



Research article

Prevalence and influencing factors of anxiety in medical students during the COVID-19 pandemic



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ABSTRACT

Background and objective: The novel coronavirus disease (COVID-19) pandemic has caused a traumatic impact on the whole world in all aspects including physical health, economic condition, and mental health. Psychological problems are commonly neglected for their inconspicuous symptoms. Little is known about the medical students' psychological status during the COVID-19 pandemic. Our study aimed to investigate the prevalence and influencing factors of anxiety among medical students during the COVID-19 pandemic.

Methods: Two thousand and two medical students were investigated in this cross-sectional study. Zung's self-rating anxiety scale was used to evaluate their anxiety symptoms. A total of 1917 questionnaires were collected, and the response rate was 95.8%.

Results: There were 1735 (90.5%) complete and valid questionnaires. The average SAS standard score was 42.8 ± 11.0 . The results indicated that the prevalence of anxiety in medical students was 25.9%. Less social support (OR = 1.4, 95%CI 1.2–1.7) is an independent risk factor of anxiety syndrome, while the female (OR = 0.6, 95%CI 0.5–0.8) is less likely to have anxiety syndrome.

Conclusion: The prevalence of anxiety in medical students is higher during the COVID-19 pandemic. Male students and students with less social support are more likely to have anxiety syndrome. Medical educators and students themselves should take serious steps to prevent, recognize and deal with the anxiety prevalence.

1. Introduction

The novel coronavirus disease (COVID-19) broke out in December 2019 was declared a pandemic by the World Health Organization in March 2020 due to its alarming spreading speed and severity. There have been 541 million confirmed cases and over 6.3 million deaths reported globally as of 26 June 2022. Furthermore, the lockdown and quarantine policy adopted by most governments posed a critical challenge to the whole society. The pandemic and coping strategies caused tardiness and even stagnation in the economy and brought remarkable changes to other aspects of life. Apart from the obvious shifts in lifestyle, evidence has shown that the pandemic had simultaneously left negative effects on people's mental health (Shah et al., 2021). The following psychological problems included stress, anxiety, and depression, which might be a nature response to COVID-19 but should be noticed and well handled (Ng et al., 2020). But these mental health problems are often inconspicuous, easily neglected, and longstanding (He et al., 2021). Though the negative effects on the mental health of the epidemic were widely acknowledged

by most studies, the influencing factors varied. Reviews showed that potential stressors of negative psychological effects included long quarantine duration, infection fears, frustration, boredom, inadequate supplies, inadequate information, financial loss, and stigma (Brooks et al., 2020).

College students are often on a life stage of character transformation in society when they are prone to mental disorders (Macaskill, 2013). In comparison, medical students show poorer mental health conditions (MacLean et al., 2016). The long and demanding medical education makes medical students bear more physical and mental pressure than other majors. Therefore, the prevalence of mental disorders like anxiety and depression is much higher than in other college students (Cuttilan et al., 2016). These mental disorders are usually not paid much attention to at the beginning but could cause poor academic performance, substance abuse, academic dishonesty, and even suicide if not properly dealt with (Dyrbye et al., 2005). This kind of inconspicuous and potential detriment of COVID-19 is drawing attention worldwide. Additionally, efforts have been made in this area in many countries. Researches in the

Abbreviations: COVID-19, Coronavirus disease 2019; SAS, Zung's self-rating anxiety scale; OR, odds ratio; CI, confidence interval.

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UK (Choi et al., 2020), Greece (Kaparounaki et al., 2020), Poland (Debowska et al., 2020), and many other countries indicated that the psychological impact was significant. But relevant research is scanty domestically. The aim of our study was to investigate the prevalence and influencing factors of anxiety among medical students during the COVID-19 pandemic and further to seek eligible measures to prevent and improve the psychological problems.

2. Material and methods

2.1. Participants

The current cross-sectional survey was conducted from May 1st, 2021 to May 31st, 2021. A total of 2002 participants from first to third grade in a medical college in Shandong Province were selected by a cluster sampling technique. And 1917 questionnaires were returned with a response rate of 95.8%. There were 1735 complete and valid questionnaires.

2.2. Assessment of anxiety symptoms

Zung's self-rating anxiety scale (SAS) was used to assess anxiety symptoms, which contained 20 items on evaluating subjective feelings of anxious patients. The standardized score was the cumulative score (the rough score) multiplied by 1.25. Anxiety symptoms were defined when the standardized score equals more than 50. A score of 50–59 suggested mild anxiety, a score of 60–69 suggested moderate anxiety and those with a score of ≥ 70 suggested severe anxiety. The higher the score one got, the more anxious he or she was.

2.3. Demographic characteristics

Apart from the SAS questionnaire, demographic characteristics were collected via a self-rating questionnaire including gender, whether they are the only child in a family, whether they are identified as a poor student, whether they have got a scholarship, academic performance (good, intermediate, poor), hometown (big city, middle city, small city or rural area), parents' highest education degree (university and higher, high school, junior high school and below), family economy (rich, common, poor), grades (first year, second year and third year) and social support in difficulty (large, general, small).

2.4. Questionnaire filling out

Questionnaires were filled out anonymously. E-mails attached with questionnaires and brief instructions were sent to participants by head teachers. Students filled in independently and voluntarily based on the questionnaire contents. Results were sent back to head teachers and then submitted to the research group.

2.5. Statistics

Continuous variables were demonstrated as mean values \pm standard deviation. First, we did the univariate analysis, the demographic and selected characteristics were included as variables. We used a t-test to determine the differences in continuous variables between groups. In the comparisons of mean deviations in multiple groups, analysis of variance was used. Then the multivariate analysis was conducted. Multiple logistic regression analysis was conducted to identify influencing factors of anxiety syndromes. The strength of the associated factors was presented by an odds ratio (OR) with a 95% confidence interval (CI). P-values < 0.05 were considered statistically significant. All data were double-entered through epidata software to check the consistency. Then the database was locked after being confirmed correctly. Data analysis was conducted in SPSS Version 13.0.

2.6. Ethical approval and consent to participate

This study was performed in accordance with the Declaration of Helsinki and was approved by the ethical committee of the Peking University Third Hospital with the approval number (Approval No: IRB00006761-M2021172). Consent was obtained from all participants to use the information anonymously for the purpose of study.

3. Results

The final sample was 1735 including 600 males and 1135 females with a completion rate of 90.5%. The Cronbach's α coefficient of the SAS questionnaire is 0.87. The average age was 19.5 ± 0.6 years. The SAS standard score had a minimum of 25 points and a maximum of 100 points, with an average score of 42.75 ± 11.03 . Among them, there were 450 participants (25.9%) with SAS standard score ≥ 50 (mild anxiety), 139 participants (8.0%) with SAS standard score ≥ 60 (moderate anxiety), and 26 participants (1.5%) SAS standard score ≥ 70 (severe anxiety).

In the univariate analysis, gender, family economy, social support and grades might be the influencing factors. Male students got higher average SAS scores than female students (44.2 ± 12.5 VS 42.0 ± 10.1), poor students got higher average scores than non-poor students (43.7 ± 10.9 VS 42.4 ± 11.1). Students who had received scholarships got high average scores (44.4 ± 12.6 VS 42.5 ± 10.7). The average scores of students with good, intermediate and poor grades were 41.7 ± 10.7 , 42.9 ± 10.7 , and 43.9 ± 12.0 respectively. The average score of students from big cities, had better financial backgrounds, got less social support is significantly higher than those not. The scores of juniors were higher than freshmen and sophomores. However, whether being the only child and the educational background of the parents had no obvious influence on students' SAS scores (Table 1).

In the multivariable logistic regression model, female students were less likely anxious (OR 0.6, 95% CI 0.5–0.8), while students with less social support had more obvious anxiety syndrome (OR 1.4, 95% CI 1.2–1.7) after adjustment for gender, being the only child, poor students, scholarship, academic performance, the origin of home, family economy, social support and parents' education background (Table 2).

4. Discussion

Our study found that the detection rate of anxiety symptoms of medical students in school was 25.9%, and the average SAS standard score was 42.8 ± 11.0 . In the multiple regression model, female students were less likely anxious (OR 0.6, 95% CI 0.5–0.8), while students with less social support have more obvious anxiety syndrome (OR 1.4, 95% CI 1.2–1.7).

The COVID-19 pandemic has caused a traumatic impact on the whole world in all aspects including physical health, economic condition, and mental health. Little is known about the students' mental health. As far as we know, this is the first survey among medical students with a big sample in China. As a result, the average SAS standard score (42.8 ± 11.0) in this study was significantly higher than the norm score (29.78 ± 10.07) which was reported by the Chinese scale cooperative group (Xu L.M. et al., 2002). The anxiety syndrome was quite obvious in medical students. A meta-analysis on mental health problems of Chinese medical students before the pandemic found that the prevalence of anxiety was 21% (Zeng et al., 2019). There are also some studies assessing the anxiety syndrome of medical students in China in which the SAS standard scores vary. Mei L. reported the SAS standard score was 27.93 ± 6.94 , and the detection rate of anxiety syndrome was 6.25% with SAS questionnaire among 361 eight-year fourth-grade medical students (Mei et al., 2006). Another study on medical freshmen and sophomores in China showed that the average SAS score was 37.55 ± 7.12 and 16.11% of the score exceed 50. It was as expected that our average SAS standard scores were higher than those in the previous studies. The best explanation for the

Table 1. The differences of SAS scores between groups.

Variate	SAS Score	P
Gender	44.2 ± 12.5	<0.001
Male	42.0 ± 10.1	
Female		
Only child	42.6 ± 11.8	0.724
Yes	42.8 ± 10.6	
No		
Poor student	43.7 ± 10.9	0.024
Yes	42.4 ± 11.1	
No		
Scholarship	44.4 ± 12.6	0.017
Ever got	42.5 ± 10.7	
None		
Academic performance	41.7 ± 10.7	0.011
Good	42.9 ± 10.7	
Intermediate	43.9 ± 12.0	
Poor		
Origin of home	45.4 ± 13.1	0.002
Big city	41.9 ± 11.1	
Middle city	42.1 ± 10.9	
Small city	42.9 ± 10.4	
Rural area		
Family economy	42.3 ± 11.9	<0.001
Rich	41.9 ± 10.6	
Common	44.4 ± 11.2	
Poor		
Social support	40.7 ± 10.0	<0.001
Strong	41.7 ± 10.3	
Common	45.0 ± 11.9	
Weak		
Grades	42.4 ± 10.5	<0.001
First	42.9 ± 12.2	
Second	45.0 ± 10.6	
Third		
Father's educational background	43.0 ± 11.7	0.253
University and higher	42.6 ± 10.7	
High school	44.3 ± 11.7	
Junior school and below		
Mother's educational background	42.5 ± 12.5	0.552
University and higher	42.7 ± 10.7	
High school	43.4 ± 10.8	
Junior school and below		

Table 1 showing the differences SAS scores between groups. T-test was used to produce a p-value. The analysis shows that male students, junior students, students with poorer backgrounds and less social support get significantly higher scores. (Family economy: Rich = annual household income over 500,000 Yuan; Common = annual household income less than 500,000 Yuan but more than 200,000 Yuan; Poor = annual household income less than 200,000 Yuan.) P-value <0.05 were considered statistically significant.

differences may be the influence of COVID-19 pandemic. Under the influence of COVID-19 pandemic, anxiety is more obvious among medical students.

There are a few similar studies in the world. The rate varies among studies. In Italian, the prevalence of anxiety was 48.9% (Abenavoli et al., 2021). A systematic review of eight cross-sectional studies showed the prevalence of anxiety was 28% (Lasheras et al., 2020). It is interesting to discover that students with medical backgrounds were less likely to develop anxiety during COVID-19 compared with other majors (Chang et al., 2020). Majors like management seemed to have a higher level of anxiety in comparison with medical science during the epidemic (Sundarasan et al., 2020). The prevalence of anxiety in medical students showed less increment because of better comprehension of COVID-19 and more appropriate hygiene behaviors (Olaimat et al., 2020). The level of knowledge and prevention and control measures for COVID-19 might have protective effects (Loda et al., 2020). In the meanwhile, medical students who worked in hospitals like students during their internships period were at high risk of mental health problems (Sneyd et al., 2020). So in short,

Table 2. The multiple logistic regression model for anxiety.

variables	OR	95% CI	P
Female	0.6	0.5–0.8	<0.001
Only child	0.9	0.8–1.3	0.846
Poor students	0.9	0.7–1.2	0.406
Scholarship	0.7	0.5–1.1	0.052
Academic performance	1.1	0.9–1.3	0.392
Origin of home	0.9	0.8–1.1	0.493
Family economy	1.1	0.9–1.3	0.630
Low social support	1.4	1.2–1.7	<0.001
Grades	1.2	0.9–1.4	0.129
Father's educational background	0.9	0.7–1.2	0.394
Mother's educational background	1.1	0.9–1.3	0.296

Table 2 showing the multiple logistic regression result. The analysis shows that female students (OR 0.6, 95% CI 0.5–0.8), students with less social support (OR 1.4, 95% CI 1.2–1.7) are independent factors influencing anxiety prevalence. P-value <0.05 were considered statistically significant.

anxiety showed higher prevalence than before the pandemic but might less growth in medical students than students in other majors.

There were several factors found related to the degree of anxiety in medical students, such as gender, location, economic conditions, curricular performance, social support, and so on (Wang et al., 2020). Recognizing the influencing factors of anxiety susceptibility can promote the reduction of anxiety (He et al., 2021).

According to this study, male students were much more anxious than female students, which is similar to the research of Xu L.M. (Xu L.M. et al., 2002). This phenomenon is probably because that psychological characteristic differs between male and female students. Male students are supposed to pay more attention to self-adjustment and self-relaxation. We have also noticed that female students showed high odds of anxiety in studies of Poland and Malaysia (Debowska et al., 2020; Sundarasan et al., 2020). This might because the difference in study subjects. The participants from both studies were from all majors while our study focused on medical students. As is shown in a longitudinal study, female students' anxiety levels were associated with their body image, drinking habits and academic performance (Gao et al., 2020). The conditions of these factors are likely to be different among medical students, which might explain our result.

Social support was an independent factor among the various factors that affect anxiety in our study. Social support refers to the degree of the spiritual and material connection between individuals, including relatives, friends, colleagues, partners, etc. We get support from various aspects of society such as family, workplace, party groups, trade unions, and other organizations. When encountering difficulties, college students are less likely to develop anxiety syndrome if they can get more social support, it can also serve as a buffer against the current stressors (Hajduk et al., 2020). But the home confinement of college students disrupted education, physical activities, and opportunities for socialization (Singh et al., 2020). This lack or absence of social support is often followed by uncertainty and anxiety. Our study showed that the probability of anxiety symptoms of students with low social support is 1.4 times higher than that of students with high social support. During the outbreak period time, social support might play a more significant role: individuals with low perceived social support were 4.84–5.98 times more likely to have anxiety and depressive symptoms (Ma et al., 2020). Zhao Z.Q. and others evaluated 396 medical students and found a 35.35% anxiety tendency. Students with more social support had significantly lower SAS scores than those with less social support (Zhao Z.Q. et al., 2011). Medical students, as a special group who bear heavy pressure of arduous study and fierce competition, are more likely to feel anxious, especially without their parents' company in school. Therefore, college educators are supposed to provide more effective social support to medical students in professional lessons, career planning, and psychological health to help them thrive in medical school.

What's more, our results showed that anxiety level in third-year students was higher than first and second year, while the associations were not significant in the multivariable analysis. This is consistent with another online survey of college students in China (Liu et al., 2020). However, for senior students overseas, things can be different. They were faced with the challenge of joining the front-line workforce (Choi et al., 2020). The fear of medical resources shortage (Harries et al., 2021), infection risks, and unpracticed medical skills caused anxiety feelings in these students (Gallagher and Schleyer, 2020). That might explain why senior students in China seemed less anxious.

Medical students are worried more about educational changes (Loda et al., 2020). The sudden shift in online education might cause concerns in medical students (Nishimura et al., 2021). Educators should explain the potential benefits of online study and take this opportunity to develop the self-learning skills of students. Peer monitoring can provide social contact and help ease stressors (Eva and Anderson, 2020). It should be noticed that college students are in high demand of psychological knowledge and interventions (Wang et al., 2020). Resilience and positive coping strategies can protect students from the occurrence of anxiety (Zhang et al., 2020). Measures should be taken to pay more attention to the emotional changes of medical students to prevent psychological problems including encouraging physical exercise, conducting psychological counseling, and cultivating social skills. Establishing online support groups and providing remote psychological counseling and therapy are good ways to cope with psychological maladjustment and symptoms (Ng et al., 2020a,b). Organizing a mental health cell consisting of at least one psychiatrist or psychologist to provide support for both students and parents is also recommended (Sifat, 2021).

Several limitations of our study should be noted. First, as a cross-sectional study, our research only reflects students' psychological state at a certain stage but not the full period, so it can't reflect the trend. Longitudinal research is expected to study the changes of psychological state as COVID-19 pandemic develops and the long-term impact of COVID-19. Second, some factors were not considered in our study. The basal psychological state was not recorded, we were not able to analyze the relationship between baseline psychological state and the presence of anxiety in a pandemic. As there were no reported cases in the school we investigated, we didn't do the relevant research. Third, our research was carried out in the form of online questionnaires, students were asked to provide information that concerns their privacy, which might increase the response biases. Lastly, though we have a relative high sample size and response rate, the cluster sampling method has its limitation. A multicenter larger-scale study would better reflect the anxiety prevalence during COVID-19 across the country. However, despite these limitations, our study is a large cross-sectional research on the prevalence and influencing factors of anxiety in medical students during the COVID-19 pandemic.

5. Conclusion

In summary, medical students have a high prevalence of anxiety during the COVID-19 epidemic. The male students and the students with less social support are more likely to have anxiety syndrome. From a long perspective of view, the psychological impact of COVID-19 on students seems to be long-lasting and shows an increasing trend (Chen et al., 2021). Medical students should get proper guidance and strong support to help them develop a healthy mind which will play a significant role in their medical career. It is exactly the aim of medical education to cultivate talents with superb medical technology and high psychology quality.

Declarations

Author contribution statement

Weixian Xu: Conceived and designed the experiments; contributed reagents, materials, analysis tools or data; wrote the paper.

Hui Liu: Analyzed and interpreted the data; wrote the paper.

Xin Liu: Analyzed and interpreted the data.

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Data availability statement

The datasets used and analyzed during the current study are available in the supplementary material.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

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