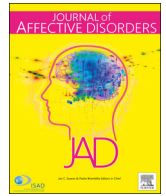




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Prevalence of anxiety and depression symptom, and the demands for psychological knowledge and interventions in college students during COVID-19 epidemic: A large cross-sectional study

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ABSTRACT

Background: Although studies have suggested experiencing the epidemic of severe infectious diseases increased the prevalence of mental health problems, the association between COVID-19 epidemic and risk of anxiety and depression symptom in college students in China was unclear.

Methods: A large cross-sectional online survey with 44,447 college students was conducted in Guangzhou, China. The Zung's Self-rating Anxiety Scale (SAS) and the Center for Epidemiologic Studies Depression Scale (CES-D Scale) were used to define the anxiety and depression symptom, respectively. Multivariable logistic regression models were used to analyze the association between COVID-19 epidemic and risk of anxiety and depression symptom.

Results: The prevalence of anxiety and depression symptom was 7.7% (95% confidence interval [CI]: 7.5%, 8.0%) and 12.2% (95%CI: 11.9%, 12.5%), respectively. Compared with students who reported have not infected or suspected cases in family members and relatives, students who reported having confirmed (OR = 4.06; 95%CI: 1.62, 10.19; P = 0.003), and suspected (OR = 2.11; 95%CI: 1.11, 4.00; P = 0.023) cases in family members and relatives had higher risk of depression symptom. Additionally, the proportions of students with anxiety and depression symptom reported more demand of psychological knowledge and interventions than those without (P < 0.001).

Limitations: All the data in this study was collected through online questionnaire, and we did not evaluate the reliability and validity.

Conclusions: The prevalence of anxiety and depression symptom was relatively low in college students, but the COVID-19 epidemic-related factors might be associated with higher depression symptom risk.

Introduction

In December 2019, an unknown etiology respiratory illness broke out in Wuhan, the capital city of Hubei province in China. (Lu et al., 2020a) Subsequently, it had been proved that it was caused by a novel enveloped RNA beta coronavirus. (Lu et al., 2020b) Due to its systematic similarity to SARS-CoV, the coronavirus has been named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), (Zhu et al., 2020) which has spread rapidly to all provinces in China and many countries

around the world. (Han and Yang, 2020; Holshue et al., 2020; Phan et al., 2020; Rothe et al., 2020; Xu et al., 2020) Recently, the World Health Organization (WHO) declared the event as the public health emergency of international concern. As of April 12, 2020, a total of 1852,024 laboratory-confirmed cases, and 114,090 deaths had been documented globally. (Holshue et al., 2020; Phan et al., 2020; Rothe et al., 2020)

In addition to seriously threatening the physical health of susceptible people, the large-scale epidemic of emerging infectious diseases

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may also exacerbate the negative impact on mental health, such as anxiety, depression and other negative emotions, even cause psychological crisis. Previous a telephone survey conducted in Hong Kong general population observed that population became more pessimistic after experiencing the epidemic of severe acute respiratory syndrome (SARS) in 2003. (Lau et al., 2006) Moreover, another study also showed that the number of people reporting mental health and psychosocial problems increased significantly during the outbreak of Ebola virus disease. (Leone, 2014)

To prevent the large-scale spread of the disease, the Central People's Government postponed start time of all schools, including college and university. Thus, almost all college students in China were asked to stay home and isolate themselves lasted for a longer time, which might increase risk of depressed mood. (Ravesloot et al., 2016) Furthermore, the original life and work plans were disturbed by the event, which may further elevate the mental stress level and anxiety degree of most college students. However, the prevalence of anxiety and depression symptom in college students during COVID-19 epidemic and the association between COVID-19 epidemic and risk of anxiety and depression symptom were still unclear.

Using data from a large cross-sectional survey conducted during the early outbreak peak of COVID-19 in China, the current study aimed to explore the prevalence of anxiety and depression symptom during COVID-19 epidemic, the association of COVID-19 epidemic with anxiety and depression symptom in college students.

Methods

Participants

Participants in the current study came from a large cross-sectional survey, which was conducted from 31 January 2020 to 5 February 2020 during the early outbreak peak of COVID-19 in China. The survey aimed to understand accurately the needs of college students on epidemic awareness, protection, travel tools and mental health condition, and the needs of mental intervention services, to provide a comprehensive data for school to formulate prevention and control policies. The survey selected four universities in southern China as settings, and all students of these four universities were enrolled into the survey. Majors included medicine, science, engineering, and literature to ensure the sample was representative. The data was collected using the online questionnaire instead of face-to-face interview, considering the severity of the COVID-19. The link of online questionnaire was sent to students by university counselors to recruit our study participants. Finally, 44,456 students completed voluntarily the online questionnaire. The response rate was 80.0%. After excluding participants who younger than 16 years old ($n = 9$), 44,447 students were enrolled into the final analysis.

The protocol of this study was approved by the Biomedical Ethics Committee of the Southern Medical University. All the participants signed the informed consent before completed the online questionnaire.

Assessment of anxiety and depression symptoms

Wildly used Zung's Self-rating Anxiety Scale (SAS) was used to assess anxiety symptom. (Zung et al., 1965) The SAS consists of 20 self-report items on anxiety symptom. Some of the items were worded symptomatically positive rated on a 4–1 scale (a little of the time, some of the time, good part of the time, and most of the time), and others symptomatically negative rated on a 1–4 scale. A standardized scoring algorithm is used to define symptom of anxiety, with a total score range of 20–80. Anxiety symptom was defined if the SAS score was ≥ 50 points. The Center for Epidemiologic Studies Depression Scale (CES-D Scale) was used to measure depressive symptomatology. (Radloff, 1977) Similarly, the CES-D Scale consists of 20 self-report items on depression symptom, which were selected from a pool of items from previously

validated depression scales (Beck et al., 1961; Zung, 1965). Four items were worded in the positive direction to break tendencies toward response set as well as to assess positive affect. Each response was scored from 0 to 3 on a scale of frequency of occurrence of the symptom. The possible range of scores is 0 to 60, with the higher scores indicating more symptoms. Depression symptom was defined if the CES-D score was ≥ 28 points.

Covariates

Covariates included demographic variables and epidemic-related variables. The demographic variables were defined as follows: age group (16–23 years and 24–50 years), sex (Male and Female), residence (Rural, Urban), birthplace (Hubei province, Others), education level (Undergraduate and Postgraduate), nationality (Han and Minority), and health status (Very healthy, Well, General or poor). The health status of students was defined according to the self-reported information. The COVID-19 epidemic-related variables were defined as follows: cumulative number of confirmed cases in the provinces (1–499, 500–999, 1000–9999, or $> 10,000$); whether have confirmed cases in family members and relatives (No case, Confirmed case, Suspected cases, or Not clear); whether Lived in, Travel to, or Passed by the Hubei province in the last two weeks (None, Lived in, Travel to, or Passed by).

Statistical analysis

Data in the current study was collected using an online questionnaire. SPSS version 20.0 (SPSS Inc. Chicago, IL) was used to perform the statistical analysis.

Numbers and percentages are used to describe categorical variables. The Chi-square was used to compare the difference of anxiety and depression symptom prevalence between exposed and non-exposed groups. To explore factors associated with anxiety and depression symptom prevalence, we performed multivariable logistic regression models using the anxiety and depression symptom as dependent variable, respectively, age group, sex, education level, birthplace, district, and nationality as independent variables. A $P < 0.05$ was considered statistically significant.

Results

Characteristics of participants are presented in **Table 1**. The current study enrolled 44,447 college students with a mean age of 21.0 years (SD 2.4), including 20,217 (45.5%) male students and 24,230 (54.5%) female students. Majority of students were undergraduate (89.4%), Han nationality (97.2%), and born in other provinces outside of Hubei (98.4%). Female college students had higher proportions of postgraduate, minorities, and lived in rural during COVID-19 epidemic ($P < 0.05$). In addition, most of college students lived in provinces where cumulative number of confirmed cases range from 1000 to 9999 (80.2%), and only 1.6% of students lived in Hubei province during COVID-19 epidemic.

Table 2 shows the bivariate analysis of epidemic-related and major demographic factors associated with the prevalence of anxiety and depression symptom. The overall prevalence of anxiety and depression symptom was 7.7% (95%CI: 7.5%, 8.0%) and 12.2% (95%CI: 11.9%, 12.5%) in college students during COVID-19 epidemic, respectively. Compared with students lived in provinces where cumulative number of confirmed cases range from 1 to 499, students lived in provinces where cumulative number of confirmed cases range from 1000 to 9999 had a higher depression symptom risk (OR = 1.25; 95%CI: 1.14, 1.38; $P < 0.001$). Compared with students who reported have not infected or suspected family members and relatives, students who reported having confirmed (OR = 4.06; 95%CI: 1.62, 10.19; $P = 0.003$), suspected (OR = 2.11; 95%CI: 1.11, 4.00; $P = 0.023$) and not clear (OR = 2.73; 95%CI: 2.41, 3.10; $P < 0.001$) had higher risk of depression symptom.

Table 1
The basic characteristics of study population.

Variables	Total (n = 44,447)	Male (n = 20,217)	Female (n = 24,230)	p-value
Age, mean (SD),years	21.0(2.4)	21.2(2.5)	20.9(2.3)	0.946
Age Group, n (%)				<0.001
16–23	39,208(88.2)	17,571(86.9)	21,637(89.3)	
24–50	5239(11.8)	2646(13.1)	2593(10.7)	
Education level, n (%)				0.018
Undergraduate	39,725(89.4)	18,146(89.8)	21,579(89.1)	
Postgraduate	4722(10.6)	2071(10.2)	2651(10.9)	
Birthplace, n (%)				0.503
Hubei	703(1.6)	311(1.5)	392(1.6)	
Others	43,744(98.4)	19,906(98.5)	23,838(98.5)	
District, n (%)				<0.001
Urban	28,318(63.7)	12,689(62.8)	15,629(64.5)	
Rural	16,129(36.3)	7528(37.2)	8601(35.5)	
Ethnicity, n (%)				<0.001
Han	43,184(97.2)	19,810(98.0)	23,374(96.5)	
Minorities	1263(2.8)	407(2.0)	856(3.5)	
Cumulative number of confirmed cases in the provinces, n (%)				<0.001
1–499	5364(12.1)	2019(10.0)	3345(13.8)	
500–999	2741(6.2)	1266(6.3)	1475(6.1)	
1000–9999	35,639(80.2)	16,621(82.2)	19,018(78.5)	
≥10,000	703(1.6)	311(1.5)	392(1.6)	

Abbreviation: SD, standard deviation;

Students who passed by Hubei province in the last two weeks had a lower depression symptom risk (OR=0.73; 95%CI: 0.56, 0.96; P = 0.025). Additionally, self-reported health condition was also associated with risk of anxiety and depression symptom. Compared with students who reported very well, those who reported well and general or poor had higher risk of anxiety and depression symptom (P<0.001). Compared with graduate students, postgraduate students reported lower prevalence of anxiety and depression symptom (P<0.001).

Multivariable analysis of epidemic-related and major demographic factors associated with the prevalence of anxiety and depression symptom was showed in Table 3. After adjusting for age group, sex, ethnicity, birthplace, cumulative number of confirmed cases in the

provinces; having infected family members and relatives or not, self-reported health condition, and education level were associated with anxiety and depression symptom (P<0.001). Compared with students who lived in province where cumulative number of confirmed cases range from 1 to 499, the odds ratio of depression symptom was 1.25 (95%CI: 1.13, 1.38; P<0.001) for those who lived in province where cumulative number of confirmed cases range from 1000 to 9999. Compared with students who have not family members and relatives infected COVID-19, those who have family members and relatives confirmed and suspected infected COVID-19 had higher risk of depression symptom (P<0.001). The risk of anxiety and depression symptom was significantly higher among students who self-reported

Table 2
Bivariate Analysis:Association of Epidemic-related and Major Demographic factors with Anxiety and Depression symptom (N = 44,447).

	Anxiety No. (%) [95% CI]	Crude OR(95% CI)	Depression No. (%) [95% CI]	Crude OR(95% CI)
Total	3434(7.7) [7.5,8.0]		5404(12.2) [11.9,12.5]	
Epidemic-related factors				
Cumulative number of confirmed cases in the provinces				
1–499	388(7.2) [6.5, 7.9]	Ref.	556(10.4) [9.6, 11.2]	Ref.
500–999	187(6.8) [5.9, 7.8]	0.94(0.78, 1.12)	268(9.8) [8.7, 10.9]	0.94(0.80, 1.09)
1000–9999	2824(7.9) [7.6, 8.2]	1.10(0.99, 1.23)	4511(12.7) [12.3, 13.0]	1.25(1.14, 1.38)
≥10,000	35(5.0) [3.8, 6.6]	0.67(0.47, 0.96)	69(9.8) [7.6, 12.0]	0.94(0.72, 1.22)
Having infected family members and relatives or not				
No cases	3179(7.4) [7.1, 7.6]	Ref.	5039(11.7) [11.4, 12.0]	Ref.
Confirmed cases	3(15.0) [0.0, 32.2]	2.21(0.65, 7.56)	7(35.0) [12.1, 57.9]	4.06(1.62, 10.19)
Suspected cases	7(12.7) [3.6, 21.8]	1.83(0.83, 4.05)	12(21.8) [10.6, 33.1]	2.11(1.11, 4.00)
Not clear	245(18.8) [16.7, 21.0]	2.91(2.52, 3.36)	346(26.6) [24.2, 29.0]	2.73(2.41, 3.10)
Lived in, Travel to or Passed by Hubei province in the last two weeks				
None	3360(7.8) [7.5, 8.0]	Ref.	5287(12.2) [11.9, 12.5]	Ref.
Lived in Hubei province	28(5.6) [3.6, 7.6]	0.70(0.48, 1.02)	51(10.1) [7.5, 12.8]	0.81(0.60, 1.08)
Travel to Hubei province	6(12.2) [2.7, 21.8]	1.658(0.70, 3.90)	9(18.4) [7.1, 29.6]	1.62(0.78, 3.33)
Passed by Hubei province	40(6.5) [4.5, 8.4]	0.82(0.60, 1.14)	57(9.2) [7.0, 11.5]	0.73(0.56, 0.96)
Major demographic variables				
Health Status				
Very healthy	1040(4.5) [4.2, 4.8]	Ref.	1491(6.4) [6.1, 6.7]	Ref.
Well	1219(8.2) [7.7, 8.6]	1.90(1.74, 2.06)	2074(13.9) [13.3, 14.5]	2.35(2.09, 2.52)
General or poor	1097(24.8) [23.5, 26.0]	7.02(6.40, 7.70)	1702(38.4) [37.0, 39.9]	9.091(8.31, 9.85)
Education level, Years				
Undergraduates	3199(8.1) [7.8, 8.3]	Ref.	5031(12.7) [12.3, 13.0]	Ref.
Postgraduates	235(5.0) [4.4, 5.6]	0.60(0.52, 0.68)	373(7.9) [7.1, 8.7]	0.59(0.53, 0.66)
Residence				
Rural	2194(7.8) [7.4, 8.1]	Ref.	3478(12.3) [11.9, 12.7]	Ref.
Urban	1240(7.7) [7.3, 8.1]	0.99(0.92, 1.07)	1926(11.9) [11.4, 12.4]	0.97(0.91, 1.03)

Abbreviations: Ref., Reference; No., numbers; OR, odds ratio; CI: conference interval.

Table 3
Multivariable Analysis: Association of Epidemic-related and Major Demographic factors with Anxiety and Depression symptom (N = 44,447).

Characteristics	Anxiety		Depression	
	No.	Adjusted OR (95% CI)	No.	Adjusted OR (95% CI)
Total	3434		5404	
Epidemic-related factors				
Cumulative number of confirmed cases in the provinces				
1–499	388	Ref.	556	Ref.
500–999	187	0.66(0.38, 1.12)	268	1.05(0.70, 1.58)
1000–9999	2824	1.07(0.95, 1.20)	4511	1.25(1.13, 1.38)
≥ 10,000	35	0.95(0.78, 1.16)	69	1.00(0.84, 1.18)
Having infected family members or relatives or not				
No cases	3179	Ref.	5039	Ref.
Confirmed cases	3	1.97(0.55, 7.07)	7	4.02(1.53, 10.70)
Suspected cases	7	1.71(0.75, 3.90)	12	2.04(1.04, 4.04)
Not clear	245	2.07(1.78, 2.42)	346	1.89 (1.65, 2.18)
Lived in/Travel to/Passed by Hubei province In the last two weeks				
None	3360	Ref.	5287	Ref.
Lived by Hubei province	28	1.14(0.64, 2.03)	51	1.00(0.64, 1.58)
Travel to Hubei province	6	1.52(0.62, 3.75)	9	1.39(0.63, 3.03)
Passed in Hubei province	40	0.91(0.64, 1.31)	57	0.87(0.64, 1.18)
Major demographic variables				
Health Status				
Very healthy	1040	Ref.	1491	Ref.
Well	1219	1.86(1.71, 2.03)	2074	2.31(2.16, 2.48)
General or poor	1097	6.69(6.10, 7.34)	1702	8.79(8.11, 9.53)
Education level, Years				
Undergraduate	3199	Ref.	5031	Ref.
Postgraduate	235	0.71(0.60, 0.84)	373	0.68(0.58, 0.78)
Residence				
Rural	2194	Ref.	3478	Ref.
Urban	1240	1.02(0.94, 1.10)	1926	0.98(0.92, 1.05)

Abbreviation: Ref., Reference; OR, odds ratio; CI: confidence interval. All the analysis adjusted for age group, sex, ethnicity, and birthplace.

well and general or poor health condition than those who reported very well ($P < 0.001$). Moreover, postgraduate had lower risk of anxiety and depression symptom than undergraduate ($P < 0.001$).

Table 4 presented the demands for psychological knowledge and interventions during COVID-19 epidemic in college students. The overall demand rate of self-reported psychological knowledge and interventions was 42.0% and 11.2%, respectively. The psychological

Table 4
The Need for Psychological knowledge and Interventions According to Anxiety and Depression symptom Group.

	Total	Anxiety		p Value	Depression		p Value
		No	Yes		No	Yes	
Need of Psychological knowledge							
Yes	18,671(42.0)	16,824(41.0)	1847(53.8)	<0.001	15,951(40.9)	2720(50.3)	<0.001
No	25,776(58.0)	24,189(59.0)	1587(46.2)		23,092(59.1)	2684(49.7)	
Psychological knowledge							
Ways to alleviate the psychological effects	13,130(70.3)	11,673(69.4)	1457(78.9)	<0.001	11,093(69.5)	2037(74.9)	<0.001
The common symptom of anxiety and depression	16,272(87.2)	14,793(87.9)	1479(80.1)	<0.001	14,019(87.9)	2253(82.8)	<0.001
Ways to seek professional psychological help	9898(53.0)	8848(52.6)	1050(56.8)	<0.001	8411(52.7)	1487(54.7)	<0.001
Others	272(1.5)	242(1.4)	30(1.6)	0.001	230(1.4)	42(1.5)	0.061
Need of Psychological Interventions							
Very	554(1.2)	355(0.9)	199(5.8)	<0.001	340(0.9)	214(4.0)	<0.001
Moderate	783(1.8)	540(1.3)	243(7.1)		484(1.2)	299(5.5)	
A little	3632(8.2)	2802(6.8)	830(24.2)		2568(6.6)	1064(19.7)	
No	39,478(88.8)	37,316(91.0)	2162(63.0)		35,651(91.3)	3827(70.8)	
Intervention methods							
TV or broadcast	32,707(73.6)	30,377(74.1)	2330(67.9)	<0.001	29,039(74.4)	3668(67.9)	<0.001
Online training courses	19,269(43.4)	17,749(43.3)	1520(44.3)	0.262	16,946(43.4)	2323(43.0)	0.562
One-to-one online counseling	12,465(28.0)	11,353(27.7)	1112(32.4)	<0.001	10,821(27.7)	1644(30.4)	<0.001
Lectures	5869(13.2)	5225(12.8)	614(17.9)	<0.001	5028(12.9)	841(15.6)	<0.001
Salons	3223(7.3)	2826(6.9)	397(11.6)	<0.001	2701(6.9)	522(9.7)	<0.001
One-to-one off-line counseling	7219(16.2)	6556(16.0)	663(19.3)	<0.001	6198(15.9)	1021(18.9)	<0.001
Poster	10,523(23.7)	9752(23.8)	771(22.5)	0.079	9300(23.8)	1223(22.6)	0.054
Others	553(1.2)	495(1.2)	58(1.7)	0.014	461(1.2)	92(1.7)	0.001

knowledge and interventions demand rate in students with anxiety and depression symptom was significantly higher than those without ($P < 0.001$). Overall, 70.3% students need knowledge of ways to alleviate the psychological effects, and the rate is higher among students with anxiety and depression symptom than those without ($P < 0.001$). Of 53.0% students need knowledge of ways to seek professional psychological help, similarly, the rate was also higher in students with anxiety and depression symptom than those without ($P < 0.001$). For acceptable interventions methods, the top three methods are TV or broadcast (73.6%), online training courses (43.4%), and one-to-one online counseling (28.0%).

Discussion

Using data from a large cross-sectional survey, the current study found the overall prevalence of anxiety and depression symptom was 7.7%, and 12.2%, respectively. The urgent demand rate of psychological knowledge and interventions was 42.0% and 11.2% during the epidemic period of COVID-19 in college students. Additionally, after adjusted for covariates, epidemic-related factors, especially having confirmed cases in family members and relatives was significantly associated with depression symptom in college students. Meanwhile, self-reported health condition was also associated with anxiety and depression symptom in college students. Interestingly, postgraduate and student who lived in Hubei province reported a lower risk of anxiety and depression symptom than undergraduate and students who lived in others provinces in China.

In the current study, we reported the prevalence of anxiety symptom was 7.7%, and the depression symptom was 12.2%, which was lower than that reported in previous studies. In 2016, a Systematic Review and Meta-Analysis reported that the overall pooled crude prevalence of depression or depressive symptom was 27.2% in medical students.(Rotenstein et al., 2016) The main reason caused the difference is most of participants in the current study came from in China southern. However, the Systematic Review and Meta-Analysis enrolled 183 studies from 43 countries. Similarly, the prevalence of depression symptom in the current study was also lower than that reported in previous Chinese studies. Previous several studies conducted in China reported that the depression symptom in college students was range from 13.5% to 68.5%.(Lun et al., 2018; Pan et al., 2016; Sobowale et al., 2014; Sun et al., 2011) We speculated the survey time could be the major reason resulted in the difference. In this study, we

conducted the data during the Chinese greatest traditional festival ‘Chinese New Year’. During Chinese New Year, almost all the Chinese, including college students, stop their work or study plans and turn back to home to enjoy their vocation of pleasure. Thus, the anxiety and depression symptom during this period could be significantly lower than that during others periods.

Despite the prevalence of anxiety and depression symptom during the Chinese New Year might be lower than that in others periods, the current study observed that COVID-19 epidemic-related factors were significantly associated with the risk of anxiety and depression symptom in Chinese college students. In the current study, we found that the risk of depression symptom in students with having confirmed cases in family members and relatives was three times higher than that in students without. Similarly, having suspected cases in family members or relatives also increased the risk of depression symptom in college students. Moreover, the risk of depression symptom for students who lived in provinces where cumulative number of confirmed cases range from 1000 to 9999 was 0.25 times higher than those who lived in provinces where cumulative number of confirmed cases range from 1 to 499. These results indicated that the epidemic of COVID-19 might have a significant effect on the risk of depression symptom in Chinese college students. It was consistent with the previous study conducted in Chengdu and Chongqing, China. (Tang et al., 2020) which had suggested that psychological consequences of the COVID-19 could be serious in university students. The outbreak of severely communicable diseases, such as severe acute respiratory syndrome (SARS), Ebola Virus Disease (EVD) was also associated with mental problems. Previous a longitudinal study from Hong Kong in China observed that anxiety level was strongly associated with the intensity of the SARS outbreak and closely mirrored the daily number of new case in community residents. (Leung et al., 2005) Similarly, consistent association was also observed in Chinese college students. (Liu et al., 2004; Q-S., 2005) Meanwhile, previous studies also explored the association between outbreak of EVD and mental problems and found that EVD risk behaviors were associated with intensity of depression symptom. (Betancourt et al., 2016)

Apart from epidemic-related factors, the current study also observed that traditional factors, such as self-reported health condition and education level were associated strongly with risk of anxiety and depression symptom, which was consistent with previous studies. A previous study observed that poor health condition in the past 2 weeks increased the risk of common mental health problems ($OR=1.72$; $95\%CI: 1.43, 2.05$) in rural-to-urban migrant workers in Shenzhen, China. (Zhong et al., 2018) In the current study, we found that postgraduate has lower risk of anxiety and depression symptom than undergraduate, which was inconsistent with previous study. A previous meta-analysis reported that the prevalence of depressive symptoms among postgraduates was similar to that of undergraduates (30.8% and 27.0%, respectively). We speculated that the difference might be associated with different panic for COVID-19 epidemic between postgraduates and undergraduates. Compared with undergraduates, postgraduates were more likely to focus on their research plans, and less likely to focus on epidemic of COVID-19. Thus, compared with undergraduates, postgraduates might have less panic for COVID-19 epidemic.

The current study found that the demands for psychological knowledge and interventions were high in college students during epidemic of COVID-19. Overall, more than 40% of students reported that they needed psychological knowledge, and about 10% of students needed psychological intervention. In which, 87.2% of students reported that they needed to understand the common symptoms of anxiety and depression, and 70.0% of students need to understand the ways of alleviate the negative psychological effects. All of these rates mentioned above in students with anxiety and depression symptom were higher than that in students without. Indicating that universities should pay more attention to students with anxiety and depression symptom, and provide more mental knowledge, such as common symptoms of anxiety and depression, common ways of alleviate

negative psychological effects by opening online training courses or setting channels of one-to-one online counseling for students.

Despite the current study is the largest cross-sectional study to investigate the prevalence of anxiety and depression symptom, and explore the association between COVID-19 epidemic-related factor and the risk of anxiety and depression symptom. Several limitations should be mentioned: Firstly, the samples in the current study was selected though non-random sampling due to the urgency of time and particularity (Chinese spring festival), which limit the extrapolation of our results. However, the birthplace of students in our survey covered all province in China. Secondly, all the data in this study was collected through online questionnaire, and we did not evaluate the reliability and validity. However, the current study used standardized scales to evaluate the anxiety and depression symptom. Finally, the current study is a cross-sectional survey. Thus, we cannot clarify causality.

Contributors

All authors have contributed significantly the paper. ZW, HY, YY, and DL performed statistical analyses and writing the manuscript. CM and XY directed the study. YZ, DS, PC conducted data cleaning. ZW, WS, XW, and XW performed analysis or interpretation of the data.

Declaration of Competing Interest

None.

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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, without the consent of Elsevier B.V.. We also confirm that all authors contributed significantly to the study.

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Role of the sponsor

The funding institutions had no role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Ethical approval

All procedures complied with the ethical standards of the Biomedical Ethics Committee of the Southern Medical University and the latest version of the Helsinki Declaration.

Supplementary materials

Supplementary material associated with this article can be found, in

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