

The Psychological Responses and Associated Factors of Chinese College Students During COVID-19 Outbreak in February

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Abstract

Background

The novel coronavirus pneumonia (COVID-19) is a highly contagious and highly pathogenic disease caused by a novel coronavirus—SARS-CoV-2—and has become pandemic within a short period of time. The epidemic has brought not only the risk of death from infection but also unbearable psychological pressure. College students as a special group, their mental health status need to be studied during the outbreak of COVID-19.

Methods

We used the Self-Rating Anxiety Scale (SAS), Self-Rating Depression Scale (SDS), and the compulsive behavior part of the Yale-Brown Obsessive-Compulsive Scale (YBOCS), combined with demographic information, using online questionnaires to research, and the study was conducted between February 21 and 24, 2020. A total of 2270 valid questionnaires were collected, the respondents of these questionnaires included 563 medical students and 1707 non-medical students. We separately analyzed the mental health status of medical and non-medical students during the outbreak of COVID-19.

Results

Of the 563 medical students, 20 (3.55%) students had anxiety symptoms, and 57 (10.12%) students had depressive symptoms. Gender, PMH, compulsive behavior, and regularity of daily life during the epidemic outbreak were correlated with their anxiety symptoms and age, PMH, compulsive behavior, and regularity of daily life during the epidemic outbreak were associated with their depressive symptoms. Of the 1707 non-medical students, 66 (3.87%) students had anxiety symptoms, and 180 (10.54%) students had depressive symptoms. Gender, contact history of similar infectious disease, PMH, compulsive behavior, regularity of daily life and exercise during the epidemic outbreak and concern on COVID-19 were correlated with their anxiety symptoms and contact history of similar infectious disease, PMH, compulsive behavior, regularity of daily life and exercise during the epidemic outbreak and concern on COVID-19 were associated with their depressive symptoms.

Conclusions

Results indicated that gender, age, contact history of similar infectious disease, past medical history (PMH), compulsive behavior, regularity of daily life, and exercise during the epidemic outbreak are the key factors making college students anxious or depressed. The results provided a theoretical basis for relevant interventions; it is also essential for medical education and public health epidemic prevention.

1. Introduction

The novel coronavirus pneumonia (COVID-2019) has spread very quickly all over China [1]. The outbreak was first discovered in late December 2019, when a series of unexplained pneumonia cases were found, which were related to epidemiologically related seafood market exposure and undiscovered exposure in Wuhan City, Hubei Province [2]. According to the official website of the National Health Council of China, as of July 31, 2020, a total of 78,989 discharged cases, 4,634 deaths, 84,337 confirmed cases were accumulated, a total of 789,742 close contacts were tracked, and 20,278 close contacts were still under medical observation (National Health Council, 2020). The epidemic affected not only China but also other countries, the World Health Organization (WHO) declared the COVID-19 outbreak a public health emergency of international concern [3]. As of July 31, 2020, there were more than 17.7 million confirmed infections globally in more than 180 countries with over 680,000 deaths. The emergence and rapid spread of COVID-19 has brought complex challenges to the global public health and medical community.

The COVID-19 has brought not only the risk of death from infection but also unbearable psychological pressure to people around the world [4]. Previous research has shown that during the outbreak, it had a broad psychosocial impact on people at many levels. At the individual level, people may feel fear of illness or death, helplessness, and stigma [5]. During a public health emergency, approximately 10% to 30% of the public are very or quite concerned about the possibility of contracting the disease [6]. As schools and businesses close, the negative emotions experienced by individuals become more complicated [7]. During the SARS outbreak, many studies investigated the psychological impact on uninfected communities and found a significant incidence of mental illness [8]. Those who were older, of female gender, more highly educated, with a higher awareness of the risk of SARS, a moderate level of anxiety, a positive contact history, and those with SARS-like symptoms were more likely to take preventive measures against the infection [9].

College students, as a particular group, because their situation is different from others, the psychological pressure they face may also be different from others. Because the university stage is a stage of transition to maturity. In this stage, the mental state of the students is not stable enough, and it is easy to cause many psychological problems. And the outbreak of infectious diseases will have a psychological impact on medical staff and ordinary people. An obvious example is the mental sequelae observed during the outbreak of severe acute respiratory syndrome (SARS) in 2003 [10]. Studies of SARS outbreaks have shown that medical staff experienced acute stress reactions [11,12]. At present, there have been many studies on the mental health of the general public and college students during the epidemic. However, our study starts with the university students, dividing the group into medical students and non-medical students. Therefore, this study represents the psychological impact and

mental health survey conducted among medical students and non-medical students. Our research team focused on medical students and non-medical students, and took this epidemic as the starting point. During the epidemic, we conducted relevant psychological problems research, explored related influencing factors, identified risk and protective factors contributing to mental stress, and provided evidence for psychological intervention programs for medical students and non-medical students. It is essential for the healthy growth of medical students and effective response to future medical work, and also for the intervention of mental health of non-medical students.

2. Materials And Methods

2.1 Study population and sample

The target population included medical students from 37 medical colleges as well as non-medical students from more than 20 non-medical colleges. We adopted a cross-sectional survey design and used anonymous online questionnaires to investigate the mental health status of students in the above schools during the epidemic of COVID-19. A snowball sampling strategy was utilized, the online survey was first distributed to medical students, and they were encouraged to pass it on to others. After deleting the data from the questionnaires with unclear answers and unqualified conditions, we finally got 2270 valid questionnaires, including 563 medical students and 1707 non-medical students.

2.2 Study instruments

The questionnaire contained the demographic information, the Self-Rating Anxiety Scale (SAS), the Self-Rating Depression Scale (SDS), and the compulsive behavior part of the Yale-Brown Obsessive-Compulsive Scale (YBOCS).

2.2.1 Demographic information

The demographic information consisted of questions that covered several aspects: gender, age, whether it is an only child, nationality, place of residence, region, whether it has joined in the volunteer works, contact history of similar infectious disease, past medical history (PMH), the regularity of daily life and exercise during the epidemic.

2.2.2 SAS and SDS

The SAS and SDS were built by William W. K. Zung, a psychiatrist at the University of Duke. Both SAS and SDS were made just like the questionnaire in a survey. They each have 20 items self-report examinations that will measure the level of anxiety symptoms or depressive symptoms. The SAS and SDS are well-validated scales, the SAS has demonstrated good internal consistency (Cronbach's $\alpha=0.828$), and SDS also showed good internal consistency (Cronbach's $\alpha=0.849$). The scores of 20 items are added together and then converted into standard scores. According to the results of the Chinese norm, people who score more than 50 on the SAS scale have anxiety symptoms, and people who score more than 53 on the SDS have depressive symptoms.

2.2.3 YBOCS

The YBOCS was designed to remedy the problems of existing rating scales by providing a specific measure of the severity of symptoms of obsessive-compulsive disorder that is not influenced by the type of obsessions or compulsions present. The scale is a clinician-rated, 10-item scale, our questionnaire contained only part of its compulsive behavior scale, and it has demonstrated good internal consistency (Cronbach's $\alpha=0.810$). According to the scoring criteria, people with a score of 6 or more have compulsive behavior.

2.3 Data analysis

Data were analyzed with SPSS Version 26.0. The univariate analyses were used to explore the significant associations between sample characteristics and anxiety symptoms or depressive symptoms during the COVID-19 epidemic.

Binary logistic regression analysis was carried out by taking anxiety symptoms or depressive symptoms as dependent variables and variables with statistical significance ($P<0.05$) according to univariate analysis as independent variables. To avoid missing some important factors, variables with a P-value higher than 0.05 but less than 0.10 are also added to the regression analysis.

3. Results

Table 1 showed the number of students whose mental health was affected or not among 563 medical and 1707 non-medical students during the outbreak of COVID-19. Of the 563 medical students, 20 (3.55%) students had symptoms of anxiety, and 57 (10.12%) students had depressive symptoms. Of the 1707 non-medical students, 66 (3.87%) students had anxiety symptoms, and 180 (10.54%) students had depressive symptoms.

Table 1 Distribution of anxiety symptoms or depressive symptoms among medical and non-medical students N (%)

	total	Anxiety symptoms		Depressive symptoms	
		Negative	Positive	Negative	Positive
Medical Students	563	543(96.45)	20(3.55)	506(89.88)	57(10.12)
Non-medical students	1707	1641(96.13)	66(3.87)	1527(89.46)	180(10.54)

Table 2 showed the results of univariate analyses of anxiety symptoms and depressive symptoms of medical students. As shown in Table 2, gender, PMH, compulsive behavior, and regularity of daily life during the epidemic outbreak were correlated with their anxiety symptoms and age, PMH, compulsive behavior, and regularity of daily life during the epidemic outbreak were associated with their depressive symptoms.

Table 2 Associated factors of anxiety symptoms or depressive symptoms among the medical students N (%)

Variable		total	Anxiety symptoms		Statistics	P value	Depressive symptoms		Statistics	P value
			Positive	Negative			Positive	Negative		
Gender	Male	161	11(6.83)	150(93.17)	7.080	0.008 ^{a*}	17(10.56)	144(89.44)	0.047	0.829 ^a
	Female	402	9(2.24)	393(97.76)			40(9.95)	362(90.05)		
Age	Below 19	145	2(1.38)	143(98.62)	2.793	0.247 ^a	12(8.28)	133(91.72)	6.288	0.043 ^{a*}
	20-23	313	14(4.47)	299(95.53)			40(12.78)	273(87.22)		
	24 and above	105	4(3.81)	101(96.19)			5(4.76)	100(95.24)		
Only child	Yes	224	11(4.91)	213(95.09)	2.003	0.157 ^a	18(8.04)	206(91.96)	1.783	0.182 ^a
	No	339	9(2.65)	330(97.35)			39(11.50)	300(88.50)		
Nationality	Han Nationality	504	18(3.57)	486(96.43)	0.000	1.000 ^b	50(9.92)	454(90.08)	0.219	0.640 ^a
	Minority	59	2(3.39)	57(96.61)			7(11.86)	52(88.14)		
Place of residence	Urban	261	8(3.07)	253(96.93)	0.337	0.561 ^a	25(9.58)	236(90.42)	0.159	0.690 ^a
	Rural	302	12(3.97)	290(96.03)			32(10.60)	270(89.40)		
Region	Hubei Province	5	0(0)	5(100)		1.000 ^c	0(0)	5(100)		1.000 ^c
	non-Hubei Province	558	20(3.58)	538(96.42)			57(10.22)	501(89.78)		
Joining in the volunteer work	Yes	85	3(3.53)	82(96.47)	0.000	1.000 ^b	7(8.24)	78(91.76)	0.393	0.531 ^a
	No	478	17(3.56)	461(96.44)			50(10.46)	428(89.54)		
Contact history of similar infectious disease	Yes	9	1(11.11)	8(88.89)		0.280 ^c	3(33.33)	6(66.67)		0.053 ^c
	No	554	19(3.43)	535(96.57)			54(9.75)	500(90.25)		
PMH	Yes	27	5(18.52)	22(81.48)		0.002 ^{c*}	8(29.63)	19(70.37)	9.713	0.002 ^{b*}
	No	536	15(2.80)	521(97.20)			49(9.14)	487(90.86)		
Compulsive behavior	Yes	99	9(9.09)	90(90.91)	8.883	0.003 ^{b*}	19(19.19)	80(80.81)	10.854	0.001 ^{a*}
	No	464	11(2.37)	453(97.63)			38(8.19)	426(91.81)		
Regularity of daily life during epidemic outbreak	Regular	308	5(1.62)	303(98.38)	7.386	0.007 ^{a*}	18(5.84)	290(94.16)	13.691	0.000 ^{a*}
	Irregular	255	15(5.88)	240(94.12)			39(15.29)	216(84.71)		
Exercise during epidemic outbreak	No exercise	205	11(5.37)	194(94.63)	3.094	0.079 ^a	25(12.20)	180(87.80)	1.519	0.218 ^a
	Insist on exercising	358	9(2.51)	349(97.49)			32(8.94)	326(91.06)		
Concern on COVID-19	Not very much concerned (within 1 hr per day)	256	10(3.91)	246(96.09)	0.172	0.679 ^a	31(12.11)	225(87.89)	2.033	0.154 ^a
	Much concerned (above 1 hr per day)	307	10(3.26)	297(96.74)			26(8.47)	281(91.53)		

a Pearson Chi-Square

b Continuity Correction

c Fisher's Exact Test

* p < 0.05

Table 3 showed the results of univariate analyses of anxiety symptoms and depressive symptoms of non-medical students. As shown in Table 2, gender, contact history of similar infectious disease, PMH, compulsive behavior, regularity of daily life and exercise during the epidemic outbreak and concern on COVID-19 were correlated with their anxiety symptoms and contact history of similar infectious disease, PMH, compulsive behavior, regularity of daily life and exercise during the epidemic outbreak and concern on COVID-19 were correlated with their depressive symptoms.

Table 3 *Associated factors of anxiety symptoms and depressive symptoms among the non-medical students* N (%)

Variable		total	Anxiety symptoms		Statistics	P value	Depressive symptoms		Statistics	P value
			Positive	Negative			Positive	Negative		
Gender	Male	716	36(5.03)	680(94.97)	4.476	0.034 ^{a*}	79(11.03)	637(88.97)	0.312	0.576 ^a
	Female	991	30(3.03)	961(96.97)			101(10.19)	890(89.81)		
Age	Below 19	515	16(3.11)	499(96.89)	1,775	0.412 ^a	53(10.29)	462(89.71)	0.997	0.608 ^a
	20-23	1145	47(4.10)	1098(95.90)			124(10.83)	1021(89.17)		
	24 and above	47	3(6.38)	44(93.62)			3(6.38)	44(93.62)		
Only child	Yes	827	32(3.88)	795(96.12)	0.000	0.995 ^a	94(11.37)	733(88.63)	1.148	0.284 ^a
	No	880	34(3.86)	846(96.14)			86(9.77)	794(90.23)		
Nationality	Han Nationality	1432	58(4.05)	1374(95.95)	0.808	0.369 ^a	156(10.89)	1276(89.11)	1.148	0.284 ^a
	Minority	275	8(2.91)	267(97.09)			24(8.73)	251(91.27)		
Place of residence	Urban	677	26(3.84)	651(96.16)	0.002	0.964 ^a	73(10.78)	604(89.22)	0.067	0.795 ^a
	Rural	1030	40(3.88)	990(96.12)			107(10.39)	923(89.61)		
Region	Hubei Province	21	1(4.76)	20(95.24)	0.565 ^c	0.565 ^c	2(9.52)	19(90.48)	0.000 ^b	1.000 ^a
	non-Hubei Province	1686	65(3.86)	1621(96.14)			178(10.56)	1508(89.44)		
Joining in the volunteer work	Yes	161	6(3.73)	155(96.27)	0.009	0.923 ^a	23(14.29)	138(85.71)	2.637	0.104 ^a
	No	1546	60(3.88)	1486(96.12)			157(10.16)	1389(89.84)		
Contact history of similar infectious disease	Yes	14	3(21.43)	11(78.57)	0.015 ^{c*}	0.015 ^{c*}	5(35.71)	9(64.29)	6.981	0.008 ^{b*}
	No	1693	63(3.72)	1630(96.28)			175(10.34)	1518(89.66)		
PMH	Yes	74	7(9.46)	67(90.54)	5.032	0.025 ^{b*}	19(25.68)	55(74.32)	18.774	0.000 ^{a*}
	No	1633	59(3.61)	1574(96.39)			161(9.86)	1472(90.14)		
Compulsive behavior	Yes	214	26(12.15)	188(87.85)	45.164	0.000 ^{a*}	57(26.64)	157(73.36)	67.157	0.000 ^{a*}
	No	1493	40(2.68)	1453(97.32)			123(8.24)	1370(91.76)		
Regularity of daily life during epidemic outbreak	Regular	993	14(1.41)	979(98.59)	38.544	0.000 ^{a*}	58(5.84)	935(94.16)	55.688	0.000 ^{a*}
	Irregular	714	52(7.28)	662(92.72)			122(17.09)	592(82.91)		
Exercise during epidemic outbreak	No exercise	604	36(5.96)	568(94.04)	11.025	0.001 ^{a*}	110(18.21)	494(81.79)	58.252	0.000 ^{a*}
	Insist on exercising	1103	30(2.72)	1073(97.28)			70(6.35)	1033(93.65)		
Concern on COVID-19	Not very much concerned (within 1 hr per day)	780	22(2.82)	758(97.18)	4.227	0.040 ^{a*}	100(12.82)	680(87.18)	7.886	0.005 ^{a*}
	Much concerned (above 1 hr per day)	927	44(4.75)	883(95.25)			80(8.63)	847(91.37)		

a Pearson Chi-Square

b Continuity Correction

* p < 0.05

Table 4 and 5 showed the results of binary logistic regression analysis of factors affecting medical and non-medical students' anxiety symptoms and depressive symptoms. As shown in Table 4, female sex (OR =0.346, P=0.027) was a protective factor for anxiety symptoms, in contrast to the male sex. However, PMH (OR =5.428, P=0.006) and compulsive behavior (OR =2.857, P=0.036) were risk factors for anxiety symptoms. Age (OR =0.845, P=0.004) was a protective factor for depressive symptoms. However, contact history of similar infectious disease (OR=7.228, P=0.013), PMH (OR=4.754, P=0.002), compulsive behavior (OR =2.448, P=0.007) and irregular daily life during the epidemic outbreak (OR =2.395, P=0.005) were risk factors for depressive symptoms.

As shown in Table 5, exercise during the epidemic outbreak (OR =0.565, P=0.032) was a protective factor against anxiety symptoms experienced by the participants. However, compulsive behavior (OR =3.438, P<0.001) and irregular daily life during the epidemic outbreak (OR =4.212, P<0.001) were risk factors for anxiety symptoms. Exercise during the epidemic outbreak (OR =0.391, P<0.001) was also a protective factor for depressive symptoms. Much concerned (above 1 hr per day) on COVID-19 (OR =0.587, P=0.002) was a protective factor, too. However, PMH (OR =2.937, P<0.001), compulsive behavior (OR =3.875, P<0.001), irregular daily life during the epidemic outbreak (OR =2.389, P<0.001) were risk factors for depressive symptoms.

Table 4 Binary logistic regression analysis of factors affecting medical students' anxiety symptoms or depressive symptoms.

Variable	Anxiety symptoms			Depressive symptoms		
	OR	P	OR(95%CI)	OR	P	OR(95%CI)
Gender:(Female vs. Male)	0.346	0.027*	(0.135,0.888)			
Age				0.845	0.004*	(0.754,0.947)
Contact history of similar infectious disease:(Yes vs. No)				7.228	0.013*	(1.521,34.359)
PMH:(Yes vs. No)	5.428	0.006*	(1.632,18.056)	4.754	0.002*	(1.816,12.448)
Compulsive behavior:(Yes vs. No)	2.857	0.036*	(1.072,7.616)	2.448	0.007*	(1.281,4.677)
Regularity of daily life during epidemic outbreak:(Irregular vs. Regular)	2.595	0.085	(0.876,7.690)	2.395	0.005*	(1.299,4.413)
Exercise during epidemic outbreak:(Yes vs. No)	0.566	0.240	(0.219,1.462)			

* p < 0.05

Table 5 Binary logistic regression analysis of factors affecting non-medical students' anxiety symptoms and depressive symptoms.

Variable	Anxiety symptoms			Depressive symptoms		
	OR	P	OR(95%CI)	OR	P	OR(95%CI)
Gender:(Female vs. Male)	0.601	0.054	(0.358,1.009)			
Contact history of similar infectious disease:(Yes vs. No)	3.069	0.132	(0.714,13.182)	3.211	0.070	(0.909,11.342)
PMH:(Yes vs. No)	2.004	0.120	(0.834,4.814)	2.937	0.000*	(1.629,5.294)
Compulsive behavior:(Yes vs. No)	3.438	0.000*	(1.989,5.939)	3.875	0.000*	(2.628,5.714)
Regularity of daily life during epidemic outbreak:(Irregular vs. Regular)	4.212	0.000*	(2.267,7.827)	2.389	0.000*	(1.690,3.377)
Exercise during epidemic outbreak:(Yes vs. No)	0.565	0.032*	(0.334,0.953)	0.391	0.000*	(0.279,0.547)
Concern on COVID-19:(Much concerned vs. Not very much concerned)	1.602	0.092	(0.925,2.773)	0.587	0.002*	(0.417,0.826)

* p < 0.05

4. Discussion

Since the outbreak of severe acute respiratory syndrome (SARS) in 2003, the novel coronavirus pneumonia (COVID-2019) is by far the largest outbreak of atypical pneumonia [13]. COVID-19, similarly to SARS, has brought not only the risk of death but also unbearable psychological

pressure to people around the world [4].

Studies have shown the psychological impact of the initial stage of COVID-19 in China among the general population [14,15,16]. Compared with medically trained medical staff, medical staff without medical training are more prone to the psychological impact of COVID-19 [17]. Our research team focused on medical students and non-medical students during the COVID-19 outbreak. Our data demonstrated that 3.55% of medical students had anxiety symptoms, and 10.12% of medical students had depressive symptoms during the outbreak of COVID-19. About 3.87% of non-medical students had anxiety symptoms, and 10.54% of non-medical students had depressive symptoms during the outbreak of COVID-19. The incidence of anxiety and depressive symptoms of non-medical students is slightly higher than that of medical students. As the continuous spread of the epidemic, strict isolation measures and delays in schools, colleges, and universities across the country may affect the mental health of college students, there have been reports on the mental health status of college students facing the epidemic [18].

It can be concluded from our study that medical students and non-medical students with compulsive behaviors are more likely to have symptoms of anxiety and depression. This is similar to previous research results. Previous studies have suggested that youth with obsessive-compulsive disorder (OCD) are at risk of experiencing comorbid psychiatric conditions, such as depression and anxiety [19]. Medical students with PMH are more likely to have symptoms of anxiety and depression, and non-medical students with PMH are more likely to have depressive symptoms, indicating that they are more sensitive to the epidemic and require more psychological intervention.

Medical students with irregular daily life during the epidemic outbreak are more likely to have depressive symptoms, while non-medical students are more likely to have symptoms of anxiety and depression, which is similar to previous research results. Previous studies have suggested that with the increasing pressure of modern life and the irregular lifestyles, depression has become increasingly threatening to human health, studies have also suggested that better mental health at baseline was predicted by a lower body mass index, a higher frequency of physical and mental activities, non-smoking, a non-vegetarian diet, and a more regular social rhythm [20]. Students should maintain a regular life during the epidemic to ensure good mental health.

Medical students with contact history of similar infectious disease are more likely to have depressive symptoms, because it may cause students to worry about whether they have been infected, and medical students are more likely to be exposed to similar diseases in clinical work. This is also similar to previous research results, and previous studies have also suggested that people in the contact history were associated with contact with an individual with suspected COVID-19 or infected materials, which were significantly associated with anxiety [14]. Female medical students are less likely to have anxiety symptoms, and older medical students are less likely to have depressive symptoms, studies have suggested that females suffered a greater psychological impact as well as higher levels of stress, anxiety, and depression [14]. It seems that this is inconsistent with our research results. But a statistically significant difference was observed between the genders in their levels of knowledge, and female medical students had a significantly higher level of professional knowledge than males [21]. Thus, female medical students may have a more comprehensive understanding of the disease and are less likely to have anxiety symptoms about the epidemic. Similarly, since older medical students have a higher level of awareness of the disease, they are less likely to experience anxiety symptoms.

Non-medical students with exercise during the epidemic outbreak were less likely to have depressive symptoms. Studies have suggested that physical exercise is associated with greater cardiovascular fitness, improved muscle strength and endurance, and the reduction of depression and anxiety [22]. Unexpectedly, non-medical students with much concern on COVID-19 were less likely to have depressive symptoms maybe due to the positive scientific information dissemination on public emergencies from Chinese media. Therefore, it is recommended to maintain appropriate physical exercise during the epidemic, to pay proper attention to the news, especially the good news for the epidemic, and such behaviors are beneficial to maintain a good attitude during the outbreak of COVID-19.

This study has some limitations. In view of the limited available resources and the time of the COVID-19 outbreak, we adopted the snowball sampling strategy, which is not based on randomly selected samples. Besides, we did not conduct a prospective study that would provide specific findings to support the needs of targeted public health initiatives.

5. Conclusions

During the outbreak of COVID-19, 3.55% of medical students had anxiety symptoms and 10.12% with depressive symptoms. Meanwhile, 3.87% of non-medical students had anxiety symptoms and 10.54% with depressive symptoms.

Among medical students, female sex was a protective factor for anxiety symptoms. Otherwise, PMH and compulsive behavior were risk factors for anxiety symptoms. Age was a protective factor for depressive symptoms. Contact history of similar infectious disease, PMH, compulsive behavior, and irregular daily life during the epidemic outbreak were risk factors for depressive symptoms.

Among non-medical students, exercise during the epidemic outbreak was a protective factor against anxiety symptoms. Compulsive behavior and irregular daily life during the epidemic outbreak were risk factors for anxiety symptoms. Exercise during the epidemic outbreak was also a

protective factor for depressive symptoms. Much concerned (above 1 hr per day) on COVID-19 was a protective factor, too. PMH, compulsive behavior, irregular daily life during the epidemic outbreak were risk factors for depressive symptoms.

Our findings can be used to make psychological interventions to improve mental health and psychological adaptability during the COVID-19, and they require attention, help, and support of the society, families, and colleges.

Abbreviations

COVID-19: Corona Virus Disease 2019; SAS: Self-Rating Anxiety Scale; SDS: Self-Rating Depression Scale; YBOCS: Yale-Brown Obsessive-Compulsive Scale; PMH: past medical history.

Declarations

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Authors' contributions

Y-JB, H-QJ, YW and M-LX designed the online questionnaires. Y-JB, X-DZ, K-HL, DZ, H-YY, L-YZ, WW, YL, Y-QS, FZ and X-WS organized and analyzed the data. Y-JB and X-DZ wrote the paper. All authors read and approved the final manuscript.

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Availability of data and materials

Data and materials of this study can be available upon request from the author.

Ethics approval and consent to participate

This study was conducted in compliance with the ethical principles of the Declaration of Helsinki and its later amendments, and the study was reviewed and approved by the Ethics Committee on Human Experimentation of China Medical University (Approval No.EC-2020-KS-025). The study procedures followed ethical standards. The study protocol was informed and consent was received from all the participants. All participants were voluntary and anonymous. Confidentiality was ensured in processing personal data and maintaining individual records.

Consent for publication

Not applicable.

Competing interests

None of the authors report conflicts of interest.

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