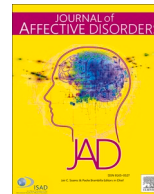




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Research paper

Mental health of college students during the COVID-19 epidemic in China

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ABSTRACT

Objectives: To assess the psychological status of college students in China during the COVID-19 outbreak, and offer some theoretical evidence for psychological intervention of college students.

Methods: An online survey was conducted from May 10, 2020 to June 10, 2020. Anxiety symptoms were measured by the Generalized Anxiety Disorder 7-Item Scale (GAD-7). Categorical data were reported as number and percentage, while continuous data were reported as mean \pm SD. Multivariate logistic regression models were used to evaluate the association between different factors and anxiety symptoms.

Results: A total of 89,588 college students participated in the current study, among which 36,865 students (41.1%) reported anxiety symptoms. Multivariate logistic regression analysis revealed that the risk factors for anxiety symptoms included the age of 26-30 ($OR=1.456$), sophomore ($OR=1.038$), junior ($OR=1.087$) and senior grades ($OR=1.161$), a higher paternal education level ($OR=1.055$), low economic status ($OR=1.520$), and low social support ($OR=1.542$).

Conclusions: About two-fifths of Chinese college students experienced anxiety symptoms during the COVID-19 epidemic. Timely and appropriate psychological interventions for college students should be implemented to reduce the psychological harm caused by COVID-19 epidemic.

Introduction

The coronavirus disease 2019 (COVID-19) was first reported in Wuhan, Hubei, China and is now rapidly spreading around the world, posing a substantial threat to the health of people. As of June 22, 2020, the WHO had reported 8,860,331 laboratory-confirmed cases, and 465,740 deaths globally, with cases of the virus and the death toll still increasing (World Health Organization). In addition to causing physical damage, COVID-19 has also caused unbearable psychological pressure

to people in China and the rest of the world (Xiao, 2020). Recent research showed that during the COVID-19 epidemic, mental health problems such as fear, anxiety and depression were common among the general public, patients, medical staff, children, and older adults (Yuchen Li et al., 2020).

Due to the continuous spread of the epidemic, the Chinese government implemented nationwide school closures. So far, the infection has caused 150 countrywide school suspensions globally and has affected 1,186,127,211 students (UNESCO). The need to protect the mental

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health of college students during confinement is warranted, however, to our knowledge, research focused on the psychological status of college students in China during the epidemic is limited. Given the dearth of existing research, the current study aimed to examine the mental health of 89,588 college students during the COVID-19 epidemic in China and to offer some theoretical evidence for psychological intervention of college students.

Methods

Sample and data collection

The current cross-sectional survey was conducted from May 10, 2020 to June 10, 2020. Twenty-one colleges were selected by a convenience sampling technique. The study was approved by the Research Ethics Committee of Hainan Medical University in Haikou, China. The Questionnaire Star (<https://www.wjx.cn>) was used to collect data online using an anonymous, self-rated questionnaire that was distributed to all selected colleges. All participants provided electronic informed consent prior to registration. To avoid the same participant repeatedly answering the questionnaire, each device (e.g. mobile phone or computer) was eligible to answer only once and logic checks were concurrently running in the background to identify invalid questionnaires. The answers to all valid questionnaires were automatically loaded into a data file and checked by two independent researchers. A total of 89,588 college students were surveyed. The online questionnaires included general demographic characteristics, concerns about COVID-19, the impact of COVID-19 on life, social support, and anxiety symptoms.

Measurements

GAD-Anxiety Screening Scale

Anxiety symptoms were measured by the Generalized Anxiety Disorder 7-Item Scale (GAD-7). GAD-7 is a seven-item anxiety scale developed by Spitzer *et al.* (Benjamin *et al.*, 2014), with a score of 0 to 3 for each item. The GAD scale ranges from 0 to 21, in which a total score of 0 to 4 suggests no anxiety symptoms, a score of 5 to 9 reflects suggests mild anxiety, a score of 10 to 14 suggests moderate anxiety and those with a total score of ≥ 15 are considered to have severe anxiety. The GAD scale had a good factorial validity and reliability (Cronbach's $\alpha = 0.901$). Furthermore, the validity of GAD in assessing anxiety in the Chinese population has been confirmed (Spitzer *et al.*, 2006).

Multidimensional Scale of Perceived Social Support

The social support of participants was assessed via the Multidimensional Scale of Perceived Social Support (MSPSS), which includes 12 items with response options ranging from 1 (very strongly disagree) to 7 (very strongly agree) (Altman and Bland, 2003). The MSPSS estimates social support quality from three sources: family, friends, and significant others (Osman *et al.*, 2014). All item scores were added up and then divided by 12. Mean scores ranging from 1 to 2.99, 3 to 5 and 5.01 to 7 were classified as low, medium and high perceived support levels, respectively (D *et al.*). The Chinese version of the MSPSS has shown good reliability and validity in different populations (Guan *et al.*, 2015).

Statistical Analysis

Categorical data were reported as number and percentage. Chi-square tests were conducted to compare the prevalence of anxiety across groups as defined by demographic data and social support levels. Multivariate logistic regression models were used to assess the association between various factors and anxiety. All statistical analyses were conducted using SPSS 21.0 (SPSS Inc, Chicago, Illinois, USA). A value of $P < 0.05$ (two-tailed) was considered statistically significant.

Results

A total of 89,588 college students participated in the current study, among which 39,194 (43.75%) were males and 50,394 (56.25%) were females. Of the 89,588 participants, 36,865 students (41.1%) reported anxiety symptoms. The prevalence of anxiety was significantly different among the college students with different age, grade and social support levels (all $P < 0.0001$). The prevalence of anxiety among college students who lived in rural areas was significantly higher than in those who lived in urban areas ($\chi^2=79.183$, $P < 0.0001$). College students with lower paternal education were more likely to have anxiety symptoms than those with a higher paternal education level. (all $P < 0.0001$). Low family economic status, reporting a greater impact of COVID-19 on life, and experiencing higher levels of concern about COVID-19 were associated with increased prevalence of anxiety ($P < 0.05$). (Table 1).

In the multivariate logistic regression analysis (Table 2). Compared with male students, female students had a higher risk of anxiety symptoms (OR=1.073, 95% CI: 1.044-1.104). Students aged 26-30 years were more likely to show anxiety compared to other ages (OR=1.456, 95% CI: 1.357-1.561). Compared to freshman (first year students), sophomores (second year students) (OR=1.038, 95% CI: 1.001-1.076), juniors (OR =1.087, 95% CI: 1.041-1.134), and seniors (OR =1.161, 95% CI: 1.096-1.230) all present a higher risk of anxiety. Those who reported that COVID had a moderate, slight, or no impact on their life, compared with those who reported a substantial impact, showed a decreased risk of anxiety symptoms (OR=0.562, 95% CI: 0.544-0.579; OR=0.366; 95% CI: 0.347-0.385, respectively). Low (OR=1.542, 95% CI: 1.390-1.711) and moderate (OR =1.862, 95% CI: 1.809-1.915) levels of social support were associated with a higher risk of anxiety compared to those with high levels of social support.

Discussion

In the current study, 41.1% of college students reported anxiety symptoms, which is higher than other investigations in China (Yueqin Huang 2019). The outbreak of COVID-19 in China has had direct and indirect impacts on all areas of society. In order to curb the outbreak and protect students from COVID-19, all schools have been closed until the epidemic is under control. Students facing long-term isolation at home and using online learning are prone to a series of emotional stress responses. Additionally, college students are more concerned about COVID-19 and any additional consequences. At the early stages of this pandemic, people received little information about nature, treatments, the fatality rate, etc., which fueled the fear about the virus (Ahmed *et al.*, 2020). With the rapid spread of COVID-19, college students who received a large amount of negative information may be at a greater risk of psychological maladjustment (Lu *et al.*, 2013). Therefore, it is necessary to pay special attention to the psychological status of college students who are in long-term home isolation and to take timely and appropriate interventions to maintain and improve their mental health.

The present study found no significant difference in gender, which was in line with previous studies (Ji X *et al.*, 2020). This indicates that male and female college students experienced similar stresses and negative emotions as a result of the COVID-19 epidemic. We also found that sophomore, junior and senior students were more likely to have anxiety than freshman students. This may relate to differences in the curriculum design. Compared to sophomore, junior and senior students, freshmen students are not required to undertake any practicum. Previous research found that exemption from the practicum may relieve some stress and anxiety (Teris *et al.*, 2016). In addition, for more senior students the academic pressure is greater, and some of them face graduation, employment, and practice, etc., but the epidemic of COVID-19 inevitably affects the development of various things.

Self-perceived family economic status also was a significant factor of anxiety for college students during the COVID-19 epidemic. Some researchers showed that financial vulnerability may exacerbate anxiety

Table 1
The anxiety of college students in facing the epidemic of COVID-19

| Variables | | Total | No anxiety | Anxiety | χ^2 | P |
|---------------------------------------|------------------------------|-------|--------------|--------------|--------------|---------|
| Sex | Male | 39194 | 23166 (59.1) | 16028 (40.9) | 1.878 | 0.171 |
| | Female | 50394 | 29557 (58.7) | 20873 (41.3) | | |
| Age | 18-20 | 28482 | 17425 (61.2) | 11057 (38.8) | 140.22 | <0.0001 |
| | 21-25 | 57012 | 33141 (58.1) | 23871 (41.9) | | |
| | 26-30 | 4094 | 2157 (52.7) | 1937 (47.3) | | |
| Grade | Freshman | 38273 | 23178 (60.6) | 15095 (39.4) | 97.213 | <0.0001 |
| | Sophomore | 27561 | 16088 (58.4) | 11473 (41.6) | | |
| | Junior | 17067 | 10044 (56.9) | 7364 (43.1) | | |
| | Senior and above | 6687 | 3754 (56.1) | 2933 (43.9) | | |
| Place of residence | Urban | 41242 | 24925 (60.4) | 16318 (39.6) | 79.183 | <0.0001 |
| | Rural | 48345 | 27798 (57.5) | 20547 (42.5) | | |
| Father education level | Junior high school and below | 52120 | 30258 (58.1) | 21862 (41.9) | 32.609 | <0.0001 |
| Mother education level | High school and above | 37468 | 22465 (60.0) | 15003 (40.0) | 55.84 | <0.0001 |
| | Junior high school and below | 61752 | 35823 (58.0) | 25920 (42.0) | | |
| Self-perceived family economic status | High school and above | 27836 | 16891 (60.7) | 10945 (39.3) | 603.132 | <0.0001 |
| | Good | 9530 | 6104 (64.1) | 3426 (35.9) | | |
| | Fair | 56318 | 34194 (60.7) | 22124 (39.3) | | |
| Impact of COVID-19 on life | Bad | 23740 | 12425 (52.3) | 11315 (47.7) | 2947.706 | <0.0001 |
| | Quite impacted | 23542 | 24467 (51.0) | 23542 (49.0) | | |
| | Moderately impacted | 31841 | 20914 (65.7) | 10927 (34.3) | | |
| Concern about COVID-19 | Slightly or not impacted | 9738 | 7342 (75.4) | 2396 (24.6) | 93.05 | <0.0001 |
| | Quite concerned | 75765 | 44078 (58.2) | 31687 (41.8) | | |
| | Moderately concerned | 13138 | 8230 (62.6) | 4908 (37.4) | | |
| Social Support | Slightly or not concerned | 685 | 415 (60.6) | 270 (39.4) | 1874.871 | <0.0001 |
| | High | 48438 | 31684 (65.4) | 16754(34.6) | | |
| | Moderate | 39204 | 20031(51.1) | 19173(48.9) | | |
| Total | Low | 1946 | 1008 (51.8) | 938 (48.2) | 36865 (41.1) | |
| | | 89588 | 52723 (58.9) | | | |

Table 2
Multivariate logistic regression of factors influencing college students' anxiety

| Variables | | | β | SE | Wald | P | OR | 95%CI |
|---------------------------------------|------------------------------|-----------|---------|-------|----------|-------|-------|-------------|
| Constant | | | -0.514 | 0.030 | 294.045 | | | |
| Age | 18-20 | Reference | | | | | | |
| | 21-25 | | 0.030 | 0.018 | 2.714 | 0.099 | 1.031 | 0.994-1.068 |
| | 26-30 | | 0.375 | 0.036 | 111.176 | 0.000 | 1.456 | 1.357-1.561 |
| Grade | Freshman | Reference | | | | | | |
| | Sophomore | | 0.037 | 0.018 | 4.060 | 0.044 | 1.038 | 1.001-1.076 |
| | Junior | | 0.083 | 0.022 | 14.558 | 0.000 | 1.087 | 1.041-1.134 |
| | Senior and above | | 0.150 | 0.029 | 25.734 | 0.000 | 1.161 | 1.096-1.230 |
| Father education level | Junior high school and below | Reference | | | | | | |
| | High school and above | | 0.054 | 0.015 | 12.734 | 0.000 | 1.055 | 1.024-1.088 |
| Self-perceived family economic status | Good | Reference | | | | | | |
| | Fair | | -0.016 | 0.024 | 0.418 | 0.518 | 0.984 | 0.938-1.033 |
| | Bad | | 0.141 | 0.027 | 26.443 | 0.000 | 1.520 | 1.091-1.216 |
| Impact of COVID-19 on life | Quite impacted | Reference | | | | | | |
| | Moderately impacted | | -0.577 | 0.016 | 1327.683 | 0.000 | 0.562 | 0.544-0.579 |
| | Slightly or not impacted | | -1.006 | 0.026 | 1478.849 | 0.000 | 0.366 | 0.347-0.385 |
| Social Support | High | Reference | | | | | | |
| | Moderate | | 0.621 | 0.014 | 1836.888 | 0.000 | 1.862 | 1.809-1.915 |
| | Low | | 0.433 | 0.053 | 66.602 | 0.000 | 1.542 | 1.390-1.711 |

among college students (Kaya et al., 2007; Lu et al., 2013; Teris et al., 2016). Consistent with previous studies, we also found that college students who reported low economic status were more likely to have anxiety symptoms than those who reported higher economic status. During the COVID-19 pandemic, many companies and factories have postponed their operation, which inevitably affected the economic income of some families. Under such circumstances, it is hard for students to maintain mental wellbeing.

Social support is an important environmental resource for individuals in social life and is closely related to mental health (Tambag et al., 2018). The degree of impact of COVID on life is also a factor for college students' anxiety, which might be related to the high contagiousness of the COVID-19 (Song et al., 2019). Our study also found that college students whose father's education level was higher experienced a greater risk of anxiety symptoms. Previous research found that social support is an important variable that has been shown to be negatively associated with anxiety in college students (Ratanasiripong, 2012).

Similarly, our study showed that lower levels of social support are associated with an increased risk of anxiety symptoms. Therefore, we should pay attention to the role of social support in maintaining college students' mental health. On the one hand, parents should strengthen communication with their children and ensure that they receive family psychological support. On the other hand, universities should set up online mental health education courses about the COVID-19 epidemic to improve college students' psychological adaptability.

The present study has several strengths. Firstly, to the best of our knowledge, this is the largest sample survey on the mental health of college students during the COVID-19 epidemic. Secondly, this study indicated that a considerable number of college students have mental health problems, and findings of this study could provide valuable references for preventing college students' mental problems in other areas and countries. Limitations of this study include that this is a cross-sectional study; as the epidemic changes, the mental health of college students may also change. Further research is needed to track the

dynamic changes of the college students' mental health status throughout the epidemic.

Conclusion

About two-fifths of Chinese college students experienced anxiety symptoms during the COVID-19 epidemic. Timely and appropriate psychological interventions for college students should be implemented to reduce the psychological harm caused by COVID-19 epidemic. Meanwhile, psychological skills training should be strengthened to better regulate the psychological status of college students as well as to mitigate the psychological problems of patients.

Contributors

WNF, SJY, QZ and CZL conceived and designed the study. WNF, SJY, QZ, DAL, XYS, ZYL and CZL participated in the acquisition of data. WNF and SJY analyzed the data. CZL gave advice on methodology. WNF and SJY drafted the manuscript, WNF, SJY, QZ, DAL, XYS, ZYL and CZL revised the manuscript. All authors read and approved the final manuscript.

Declaration of Competing Interest

The authors declare that they have no conflicts of interest.

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Authorship and copyright

All authors confirm that the submitted manuscript is an original contribution and has not been previously published, that it is not under consideration for publication elsewhere, and that, if accepted, will not be published elsewhere in similar form in any language.

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Ethics approval

The study was approved by the Research Ethics Committee of Hainan

Medical University in Haikou, China.

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