during COVID-19 pandemic. Overall, 19.0% and 45.3% of respondents reported distress and anxiety, respectively. The findings are similar to those of the current studies on COVID-19 among Greece (Kaparounaki *et al.* 2020) and US (Son *et al.* 2020) university students. In previous studies conducted on university students during the 2003 SARS outbreak, anxiety and distress/depression were the main psychosomatic symptoms observed (Cheng & Cheung 2005; Huang *et al.* 2003). The psychological response of university students to the COVID-19 pandemic has been fairly complicated. Sources of distress and anxiety may involve fear of future employment (Ma & Song 2020), fear of being isolated, and concerns about academic performance (Son *et al.* 2020). According to the psychological theory of stress, SARS and COVID-19 are major stressors (Main *et al.* 2011). When faced with danger, an individual may feel symptoms like being afraid, nervousness, higher heart rate, and shortness of breath (Jiang & Wang 2015). If the symptoms exist for a long time (such as in infectious disease), it may also lead to psychological reactions such as inattention, anorexia, and poor sleep (Gao *et al.* 2020; Jiang & Wang 2015). Therefore, the

TABLE 3 Anxiety measurement by the SAS

| Item | No. (%) | | | |
|--|--------------------------------|------------------|-----------------------|------------------|
| | A little of the time | Some of the time | Good part of the time | Most of the time |
| 1. I feel more nervous and anxious than usual. | 156 (29.9) | 257 (49.3) | 73 (14.0) | 35 (6.7) |
| 2. I feel afraid for no reason at all. | 232 (44.5) | 202 (38.8) | 58 (11.1) | 29 (5.6) |
| 3. I get upset easily or feel panicky. | 170 (32.6) | 245 (47.0) | 70 (13.4) | 36 (6.9) |
| 4. I feel like I'm falling apart and going to pieces. | 251 (48.2) | 201 (38.6) | 36 (6.9) | 33 (6.3) |
| 5. My arms and legs shake and tremble. | 289 (55.5) | 187 (35.9) | 14 (2.7) | 31 (6.0) |
| 6. I am bothered by headaches neck and back pain. | 216 (41.5) | 199 (38.2) | 75 (14.4) | 31 (6.0) |
| 7. I feel weak and get tired easily. | 216 (41.5) | 205 (39.3) | 73 (14.0) | 27 (5.2) |
| 8. I can feel my heart beating fast. | 219 (42.0) | 212 (40.7) | 65 (12.5) | 25 (4.8) |
| 9. I am bothered by dizzy spells. | 255 (48.9) | 164 (37.2) | 46 (8.8) | 26 (5.0) |
| 10. I have fainting spells or feel like it. | 298 (57.2) | 168 (32.2) | 30 (5.8) | 25 (4.8) |
| 11. I get feelings of numbness and tingling in my fingers and toes. | 313 (60.1) | 166 (31.9) | 17 (3.3) | 25 (4.8) |
| 12. I am bothered by stomach aches or indigestion. | 283 (54.3) | 173 (33.2) | 39 (7.5) | 26 (5.0) |
| 13. I have to empty my bladder often. | 202 (38.8) | 223 (42.8) | 71 (13.6) | 25 (4.8) |
| 14. My face gets hot and blushes. | 195 (37.4) | 246 (47.2) | 57 (10.9) | 23 (4.4) |
| 15. I have nightmares. | 209 (40.1) | 238 (45.7) | 44 (8.4) | 30 (5.8) |
| 16. I feel that everything is all right and nothing bad will happen. | 68 (13.1) | 183 (35.1) | 164 (31.5) | 106 (20.3) |
| 17. I feel calm and can sit still easily. | 80 (15.4) | 221 (42.4) | 136 (26.1) | 84 (16.1) |
| 18. I can breathe in and out easily. | 154 (29.6) | 117 (22.5) | 101 (19.4) | 149 (28.6) |
| 19. My hands are usually dry and warm. | 79 (15.2) | 133 (25.5) | 184 (35.3) | 125 (24.0) |
| 20. I fall asleep easily and get a good night's rest. | 89 (17.1) | 170 (32.6) | 177 (34.0) | 85 (16.3) |
| Total | [M (IQR), 46.00 (40.00–56.00)] | | | |
| Total standard score < 50 | 285 (54.7) | | | |
| 50 ≤ Total standard score < 60 | 164 (31.5) | | | |
| 60 ≤ Total standard score < 70 | 42 (8.1) | | | |
| Total standard score ≥ 70 | 30 (5.8) | | | |

IQR, inter-quartile range; M, median; SAS, Self-Rating Anxiety Scale.

development of guidelines for psychological counselling and interventions is being identified as a necessary measure during COVID-19 pandemic (Bao *et al.* 2020; Xiang *et al.* 2020).

Risk factors for mental health outcomes

According to the results of logistic regression analysis, age and current health status were positive predictors of less distress symptoms. The degree of distress was lesser in the higher age group than in the lower age group (OR, 0.509; $P = 0.011$). Older university students tend to be better educated, which may contribute to their resilience in facing the stressors associated with COVID-19. The degree of distress in the general health status group was more than that in the good health status group (OR, 1.983; $P = 0.008$). People in poor physical condition are susceptible to COVID-19 (World Health Organization, 2020a). They are very anxious and worried about their health; thus, they are in a highly stressful state because of COVID-

19. The results also identified the higher frequency of paying attention to pandemic information as a characteristic that is associated with higher anxiety. The availability of the network, especially micro-blog, WeChat, and other media, allow rapid and broad dissemination of information (Al-Surimi *et al.* 2017); thus, the network media greatly increases an individual's access to information. Studies have shown that long-term attention to information stimulates the brain's reward centre to secrete dopamine, a hormone that produces a sense of happiness (Zhao 2019). However, repetitive stimulation reduces the threshold of excitation, and the original happiness is transformed into a sense of emptiness, which could lead to emotional distress (Zhao 2019). Similarly, when paying too much attention to pandemic information, excessive stimulation occurs, which weakens emotional regulation and processing ability, which in turn causes anxiety and other negative emotions (Bergeron & Sanchez 2005; Zhao 2019). It is worthy to note that medical students reported more symptoms of distress and anxiety

TABLE 4 Severity categories of distress and anxiety measurements in total cohort and subgroups

| Variable | SRQ-20, distress symptoms | | | | SAS, anxiety symptoms | | | | | Z/ χ^2 | P value |
|---|---------------------------|-----------------------|-------------|----------|-----------------------|---------------------|--------------------|------------------------|----------------------|-------------|---------|
| | No. (%) | | Z/ χ^2 | P value | No. (%) | | | | | | |
| | Normal cases | Mental disorder cases | | | Normal cases | Total anxiety cases | Mild anxiety cases | Moderate anxiety cases | Severe anxiety cases | | |
| Gender | | | | | | | | | | | |
| Female | 322 (79.7) | 82 (20.3) | -1.399 | 0.162 | 219 (54.2) | 185 (45.8) | 131 (32.4) | 30 (7.4) | 24 (5.9) | -0.223 | 0.824 |
| Male | 100 (85.5) | 17 (14.5) | | | 66 (56.4) | 51 (43.6) | 33 (28.2) | 12 (10.3) | 6 (5.1) | | |
| Age, year | | | | | | | | | | | |
| ≤22 | 248 (77.5) | 72 (22.5) | -2.566 | 0.010* | 174 (54.4) | 146 (45.6) | 105 (32.8) | 25 (7.8) | 16 (5.0) | -0.123 | 0.902 |
| >22 | 174 (86.6) | 27 (13.4) | | | 111 (55.2) | 90 (44.8) | 59 (29.4) | 17 (8.5) | 14 (7.0) | | |
| Nationality | | | | | | | | | | | |
| Han | 409 (81.0) | 96 (19.0) | -0.026 | 0.979 | 275 (54.5) | 230 (45.5) | 158 (31.3) | 42 (8.3) | 30 (5.9) | -1.017 | 0.309 |
| Others | 13 (81.2) | 3 (18.8) | | | 10 (62.5) | 6 (37.5) | 6 (37.5) | 0 (0.0) | 0 (0.0) | | |
| Education level | | | | | | | | | | | |
| Junior college student | 36 (66.7) | 18 (33.3) | 8.690 | 0.013* | 26 (48.1) | 28 (51.9) | 14 (25.9) | 9 (16.7) | 5 (9.3) | 3.476 | 0.176 |
| Undergraduate | 351 (82.2) | 76 (17.8) | | | 241 (56.4) | 186 (43.6) | 131 (30.7) | 32 (7.5) | 23 (5.4) | | |
| Postgraduate | 35 (87.5) | 5 (12.5) | | | 18 (45.0) | 22 (55.0) | 19 (47.5) | 1 (2.5) | 2 (5.0) | | |
| Major | | | | | | | | | | | |
| Non-medical | 259 (83.8) | 50 (16.2) | -1.979 | 0.048* | 186 (60.2) | 123 (39.8) | 77 (24.9) | 25 (8.1) | 21 (6.8) | -2.216 | 0.027* |
| Medical | 163 (76.9) | 49 (23.1) | | | 99 (46.7) | 113 (53.3) | 87 (41.0) | 17 (8.0) | 9 (4.2) | | |
| Place of residence | | | | | | | | | | | |
| Urban | 217 (81.3) | 50 (18.7) | -0.164 | 0.870 | 136 (50.9) | 131 (49.1) | 98 (36.7) | 15 (5.6) | 18 (6.7) | -1.266 | 0.205 |
| Rural | 205 (80.7) | 49 (19.3) | | | 146 (58.7) | 108 (41.3) | 66 (26.0) | 27 (10.6) | 12 (4.7) | | |
| Medical condition of the place of residence | | | | | | | | | | | |
| Good | 129 (89.6) | 15 (10.4) | 9.538 | 0.023* | 73 (50.7) | 71 (49.3) | 47 (32.6) | 16 (11.1) | 8 (5.6) | 2.572 | 0.462 |
| Average | 211 (77.6) | 61 (22.4) | | | 153 (56.3) | 119 (43.7) | 77 (28.3) | 24 (8.8) | 18 (6.6) | | |
| Fair | 72 (78.3) | 20 (21.7) | | | 50 (54.3) | 42 (45.7) | 37 (40.2) | 2 (2.2) | 3 (3.3) | | |
| Poor | 10 (76.9) | 3 (23.1) | | | 9 (69.2) | 4 (30.8) | 3 (23.1) | 0 (0.0) | 1 (7.7) | | |
| Current health status | | | | | | | | | | | |
| Good | 322 (85.6) | 54 (14.4) | -4.343 | 0.000*** | 201 (53.5) | 175 (46.5) | 120 (31.9) | 30 (8.0) | 25 (6.6) | -1.075 | 0.282 |
| General/fair | 100 (69.0) | 45 (31.0) | | | 84 (57.9) | 61 (42.1) | 44 (30.3) | 12 (8.3) | 5 (3.4) | | |
| Frequency of paying attention to pandemic information | | | | | | | | | | | |
| >10 times a day | 74 (85.1) | 13 (14.9) | 2.443 | 0.486 | 38 (43.7) | 49 (56.3) | 29 (33.3) | 11 (12.6) | 9 (10.3) | 7.987 | 0.046* |
| 6-10 times a day | 53 (76.8) | 16 (23.2) | | | 42 (60.9) | 27 (39.1) | 23 (33.3) | 2 (2.9) | 2 (2.9) | | |
| 1-5 times a day | 292 (80.7) | 70 (19.3) | | | 202 (55.8) | 160 (44.2) | 112 (30.9) | 29 (8.0) | 19 (5.2) | | |
| Never | 3 (100.0) | 0 (0.0) | | | 3 (100.0) | 0 (0.00) | 0 (0.0) | 0 (0.0) | 0 (0.0) | | |
| Total | 422 (81.0) | 99 (19.0) | | | 285 (54.7) | 236 (45.3) | 164 (31.5) | 42 (8.1) | 30 (5.8) | | |

*P value < 0.05, *** P value < 0.001. SAS, Self-Rating Anxiety Scale; SRQ-20, 20-item Self Reporting Questionnaire.

(23.1% had distress, and 53.3% had anxiety). Medical students practising clinical tasks, especially those treating patients or volunteering in hospitals during the pandemic outbreak, are at higher risk of being exposed to infection because of close contact with patients. Therefore, it is necessary to take medical students, especially those who participate in the front-line clinical service during the pandemic, as a focus of psychological intervention. According to the univariate and multivariate analyses, gender, nationality, and place of

residence did not influence distress and anxiety levels among university students during the COVID-19 pandemic. In universities, students had similar basic education, age, and social status; hence, there were no significant differences in these aspects.

Limitations

It must be acknowledged that this study has several limitations. Firstly, the study was carried out in one

TABLE 5 Risk factors for distress and anxiety measurements identified by logistic regression analysis

| Variable | No. of distress or anxiety cases/No. of total cases (%) | OR (95% CI) | P value [†] | |
|---|---|---------------------|----------------------|---------|
| | | | Category | Overall |
| <i>SRQ-20, distress symptoms</i> | | | | |
| Age, year | | | | |
| ≤22 | 72/320 (22.5) | 1 [reference] | NA | 0.011* |
| >22 | 27/201 (13.4) | 0.509 (0.301–0.859) | 0.011* | |
| Major | | | | |
| Non-medical | 50/309 (16.2) | 1 [reference] | NA | 0.049* |
| Medical | 49/212 (23.1) | 1.617 (1.002–2.600) | 0.049* | |
| Current health status | | | | |
| Good | 54/376 (14.4) | 1 [reference] | NA | 0.008** |
| General | 45/145 (31.0) | 1.983 (1.193–3.297) | 0.008** | |
| Total | 99/521 (19.0) | | | |
| <i>SAS, anxiety symptoms</i> | | | | |
| Major | | | | |
| Non-medical | 123/309 (39.8) | 1 [reference] | NA | 0.003** |
| Medical | 113/212 (53.3) | 1.753 (1.209–2.542) | 0.003** | |
| Frequency of paying attention to pandemic information | | | | |
| >10 times a day | 27/69 (39.1) | 1 [reference] | NA | 0.033* |
| 6–10 times a day | 49/87 (56.3) | 0.486 (0.250–0.944) | 0.033* | |
| 1–5 times a day | 160/362 (44.2) | 0.480 (0.293–0.787) | 0.004** | |
| Never | 0/3 (0.0) | 0.000 | 0.999 | |
| Total | 236/521 (45.3) | | | |

**P* value < 0.05, ** *P* value < 0.01. † Category refers to the *P* value for each category vs the reference, while overall refers to the results of the logistic regression. CI, confidence interval; NA, not applicable; OR, odds ratio; SAS, Self-Rating Anxiety Scale; SRQ-20, 20-item Self Reporting Questionnaire.

province of China, which may limit the generalization of our findings to other regions of China or other countries. Secondly, the analysis of risk factors for distress and anxiety was based on a few simple factors, such as gender and age, which may not accurately reflect the influence of factors on mental health outcomes. Thirdly, the psychological state of university students reflected in this study may not solely be caused by COVID-19; it may partly be caused by the aggravation of other psychological issues already existing in students during the pandemic period. Therefore, analysis of the psychological state needs to be repeated post-pandemic in order to test for accuracy.

CONCLUSION

Our findings indicated that the COVID-19 pandemic caused distress and anxiety symptoms among university students and more severe mental stress among younger students, medical students, students in general health status, and those who paid too much attention to the news of the pandemic. We suggest that the government, university administrators, and the society not only strengthen the operability research to help

university students in coping better in various stressful situations but also actively carry out psychological intervention and training of university students in response to public emergencies.

RELEVANCE TO CLINICAL PRACTICE

Considering the severity of worldwide pandemic situation, more understanding is needed about relative impact of pandemic on psychological status of university students and how to mediate their negative emotions. The study provides information that could be used by healthcare professionals, educators, and policymakers to identify those university students who with a high risk of mental health problems during pandemics. Moreover, the results of this study can contribute to develop supportive psychological intervention measures and strategies tailored to individual needs of each university student.

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ETHICS APPROVAL

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