Shruti Verma
MBBS, Government Medical
College and Rajindra Hospital,
Patiala, Punjab, India

Ranjive Mahajan
MD, Professor and Head,
Department of Psychiatry,
Dayanand Medical College and
Hospital, Ludhiana, Punjab,
India

Vivek Vardhan Gupta
MDS, Associate Professor,
Department of Public Health
Dentistry, Christian Dental
College and Hospital,
Ludhiana, Punjab, India

An assessment of the impact of COVID-19 on the mental health of medical students across various medical colleges of Punjab

Shruti Verma, Ranjive Mahajan and Vivek Vardhan Gupta

DOI: https://doi.org/10.22271/27069567.2021.v3.i1g.167

Abstract
Background: The COVID-19 pandemic has had far reaching effects on almost all aspects of everyday living especially on the economic front and has brought more focus on the importance of mental health amidst all the uncertainty and fear looming large on the minds of people. Various studies have been conducted amongst medical students in different countries and have shown varying levels of anxiety and depression in them. Hence this study was designed to assess the prevalence of the same in the medical students of Punjab.
Method: This was an observational, cross sectional study conducted amongst 267 undergraduate medical students on World Mental Health Day 10th October 2020 using an online questionnaire comprising of the GAD- 7 and PHQ-9 scale questions.
Results: A total of 267 students participated in the online survey out of which 170(63.6%) were females and 97(36.3%) were males. According to the scoring obtained using the GAD-7 scale, some levels of anxiety were prevalent in 181 students i.e.67.7% with scores of more than five, which came out to be statistically significant with a p- value of 0.018 for the study population. A significant positive correlation was seen between the levels of anxiety and depression with the Pearson correlation coefficient r=0.72.
Conclusion: The present study implies that substantial efforts are required to promote good mental health and reduce the stigma that plagues these topics. Early diagnosis and treatment of these conditions can help the students experience a more fulfilling and meaningful life and medical career.

Keywords: COVID-19, mental health, anxiety, medical students, GAD-7, PHQ-9

Introduction
With the onset of the pandemic which had its epicentre in the Wuhan district of China, the ripples that this disease has had on the various aspects of everyday living have been manifold. Mental Health is one such aspect that has been profoundly impacted, yet it is comparatively more difficult to evaluate, compared to the economic slowdown and social disruption which have resulted due to this. The WHO Director-General declared the novel coronavirus outbreak a public health emergency of international concern (PHEIC), WHO's highest level of alarm on 30th January 2020 [1]. With the increasing worldwide death toll on a daily basis and still no definite cure, uncertainty looms large on the heads of the entire medical fraternity worldwide and the global population as we struggle to find a foothold into the normalcy of the pre-COVID times. Globally, as of 16 February 2021, there have been 108,684,743 confirmed cases of COVID-19, including 2,399,103 deaths, reported to WHO [2]. The first case in India was confirmed on January 31st 2020. Under the purview of the rising number of cases in the country, a nationwide lockdown starting from the midnight of March 24 was imposed [3]. It brought everything except essential services to a standstill and caused the closure of all the educational institutions for an indefinite time period, grossly marring the educational design that was in place. In these unprecedented times, the teaching of the gruelling MBBS course was subsequently shifted online but the effectiveness of the same was questionable since medicine is best learned at the patient's bedside. It was found that online medical education was faced with challenges related to communication, student assessment, use of technology tools, online experience, pandemic-related anxiety or stress, time management, and technophobia [4]. Poor network facilities might also have been a major deterrent in developing countries like India since not all have access to high speed internet

Corresponding Author:
Shruti Verma
MBBS, Government Medical
College and Rajindra Hospital,
Patiala, Punjab, India

required for online classroom sessions. The transition from face to face teaching to online delivery has a serious impact on assessments and evaluation as applying assessments online on courses designed for face to face learning is a challenging task [5].

A number of studies are thus mushroomed up all over the world and reported high levels of depression, anxiety, insomnia, distress, irritability, frustration, boredom and loneliness stemming from the fear and uncertainty in the current scenario amongst the medical professionals and general public alike. In the meta-analysis by Xiong *et al.*, it was found that relatively high rates of symptoms of anxiety (6.33% to 50.9%), depression (14.6% to 48.3%), posttraumatic stress disorder (7% to 53.8%), psychological distress (34.43% to 38%), and stress (8.1% to 81.9%) are reported in the general population during the COVID-19 pandemic in China, Spain, Italy, Iran, the US, Turkey, Nepal, and Denmark. Risk factors associated with distress measures include female gender, younger age group (≤40 years), presence of chronic/psychiatric illnesses, unemployment, student status, and frequent exposure to social media/news concerning COVID-19 [6].

This study was designed in order to assess the far reaching effects of the pandemic on the mental health of the medical students studying in various medical colleges across the state by estimating the prevalence and severity of anxiety and depression so that measures could be taken to mitigate the impact on the mental well-being of these future Healthcare providers of the nation.

Materials and Methods:
For the assessment of the well-being of the mental health of the medical undergraduate students, an online questionnaire was prepared comprising of the gender and year of study of the participants and employed the use of General Anxiety Disorder (GAD-7) scale and the Patient Health Questionnaire (PHQ-9) assessment scales. These are validated and reliable scales routinely used for screening purposes in clinical settings [7, 8]. These scoring systems formed the basis for formulating an online scoring survey based questionnaire using "Jotform" which was then circulated online amongst the medical students in various parts of Punjab on the occasion of the World Mental Health Day- 10th October 2020 [9]. Demographic characteristics like gender and year of study were also asked by the students. This was almost 8 months after the first case of COVID-19 was suspected in a female patient in Kerala on 27th January 2020 [10]. The online questionnaires were completed by those students who were willing to participate in the survey.

The Depression Screening Tool PHQ-9
To screen and analyse the prevalence and the levels of depression, 9 questions from the patient health questionnaire were used which are routinely used in clinics for the screening of depression. The PHQ-9 is the depression module, which scores each of the 9 DSM-IV criteria as "0" (not at all) to "3" (nearly every day) [8]. The total scores from these 9 questions can be used to categorize Depression as 0-4 as Normal/minimal, 5-9 as Mild, 10-14 as Moderate,15-19 as moderately severe and 20-27 as Severe depression.

The Anxiety Screening Tool GAD-7
For the screening of anxiety levels in the respondents, Generalized Anxiety Disorder Scale was used. The GAD- 7

is a valid and efficient tool for screening for GAD and assessing its severity in clinical practice and research [7]. It comprises of 7 questions and scoring is done on the basis of the frequency as in PHQ-9 scale as 0,1,2,3 for not at all, Several Days, Most of the Days, and Nearly every day respectively. The categorization is done as follows: 0-4 as Normal/Minimal Anxiety; 5-9 as Mild anxiety; 10-14 as Moderate Anxiety; 15-21 as Severe Anxiety.

Statistical Analysis
The data was analysed to assess the degree to which COVID-19 has had an impact on the mental health of the students using Microsoft Excel and IBM SPSS Statistical Software Version 20.0. A p-value of <0.05 was considered statistically significant. Chi-square test and one way ANOVA were used to determine whether there was any significant difference between the levels of anxiety and depression and their genders and year of study respectively. Pearson correlation coefficient was used to find out relation between anxiety and depression.

Results
Responses were collected from a total of 267 MBBS students of Punjab from Baba Farid University of Medical Sciences (BFUHS) ranging from first year to intern year via the use of the online questionnaires. We sought to evaluate the prevalence and severity of anxiety and depression in these students. Demographic data showed that 170(63.6%) females and 97(36.3%) males took part in this study which involved voluntary participation and ensured anonymity of the respondents.
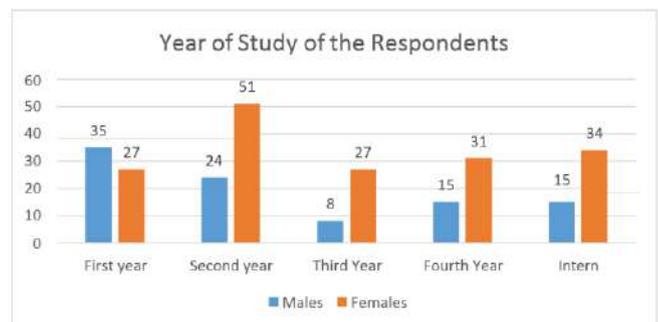

Fig 1: Gender wise distribution of study respondents and their year of study

Table 1: Anxiety levels with GAD-7 scale

Anxiety levels according to GAD-7 scale	No. of respondents	Percentage
Minimal/ Normal(0-4)	86	32.2%
Mild anxiety (5-9)	105	39.3%
Moderate anxiety (10-14)	52	19.5%
Severe anxiety (15-20)	24	9.0%

According to the GAD-7 scale, anxiety was noted to be prevalent in 181 (67.7%) students (GAD-7 scores≥5) with the following overall levels of anxiety out of which 70 (38.6%) females and 35 (19.3%) males reported mild anxiety levels. The mean GAD score in females was found to be 7.71 with S.D. of 4.72 and the average score in males was found to be 6.25 with the S.D. of 5.06. Upon the application of the Independent Sample T- Test, the cumulative level of anxiety in the study population is found to be significant with a p-value of 0.018.

Table 2: Depression Levels with PHQ-9 scale

Depression levels according to PHQ-9 scale	No. of respondents	Percentage
Minimal/ Normal (0-4)	106	39.7%
Mild depression (5-9)	73	27.3%
Moderate Depression (10-14)	52	19.4%
Moderately Severe Depression (15-19)	23	8.6%
Severe Depression (20-27)	13	4.8%

With the use of the Patient Health Questionnaire-9 (PHQ-9) scale, some levels of depression were seen in 60.2% students (score≥5) out of which 47 (29.1%) and 38 (23.6%) females showed mild and moderate levels of depression. In

the male respondents, 26 (16.1%) and 14 (8.6%) showed mild and moderate levels of depression respectively. The mean PHQ score of the females came out to be 7.8 with the S.D. of 6.02. In males, mean of 6.97 with S.D. of 6.15 were obtained. Upon the application of the independent sample T-Test, the cumulative levels of depression in the study population came out to be non-significant with a p-value of 0.28

The gender wise distribution of anxiety and depression according to the GAD-7 and PHQ-9 scores is shown in Table 3 show p-values as 0.199 and 0.569 respectively. Hence, there is no correlation between the levels of anxiety and depression and gender.

Table 3: Correlation between gender and levels of anxiety and depression.

Number (Percentage)	Minimal	Mild	Moderate	Severe	
Anxiety					
170 (63.7%)	47 (27.6%)	70 (41.1%)	36 (21.1%)	17 (10%)	p-value =0.19 (N.S.)
97 (36.3%)	39 (40.2%)	35 (36%)	16 (16.4%)	7 (7.2%)	
267	86 (32.2%)	105 (39.3%)	52 (19.4%)	24 (8.9%)	
Depression					
170 (63.7%)	63 (21.1%)	47 (27.6%)	38 (22.3%)	14 (8.2%)	p-value =0.56 (N.S.)
97 (36.3%)	43 (44.3%)	26 (26.8%)	14 (14.4%)	9 (9.2%)	
267	106 (39.7%)	73 (27.3%)	52 (19.4%)	23 (8.6%)	

Table 4: Correlation between the year of study and GAD-7 and PHQ-9 scores

Variables	Year of education	Mean	Std. Deviation	p- value	95% Confidence Interval for Mean
					Upper and Lower limits
Generalized Anxiety Disorder	1st Year	7.41	4.68	0.16 (NS)	6.22-8.61
	2nd year	7.44	5.47		6.18-8.69
	3rd year	5.28	3.55		4.06-6.5
	4th year	7.86	5.17		6.33-9.4
	Intern	7.18	4.63		5.85-8.51
	Total	7.17	4.89		6.58-7.76
Depression	1st Year	8.64	6.67	0.27 (NS)	6.95-10.33
	2nd year	7.58	6.18		6.16-9.01
	3rd year	6.91	5.37		5.06-8.75
	4th year	7.73	6.72		5.74-9.73
	Intern	6.12	4.68		4.77-7.46
	Total	7.50	6.07		6.77-8.23

Upon the application of one way ANOVA, no significant difference was seen between the year of study and the levels of anxiety and depression in the study population, thus no correlation is found between these parameters. (p>0.05)

In the given study population, the Pearson correlation coefficient was calculated to have an r value of 0.72 between the levels of anxiety and depression. This strong positive correlation implies that with the increase in the levels of anxiety, a subsequent increase was also seen in the levels of depression in the study participants.

Discussion
The main aim of the study was to estimate the prevalence of anxiety and depression in the medical students studying in various levels of Punjab and it was found that 67.7% students were in an anxious and 60.2% were in a depressed state of mind indicating that the effects of the social

restrictions owing to the pandemic and the continuous 7 month long closure of the medical college had taken a toll on the daily living of the students. It is important for us to find remedial measures for such a condition and to diagnose these conditions early so that they don't hamper the progress of students in their medical education and careers. Various studies have been conducted all over the world to assess the neuropsychiatric complications of COVID-19 which are ranging from acute delirium to long term fatigue and high rates of anxiety, depression and post- traumatic stress disorder in people who recover after hospital admission for COVID-19 [11, 12]. Efforts should be made to mitigate and promote good mental health by emphasizing the importance of physical activity and routine to keep mental health troubles at bay as advocated by both the World Health Organization and doctors worldwide [13]. Students should be encouraged to connect with their peers via the social media

platforms but should also monitor the amount of screen time since studies have shown that prolonged usage of technology might also trigger poor self-esteem and anxiety. In the meta-analysis by Karim *et al*., it was seen that in the 16 studies considered, anxiety and depression were the most commonly measured outcome. The prominent risk factors for anxiety and depression emerging from this study comprised time spent, activity, and addiction to social media [14].

Comparable levels were obtained in a study conducted in Brazil where a higher cut off of 10 for the GAD-7and PHQ-9 scales were used, 46.17% and 64.41% medical students were identified with moderate or severe symptoms of anxiety and depression respectively [15]. Liu *et al*. in reported lower levels using the same scoring scales in Chinese medical students reported 22.1% with anxiety and 35.5% with depression which are much lower than the levels found in our students in Punjab [16]. However, the majority of students in both cases reported anxiety and depression which were mild or moderate.

Our study also shows higher levels of anxiety as compared to the baseline prevalence of anxiety amongst medical students in a meta-analysis done prior to COVID-19 which was at 33.8% and also against the estimated overall prevalence of anxiety during the pandemic as 28% as reported in the meta-analysis by Lasheras *et al*. [17]

The impact of the pandemic was seen among students all over the world. For instance, in an interview based study in the United States, 71% students indicated increased stress and anxiety due to the COVID-19 outbreak. They cited worry about their health, difficulty concentrating and changes in their sleep patterns and increased concerns on their academic performances [18].

Even though the overall prevalence of both anxiety and depression was seen to be higher in the females in our study, statistically, similar results across the genders and years of study were seen by Liu *et al*. and our study emphasizing on the equivalent psychological impact on both genders and also across the various years of study [16]. However, amongst Iranian medical students, females showed higher anxiety levels as compared with males (p<0.001) even though no such differences were seen in the case of depression.[19] Overall, gender didn't seem to have much role to play in development of these conditions in medical students even though higher levels maybe observed in the females in the general population [20].

Study in Jamnagar medical students in July in India by using the DASS21 Scale revealed lower levels of anxiety and depression at 17.2% and 10.8% respectively [21]. On the other hand, in Chennai in June 2020, using DASS-21 scale, depression and anxiety levels in medical students were reportedly 35.5% and 33.2% respectively [22]. Heterogeneous results thus seem to be observed in different parts of the country which could have been due to a difference in the time period and regional differences as these were conducted at an earlier time period. Vala *et al*. also excluded the students with any pre-existing mental disorders unlike most other studies resulting in lower percentages [21].

The psychological impact of the illness as seen in the medical students may also be a product of factors affecting the general population stemming from a specific and uncontrolled fears related to infection, pervasive anxiety,

frustration and boredom and disabling loneliness from social isolation [23].

An increased evaluation of the demographic characteristics and the consideration of parameters like economic status, rural/urban areas, and class performance may also help us in the better identification of the factors and the remedial measures that need to be considered while drawing conclusions on these issues. Such parameters were incorporated in studies in China, Iran and Pakistan [16, 19, 24]. Students with higher GPA were found to have lower levels of anxiety in Iran [19]. Higher knowledge of COVID-19 was speculated to be the reason for lower anxiety as information can decrease anxiety. Thus, measures need to be taken to promote circulation of reliable information online regarding the prevention, spread, treatment and vaccination and debunk any myths surrounding these.

The higher levels of anxiety and depression seen in our study as compared to other studies might also suggest a time dependent increase in these levels with the prolonged duration of lockdown and shutdown of the educational institutions lasting longer than anticipated at the time of closure. An unprecedented delay in their university exams normally scheduled in November in the dearth of proper formal teaching might also be a contributing factor.

Various other stressors identified in the medical student population including worry about the economic influences, academic delays, and the impact on their daily lives including apprehensions over contracting the infection and spreading it to the family leading to an increased emotional and financial burden.

World Health Organization has repeatedly emphasized on the importance of proper diet, sleep, exercise in order to maintain well-being during the pandemic [25]. Regular physical exercise is for mental health, and able to alleviate the levels of depression and anxiety during COVID-19 pandemic. Staying physically active during the COVID-19 pandemic would contribute to the attenuation of the side effects of COVID-19 on mental health after the pandemic.[26]

Other remedial measures could include adequate social support for the general population with regard to specific at risk populations (infected patients, quarantined individuals and medical professionals) which should be provided by offering targeted tailored messages according to the most reliable scientific evidence [23]. Students and staff should receive regular information through emails and university intranets. Proper counseling services should be available to support the mental health and well-being of students. Faculty should embrace technology and pay careful attention to student experiences to make the learning experience rich and effective [5].

Conclusion

It is imperative that we incorporate mental health advocacy as a part of the medical school curriculum and formulate health care policies so that we can maintain optimal functioning of both self and the healthcare institutions even in the times of adversity such as the COVID-19 pandemics. With improvement in both mental and physical health along with policies to better tackle pandemic like situations in the future, we can bring about a substantial decline in the number of possible casualties while striving towards better global health.

Limitation
Since this is a cross sectional study and sample size taken is small and corresponds to students of BFUHS, Punjab, the results of the study may not be generalizable across other students in a different demographic setting. We also can't distinguish those students with mental health conditions pre-existing before the onset of the pandemic which might have further got accentuated and those who developed anxiety and depression resulting due to the pandemic. The study was self-reported in nature; as a result reporter effect with the underestimation or overestimation of the conditions could be possible. Also, a longitudinal follow up type of study could draw more definite conclusions regarding the factors leading to the development of mental health problems in medical students.

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