ORIGINAL ARTICLE

Impact of COVID-19 outbreak on mental health of undergraduate and postgraduate medical students

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Abstract:

Background: The COVID-19 pandemic, the largest crisis of modern era has subjected medical students and healthcare workers to immense amount of stress due to myriad problems like exposure risk, health concerns and subsequent economic repercussions.

Aim: The aim of this study was to estimate the prevalence of depressive symptoms among medical students studying in the sub-continent and in foreign medical universities during the height of the COVID-19 pandemic.

Setting and design: This was a cross sectional study.

Materials and methods: A web-based survey was conducted using a specially constructed questionnaire pertaining to COVID-19 pandemic. Depressive symptoms were assessed using DASS-21 questionnaire and sleep quality with Pittsburgh Sleep quality index (PSQI), respectively.

Statistical analysis: Chi-square tests was used for proportions. Pearson's correlation analysis was done to evaluate the correlation between study DASS-21 subscales and PSQI. Multiple logistic regression was done to assess the association between study variables and the likelihood of having depressive symptoms.

Results: Postgraduate medical students and those studying in foreign universities had a significantly higher prevalence of depression than undergraduates and students studying in Indian universities, respectively. These two sub-groups also had poorer sleep quality ($P<0.001$). A statistically significant correlation ($P<0.001$) was observed between depressive symptoms and sleep quality. On multiple logistic regression, post-graduate medical students (OR=3.4), lockdown duration (OR=4.3), poorer PSQI(OR=1.2) and female gender (OR=4.1) had significantly higher odds to exhibit depression.

Conclusion: Post-graduate medical students and those studying in foreign medical universities had significantly higher prevalence of depression during the COVID-19 lockdown.

Keywords: *COVID-19, lockdown, depression, post-graduates.*

INTRODUCTION

The ongoing COVID-19 pandemic has not only posed new challenges among medical students studying in India but also among those studying in foreign countries. It is needless to say that expansion of higher education systems worldwide and the globalization of economies over the last few decades have led to a tangential rise in the number of students enrolled in educational institutions outside their native countries.

Undergraduate (UG) and postgraduate (PG) medical students face not only life events and stressors as other students, but also additional pressures, as they the frontline warriors involved in patient care and treatment. Some studies done on medical students during the pandemic have shown that they experience high levels of anxiety as they are more likely to encounter COVID-19 infected individuals and often lack sufficient information. The lack of adequate knowledge among medical students can lead to apprehension and significant increase in stress and anxiety levels.[1-3]

In India, the government declared had nationwide lockdown from 25th March 2020 in an effort to contain the spread of COVID-19 infection. However, most economists are of the opinion that lockdown for prolonged periods significantly impacts the nation's economy leading to loss of jobs and reduces the prospects of getting a new job. Undoubtedly, previous public health emergencies during SARS, MERS and Ebola outbreaks were associated with increased psychological distress in the affected population. [4] A study by Matthews et al reported that social distancing and isolation was strongly associated with anxiety, depression, self-harm, and suicidal tendencies. [5]

Students studying in foreign universities are inclined to experience countless challenges as they are devoid of the support of family and friends and home atmosphere. Moreover, financial concerns, uncertain immigration status, language barriers and perceived discrimination significantly add to the overall burden in daily life. A study by Lee at al found that internationalstudents have to face myriad challenges like the need to learn the norms and the languages of host countries, meet the rigours of academics, live alone, and manage finances, homesickness and often face racial prejudice and discrimination. [6]

Those students, who are less capable of adjusting to adverse circumstances, change and loss before leaving their home countries will tend to experience greater difficulty in adopting to life and study abroad.

The aim of the present study was to find out the prevalence of depressive symptoms among Indian under-graduate and post-graduate medical students studying in the sub-continent as well as foreign medical universities during the height of the second wave COVID-19 outbreak.

METHODS

Study setting and design

This was a cross sectional study among undergraduate and post-graduate students studying in regional medical colleges in the sub-continent and among those Indians students studying in foreign medical universities. The study was undertaken between April and July 2021 at the peak of the second wave of COVID-19 pandemic in India. The undergraduate medical course in India is Bachelor of Medicine and Bachelor of Surgery (M.B.B.S), which is of 4.5 years duration followed by compulsory rotatory internship of one-year duration. The post-graduated medical course is of 3-years duration. The duration of MBBS course for Indian students in Russia, Ukraine, Kyrgyzstan and China is about 6 years including one-year internship.

Selection of Study Participants

A letter was sent to the Dean of regional medical colleges and foreign medical universities to explain the study purpose and to request participation in the study. Three regional medical colleges and four foreign medical universities (two in Russia and one each in Ukraine, Kyrgyzstan and China) responded and agreed

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to participate in the study; after reviewing the protocol and potential risks and benefits, permission was granted to conduct the study among medical students who were willing.

Survey

In order to minimize the face-to-face interaction and to comply with social distancing norms, we developed a self-administered online questionnaire. This was a 12-point questionnaire assessing the impact of lockdown during the COVID-19 outbreak. The response of questions 9-15 were measured on a Likert scale of 1to 5 with one being the least and 5 being the maximum. A pilot assessment was first done on 10 responders. After assessment of the responses, changes were made in the questionnaire for simplification.

The survey was conducted via Google form whose link was sent through personal email IDs of the students which were collected from their respective institutional heads. A maximum of three e-mail reminders were sent. A written informed consent was obtained from all participants as per the tenets of the declaration of Helsinki.

Sociodemographic details such as age, gender, year of study, place of residence and gross monthly income of the family were collected. The mental health status was assessed using Depression Anxiety Stress Scale 21 items (DASS21). All records were kept anonymous and did not involve divulging any personal information

Estimation of mental health status

Mental health status of study participants was assessed using DASS-21. The Depression, Anxiety and Stress Scale - 21 Items (DASS-21) is a set of three self-report scales designed to measure the emotional states of depression, anxiety and stress. Each of the three DASS-21 scales contains 7 items, divided into subscales with similar content. The total sub scores range from 0 to 42 and is categorized into normal, mild, moderate, severe, and extremely severe. In this study, DASS21 sub scores were categorized dichotomously, with the participants being divided in to those who showed symptoms of depression, anxiety and stress and those who did not, based on the cut-off sub-scores of 9, 7 and 14 respectively. [7]

Estimation of sleep quality

Subjective sleep quality was assessed using PSQI which includes 21 items that assess seven components viz. subjective sleep quality, sleep duration, sleep latency, habitual sleep efficiency, use of sleep medications, sleep disturbance, and daytime dysfunction over the duration of 2 weeks prior to assessment. Global PSQI scores are obtained by summing up the seven individual sub scores and it ranges from 1 to 21 with higher scores (>5) denoting poor sleep quality.

SAMPLE SIZE CALCULATION

Our aim was to estimate the prevalence of unknown parameter(s) from the target population using a random sample. Sample size was calculated using formula,

$$N = \frac{Z^2 P (1-P)}{d^2}$$

In this formula, N is the sample size, Z is the statistic corresponding to level of confidence (standard normal variate), P is expected prevalence (that will be obtained from previous studies published or a pilot study conducted by the researchers in our region), and d is precision (corresponding to effect size).

According to a study conducted in India, the prevalence of depression among medical students is 7.6%. [8] Considering precision of 0.5, the level of confidence aimed for was 95%, the normal standard variate Z=1.96, the estimated sample size was calculated to be 385.

STATISTICS

All the collected data was transferred from google forms to an Excel spreadsheet and was quality-checked by a researcher to ensure accuracy and completeness. Statistical analysis was performed using IBM, SPSS Statistics version 26 (IBM Inc.). Descriptive data was summarized as frequencies and percentages for categorical variables, and mean ± standard deviation (SD) for continuous variables. P-value less than 0.05 was considered statistically significant. Chi-square tests/ Fischer exact test (whichever applicable) were used for proportions. Pearson's correlation analysis was done to evaluate the correlation between study variables (DASS-21 subscales and PSQI). Univariate analysis was done to determine whether there are any statistically significant association between demographic variables and outcome measures. After adjusting for potential confounders like age, gender and family income, multiple logistic regression was done to assess the association of independent variables on the dependent variables (DASS score, PSQI scores). For sub-group analysis, logistic regression model was constructed was to ascertain the effect independent variables on the likelihood of medical students having depression.

The mean overall PSQI score of the study sample was 4.1±3.2. The prevalence of disturbed sleep quality (PSQI>5) was 20%. The sleep quality did not significantly (P=0.070) differ between males and females (3.9±2.2 versus 4.5±4.2). Sleep quality was significantly

RESULTS

A total of 400 medical students completed the questionnaire. Out of these, 248(62%) were medical students studying in India and 152(38%) were studying in foreign medical universities. One hundred and ninety-two (48%) were pursuing postgraduate course and 208(52%) were pursuing undergraduate course. The mean age was 28.4±4.3(range, 19-36 years).

The mean age of males(n=232) was 28.7±4.3 and females(n=168) was 29±4.1 years, respectively (independent t-test, P=0.310).

The mean duration of lockdown for COVID-19 containment at time of survey was 6.4±0.8 months.

The details of information obtained from the general questionnaire are mentioned in Table 1.

Information (n, %)	YES	NO
Do you receive financial support from home?	360(90)	40(10)
Were you positive for COVID-19?	56(14)	344(86)
Was your family member positive for COVID-19?	48(12)	352(88)
Is COVID-19 a biological weapon?	152(38)	248(62)
Do you have interaction with COVID patients?	200(50)	200(50)
Will lockdown have impact on your job prospects?	224(56)	176(44)
Do you think online classes will affect clinical skills?	320(80)	80(20)
Are you concerned about well-being of your family?	120(30)	280(70)
Are you worried about surviving?	88(22)	312(78)

Table 1. General information questionnaire

The prevalence of depression in postgraduate medical students was 38.4% as compared to 9.6% in undergraduates (Chi-square test, P=0.001). The mean DASS-21 depression score in postgraduates was 8.5±5.3 as compared to 5.9±3.9 in undergraduates (independent t-test, P=0.001).

The mean DASS-21 depression score in males (7.4±4.6) did not significantly differ from females (6.7±46) medical students (independent t-test, P=0.162).

The relationship between study variables and depression, anxiety and stress scores are mentioned in table 2.

Group		Depression	P value	Anxiety	P value	Stress	P value
Gender							
Male	Mean±SD	7.4±4.6					
	0.162	9.2±4	0.002	8.3±3.7	0.001		
Female	Mean±SD						
	6.7±4.6						
		7.9±4.1		14.8±4.7			
Course							
PG	Mean±SD	8.5±5.3					
	0.001	8.42±4.5	0.219	13.6±5.3	0.001		
UG	Mean±SD						
	5.9±3.5						
		8.92±3.6		8.6±3.9			
Place of study							
India	Mean±SD	6.5±3.9	0.001	7.6±4.2	0.001	10.9±5.5	0.547
Abroad	Mean±SD	8.1±5.5		10.3±3.2		11.3±4.7	
Family income							
<50000 INR	Mean±SD	8.58±5.3	0.002	10.9±3.8	0.001	17.1±1.5	0.001
50000-100000 INR	Mean±SD	7.4±5.2		9.6±4.5		17.3±1.7	
>100000 INR	Mean±SD	6.8±4.3		8±3.9		8.9±4.3	

**Abbreviations: SD (standard deviation), PG (Postgraduate), UG (Undergraduate), INR (Indian national rupee).*

Table 2. Depression, anxiety and stress scores relationship with study variables

(P=0.001) disturbed in postgraduates (5.4±4.1) as compared to undergraduates (2.9±1.1). Medical students studying in foreign medical universities had a significantly (P=0.001) worse sleep quality as compared to medical students in India (4.7±3.2 versus 3.8±3.2).

There was a significant correlation (P<0.001) between PSQI, depression score (Pearson's correlation coefficient, r=0.264), anxiety score (r=0.251) and stress score (r=0.378), respectively.

The logistic regression model was statistically significant, $\chi^2(8) = 131.220$, $p < .001$. The model explained 41.9% (Nagelkerke R^2) of the variance in depression and correctly classified 81.5% of cases. Sensitivity was 49%, specificity was 91.8 %, positive predictive value was 65.2% and negative predictive value was 85%. Out of the 8 predictor variables (6 were statistically significant (lockdown duration, anxiety score, PSQI score, stress score and type of course). Lockdown duration (OR=4.3), type of course (OR=3.4), gender (OR=4.1), and PSQI score>5 (OR=1.2) had higher odds to exhibit depression.

Variable	B	Wald	P value	OR	95% CI of OR	
					Upper	Lower
Age	-.10	3.6	.057	.90	.81	1.0
Lockdown duration	1.4	15.0	.000	4.3	2	9.2
Anxiety	-.14	5.7	.017	.86	.76	.97
Stress	-.13	3.7	.053	.87	.75	1
PSQI	.111	4.1	.041	1.1	1.0	1.2
Gender	1.42	10.6	.001	4.1	1.7	9.7
Place of Study	.053	.019	.891	1.0	.50	2.2
Type of course	1.23	5.6	.018	3.4	1.2	9.5
Constant	-7.2	4.7	.029	.001		

† Variable(s) entered on step 1: Age, Lockdown duration, Anxiety Score, Stress Score, PSQI Score, Gender, Place of Study, Course (UG/PG).

TABLE 3. Odds Ratio in Logistic Regression Model

DISCUSSION

The present cross-sectional study evaluated the prevalence of depressive symptoms in undergraduate and post-graduate medical students studying within the country and in foreign universities at time of lockdown during the COVID-19 pandemic. Our study points to a high prevalence of mental health morbidity in the form of stress, anxiety and depression, among post-graduate students and those studying in foreign universities during COVID-19 lockdown. These two sub-groups also had significantly (P<0.001) poorer sleep quality. There was a signification correlation between depressive symptoms and poorer sleep quality (P<0.001). On binary logistic regression, post-graduate students (OR=3.4), lockdown duration (OR=4.3), PSQI>5(OR=1.2) and female gender (OR=4.1) exhibited higher odds to exhibit depression.

Lakhan et reviewed 16 studies estimating mental health during first 7 months of the COVID-19 pandemic. The study population comprised 113,285 participants from different countries. The authors reported that the prevalence of depression, anxiety and stress was 20%, 35% and 53% respectively.[9] The prevalence of depression among medical students in our study was 24%; this was marginally higher than the prevalence of depression in general population during the height of pandemic. Increased workload and higher risk of infection among medical students could lead to higher levels of stress, anxiety and depressive symptoms.

In a prospective longitudinal study, Saraswathi et al evaluated the impact of COVID-19 outbreak on mental health status of UG medical students. The authors reported a significant increase in the prevalence of anxiety and stress during COVID-19, irrespective of gender and place of study. On an adjusted logistic regression model, a PSQI score greater than 5, general COVID-19 but not academic apprehensions, direct interaction with affected patients had higher odds to exhibit poor mental health. [10] It is prudent to mention that stressors and stress levels

may differ between UG and PG students due to different types of challenges faced during the course of study and during the pandemic. Moreover, PG students have bigger/immediate concerns about career and future success; the pandemic has drastically impacted world economy with declining job opportunities. This could probably explain the higher prevalence of stress and depressive symptoms in PG students in our study.

An online cross-sectional survey (n=1014) in Pakistan reported that lack of COVID-19 awareness and female gender had increased likelihood having both anxiety and depressive symptoms. Psychological intervention is needed for undergraduate medical students to reduce psychological impact of pandemic. [11]

Maqbali et al conducted a meta-analysis of 93 published studies using a random effect model evaluating the prevalence of stress, anxiety and depression among nurses during COVID-19 pandemic. The authors reported that approximately one third of working nurses during the COVID-19 pandemic had psychological problems. The pooled prevalence of stress, anxiety and depression was 43%, 37% and 35%, respectively. [12] The prevalence of psychological problems during COVID-19 pandemic were significantly higher in medical students, nurses and other health care workers compare to general population. However, a longitudinal study is needed to substantiate psychological symptoms during and after infectious disease outbreaks.

Another meta-analysis by Salari et al evaluated 29 studies and sampled 22380 participants using random effects model and I2 index. The authors reported that prevalence of depression, anxiety and stress was 24.3%, 25.8% and 45%, respectively among front-line health care workers. [13]

Islam et al conducted a web-based survey to investigate depression and anxiety among Bangladeshi university students during the COVID-19 pandemic. Among 476 students, 15% of the students had moderately severe depression, whereas 18.1% were suffering from anxiety. Students pursuing PG course (OR=2.9) and those taking private tuitions during pre-pandemic period (OR=1.2) were identified as determinants of depression on binary logistic regression. [14] In our study, the observation that PG students had higher odds (OR=3.4) to exhibit depressive symptoms resembled this study, although the reported prevalence of depression was significantly higher (24% versus 15%).

International students including medical students studying in universities other than their native countries come across similar problems like homesickness [15], unfamiliar food [16], type and quality of housing [17], and financial problems [18]. These issues were stretched to their maximum during COVID-19 lockdown. This could probably account for higher prevalence of mental health problems during global lockdown.

The limitations of our study were that study population included students of only a few international universities and data obtained could not be considered representative of international students of all the countries. Psychological symptoms were self-reported through a web-based google questionnaire and not through a clinical interview; self-reported measures should be supplemented with clinical interviews for better reliability. The web-based questionnaire was more focused on COVID-19 pandemic so other factors affecting depression like presence of depressive symptoms at baseline, past history of depression or family history of depression could not be taken into consideration. Therefore, it is difficult to elucidate which factors, if any, contributed to the self-reported depressive symptoms. Lastly, as this was an online survey, we were unable to verify the identity of the respondents and this might have contributed to some bias in the study. We also did not have data regarding the prevalence of COVID-19 in the hospitals in which these respondents were studying.

The strength of our study was the independent variables were evaluated in a multiple logistic regression model for the likelihood of having depressive symptoms. Medline search did not reveal any study evaluating mental health of medical students studying in foreign students.

In conclusion, post-graduate students and those studying in foreign medical universities had significantly higher prevalence of depression during the COVID-19 lockdown. Medical students pursuing PG and those studying in foreign universities had a significantly higher prevalence of depression. Course type (PG versus UG), gender (male versus female) and duration of lockdown were the main determinants for the likelihood of having depressive symptoms on logistic regression model. The results of the current survey are concerning and there is a need for early intervention to tackle the immediate and longer-term consequences on the mental health of PG students and those studying in foreign universities.

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CONFLICT OF INTEREST

Nil.

Competing interests

Authors have declared that no competing interests exist.

Authors' contributions

This work was carried out in collaboration among all authors. All authors have read and approved the final manuscript.

Consent

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

Ethical approval

As per international standard written ethical approval has been collected and preserved by the author(s)

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