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Online ISSN (2789-3219)

Research Article

Impact of the COVID-19 Pandemic on the Mental Health of Medical Undergraduates of a Tertiary Care Teaching Hospital in Eastern Odisha: A Cross-Sectional Study

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Abstract

Background: The Corona virus pandemic had a crushing impact on the mental health of medical undergraduates. *Objective*: The current research was conducted to evaluate the prevalence of psychological impacts, viz., anxiety, stress, and depression, in undergraduates undertaking medicine courses and assess their quality of life. *Methods*: A prospective cross-sectional study was undertaken with an online questionnaire using Google with a WhatsApp link. Informed consent (online) was obtained before enrollment in the study. This study used the DASS-21 questionnaire and a Quality of Life questionnaire for analysis. The total number of participants was 559 during the study period. Descriptive statistics, the non-parametric Chi-square test, the binomial test, the Kruskal-Wallis test, and the Mann-Whitney test were used for analysis. $p<0.05$ was considered to be statistically significant. *Results*: Out of 559 respondents, the majority were 21 years of age or older, with a male predominance of 60.6%. It was found that those who were smoking or consuming alcohol had higher DAS scores. Quality of life (QoL) was lower for those who were on medication for hypertension. Stress levels were significantly higher in males. The relationship between anxiety levels and males was statistically significant. *Conclusions*: COVID-19 had a psychological impact on the medical students. Therefore, early evaluation, timely intervention, and student counseling services need to be made available to solve this problem and remain prepared for all potential future pandemics.

Keywords: Anxiety, Depression, Medical undergraduates, Stress, QoL, Psychological impact

تأثير جائحة COVID-19 على الصحة العقلية لطلاب الطب الجامعيين في مستشفى تعليمي للرعاية الثالثية في شرق أوديشا: دراسة مقطعية

الخلاصة

الخلفية: كان لوباء فيروس كورونا تأثير ساحق على الصحة العقلية لطلاب الطب الجامعيين. **الهدف**: تم إجراء البحث لتقييم مدى انتشار الآثار النفسية، أي القلق والتوتر والاكتئاب، لدى طلاب الطب الجامعيين وتقييم نوعية حياتهم. الطريقة: تم إجراء دراسة مقطعية مستقبلية باستخدام استبيان عبر الإنترنت باستخدام Google ورابط واتساب. تم الحصول على الموافقة المستنيرة (عبر الإنترنت) قبل التسجيل في الدراسة. استخدمت هذه الدراسة استبيان DASS-21 واستبيان جودة الحياة للتحليل. وبلغ العدد الإجمالي للمشاركين 559 مشاركا خلال فترة الدراسة. تم استخدام الإحصاء الوصفي، واختبار مربع كاي غير البارامتري، والاختبار ذو الحدين، واختبار كروسكال واليس ، واختبار مان ويتني للتحليل. **النتائج**: من بين 559 مشاركا، كانت الغالبية تبلغ أعمارهم 21 عاما أو أكثر، مع غلبة الذكور بنسبة 60.6٪. وقد وجد أن أولئك الذين كانوا يدخنون أو يستهلكون الكحول لديهم درجات أعلى في DAS. كانت جودة الحياة أقل بالنسبة لأولئك الذين كانوا يتناولون أدوية لارتفاع ضغط الدم. كانت مستويات التوتر أعلى بكثير في الذكور. كانت العلاقة بين مستويات القلق والذكور ذات دلالة إحصائية. **الاستنتاجات**: كان لجائحة كورونا تأثير على طلاب الطب. لذلك، يجب توفير خدمات التقييم المبكر والتدخل في الوقت المناسب والإرشاد الطلابي لحل هذه المشكلة والبقاء على استعداد لجميع الأوبئة المستقبلية المحتملة.

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INTRODUCTION

The pandemic had a tremendously crushing effect on the education of medical undergraduates. They were perplexed and uncertain about the duration of the lockdown by the government, their future, and the health status of their relatives and peers. In 2019, it was declared a pandemic by the World Health Organization (WHO), associated with morbidity and mortality [1]. Intending to give a break to the escalation of the disease, various nations, including India, introduced lockdowns and restrictions like social distancing, quarantine, and the closure of educational institutions. Globally, studies have reported that up to 75% of medical undergraduates during their medical education were stressed [2]. The enormous curriculum, long study hours with clinical demonstrations, skill development classes, frequent examinations, peer competition, sleepless nights before exams, and other factors made medical students more overburdened. The containment of the coronavirus in public was possible through the complete lockdown by the Government of India and maintaining social distancing and self-isolation at home. Online teaching continued for all schools and colleges for an indefinite period. Hence, sudden isolation and self-containment significantly affected the student's mental health as they were kept away from their friends, affecting their hobbies and extra-academic activities [3–6]. Medical students were limited to virtual education due to their displacement from classrooms and medical campuses. This interruption posed a considerable challenge to students and educational institutions worldwide [6,7]. The adversity confronted by undergraduate students at medical colleges was changing from classrooms to online classes and assessment methods. Besides restrictions on assessing hostel facilities, the students faced many emotional afflictions during the transformation from insecure medical undergraduates to young, skilled, and dynamic physicians. Psychological health impacts on medicine students were common and deserved special attention [8–12]. Mental aggression due to pandemics was associated with abnormal behaviors, psychological turmoil, and defensive responses in this at-risk group [9–13]. The prolonged lockdown not only caused a financial crisis for the people but also drastically affected the nation's economy. Quarantines, lockdowns, and isolation had a notable effect on students at schools and colleges [14]. There were unforeseen challenges for teachers, students, and parents and considerable disturbance of the educational system [7,15-16]. Students vacated hostels and had to undergo self-learning; many had no access to interact with teachers, seniors, or classmates. This led to isolation and unpredictability for the times ahead. Studies have reported anxiety and depression resulting from isolation at home [16]. These impacted learning and created psychological problems [17]. Students of medicine face a tough and exhaustive syllabus with a considerable risk of failure. Globally, few studies analyzed mental afflictions during COVID-19, and an increase in anxiety and distress was concluded in medical students in China, the United States, and the general population in the United Kingdom [18–20]. Medical students who were graduating in March 2020 were anxious and found it difficult to complete their internship in hospitals where COVID patients were admitted. The first-year students were planning to commemorate their completion of one year. The second-year students were planning on how to adapt to the clinical rotations that would be due soon. The third-year students were eager to complete their examinations and simultaneously strengthen their clinical exposure and learning skills. The emergence of the pandemic caused a global disruption. For medicine students, this resulted in a sudden change in the teaching curriculum, reduced activities, and the absence of students from the rotation of clinical duties. All activities had a sudden halt, whereas the only constant thing that changed was time. Adaptation became the key challenge for the students when utilizing virtual platforms for learning and undertaking examinations. Clinical exposure was limited for the students to reduce the burden of the pandemic, following COVID-related protocols for hospital tasks that were deemed essential. Students had to face not only delays but, at times, also cancellations of examinations. These challenges were over and above the other ongoing challenges like restrictions on traveling, wearing masks compulsorily, and isolation. Adapting to using virtual platforms for learning and examinations, limiting clinical exposure, and following COVID-appropriate protocols for essential hospital tasks became routine for students. They were also confronted with cancellations and delays in examinations. All of these changes were on top of other challenges the pandemic brought upon, such as isolation, no traveling, etc. [21]. Currently, there are limited prospective studies analyzing the impact of the fast-spreading coronavirus pandemic on the mental health of medical undergraduates. Hence, our research aims at evaluating the prevalence of depression, anxiety, stress, and quality of life among medical undergraduates, studying the socio-demographic, educational, and previous health factors related to the pandemic, and identifying groups that may require mental health care.

METHODS

Study design

To assess the depression, anxiety, stress, and QoL of medical undergraduates due to the COVID-19 pandemic using the Depression, Anxiety, and Stress Scale-21 (DASS-21 scale) and European Health Interview Survey Quality of Life (EUROHIS-QOL 8), this study was conducted on 559 MBBS students across 1st to 4th year in a tertiary care teaching hospital at Bhubaneswar, Odisha, during the COVID-19 pandemic phase, when medical colleges were closed and students were at home in July 2021. Pre-structured DASS-21 and EUROHIS-QOL8 questionnaire-based studies were conducted through Google Forms after obtaining written consent from the students. The students were explained about the questionnaire. The inclusion criteria were medical undergraduates with a willingness to participate and a social media account. Students not willing to participate and submit outside the study period were excluded. The depression, anxiety, stress-21 item (DASS-21 scale), and

European Health Interview Survey Quality of Life (EUROHIS-QOL 8) questionnaire was designed in Google Form in English, and a link was shared with the WhatsApp group of undergraduates of 1st to 4th-year students [23]. The internal consistency and reliability of the scale were acceptable to high, with a Cronbach Alpha of 0.88 for the overall scale. The questionnaire had three sections: informed consent, demographic details, DASS-28, and the EUROHIS-QOL8 questionnaire. The Likert scale was used to measure the responses. The prevalence of depression, stress, anxiety, and QOL among undergraduate students was analyzed, along with the factors responsible for the same. The students who clicked the link were directed to the first page of the Google form, which contained information about the study. After providing consent to take the survey and completing the questionnaire, participants were directed to click the submit option, and the questionnaire was sent to Google Drive. The data retrieved from the online survey was entered into Microsoft Excel.

Sample size, study population, and study duration

All the students in 1st, 2nd, 3rd, and 4th years were taken as a sample size, and the sample population was medical undergraduates at IMS and SUM Hospital from first year to final year, which equaled 700. However, the archived sample size was 559. The study duration was 30 days.

Ethical approval

The study design was approved by the Institutional Ethical Committee of IMS and SUM Hospital (Reference ID: DRI/IMS.SH/SOA/2021/104).

Statistical analysis

Data processing and analysis were undertaken using IBM SPSS Statistics version 24.0. The severity of DAS was classified according to normal, mild, moderate, severe, and very severe based on the score as given in the result tables. The continuous variables were subjected to the Shapiro-Wilk test of normality and found to be significantly different from the normal distribution. Hence, a non-parametric test was conducted. The descriptive statistics procedure, non-parametric Chi-square test, and binomial test were used for analysis. The association of gender with DAS was made by using a cross-tabulation procedure and the Chi-square test of independence. The Kruskal-Wallis test and Mann-Whitney test were performed to compare the distribution of continuous variables by different factors. A p-value < 0.05 was considered statistically significant. Descriptive statistics for EUROHIS QOL scores were analyzed.

RESULTS

Out of 559 undergraduate respondents, a majority (62.8%) were 21 years of age or older, and the remaining 37.3% were in the 18–20 age group. The proportion distribution among age groups was significantly different ($p<0.001$). The majority of respondents were males (60.6%) ($p<0.001$). The maximum proportion of cases, 48.7%, belonged to the 1st semester, followed by 19.9% cases in the 3rd and 6th semesters, respectively, and 11.6% in the 8th semester ($p<0.001$). About 6.1% were smokers, and 9.8% were consuming alcohol. The majority of students were living in hostels (80.5%), and others were day scholars ($p<0.001$) (Table 1).

Table 1: Participants' socio-demographic characteristics (n=559)

Variables	Classes	n(%)	p
Age	≤20	208(37.2)	<0.001
	>20	351(62.8)	
Gender	Male	339(60.6)	<0.001
	Female	220(39.4)	
Semester	1st	272(48.7)	<0.001
	3rd	111(19.9)	
	6th	111(19.9)	
	8th	65(11.6)	
Smoking	Yes	34(6.1)	<0.001
	No	525(93.9)	
Alcohol	Yes	55(9.8)	<0.001
	No	504(90.2)	
Living Environment	Hostel	450(80.5)	<0.001
	Day-scholar	109(19.5)	

Proportions of students taking medication for anxiety, stress, and depression were 6.3% and 3.4%, respectively. For diabetes and hypertension, 0.5% and 2.7% were taking medicines, respectively (Table 2).

Table 2: Taking medication for different disorders (n=559)

Taking medication	Response	n(%)
Anxiety/Stress	Yes	35(6.3)
	No	524(93.7)
Depression	Yes	19(3.4)
	No	540(96.6)
Diabetes	Yes	3(0.5)
	No	556(99.5)
Hypertension	Yes	15(2.7)
	No	544(97.3)

The mean of the depression score was 6.0±4.9 and the median (IQR) was 5 (2-8) with a range of 0-21. The corresponding values in anxiety, stress, overall DAS, and QOL were 5.1±4.2, 4 (2-7) and (0-21), 6.2±4.4, 6 (3-9) and (0-21), 17.4±12.5, 16 (8-24) and (0-63), and 28.7±5.7, 29 (25-32) and (8-40), respectively (Table 3).

Table 3: Descriptive statistics of DAS and QOL score (n=559)

Descriptive Statistics	Total score				
	Depression	Anxiety	Stress	Overall DAS	QOL
Mean	6.0	5.1	6.2	17.4	28.7
SD	4.9	4.2	4.4	12.5	5.7
Q1(1st Quartile)	2	2	3	8	25
Q2(Median)	5	4	6	16	29
Q3(3rd Quartile)	8	7	9	24	32
Minimum	0	0	0	0	8
Maximum	21	21	21	63	40

Table 4 shows the comparison of the DAS score with socio-demographic variables. There were no significant differences in mean and median (IQR) of depression, anxiety, stress, and total DAS score among age groups (p>0.05) but the mean and median (IQR) of depression score were significantly higher in males [6.4±4.9 and 6 (3–9)] compared to females [5.4±5.0 and 5 (1–8)] with p=0.005.

Table 4: Comparison of depression, anxiety, and stress score with Socio-demographic variables (*n*=559)

Age group	n	Depression		Anxiety		Stress		Total DAS	
		Mean±SD	Median (IQR)	Mean± SD	Median (IQR)	Mean± SD	Median (IQR)	Mean± SD	Median (IQR)
≤ 20	208	6.0±5.1	5(2-8)	5.2±4.2	4.5(2-7.8)	6.2±4.4	6(3-9)	17.4±12.8	16(7.3-25)
> 20	351	6.0±4.9	5(2-8)	5.1±4.2	4(2-7)	6.3±4.4	6(3-9)	17.3±1.4	16(9-24)
Mann-Whitney U *p*-value		0.937		0.728		0.959		0.986	
Gender									
Male	339	6.4±4.9	6(3-9)	5.5±4.1	5(2-8)	6.7±4.4	7(4-9)	18.6±12.4	17(10-25)
Female	220	5.4±5.0	5(1-8)	4.6±4.2	4(1-6.8)	5.5±4.3	5(2-8)	15.5±12.5	13.5(6.3-22)
Mann-Whitney U *p*-value		0.005		0.002		0.000		0.001	
Semester									
1st	272	5.6±4.8	5(2-8)	5.1±4.2	4(2-7)	6.1±4.4	6(3-9)	16.9±12.6	16(7-24)
3rd	111	7.2±5.7	6(3-11)	5.9±4.6	5(2-9)	6.9±4.7	7(3-10)	20.0±13.8	19(9-30)
6th	111	5.0±4.0	4(2-7)	4.1±2.8	4(2-6)	5.4±3.8	5(2-7)	14.4±9.8	14(8-20)
8th	65	7.0±5.2	6(3-10)	5.8±4.7	5(2-8.5)	7.1±4.4	7(4-10)	19.9±13.1	18(10-26)
Kruskal Wallis Test *p*-value		0.007		0.036		0.025		0.008	
Smoking									
Yes	34	9.8±6.4	9(5.5-16.3)	7.6 ±5.5	6.5(3.8-12)	8.8±5.2	9(5-12)	26.1±15.4	27.5(16.5-33.8)
No	525	5.7±4.7	5(2-8)	5.0±0.0	4(2-7)	6.1±4.3	6(3-8.5)	16.8±12.1	15(8-23.5)
Mann-Whitney U *p*-value		0.000		0.005		0.002		0.000	
Alcohol drinking									
Yes	55	8.6±6.0	8(4-12)	7.0±5.5	6(3-10)	8.3±5.3	7(5-12)	23.9±15.6	24(11-32)
No	504	5.7±4.7	5(2-8)	4.9±4.0	4(2-7)	6.0±4.2	6(3-8)	16.6±11.9	15(8-23)
Mann-Whitney U *p*-value		0.000		0.008		0.002		0.000	
Living Environment									
Hostel	450	5.9±4.9	5(2-8)	5.3±4.2	5(2-7)	6.2±4.4	6(3-9)	17.4±12.6	16(8-25)
Day-scholar	109	6.2±5.2	5(2.5-9)	4.6±3.9	4(2-6)	6.3±4.2	6(3-9)	17.1±12.2	16(10-24)
Mann-Whitney U *p*- value		0.678		0.082		0.697		0.929	
Taking medication for Anxiety/Stress									
Yes	35	11.0±5.1	11(7-14)	9.6±4.6	10(6-13)	10.2±4.3	10(8-12)	30.8±12.7	31(22-39)
No	524	5.6±4.8	5(2-8)	4.8±4.0	4(2-7)	6.0±4.3	6(3-8)	16.5±12.0	15(8-22.8)
Mann-Whitney U *p*-value		0.000		0.000		0.000		0.000	
Taking medication for depression									
Yes	19	14.1±4.4	14(11-18)	11.4±4.8	11(9-15)	11.8±4.0	12(9-15)	37.3±10.6	35(30-44)
No	540	5.7±4.7	5(2-8)	4.9±4.0	4(2-7)	6.0±4.3	6(3-8)	16.6±12.0	15(8-23)
Mann-Whitney U *p*-value		0.000		0.000		0.000		0.000	
Taking medication for Diabetes									
Yes	3	15.0±5.2	12(12-*)	11.3±8.7	9(4-*)	12.3±8.1	11(5-*)	38.7±21.8	32(21-*)
No	556	5.9±4.9	5(2-8)	5.1±4.1	4(2-7)	6.2±4.4	6(3-9)	17.2±12.4	16(8-24)
Mann-Whitney U *p*- value		0.011		0.114		0.127		0.035	
Taking medication for Hypertension									
Yes	15	9.5±5.5	7(4-12)	9.6±5.0	9(6-13)	10.5±4.0	10(7-12)	29.6±12.9	29(21-36)
No	544	5.9±4.9	5(2-8)	5.0±4.1	4(2-7)	6.1±4.3	6(3-9)	17.0±12.3	16(8-24)
Mann-Whitney U *p*-value		0.008		0.000		0.000		0.000	

Similarly, mean and median (IQR) values in anxiety, stress, and total DAS score were significantly higher in males [5.5±4.1 and 5 (2-8)], [6.7±4.4 and 7 (4-9)] and [18.6±12.4 and 17 (10-25)] compared to females [4.6±4.2 and 4 (1-6.8)], [5.5±4.3 and 5 (2-8)], and [15.5±12.5 and 13.5 (6.3-22)] with p=0.002, p<0.001, and p=0.001, respectively. The mean and median (IQR) of depression scores among semesters varied from 5.0±4.0 and 4 (2–7) in the 6th semester to 7.2±5.7 and 6 (3–11) in the 3rd semester; the depression score difference among semesters was significant (p=0.007).

The mean and median (IQR) of anxiety scores among semesters varied from 4.1±2.8 and 4 (2–6) in the 6th semester to 5.9±4.6 and 5 (2–9) in the 3rd semester, and the score difference among semesters was significant (p=0.036). The mean and median (IQR) of stress scores among semesters varied from 5.4 and 5 (2–7) in the 6th semester to 7.1±4.4 and 7 (4–10) in the 8th semester; the score difference was significant (p=0.025). Similarly, the mean and median (IQR) of overall DAS scores among semesters varied from 14.4±9.8 and 14 (8-20) in the 6th semester to 20.0±13.8 and 19 (9-30) in the 3rd semester,

and the score difference was significant (*p*=0.008). It was found that the mean and median (IQR) of depression, anxiety, and total DAS scores were significantly higher in the 6th semester as compared to the 1st, 3rd, and 8th semesters, but for stress, the same was higher in the 8th semester compared to others. The mean and median (IQR) of the depression score were significantly higher in the group who were smoking [9.8±6.4 and 9 (5.5-16.3)] compared to those who were not smoking [5.7±4.7 and 5 (2-8)] with *p*<0.001. These groups also had significantly higher mean and median (IQR) scores for anxiety, stress, and the total DAS score compared to those who did not smoke (*p*=0.005, *p*=0.002, and *p*<0.001). The smoking group had scores of 7.6±5.5 for anxiety, 8.8±5.2 for stress, and 26.1±15.4 for total DAS. The non-smoking group had scores of 5.0±4.0 for anxiety, 6.1±4.3 for stress, and 16.8±12.1 for anxiety, stress, and total DAS. It was found that the respondents who were smoking had significantly higher depression, anxiety, stress, and total DAS levels compared to those who were not smoking. Even though the smoker group was a small group of 34 out of 559, the findings had significant clinical and academic implications. Fifty-five students were consuming alcohol. Among the respondents, those who were consuming alcohol had significantly higher mean and median (IQR) of depression, anxiety, stress, and total DAS score [8.6±6.0 and 8 (4-12)], [7.0±5.5 and 6 (3-10)], [8.3±5.3 and 7 (5-12)], and [23.9±15.6 and 24 (11-32)] than those who were not consuming alcohol [5.7±4.7 and 5 (2-8)], [4.9±4.0 and 4 (2-7)], [6.0±4.2 and 6 (3-8)], and [16.6±11.9 and 15 (8-23)] with *p*<0.05. It is implied that the respondents who were consuming alcohol had significantly higher depression, anxiety, stress, and total DAS levels compared to those who were not consuming alcohol. There were no significant differences in the mean and median (IQR) of depression, anxiety, stress, and total DAS score among the living environment conditions (*p*>0.05). Among the respondents, those who were taking medication for anxiety or stress had significantly higher mean and median (IQR) of depression, anxiety, stress, and total DAS score [11.0±5.1 and 11 (7-14)], [9.6±4.6 and 10 (6-1±4.3 and 10 (8-12)] and [30.8±123)], [10.2.7 and 31 (22-39)] than those who were not taking medication for anxiety or stress [5.6±4.8 and 5 (2-8)], [4.8±4.0 and 4 (2-7)], [6.0±4.3 and 6 (3-8)], and [16.5±12.0 and 15 (8-22.8)] with *p*<0.05. It has been implied that the respondents who were taking medication for anxiety or stress had significantly higher depression, anxiety, stress, and total DAS levels compared to those who were not taking medication for anxiety or stress. Similarly, the respondents who were taking medication for depression had significantly higher mean and median (IQR) of depression, anxiety, stress, and total DAS score [14.1±4.4 and 14 (11-18)], [11.4±4.8 and 11 (9-15)], [11.8±4.0 and 12 (9-15)] and [37.3±10.6 and 35 (30-44)] than those who were not taking medication for depression [5.7±4.7 and 5 (2-8)], [4.9±4.0 and 4 (2-7)], [6.0±4.3 and 6 (3-8)], and [16.6±12.0 and 15 (8-23)] with *p*<0.05. Additionally, the respondents who were taking medication for depression had significantly higher depression, anxiety, stress, and total DAS levels

compared to those who were not taking medication for depression. Among the respondents who were taking medication for diabetes or not, there was no significant difference in anxiety or stress levels (*p*>0.05). In depression, the total DAS mean and median (IQR) score were significantly higher in medical undergraduates who were taking medications for diabetes (15.0±5.2 and 38.7±21.8) compared to those who were not taking medications for diabetes [5.9±4.9 and 5 (2-8)] and [17.2±12.4 and 16 (8-24)] with *p*=0.011 and *p*=0.035, respectively. The mean of depression, anxiety, stress, and total DAS score were 9.5±5.5 and 7 (4-12), 9.6±5.0 and 9 (6-13), 10.5±4.0 and 10 (7-12), and 29.6±12.9 and 29 (21-36), respectively, in those who were taking medication for hypertension. The corresponding values in those who were not taking medication for hypertension were 5.9±4.9 and 5 (2-8), 5.0±4.1 and 4 (2-7), 6.1±4.3 and 6 (3-9), and 17.0±12.3 and 16 (8-24), respectively; the difference was found to be significant (*p*<0.05). Table 5 presents a comparison of the QoL scores with socio-demographic variables. The mean of the total QOL score was not significantly different among age group, gender, living environment, and taking medication for diabetes (*p*>0.05). The mean and median (IQR) of the QOL score varied from 27.7±5.7 and 27 (23-32) in the 8th semester to 29.2±5.8 and 30 (26-33) in the 6th semester, and the difference in QoL scores among semesters was found to be significant (*p*=0.026). The mean and median (IQR) of the QoL score were found to be significantly higher in those who were not smoking (28.9±5.6) and 29 (25-32) than in those who were smoking (25.9±6.9) and 27 (22.5-30) (*p*=0.007). The mean and median (IQR) of QoL scores were found to be significantly higher in those who were not consuming alcohol [28.9±5.6 and 29 (25-32)] than in those who were consuming alcohol [27.0±6.5 and 28 (23-31)] with *p*=0.049. Among the respondents, the mean and median (IQR) of QoL score were significantly lower [23.8±5.8 and 24 (20-27)] in those who were taking medication for anxiety compared to those who were not taking medication for anxiety or stress [29.0±5.6 and 29 (25-32)] with *p*<0.001. Therefore, the mean and median (IQR) of QoL score were significantly lower [21.1±5.2 and 21 (19-24)] in those who were taking medication for depression compared to those who were not taking medication for depression [29.0±5.5 and 29 (25-32)] with *p*<0.001. Similarly, the mean and median (IQR) of QoL score were significantly lower [25.5±6.1 and 27 (23-30)] in respondents who were taking medication for hypertension compared to those who were not taking medication for the same [28.8±5.7 and 29 (25-32)] with *p*=0.039. The mean and median (IQR) of the depression score were significantly higher in males [6.4±4.9 and 6 (3-9)] compared to females [5.4±5.0 and 5 (1-8)] with *p*=0.005. Similarly, mean and median (IQR) values in anxiety and stress scores were significantly higher in males [5.5±4.1 and 5 (2-8)] and [6.7±4.4 and 7 (4-9)] compared to females [4.6±4.2 and 4 (1-6.8)], and [5.5±4.3 and 5 (2-8)] with *p*=0.002 and *p*<0.001, respectively (Table 6).

Table 5: Comparison of QoL score with Socio-demographic variables (*n*=559)

Age group	n	Total QoL score		p-value
		Mean±SD	Median (IQR)	
≤ 20	208	29.2±5.8	29(25-32)	0.202
> 20	351	28.4±5.6	29(24-32)	
Gender				
Male	339	28.4±5.3	29(24-32)	0.082
Female	220	29.1±6.2	30(25-32.8)	
Semester				
1st	272	29.1±5.7	30(25-32)	
3rd	111	27.8±5.5	28(24-32)	0.026
6th	111	29.2±5.8	30(26-33)	
8th	65	27.7±5.7	27(23-32)	
Smoking				
Yes	34	25.9±6.9	27(22.5-30)	0.007
No	525	28.9±5.6	29(25-32)	
Alcohol				
Yes	55	27.0±6.5	28(23-31)	0.049
No	504	28.9±5.6	29(25-32)	
Living Environment				
Hostel	450	28.6±5.7	29(25-32)	0.196
Day-scholar	109	29.3±5.9	30(26-33)	
Taking medication for Anxiety/Stress				
Yes	35	23.8±5.8	24(20-27)	<0.001
No	524	29.0±5.6	29(25-32)	
Taking medication for depression				
Yes	19	21.1±5.2	21(19-24)	<0.001
No	540	29.0±5.5	29(25-32)	
Taking medication for Diabetes				
Yes	3	22.3±12.4	29(8-30)	0.351
No	556	28.7±5.7	29(25-32)	
Taking medication for Hypertension				
Yes	15	25.5±6.1	27(23-30)	0.039
No	544	28.8±5.7	29(25-32)	

<10. About 1/5th had mild (10–13) depression scores, 22.5% had moderate, 7.2% had severe, and 9.3% had extremely severe depression scores. There was no significant association between depression score and gender with *p*=0.086. The proportions of depression scores were evenly distributed among both males and females. Among the respondents, the maximum proportion of respondents (29.8%) had moderate (10–14)

anxiety scores, followed by 15.6% with extremely severe (20+), 10% with severe (15–19), and 9.1% with mild (8–9) anxiety scores in males. Similarly, in females, a high proportion of cases (20.5%) had a moderate score (10–14), followed by 13.6% with an extremely severe (20+), 11.8% with a mild (8–9), and 5.5% with a severe (15–19) anxiety score.

Table 6: Comparison of Depression, Anxiety & Stress score by gender (*n*=559)

Variables	Medical students		Male		Female		Mann-Whitney p-value
	Mean±SD	Median (IQR)	Mean±SD	Median (IQR)	Mean±SD	Median (IQR)	
Depression	6.0±4.9	5(2-8)	6.4±4.9	6(3-9)	5.4±5.0	5(1-8)	0.005
Anxiety	5.1±4.2	4(2-7)	5.5±4.1	5(2-8)	4.6±4.2	4(1-6.8)	0.002
Stress	6.2±4.4	6(3-9)	6.7±4.4	7(4-9)	5.5±4.3	5(2-8)	<0.001

Overall, 43.1% of respondents had depression scores. The anxiety level was significantly higher in males compared to females (*p*=0.005). The highest proportion of respondents (16.5%) had mild (15–18) stress scores, followed by 13% with moderate (19–25), 7.4% with severe (16–33), and 2.1% with extremely severe (34+) stress scores in males. Similarly, in females, the highest proportion of cases (11.4%) had moderate (19–25) stress scores, followed by 7.7% with mild (15–18) scores, 5.5% with severe (26-33) stress scores, and only 1.4% with an extremely severe (34+) stress score. The stress

level was significantly higher in males compared to females (*p*=0.013) (Table 7).

DISCUSSION

The present study investigated and analyzed the effect of the pandemic on the mental health status of undergraduate medical students at a tertiary care teaching hospital in Eastern Odisha, a government-approved center for treating COVID-19. The global outbreak of rapidly spreading infected cases of SARS-CoV-2 had caused further shocks to the system of

medical education with a forced shutdown during the lockdown period and a sense of panic, uncertainty, and anxiety among medical undergraduates [22].

Table 7: Association of depression, anxiety, and stress level with gender

Depression score group	Gender		Total n(%)	χ2, p
	Male n(%)	Female n(%)		
Normal (0-9)	135(39.8)	106(48.2)	241(43.1)	
Mild (10-13)	57(43)	43(19.5)	100(17.9)	
Moderate (14-20)	86(25.4)	40(18.2)	126(22.5)	χ2=8.149 p=0.086
Severe (21-27)	29(8.6)	11(5)	40(7.2)	
Extremely severe (28+)	32(9.4)	20(9.1)	52(9.3)	
Anxiety score group				
Normal (0-7)	120(35.4)	107(48.6)	227(40.6)	
Mild (8-9)	31(9.1)	26(11.8)	57(10.2)	
Moderate (10-14)	101(29.8)	45(20.5)	146(26.1)	χ2=14.900 p=0.005
Severe (15-19)	34(10)	12(5.5)	46(8.2)	
Extremely severe (20+)	53(15.6)	30(13.6)	83(14.8)	
Stress score group				
Normal (0-14)	207(61.1)	163(74.1)	370(66.2)	
Mild (15-18)	56(16.5)	17(7.7)	73(13.1)	
Moderate (19-25)	44(13)	25(11.4)	69(12.3)	χ2=12.711 p=0.013
Severe (26-33)	25(7.4)	12(5.5)	37(6.6)	
Extremely severe (34+)	7(2.1)	3(1.4)	10(1.8)	
Total	339(100)	220(100)	559(100)	

Moreover, the medical exam was postponed with no definite date. This triggered untoward effects on the erudition and mental health of students for almost a year or two. Medical undergraduates have higher stress, anxiety, and depression symptoms due to their curriculum, frequent examinations, and long duration of clinical classes. In the current study, students with anxiety had 59.39%, depression 56.88%, and stress 33.81%. Maheshwari *et al*. study showed students had 43% depression, 49% anxiety, and 26% stress, overall less than our study [23]. As per the study done by Lasheras *et al*., it was found that more than 25% of medical students had an impact on mental health, out of which significant depression was 38.17%, anxiety was 38.77%, and distress was 36.83%, which was lower than our study [24]. First-year medical students were most affected, compared to seniors. This result was also found in many studies, which showed higher mental illness among junior students compared to more senior ones [25–29]. A study by Saraswathi *et al*., comparing the mental health of medical students, reported increased stress during the pandemic compared to the pre-pandemic situation [28]. However, few studies reported no significant differences in the study year [30,31]. In France, the situation of medical undergraduates was just the reverse of what we found in our study because it was the first year that they were under the highest academic pressure, as the success rate was 10%. The pandemic had enhanced the unpredictability of the situation in addition to fear, anxiety, loneliness, and demotivation, as reported by Sartorao-Filho *et al*. [32]. In France, second-year students undergo clinical practice, which could be a protective factor against mental health symptoms because it allows the students to continue their usual activities and work [33]. Stress and anxiety were significantly higher in the 6th and 8th semesters as compared to other semester students; the higher the professional year, the greater the DAS scores in our study. A plethora of evidence from various studies

worldwide revealed that medical undergraduates experience profound psychological impact, and morbidity was quite significant [34,35]. A Canadian cross-sectional survey by Maser *et al*. concluded that medical students had substantially more mood disorders and psychological distress [36]. The prevalence of psychological impact in medical students was also found in studies conducted by Taneja *et al*. and Mandal *et al*., but the reason for stress in the latter could be attributed to language problems, disappointment, and the vast syllabus of 1st-year MBBS [37,38]. The prevalence of depression and anxiety in female students was higher than that of males, and some previous studies have reported a similar situation [39,40]. Females seemed to be more vulnerable to mental health problems than males [41]. Our study speculated that males had greater depression, anxiety, stress, and DAS scores. Another study showed that the prevalence of depression was three times higher during COVID-19 compared with non-pandemic times [42]. Economic turbulence, quarantine, and the unpredictability of the pandemic created more stress, anxiety, and depression for the citizens [43]. Strict government policies helped slow down the spread of the pandemic but disrupted daily life and led to adverse mental health outcomes. Individual exposure to the virus was an important risk factor for increased anxiety and depressive symptoms during the pandemic [44]. In our study, out of 559 undergraduate respondents, a comparison of the DAS score with socio-demographic variables revealed 62.8% were ≥ 21 years old, and the remaining were between 18 and 20 years old. The majority were males (60.6%) and were living in a hostel (80.5%). The depression, anxiety, stress, and total DAS score did not have significant differences among the age group (*p*>0.05) and the living environment, but gender-based differences were seen. The males had greater DAS scores as compared to the females, and the score difference among semester-wise students was significant too. This study also revealed that respondents who were smoking and taking alcohol had significantly higher levels of depression, anxiety, and stress compared to non-smokers and non-alcoholics. The same was observed for students with co-morbid conditions or with psychological issues. Total QoL score did not have a significant difference with age group, gender, living environment, or taking medication for diabetes (*p*>0.05) but there was a significant difference with semester-wise students (*p*=0.026). QoL scores were found to be significantly higher in those who were not smoking, consuming alcohol, or taking medication for anxiety or stress. Therefore, the QoL score was significantly lower for those who were taking medication for depression and hypertension [45]. Singh et al. described the attributes of anxiety, depression, and stress, as well as examination fear and higher failure rates, as in studies done in France [46]. The socio-economic effect of the SARS-COV-2 pandemic could also be a stressor for all these findings, as attributed to studies conducted in China. The anxiety and stress of students due to disruptions in education caused significant psychological distress [47]. The Corona pandemic had a robust impact globally on medical students due to the socio-economic crisis,

unpreparedness for facing an exam, feeling isolated, and lack of confidence to clear the semester examination.

Study limitations

There were certain shortcomings in our study that could not be excluded. Though convenient sampling was used for the collection of data, with the online distribution of the questionnaire, there was every possibility of selection bias. Since maintaining social distance was the need of the hour, the most appropriate method of data collection was the one we followed. Self-reporting by students would have caused bias in self-assessment and interpretation of mental health. A further investigation needs to be performed to assess the variation in DASS scores between general students and vaccination students. As this is the first survey assessing the psychological impact of COVID-19 on medical students in this region, further studies can be taken up using these results as a baseline.

Conclusion

There was a tremendous effect on the mental health of medical undergraduates during the COVID-19 pandemic. Even at home, medical students were suffering from psychological impact. Depression, stress, and anxiety were observed in greater proportion, especially in males. A structured guideline on pandemic management could reduce the cognitive dissonance among medical undergraduates and their overall mental well-being. Early evaluation and timely intervention could reduce the aftermath of the pandemic. A psychiatric consultation with the students is also necessary to understand more about the stressors and services that need to be tailored accordingly to curb this problem and all potential future pandemics.

Conflict of interests

No conflict of interest was declared by the authors

Funding source

The authors did not receive any source of fund.

Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

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