

Knowledge, Preventative Practices and Depression of Chinese University Students in Korea and China During the COVID-19 Pandemic: An Online Cross-Sectional Study

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Research article

Keywords: COVID-19, University Students, China, Korea, Preventative Practices, Depression

Posted Date: August 18th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-48092/v1>

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Abstract

(1) Background: To investigate the knowledge, preventative practices and depression of Chinese university students living in Korea ('International Group') and Mainland China ('Mainland Group') during the Coronavirus Disease 2019 (COVID-19) outbreak, and furtherly explore the determinants of depression among these students;

(2) Methods: The study was conducted using an online questionnaire tool designed by the Yonsei Global Health Center, with preventative knowledge and practice questions on COVID-19, as well as PHQ-9 (used to diagnose depression for patients). 420 college students were finally included in the analysis (171 students in Korea and 249 students in mainland China). This data was collected from March 23 to April 12, 2020;

(3) Results: Majority of these students had a good level of knowledge of COVID-19. The 'International Group' did better than the 'Mainland Group' students regarding preventative practices, but the percentage with mild depression was higher among the 'International Group'. Highly concerned about family members, highly concerned about getting COVID-19, and having a suspicion of contact with patients increased the depression state among the subjects. Meanwhile, taking preventative behaviors more comprehensively decreased the depression state of both groups;

(4) Conclusions: During the pandemic of COVID-19, the depression status of 'International Group' students was significantly severer than that in 'Mainland Group'. While the depression status of these two groups' students was correlated to highly concerning family members and getting COVID-19 and having a suspicion of contact with patients. Therefore, psychological counseling and education programs are needed in order to support and improve the mental health of 'international group's students.

1. Introduction

An increasing number of infectious diseases recently [1] have led to serious economic and social consequences around the world [2]. Studies have shown that these emergent public-health events not only result in physical pain but could also have a Profound psychological impact [3,4], such as panic, anxiety, and depression [5,6]. It was evidenced that psychological stress could promote immune dysfunction that negatively impacts human health [7]. For instance, the SARS virus brought a series of psychological problems such as post-traumatic stress disorder (PTSD) to the public [8]. Therefore, it is necessary to find out the population's mental health status during a health emergency as early as possible and to make recommendations and provide interventions.

Coronavirus Disease 2019(COVID-19) broke out in Wuhan, Hubei Province, China at the end of January 2020, and quickly spread to 188 countries and regions worldwide as of 20 May 2020 [9]. On January 30, 2020, the World Health Organization (WHO) declared that it was a "pandemic" [10]. And it has been causing confirmed cases and deaths so far. The disease is contagious, widespread, and lacking in targeted drugs [11,12]. The increasing number of patients and suspected cases, and the increasing number of outbreak-affected provinces have elicited Chinese public worry and panic about becoming infected with firstly [13,14]. Coupled with the ongoing social distance and isolation measures implemented in more countries and regions, this outbreak is leading to additional health problems such as stress, anxiety, depressive symptoms, insomnia, and fear [15] around the world [16,17]. WHO also noted that mental health and psychological well-being in different target groups should need to be taken into considerations during the COVID-19 outbreak [18].

To mitigate the outbreak, universities in China have called for by the government to either postponed or canceled all campus activities [19]. College students who are entering adulthood, may not only have to take the stress related to academic performance but face the task of taking on more adult-like responsibilities without having yet mastered the skills and cognitive maturity of adulthood [20]. Therefore, many researchers put forward that mental health problems are

very common among college students [21]. Studies indicated that students who had experienced trauma reported higher levels of anxiety, depression, and PTSD symptom than non-traumatized subjects [22]. Moreover, potential anxiety and depression problems predicted less year-end degree commitment and lower cumulative GPA (Grade Point Average) [23]. Some researches have stressed the importance of monitoring for the psychological health of university students under the current outbreak [24]. Thus, with the panic of this pandemic, the mental health of college students who just have to stay at home for a long time with decreasing collective activities may be affected, leading to anxiety or depressive symptom [25].

After China's massive outbreak, Korea also felt the risk of gigantic mass contagion in February, which was attended by a series of government policies including home quarantine, postponement of school opening, and online classes [26]. Among international students studying in Korea, the proportion of Chinese students is the biggest [27]. Most of them are living alone on their own and have ever known or experienced a severe outbreak in China firstly. Moreover, our experience has demonstrated that the transition of studying abroad adds another layer of stress that can exacerbate and amplify mental problems if they already existed [28]. Their loneliness abroad [29] paired with stress over the epidemic in Korea and homeland are also probable to affect their academic performance and depressed level.

In other research related to public mental health during the initial stage of the COVID-19 epidemic identified the risk and protective factors contributing to psychological problems [15]. Different levels of public understanding, concern, and prevention of the COVID-19 can affect their mental stress and associate with depression score. However, no research articles are examining these knowledge and risk factors of depression influence with COVID-19 on Chinese college students, which became one of the underprivileged groups in China and South Korea.

Therefore, this study conducted a cross-sectional survey of Chinese college students both in China and Korea through an online survey questionnaire, to investigate the knowledge and preventive practices of Chinese college students in Mainland China and Korea about COVID-19. It also explored the determinants in the depression status of Chinese college students due to the contemporary public-health emergency.

2. Materials And Methods

2.1. Research Subjects and Sampling Method

461 subjects were firstly included in this study from 23 March to 12 April 2020[1], the Snowball Sampling method (recruit subjects from among acquaintances) was used to collect the data from 180 Chinese college subjects (undergraduate and graduate students) studying in South Korea during March 23-April 8, 2020 and 281 Chinese college subjects (undergraduate and graduate students) studying in China during April 2-12, 2020. In line with the research aim, which was to survey college students, the samples of those who stated "Employed", "Unemployed" and "Others" in the occupation question were removed, leaving a total of 420 students (171 in South Korea, named as "International Group", and 249 in China, named as "Mainland Group"). All subjects expressed to a willingness to participate and understand the background and purpose of the study.

2.2. Data Collection Tools

The online questionnaire surveys were distributed using the Naver Online Survey (Tool) for International Group and Wejuanxing Online Survey (Tool) for Mainland Group respectively. The questionnaires for the two groups were at the same design and written in Simplified Chinese Characters. During the initial screening of the online questionnaire, the purpose of the research, and the confidentiality and privacy of individuals was ensured in written format on the first page of the survey questionnaire. Only after reading and clicking "AGREE" to make the consent, the filling of the questionnaire could begin. Before conducting the survey, we did the revision and verification of the contents of the questionnaire through the online pilot survey and to make sure that the statements are appropriate and understandable.

2.3. Research Tools

This study was conducted by 1) YGHC COVID-19 Online Survey Tool and 2) Patient Health Questionnaire-9. YGHC COVID-19 Online Survey Tool was designed and updated by Yonsei Global Health Center (YGHC), aiming to evaluate the target participants' basic demographics characteristics, knowledge about COVID-19, preventive practices against COVID-19, depressive symptoms. Questions in the YGHC COVID-19 Online Survey Tool were found to own a reasonable validity and reliability in Wang's research on Chinese general population [15]. YGHC made changes on the Part E (Precaution measures) and Part F (Additional information) according to the specific situation in the two countries. The Patient Health Questionnaire-9 (PHQ-9) was added to the study to provide a baseline for the incidence of depression.

2.4. Variables Description

2.4.1. General Demographics Data

In this study, to reflect the demographic characteristics of the respondents, the basic survey asked questions related to: "sex", "age", "education level", "marital status", "family size", "whether you had traveled abroad in the past 14 days", "whether you had chronic diseases", and "whether you had experienced quarantine". The educational level was divided into "Undergraduate" and "Graduate", and the marriage status comprised of "Single" and "Married". Family size includes "1-person family", "2-person family", "3~5 persons family" and "more than 6-member family". The question about traveling overseas in the past 14 days, having basic chronic and quarantine had two possible answers: "no" and "yes". A question about the self-assessed physical condition was also included.

2.4.2. Knowledge about COVID-19

Understanding and perception of COVID-19 and other topics were assigned in a self-enumeration questionnaire, including knowledge on transmission pathway, source of related information, degree of concern, etc.

2.4.3. Preventive practices of COVID-19

Nine basic preventive practices were incorporated into the questionnaire. We gave the score corresponding to the degree to which a measure was practiced on a daily basis (1 = Never do this and 5 = Do this every day) and added total points to all the questions to calculate the total preventive practices. Cronbach's Alpha coefficient of preventive practices of the COVID-19 scale was 0.78.

2.4.4. Patient Health Questionnaire-9

Depressive symptoms could be diagnosed based on the 9 criteria for depression in the Diagnostic and Statistical Manual of Mental Disorders published by the American Psychiatric Association [30]. To understand the response to these question, each question was divided into 4 categories: "not at all (0 points)", "several days "(1 point), "more than held the days" (2 points), and "almost every day" (3 points) [31]. According to the scoring criteria, the score on PHQ-9 was divided into five groups: 0–4, 5–9, 10–14, 15–19, 20–27, which corresponded to "minimal or none," "mild," "moderate," "moderately severe," and "severe" depression, respectively [32]. The higher the score, the more intense the level of depression.

In this study, for ease of comparison, the symptoms of depression were assessed based on depression scores from individual respondents according to the classification methods of "Ten-point hierarchies (a score of 10 points or above indicated mild depression [33])." Cronbach's Alpha coefficient of the scale in this study was 0.89.

2.5. Statistical Analysis Approach

In this study, STATA 15.0 and SPSS 24.0 were used to conduct statistical analysis. The specific analytical methods are as follows:

- (1) Firstly, descriptive statistics were calculated for demographic characteristics, knowledge, and concern about the COVID-19, and Chi-squared tests were performed in each variable between 'International Group' and 'Mainland Group'.
- (2) Secondly, an independent t-test was carried out to compare the differences between 'International Group' and 'Mainland Group' in COVID-19 prevention practice.
- (3) Thirdly, a Chi-squared test was conducted to compare the different levels of depression between the two groups.
- (4) Lastly, to explore the determinants of the different depression levels, hierarchical regression was performed.

Footnote:

[1] From WHO, date as of 31 March 2020: China: Total confirmed cases 82,545, total deaths 3314; Korea: Total confirmed cases 9,786, total death 162

3. Results

3.1. General Characteristics

The general demographic characteristics of the respondents are shown in Table 1. The research analysis was conducted in 420 Chinese students, including 171 individuals (40.8%) studying in South Korean universities and 249 persons (59.2%) studying in Mainland China. In terms of sex, there were 133 males (31.7%) and 287 females (68.3%) among them. The age for 'International Group' was 24.08 ± 4.14 years old, while for 'Mainland Group' it was 22.12 ± 2.28 years old. Regarding the educational level, 57.31% (98) of the students in South Korea were enrolled in a bachelor's degree, 42.69% (73) of them were pursuing a master's course or above. The percentage of bachelor degrees for 'Mainland Group' (71.1%) was almost double compared to that of graduates ($\chi^2=8.509$, $p=0.004$).

In terms of marital status, the numbers of single and married students were similar in the two groups, 159 (93%) and 12 (7.02%) for 'International Group', 242 (97.2%), and 7 (2.8%) for 'Mainland China', respectively ($\chi^2=4.153$, $p=0.042$). Regarding the family structures, the "three- to five-member family" was the biggest proportion of the two groups. The proportion of answers for overseas travel history in the past 14 days, the prevalence of chronic diseases, and self-evaluation of the physical health of the two groups was almost the same. The response to a question about whether one had been quarantined demonstrated remarkable difference with 17% of students answering yes in the "International Group" as compared to 47.8% in the "Mainland Group" ($\chi^2=42.230$, $p=0.000$).

3.2. Knowledge about COVID-19

The results regarding the knowledge of college adults about COVID-19 are presented in Table 2. The largest proportion of students (100% for 'International Group' VS. 99.6% for 'Mainland Group' felt that the virus can spread through droplets, followed by the thoughts that it could be transmitted via contacting contaminated objects (84.80% for 'International Group' VS. 91.57% for 'Mainland Group') and the air (64.84% for 'International Group' VS. 66.27% for 'Mainland Group'). As for satisfaction with information about COVID-19, the proportion of students who felt satisfied and above in 'International Group' (91.81%) was slightly lower than that in 'Mainland Group' (95.98%) ($\chi^2=3.274$, $p=0.070$). The information knowing about the number of infected cases (98.25% for 'International Group' VS. 100% for 'Mainland Group'), deaths cases (98.93% for 'International Group' VS. 99.20% for 'Mainland Group'), and recovered cases (95.32% for 'International Group' VS. 98.39% for 'Mainland Group') were all more than 90% as shown in Table 2. Concerning the paths of information,

92.14% got information using one source to three sources like internet or TV, 94.15% for 'International Group', and 90.76% for 'Mainland Group'.

Responding to the diagnosis confidence, the percentage of respondents in the 'International Group' with high confidence (59.06%) was lower than that in the mainland group (77.11%) ($\chi^2=15.647$, $p=0.000$). Although the two groups displayed a similar distribution of the degree of concerning this disease (62% for 'highly concerning' and 38% for 'lowly concerning' in both two groups, $\chi^2=4.246$, $p=0.039$), the results of perceived probability among these respondents were different. The proportion among the two groups who thought they were highly likely to be infected (34.50% for 'International Group' VS. 97.99% for 'Mainland Group') was the opposite of the proportion who thought they were more likely to survive the infection (91.81% for 'International Group' VS. 86.74% for 'Mainland Group'). On the answers of concerns on family members in the respondents, there was only a slight distinction in the percentage of the two groups who were highly worried (81.29% for 'International Group' VS. 77.11% for 'Mainland Group'). And there had not much difference between the knowledge score of the two groups (13.97 ± 1.88 VS. 13.99 ± 1.92) and the overall average (13.97 ± 1.90).

3.3. Differences in preventative practices between the Chinese students in the two countries during COVID-19

Table 3 illustrated the differences between the 'International Group' and 'Mainland Group' on the level of preventative practice of COVID-19. As mentioned before, nine items were integrated in the questionnaire survey asked about the level of prevention practice for COVID-19.

In terms of covering mouths when coughing and sneezing, the number of 'International Group' who covered their mouths when coughing or sneezing was 4.67 ± 0.80 , while that of 'Mainland Group' was 4.36 ± 1.02 ($t=3.28$, $p<0.001$). As for whether to wear masks, the number of 'International Group' was 4.32 ± 0.79 , and that of the 'Mainland Group' was 4.27 ± 0.89 , there was no statistical significance was found between these two groups.

It was confirmed to be a statistically significant on washing hands with soap and water ($t=2.83$, $p<0.001$), and 'washing hands immediately after touching contaminated items' ($t=7.11$, $p<0.001$) between the 'International Group' and 'Mainland Group'. As for "whether to wash hands after coughing, rubbing nose ore sneezing", statistical significance was identified between the 2 groups ($t=1.76$, $p<0.05$), while the number is 4.18 ± 1.05 for 'International Group' and 3.98 ± 1.13 for 'Mainland Group'.

There was statistical significance in the "avoiding action" part questions between the two groups, except "avoiding meeting with more than 10 people". Specifically, the T value and significance between the groups were $t=2.23$ and $p<0.05$ for "avoiding the public transportation", $t=-5.81$ and $p<0.01$ for 'avoiding using elevator', $t=-10.13$ and $p<0.001$ for "sitting in one row while having a meal". The score of "avoiding the public transportation", "avoid using elevator", "sit in one row while having a meal" for 'International Group' was 4.73 ± 0.66 , 3.44 ± 1.40 , 2.80 ± 1.70 , and 4.58 ± 0.72 , 4.18 ± 1.19 , 4.22 ± 1.18 , for 'Mainland Group' respectively. It was noted that the scores of "avoiding meeting with more than 10 people" were high in both groups (4.74 ± 0.89 for 'International Group' VS. 4.76 ± 0.62 for 'Mainland Group').

3.4. Depressive symptoms resulting from the analysis

The Chi-Square Test was performed to determine the difference in depression status between the 'International Group' and 'Mainland Group'. Depressive symptoms were categorized into "normal" and "mild" depression (cut-off score of 10) in this study. As Table 4 shown, the difference between the two groups which was confirmed as statistically significant ($p<0.05$), the depression status of 'International Group' was severer than that of Mainland Groups'.

A stepwise regression analysis was firstly conducted to explore factors of the depression status of the respondents including all variables. It was proved that "information satisfaction", "patients' contact history", "concern about family members", and "self-assessed physical condition" were statistically significantly correlated to the depression status of the

subjects. So the 4 variables were put in place of the hierarchical regression in different models in combination with the variables of demographics characteristic, knowledge score, and preventative score.

Table 5 displays the results of hierarchical regression analysis on the determinants of depression on COVID-19 with 4 models. In Model 1 and Model 2, age, sex, education level, and marital status were found to be not statistically significantly correlated with the depression status of the subjects. While the students who had a better assessment of their health got less depressive scores ($t=-1.865$, $p<0.05$), and the preventive practice worked positively on reducing subjects' depression status ($t=-3.221$, $p<0.001$ & $t=-3.027$, $p<0.01$). As more variables added in Model 3 and Model 4, "preventive practice", "contact patients history", "concern for family members" and "concern for this disease" were clarified to be statistically significant factors of the depression status. The value of Durbin-Waston was close to 2, indicating that the observed value was independent. Although R was small, the p values of F value in these 4 models were less than 0.01, showing a strong correlation of the interpretive power of the models.

4. Discussion

4.1. Preventative Practices and Depression Status of the 'International Group' and 'Mainland Group' Students

Public health emergencies have the characteristics of suddenness, shared common characteristics, and serious social hazards. The outbreak of COVID-19 coincided with the Chinese lunar New Year holiday and the opening of South Korean universities, shared fields in the two countries have been affected, directly or indirectly. Past research related emergency found that there were quite a few college students who lack the experience of an emergency, lack of analytical and speculative skills, with impulsive behavior, vulnerable and unstable mood [34,35]. To prevent the outbreak from escalating, universities in China and South Korea have postponed the start of the semester and canceled all campus events such as workshops, conferences, sports, and other activities. College students have to go out less, which makes them unable to go to school and take part in communal activities, which can affect their learning progress and increase their anxiety and depression. Thus, when an emergency occurs, the psychological problems of college students cannot be overlooked.

This study found that these college students had a certain degree of knowledge of COVID-19. Combined with the results of information satisfaction and information sources, most of them had mastered how the virus transmitted and heard about the detailed information of cases, which shows that the publicity work and health education of schools, health institutions and mass media have been done well. And it has been reported that public concern over the outbreak is growing as confirmed and suspected cases continue to increase, with the increasing number of provinces and countries affected by the outbreak [13]. The hierarchical multiple regression analysis also indicated that levels of concern about family members, catching the COVID-19 disease, and having a suspicion of contact with patients were correlated with the depression state of these university students.

Some studies have done early on the effects of the COVID-19 on university students' psychological state [15,24,36,37,38], but all of the subjects investigated were in mainland China. Because the "Patient No. 31" who had participated in a gathering in Daegu at the Shincheonji Church of Jesus the Temple of the Tabernacle of the Testimony led to a sudden outbreak of the epidemic in South Korea [39] that attracted worldwide attention, which suggested upgraded quarantine and isolation were needed [40]. Due to most of the 'International Group' students in Korea live alone, they are faced with the fear and further quarantine of the epidemic by themselves (83.14% of them had self-quarantined). Table 3 revealed that comparing with 'Mainland Group', the 'International Group' showed a notable difference in preventative practices against COVID-19 as saw in seven out of nine questions. Only in "avoiding using elevator" and "sitting in one row while having a meal", 'Mainland Group' did better than that in 'International Group'. Therefore, these effective measures to prevent the virus should be more publicized through health education and publicity work by health institutions and mass media.

These differences in Table 2 demonstrated that “International Group” students and “Mainland Group” students experienced similar worries and concerns about this disease and family members. But it should be taken seriously that a notable part of students believed they had a high perceived probability of getting an infection from this disease in ‘Mainland Group’. This is also consistent with the situation in mainland China, where COVID-19 has covered almost every province since January. Chi-square analysis indicated that the average scores of PHQ-9 in these two groups were 7.20(CI: 6.390-7.800) for ‘International Group’ and 6.20(CI: 5.583-6.819) for ‘Mainland Group’ respectively, which is higher than the average score for college students in the general survey [37,41]. In the case of a benchmark of 10 points, the proportion (28.65%) of ‘International Group’ who experienced mild symptoms was much higher than that in ‘Mainland Group’ (18.88%). It is also showed that the outbreak of COVID-19 may have a certain impact on the psychological state of college students, especially the ‘International Group’.

Worrying about the epidemic at home and abroad also aggravates the depression status of the ‘International Group’, which is higher than that of the ‘Mainland Group’. It could be observed in this study that under the stress of the coronavirus outbreak, the incidence of depression among college students in the ‘International group’ is much higher than that in the ‘Mainland group’. In further interviews, the ‘International Group’ also expressed their loneliness in a foreign country and their need for psychological counseling. Therefore, the universities of Korea urgently need to take necessary psychological interventions, and health education measures for them [42].

Improving college students' knowledge and prevention of the virus is conducive to their psychological health. As demonstrated in this study, the more comprehensive preventive measures, the better the psychological state of college students, which were further manifested by the lower risk of mild depression and the more positive their response to the epidemic. Therefore, pertinent departments and universities should make good use of social networking platforms, social software, etc. to attract university students to receive relevant and comprehensive news and information, and education on COVID-19.

Psychological thoughts of college students could also affect college students' mental health. The results of the study showed that students who felt good about their bodies and did not suspect contact with the patient, in the low level of stress and worry about their families and this disease, had fewer symptoms of depression. In this outbreak, the generation of rumors and their influence cannot be overlooked [43]. The negative and false contents of the epidemic information have a great deal of psychological impact [44] on the students because receiving a lot of negative information could make them feel negative and require the companionship of family and friends at this time, but the biggest problem is that most of the students studying abroad are alone because the countries' banning on transportation and migration. Thus, more social and school support is needed to help them turn into a positive mindset. At the same time, government departments should release fair information in time to reduce the spread of discriminatory information, and schools should give students more caring.

4.2. Implications

Both government departments and universities should provide and ensure the dissemination of fair information, and carry out a variety of effective health education and health activities according to the characteristics of the two students groups in time so that university students could understand the more comprehensive information of COVID-19 and implement the relevant preventive measures better. Moreover, psychological consultation and help to reduce the negative effects on university students brought by the outbreak are also needed.

4.3. Limitation and Future Research

This study has several limitations. Owing to the restrictions of various activities and methods limitations during the COVID-19 pandemic, first, a web-based questionnaire was adopted in this study, which may have some shortcomings. One example is that self-assessed levels of physical condition and depression scores may not always be aligned with

assessment by their real situation because of the “socially desirable response”. Second, the survey method employed was a Snowball sampling method and therefore may not be possible to make statistical inferences from the sample to the population on account of the absence of random selection of samples. Furthermore, although it is impossible, it would be ideal to conduct an innovative study on the same group of participants before the survey. Another limitation is the case that the severity of the epidemic varies from region to region, and the effects on depression of these university students may be also different. Therefore, we need further study on their depression status, we are planning to conduct a prospective study on a comparable group. Notwithstanding the above limitations, this study provides invaluable information on the Knowledge, Preventative practice, and Depressive symptoms from Chinese students in two countries(China and South Korea) that had suffered the big outbreak of COVID-19 at that time. Our results could be used as a valuable reference for further psychological interventions for college students in different areas during public health events.

5. Conclusions

The present study investigates the knowledge, preventative practices, and depression status of Chinese university students living in South Korea and Mainland China during the COVID-19 outbreak, and furtherly explore the determinants of depression among these 2 groups’ students. The results showed that the majority of these 2 groups’ respondents had a satisfactory level of knowledge of COVID-19. The ‘International Group’ did better than the ‘Mainland Group’ students regarding preventative practices, but the percentage of mild depression was higher among the ‘International Group’. Highly concerned about family members, highly concerned about getting COVID-19, and having a suspicion of contact with patients increased the depression state among the subjects. Meanwhile, taking preventative behaviors more comprehensively can decrease the depression state of both groups.

Declarations

Ethics approval and consent to participate: All subjects gave their informed consent for inclusion before they participated in the study. This study was approved by Yonsei University Institutional Review Committee (IRB) before the data collection (Task No. 1041849-202005 - SB-054-01)

Consent of publication: Not applicable

Competing interests: The authors declare that they have no competing interests.

Funding: This research received no external funding.

Author Contributions: Conceptualization, Eum Woo Nam; Data curation, Bo Zhao; Formal analysis, Bo Zhao; Methodology, Bo Zhao; Resources, Bo Zhao and Fanlei Kong; Supervision, Fanlei Kong and Eum Woo Nam; Validation, Eum Woo Nam; Visualization, Fanlei Kong; Writing – original draft, Bo Zhao; Writing – review & editing, Fanlei Kong and Eum Woo Nam.

Acknowledgments: Thanks for the participation of every respondent in this research and cooperation of researchers in Yonsei Global Health Center

References

1. Reperant LA, Osterhaus AD. AIDS, Avian flu, SARS, MERS, Ebola, Zika... what next?. Vaccine. 2017 Aug 16;35(35):4470-4.
2. Schlipkötter U, Flahault A. Communicable diseases: achievements and challenges for public health. Public Health Reviews. 2010 Jun;32(1):90.

3. World Health Organization. Securing regional health through APSED: building sustainable capacity for managing emerging diseases and public health events: progress report 2012. Rev. Manila: WHO Regional Office for the Western Pacific; 2012.
4. Hua L, Hua F. Progress in Health Education and Health Promotion. Chinese General Practice. 2001;4(10):757-9:(in Chinese).doi:10.3969/j.issn.1007-9572.2001.10.001
5. Jeong H, Yim HW, Song YJ, Ki M, Min JA, Cho J, Chae JH. Mental health status of people isolated due to Middle East Respiratory Syndrome. Epidemiology and health. 2016;38.
6. Mohammed A, Sheikh TL, Gidado S, Poggensee G, Nguku P, Olayinka A, Oluabunwo C, Waziri N, Shuaib F, Adeyemi J, Uzoma O. An evaluation of psychological distress and social support of survivors and contacts of Ebola virus disease infection and their relatives in Lagos, Nigeria: a cross sectional study– 2014. BMC Public Health. 2015 Dec;15(1):824.
7. Godbout JP, Glaser R. Stress-induced immune dysregulation: implications for wound healing, infectious disease and cancer. Journal of Neuroimmune Pharmacology. 2006 Dec 1;1(4):421-7.
8. Qun L, Zhong C. Basic Methods of Psychological Intervention in SARS. Chinese Mental Health Journal. 2003;17(8):534-5:(in Chinese).doi:10.3321/j.issn:1000-6729.2003.08.007
9. "COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU)". ArcGIS. Johns Hopkins University. Retrieved 20 May 2020.
10. Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. Acta bio-medica: Atenei Parmensis. 2020 Mar 19;91(1):157-60.
11. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention. Jama. 2020 Apr 7;323(13):1239-42.
12. Rodriguez-Morales AJ, Cardona-Ospina JA, Gutiérrez-Ocampo E, Villamizar-Peña R, Holguin-Rivera Y, Escalera-Antezana JP, Alvarado-Arnez LE, Bonilla-Aldana DK, Franco-Paredes C, Henao-Martinez AF, Paniz-Mondolfi A. Clinical, laboratory and imaging features of COVID-19: A systematic review and meta-analysis. Travel medicine and infectious disease. 2020 Mar 13:101623.
13. Bao Y, Sun Y, Meng S, Shi J, Lu L. 2019-nCoV epidemic: address mental health care to empower society. The Lancet. 2020 Feb 22;395(10224):e37-8.
14. Wang C, Pan R, Wan X, Tan Y, Xu L, McIntyre RS, Choo FN, Tran B, Ho R, Sharma VK, Ho C. A longitudinal study on the mental health of general population during the COVID-19 epidemic in China. Brain, behavior, and immunity. 2020 Apr 13.
15. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, Ho RC. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. International journal of environmental research and public health. 2020 Jan;17(5):1729.
16. Rajkumar RP. COVID-19 and mental health: A review of the existing literature. Asian journal of psychiatry. 2020 Apr 10:102066.
17. Torales J, O'Higgins M, Castaldelli-Maia JM, Ventriglio A. The outbreak of COVID-19 coronavirus and its impact on global mental health. International Journal of Social Psychiatry. 2020 Mar 31:0020764020915212.
18. World Health Organization. Mental health and psychosocial considerations during the COVID-19 outbreak, 18 March 2020. World Health Organization; 2020.
19. Chen S, Yang J, Yang W, Wang C, Bärnighausen T. COVID-19 control in China during mass population movements at New Year. The Lancet. 2020 Mar 7;395(10226):764-6.
20. Pedrelli P, Nyer M, Yeung A, Zulauf C, Wilens T. College students: mental health problems and treatment considerations. Academic Psychiatry. 2015 Oct 1;39(5):503-11.

21. Blanco C, Okuda M, Wright C, Hasin DS, Grant BF, Liu SM, Olfson M. Mental health of college students and their non-college-attending peers: results from the national epidemiologic study on alcohol and related conditions. *Archives of general psychiatry*. 2008 Dec 1;65(12):1429-37.
22. Vrana S, Lauterbach D. Prevalence of traumatic events and post-traumatic psychological symptoms in a nonclinical sample of college students. *Journal of traumatic stress*. 1994 Jun 1;7(2):289-302.
23. Ruthig JC, Haynes TL, Stupnisky RH, Perry RP. Perceived academic control: Mediating the effects of optimism and social support on college students' psychological health. *Social psychology of education*. 2009 Jun 1;12(2):233-49.
24. Cao W, Fang Z, Hou G, Han M, Xu X, Dong J, Zheng J. The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry research*. 2020 Mar 20;112934.
25. Sahu P. Closure of universities due to Coronavirus Disease 2019 (COVID-19): impact on education and mental health of students and academic staff. *Cureus*. 2020 Apr;12(4).
26. Fisher M, Sang-Hun C. How South Korea flattened the curve. *The New York Times*. 2020.
27. Lee SW. Circulating East to East: Understanding the push-pull factors of Chinese students studying in Korea. *Journal of Studies in International Education*. 2017 May;21(2):170-90.
28. McCabe L. Mental health and study abroad: Responding to the concern. *International Educator*. 2005 Nov 1;14(6):52.
29. Hunley HA. Students' functioning while studying abroad: The impact of psychological distress and loneliness. *International Journal of Intercultural Relations*. 2010 Jul 1;34(4):386-92.
30. Ferrando SJ, Samton J, Mor N, Nicora S, Findler M, Apatoff B. Patient Health Questionnaire-9 to screen for depression in outpatients with multiple sclerosis. *International Journal of MS Care*. 2007;9(3):99-103.
31. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *Journal of general internal medicine*. 2001 Sep;16(9):606-13.
32. Spitzer RL, Kroenke K, Williams JB, Patient Health Questionnaire Primary Care Study Group. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. *Jama*. 1999 Nov 10;282(18):1737-44.
33. Manea L, Gilbody S, McMillan D. Optimal cut-off score for diagnosing depression with the Patient Health Questionnaire (PHQ-9): a meta-analysis. *Cmaj*. 2012 Feb 21;184(3):E191-6.
34. Scharl JC. Lonely and Scared: College Students' Culture of Immaturity. *Academic Questions*. 2020 Jan 27:1-1.
35. Meng H, Han W, Li W. The Effect of Interactive Approach yo Teaching Health Psychology on Mental Health Status of College Students [J]. *Chinese Journal of School Health*, 2004, 25(2): 160-161:(in Chinese).doi:10.3969/j.issn.1000-9817.2004.02.010
36. Jing L, Yu Y, Dong W. Mental health status and its influencing factors among college students during the epidemic of COVID-19. *Journal of Southern Medical University*. 2020 Feb 20;40(2):171:(in Chinese).doi:10.12122/j.issn.1673-4254.2020.02.06
37. Liu X, Liu J, Zhong X. Psychological State of College Students During COVID-19 Epidemic. Available at SSRN 3552814. 2020 Mar 10.
38. Chang J, Yuan Y, Wang D. Mental health status and its influencing factors among college students during the epidemic of COVID-19. *Nan fang yi ke da xue xue bao= Journal of Southern Medical University*. 2020 Feb 29;40(2):171.
39. Choi S, Ki M. Estimating the reproductive number and the outbreak size of COVID-19 in Korea. *Epidemiology and Health*. 2020 Mar 12;42.
40. Yoo JH, Hong ST. The outbreak cases with the novel coronavirus suggest upgraded quarantine and isolation in Korea. *Journal of Korean Medical Science*. 2020 Jan 6;35(5).
41. Dan C. The Research on Predictive Model of Depression among College students[D]. Zhejiang University, 2011:(in Chinese).

42. Kitzrow MA. The mental health needs of today's college students: Challenges and recommendations. NASPA journal. 2003 Dec 1;41(1):167-81.

43. Cinelli M, Quattrocioni W, Galeazzi A, Valentini CM, Brugnoti E, Schmidt AL, Zola P, Zollo F, Scala A. The covid-19 social media infodemic. arXiv preprint arXiv:2003.05004. 2020 Mar 10.

44. Nicomedes CJ, Avila R. An Analysis on the Panic of Filipinos During COVID-19 Pandemic in the Philippines. 2020Author 1, A.; Author 2, B. Title of the chapter. In *Book Title*, 2nd ed.; Editor 1, A., Editor 2, B., Eds.; Publisher: Publisher Location, Country, 2007; Volume 3, pp. 154–196.

Tables

Table 1. Demographic and general characteristics of the participants.

Variables	International Group (N = 171)	Mainland Group (N = 249)	Total (N = 420); n(%)	χ ²	<i>P</i>
Gender					
Male	57 (33.33)	76 (30.52)	133 (31.67)	0.370	0.543
Female	114 (66.67)	173 (69.48)	287 (68.33)		
Age					
Mean ± S.D.	24.08 ± 4.14	22.12 ± 2.28	22.90 ± 3.30	66.888	0.000
Educational Level					
Undergraduate	98 (57.31)	177 (71.08)	275 (65.48)	8.509	0.004
Graduate	73 (42.69)	72 (28.92)	145 (34.52)		
Marital Status					
Single	159 (92.98)	242 (97.19)	401 (95.48)	4.153	0.042
Married	12 (7.02)	7 (2.81)	19 (4.52)		
Family Size					
1 member	9 (5.26)	1 (0.40)	10 (2.38)	32.126	0.000
2 members	24 (14.04)	8 (3.21)	32 (7.62)		
3-5 members	134 (78.36)	221 ((88.76)	355 (84.52)		
6 members or more	4 (2.34)	19 (7.63)	23 (5.48)		
Traveled abroad					
No	166 (97.08)	244 (97.99)	410 (97.62)	0.366	0.545
Yes	5 (2.92)	5 (2.01)	10 (2.38)		
Chronic illness					
No	159 (92.98)	232 (93.17)	391 (93.10)	0.006	0.940
Yes	12 (7.02)	17 (6.83)	29 (6.90)		
Self-quarantined					
No	29 (16.96)	119 (47.79)	148 (35.24)	42.230	0.000
Yes	142(83.04)	130 (52.21)	272 (64.76)		
Self-assessed physical condition					
Above good	153 (89.47)	227 (91.16)	380 (90.48)	1.206	0.752
Below fair	18 (10.53)	22 (8.84)	40 (9.52)		

Note: 'International Group' means the Chinese college students who studying in South Korea; 'Mainland Group' means the Chinese college students who studying in Mainland China.

Table 2. Difference in knowledge about COVID-19.

Variables	International Group (N = 171)	Mainland Group (N = 249)	Total (N = 420); n(%)	χ^2	<i>P</i>
Route of transmission					
Droplets (agree)	171 (100)	248 (99.60)	419 (99.76)	0.688	0.407
Objects (agree)	145 (84.80)	228 (91.57)	373 (88.81)	6.213	0.045
Air (agree)	116 (67.84)	165 (66.27)	281 (66.90)	1.037	0.595
Information satisfaction					
Above Satisfied	157 (91.81)	239 (95.98)	396 (94.3)	3.274	0.070
Below dissatisfied	14 (8.19)	10 (4.02)	24 (5.7)		
Updated information					
Infected cases (yes)	168 (98.25)	249 (100)	417 (99.29)	4.400	0.036
Death cases (yes)	169 (98.93)	247 (99.20)	416 (99.05)	0.144	0.704
Recovered cases (yes)	163 (95.32)	245 (98.39)	408 (97.14)	3.447	0.063
Number of information source					
1~3	161 (94.15)	226 (90.76)	387 (92.14)	1.608	0.205
4~6	10 (5.85)	23 (9.24)	33 (7.86)		
Confidence about diagnose					
Highly confident	101 (59.06)	192 (77.11)	293 (69.76)	15.647	0.000
Lowly confident	70 (40.93)	57 (22.89)	127 (30.24)		
Concern about this disease					
Highly	123 (61.93)	155 (62.25)	278 (66.19)	4.246	0.039
Lowly	48 (38.07)	94 (37.75)	142 (33.81)		
Perceived probability					
Get infected (high)	59 (34.50)	48 (19.28)	107 (25.48)	12.379	0.000
Survive after infection (high)	157 (91.81)	216 (86.74)	373 (88.81)	2.618	0.106
Concern about family members					
Highly	139 (81.29)	192 (77.11)	331 (78.81)	1.060	0.303
Lowly	32 (18.71)	57 (22.89)	89 (21.19)		
Knowledge score					
Mean \pm S.D	13.97 \pm 1.88	13.99 \pm 1.92	13.97 \pm 1.90	4.854	0.963

Table 3. Preventative practice against COVID-19 taken by Chinese students in the two countries.

Mean \pm S.D

Variables(Score: 1–5)	International Group (N = 171)	Mainland Group (N = 249)	Total (N = 420)	t
1. Covering mouth when coughing and sneezing	4.67 ± 0.80	4.36 ± 1.02	4.49 ± 0.95	3.28 ***
2. Wearing mask regardless of the presence or absence of symptoms	4.32 ± 0.79	4.27 ± 0.89	4.30 ± 0.86	0.52
3. Washing hands with soap and water	4.84 ± 0.44	4.62 ± 0.66	4.71 ± 0.59	2.83 ***
4. Washing hands immediately after coughing, rubbing nose or sneezing	4.18 ± 1.05	3.98 ± 1.13	4.06 ± 1.10	1.76*
5. Washing hands after touching contaminated objects	4.93 ± 0.38	4.47 ± 0.78	4.66 ± 0.69	7.11 ***
6. Avoiding public transportation	4.73 ± 0.66	4.58 ± 0.72	4.65 ± 0.70	2.23 *
7. Avoiding elevators	3.44 ± 1.40	4.18 ± 1.19	3.88 ± 1.33	-5.81 ***
8. Sitting in one row while having a meal	2.80 ± 1.70	4.22 ± 1.18	3.64 ± 1.57	-10.13 ***
9. Avoiding meeting more than 10 people	4.74 ± 0.89	4.76 ± 0.62	4.75 ± 0.74	-0.22

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

Table 4. Difference in depressive states of the students in the two countries.

Mean ± SD

PHQ-9		International Group (N = 171)	Mainland Group (N = 249)	Total (N = 420); n(%)	$\chi^2 = 5.50 *$
Scores		7.20 ± 0.41	6.20 ± 0.31	6.60 ± 5.14	
Based on a scale of 10 points	Normal	122 (71.35)	202 (81.12)	324 (77.14)	
	Mild	49 (28.65)	47 (18.88)	96 (22.86)	

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 5. Hierarchical regression analysis on determinants of depression using PHQ-9 during COVID-19 (N = 420).

PHQ-9.									
Variables	Model 1		Model 2		Model 3		Model 4		
	β	t(p)	β	t(p)	β	t(p)	β	t(p)	
Constant	12.122	3.439***	13.137	3.713***	11.586	3.296***	10.264	2.936**	
Preventative practice score	-0.165	-3.221***	-0.155	-3.027**	-0.139	-2.745**	-0.138	-2.749**	
Age	0.199	1.691	0.214	1.823	0.213	1.842	0.225	1.966*	
Gender									
Male	(ref)		(ref)		(ref)		(ref)		
Female	-0.145	-0.547	-0.097	-0.178	-0.020	-0.037	-0.231	-0.431	
Educational level									
Undergraduates	(ref)		(ref)		(ref)		(ref)		
Graduates	-0.401	-0.531	-0.466	-0.620	-0.609	-0.820	-0.706	-0.963	
Marital status									
Single	(ref)		(ref)		(ref)		(ref)		
Married	-0.990	-0.742	-1.186	-0.892	-0.938	-0.714	-0.898	-0.693	
Knowledge belief score	-0.142	-1.025	-0.149	-1.081	-0.109	-0.836	-0.165	-1.279	
Information satisfaction									
Lowly	(ref)		(ref)		(ref)		(ref)		
Highly	-1.517	-1.415	-1.486	-1.392	-1.316	-1.249	-1.486	-1.426	
Self-assessed physical condition									
Below fair			(ref)		(ref)		(ref)		
Above good			-1.865	-2.208*	-1.702	-2.040*	-1.501	-1.820	
Contact patients history									
No					(ref)		(ref)		
Yes					-2.842	-0.983	-2.900	-1.015	
Not sure					4.413	3.539***	4.069	3.287***	
Concern on family members									
Lowly							(ref)		
Hightly							1.580	2.624**	

Concern on this disease				
Lowly			(ref)	
Highly			1.098	2.081*
F	2.778**	3.063**	3.875***	4.456***
R ²	0.045	0.056	0.087	0.116
Adjusted R ²	0.029	0.038	0.064	0.090
Durbin-Waston	1.972			

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

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