

METHODS

Mental health of Indian young adults during COVID-19

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The Coronavirus disease (COVID-19) pandemic stands as a global crisis that had severe repercussions on health and society severely affecting mental health. Certain groups such as young adults were affected on a greater potency by the closure of educational institutes. Sudden social isolation and disconnectedness fueled affective and behavioral problems. In this paper, we discuss how COVID-19 has affected vulnerable undergraduate students in India. The responses were collected using standardized psychometric scales: Generalized Anxiety Disorder Assessment (GAD-7) and Centre for Epidemiological Studies–Depression (CES-D) for generalized anxiety and Depression respectively, ($n = 1,038$) from students pursuing bachelor's degrees from different universities in India. On comparing the means, we find clinical anxiousness and depressive symptoms among 18.2% ($n = 189$) and 25.3% ($n = 263$), respectively. It was found that there was an effect of gender on that led to increased anxiety and depression levels in higher education students. We also observed that the academic field in which they were enrolled such as STEM or non-STEM also had an effect on their mental health. Significant depression scores were found for seniors, juniors, and sophomores in comparison to freshmen, whereas for anxiety we found that seniors and juniors had higher levels in comparison to freshmen and sophomores. Regression analysis further predicted that increased anxiety was associated with individuals whose family or friends were diagnosed with COVID-19. Symptoms of depression were significantly low when people had regular interaction with friends and family and followed an active lifestyle. The study highlights the prevalence of severe anxiety and heightened depressive symptoms among students. A pattern of gender difference was observed emphasizing the effect of societal gender norms. Hence, the study finds that the young adult population of India requires immediate attention to formulate policies that can mitigate negative developments.

Keywords: anxiety, depression, survey, youth, COVID-19

1. Introduction

A scientific briefing released by World Health Organization (1) highlights the massive increase in the global prevalence of anxiety and depression during COVID-19 on the world's mental health. Many professionals expected a "tsunami of psychiatric illnesses because of the COVID-19 pandemic (2) with a long-lasting impact (3). Rogers et al. (4) reported increased neurocognitive and psychiatric impairments involving significant anxiety levels, depression, and post-traumatic stress disorder. The information collected

till now serves as the tip of an iceberg. There has been a significant rise in concern for the psychological distress caused by the pandemic across the globe. Experts have argued for timely action on mental health (5), (6) issuing guidelines in the public interest. A similar pattern of distress levels was observed during SARS where individuals reported increased stress levels with anxiety and depression (7, 8). A rapid assessment conducted by UNICEF (9) in nine countries found that 27% of the participants reported anxiety and at least 15% with depression. During the pandemic, people develop insecurity and are always in the fear of

contracting the virus, which results in anxiety, stress, and depression (10).

Existing evidence indicates that women and young adults are disproportionately at risk of developing mental disorders. The worst affected stratum of the global population is the 15–24-year-old young adults (11–13). Before the pandemic, studies had confirmed that young adults are at high risk of developing poor mental health and substance abuse (14, 15). During the pandemic, various reasons such as the closure of universities, unemployment, and lack of social life contributed toward deteriorating mental health. A large portion of the young adult population (56%) exhibited severe symptoms of anxiety and depression with stress. It was found that when compared to adults, young adults were at high risk of poor mental health and substance disorders (16).

India reported one of the highest COVID-19 infection rates with 2.5 million confirmed cases in the whole world (17). Since, the first case was registered on January 30, 2020, the cases saw an upsurge with the government imposing a nationwide lockdown. During the lockdown, there were restrictions, which led to the closure of public spaces like gyms, parks etc., and institutions such as colleges and schools etc. The sudden imposition of restrictions affected people in different ways. A study reported that students and healthcare professionals were severely affected by the pandemic and experienced significant anxiety and depression over others (18). A systematic review by (19) reported that among five studies at least 41.90% of participants reported depression and 42.87% with significant anxiety.

This study was conducted to understand how young adults are dealing with the sudden changes introduced due to the pandemic. We wanted to explore how COVID and its restrictions brought changes in the affective and behavioral states of the students. In this paper, we discuss how the ongoing pandemic has affected the psychological distress and the extent of vulnerability.

2. Method

In this section, we make a brief mention of the situation in India in accordance with the chronology of events in India during the COVID-19 pandemic. The first recorded infection of India with the novel coronavirus was found in Thrissur, Kerala on 27th January, 2020. The first nationwide lockdown was imposed on 25th March, 2020 followed by strict restrictions. The cases saw a constant rise and reached 90,000 cases per day mid-September marking the peak of first wave. Towards the end of the year India lifts several restrictions. In March 2021, sudden spiralling cases had

devastating implication on the country as it has to battle with the rising number of daily cases, mortality rate, supply shortage of vaccines, oxygen and unavailability of hospital beds. The first wave was thought of as a successful mitigation of crisis but the second wave shook Indian healthcare system. The onset of second wave was delayed but the cases rose exponentially which again led to imposition of strict lockdown nationwide. During the second wave, India witnessed the highest surge of 4.14 lakh cases per day. The second wave recorded highest mortality taking the numbers to 2.5 lakhs (20).

2.1. Study design and participants

The study was conducted in India during the second and the third wave, i.e., from July 2021. We continued the collection of data until the end of January 2022.

The online form was developed on Google forms. It was officially launched on 15th June 2021 until the end of January 2022. The form was administered to a large sample ($N = 1,211$) of Indian undergraduates who are pursuing bachelor's degree from prestigious Indian universities and technical Institutes. Multiple steps were followed for the distribution of forms: (A) email invites were sent out to students with institute ids, (B) snowball sampling was used through social media platforms such as LinkedIn to recruit students from universities without official mail ids, and (C) mailing lists of universities. The whole questionnaire took 10 minutes to complete. Ethical approval for the current study was taken from the Local Ethics committee of the Indian Institute of Technology, Roorkee. The study followed the declaration of Helsinki (21) safeguarding the ethical treatment involving Human subjects. Data were recorded after obtaining informed consent from the participants.

A total of 1,249 responses were recorded. Responses were eliminated if the answers were incomplete or left unattended. Hence, 1,038 responses were retained and included in the final analysis. The median age of all participants were 19 years belonging to age range of (18–23 years), where 55.4% of the participants were female ($N = 576$) and 44.4% were male ($N = 461$).

2.2. Sociodemographic variables and assessment tools

Sociodemographic variables included in the study were age, gender, and information on the course and present year of enrolment. The variables related to risks due to COVID-19 were assessed by the administration of three questions asking (A) COVID-19 positivity of any close relative or family member, (B) Virtual Interaction with friends, and (C) following an active lifestyle. All three variables were assessed

TABLE 1 | Descriptive statistics for gender and college year for anxiety.

Gender	College year	Mean	SD
Female	Freshman	8.57	5.09
	Sophomore	7.88	4.3
	Junior	10.91	4.86
	Senior	14.52	6.47
Male	Freshman	7.11	4.67
	Sophomore	7.43	4.64
	Junior	10.64	5.36
	Senior	10.9	5.66

by using a “YES or NO” response. All the above variables were used individually as there are no know scales for them.

For this study we used the Generalized Anxiety Disorder Questionnaire; Edition 7 (22), a seven-item scale that assesses the clinical markers of GAD. The items are rated on a four-point Likert scale with the score ranging from zero to twenty-one. The reliability of GAD-7 is 0.89 (Cronbach's Alpha). Intercorrelation with Rosenberg Self-Esteem Scale and PHQ-2 were $r = -0.43$ and $r = 0.64$, respectively (23). The Centre for Epidemiological Studies-Depression (CES-D) by (24), a twenty-item scale asking the respondents to rate questions on the defining symptoms of depression. The Cronbach's alpha coefficient was 0.865.

In this study, we examine using two-way analysis of variance (ANOVA) to determine the statistical difference in anxiety levels and depression based on academic year and the field of study. We also predict the levels of anxiety and depression using regression analysis to examine the variables related to COVID risk.

3. Result

3.1. Gender difference

In order to examine the symptoms of Anxiety and Depression among the undergraduate student population in India, we studied a total of 1,037 participants, where clinical symptoms of Anxiety and Depression were observed in 18.2% ($n = 189$) and 25.3% ($n = 263$), respectively.

The descriptive data for anxiety have been shared in **Table 1**. The results indicated a significant main effect for gender $F_{(1,1029)} = 14.24$, $p = < 0.001$, partial $\eta^2 = 0.14$; a significant main effect was found for college years $F_{(3,1029)} = 36.81$, $p = < 0.001$, partial $\eta^2 = 0.97$ and no significant difference was found in the interaction effect of gender and college years $F_{(3,1029)} = 2.716$, $p = 0.044$, partial $\eta^2 = 0.08$.

In Depression, (refer to **Table 2** for descriptive details) the results indicated a significant main effect for college year $F_{(3,1029)} = 4.6$, $p = 0.003$, partial $\eta^2 = 0.13$; a significant

interaction effect of gender and college year was observed $F_{(3,1029)} = 5.7$, $p = < 0.001$, partial $\eta^2 = 0.016$; and no significant main effect was found for gender $F_{(1,1029)} = 3.86$, $p = < 0.05$, partial $\eta^2 = 0.004$.

3.2. Course difference

A two-way ANOVA was performed to evaluate the effects of Course (STEM and Non-STEM) and College year (Freshmen, Sophomore, Junior and Senior) on Anxiety. The Means and Standard Deviations for Courses and College years are presented in **Table 3**.

The results indicated a significant main effect for Course, $F_{(1,1030)} = 16.87$, $p = (< 0.001)$, partial $\eta^2 = 0.016$; a significant main effect for college year, $F_{(3,1030)} = 45.67$, $p = (0.001)$, partial $\eta^2 = 0.117$; and a significant interaction effect between course and college years, $F_{(2,1030)} = 10.93$, $p = (< 0.001)$, partial $\eta^2 = 0.021$. *Post hoc* testing using Tukey's HSD indicated that the anxiety scores of senior year students were significantly different from those of freshmen ($p = < 0.001$) and sophomore ($p = < 0.001$) but not for junior year students ($p = 0.346$) across the courses.

For depression, two-way ANOVA was used to examine the effects of Course (STEM and Non-STEM) and College year (Freshman, Sophomore, Junior and Senior). The Means and Standard Deviations for Courses and College years are below (**Table 4**).

The results indicated a significant main effect for Course, $F_{(1,1030)} = 16.7$, $p = (< 0.001)$, partial $\eta^2 = 0.016$; a significant main effect for college year, $F_{(3,1030)} = 6.95$, $p = (0.001)$, partial $\eta^2 = 0.02$; and a significant interaction effect between course and college years, $F_{(2,1030)} = 0.647$, $p = (< 0.001)$, partial $\eta^2 = 0.001$. *Post hoc* testing using Tukey's HSD indicated that the depression scores of senior year students were significantly different from those of freshmen ($p = 0.042$) whereas no significant difference was observed for sophomore ($p = 0.261$) and junior year students ($p = 0.813$) across the courses.

3.3. Multiple regression analysis for COVID peaks

In order to test the independent contribution of (a) COVID-19 positivity of close friends or relatives, (b) Virtual Interaction with friends, and (c) Active lifestyle to clinical symptoms in the first and second COVID waves (see **Table 5**).

3.3.1. Anxiety

The overall model was significant $F_{(3,1033)} = 3.01$, $p < 0.005$, explaining 48% of the variation. COVID Positivity of close friends or relatives significantly predicted anxiety ($B = -0.229$, $t = -2.87$, $p < 0.005$). Thus, Virtual Interaction with friends and active lifestyle in the model,

TABLE 2 | Descriptive statistics for gender and college year for depression.

Gender	College year	Mean	SD
Female	Freshman	17.73	12.04
	Sophomore	15.98	13.78
	Junior	17.28	13.11
	Senior	23.24	15.71
Male	Freshman	16.47	13.44
	Sophomore	21.22	17.5
	Junior	24.56	18.03
	Senior	20.83	17.6

TABLE 3 | Descriptive statistics for anxiety in academic year.

Course	Academic year	Mean	SD
STEM	Freshmen	5.52	4.4
	Sophomore	7.23	4.6
	Junior	10.83	5.15
	Senior	11.78	6.04
Non-STEM	Freshmen	9.05	4.83
	Junior	7.98	4.3
	Senior	10.8	4.99

TABLE 4 | Descriptive statistics for depression academic year.

Course	College year	Mean	SD
STEM	Freshmen	13.37	8.71
	Sophomore	15.77	15.47
	Junior	18.22	15.29
	Senior	21.42	17.18
Non-STEM	Freshmen	18.9	13.67
	Junior	20.19	15.85
	Senior	20.87	15.46

thus COVID Positivity of close friends or relatives was only significant predictor.

3.3.2. Depression

The overall model was significant $F_{(3,1033)} = 59.1, p < 0.001$, explaining 51% of the variation. Virtual interaction with friends ($B = 1.73, t = -11.1, p = < 0.001$) and active lifestyle ($B = 1.64, t = -3.42, p = < 0.001$) were significant predictors. Thus, Virtual interaction with friends was the strongest predictor, followed by Active lifestyle, whereas COVID positivity was not a significant predictor.

4. Discussions

The data collected from the undergraduate population of India show that the effects of COVID-19 and restrictions such as lockdowns imposed a profound threat with long-lasting aftereffects on psychological health. The findings of this study show a high risk of anxiety and depression among undergraduate students. In general, we observed that 70.5% students show symptoms of Anxiety, whereas students on the borderline or exhibiting clinical symptoms were 42.7%. For depression, we observed clinical symptoms in 25.5% of the students. These findings are supported by other findings where a study by (25) found that anxiety was prevalent in 50% of cases. In depression, a study in Karnataka (India) observed 14.2% of clinical depressive symptoms among undergraduates whereas (26) reported 22.8% for severe depression and 7.2% for clinical depression for students in Bangladesh. A meta-analysis, conducted by (27) reported an increase in prevalence post-COVID outbreak at 40.7% for anxiety and 35.9% for depression. However, we see studies reporting a wide range of variations in the rate of anxiety and depression found in undergraduate students (27).

Gender differences prevailed as we observed significant main effects of gender on anxiety levels, main effects of college year and also their interaction. However, in depression we found that the main effect of gender does not exist, rather a significant main effect of the academic year and the interaction between gender and academic year. These results are supported by studies with similar findings: a study conducted in India (Kashmir valley) found that anxiety was majorly associated with the female gender (28); with higher states of anxiety in females than males during COVID (29) and another study conducted in Chinese population found an increased prevalence of anxiety symptoms among females and depression for males (30). Other studies have reported an increased risk of females for anxiety and depression due to increased isolation and previously present symptoms. Various variables play roles in their relationship with the clinical symptoms found in gender. A study conducted by Tang and He (31) revealed that during the pandemic, the academic engagement of students suffered highly due to depression. Another study reported that COVID-19 protocols restricting normal day activities affected the mental health of men and women differently, suggesting a sudden increase in the vulnerability of men toward depression (32).

Our Data highlighted the main effect of course, academic year, and their interaction effect of on the risk of developing anxiety and depression. Many studies have stressed the role of course in affected mental health during COVID. A study on medical students reported that half of the sample reported symptoms of mental disorder and only 13.2% demonstrated normal values (33). In this paper, we emphasize the two courses Indian students are largely enrolled in, i.e., STEM and non-STEM courses. Considering that different students were in different academic years, differences in the range

TABLE 5 | Multiple regression models for three variables studied during COVID.

	t	P	B	F	df	P	Adj R2
<i>Anxiety overall model</i>				3.01	1033	0.002*	0.48
<i>COVID positivity of close friends or relatives</i>	-2.87	0.003	-0.229				
<i>Virtual interaction with friends</i>	0.79	0.43	0.06				
<i>Active lifestyle</i>	0.41	0.684	0.032				
<i>Depression overall model</i>				59.1	167	<0.001**	0.51
<i>Covid positivity of close friends or relatives</i>	1.08	0.28	1.56				
<i>Virtual interaction with friends</i>	-11.1	<0.001	1.73				
<i>Active lifestyle</i>	-3.42	<0.001	1.64				

** $p < 0.001$. * $p < 0.05$.

of mental health risks were observed. In both the STEM and non-STEM courses, we found that students enrolled in the senior, junior, and sophomore years had an elevated range of anxiety symptoms when compared to freshmen. For Depression, we see that the junior and senior year students are more at risk than students in the first and second year of their academic setting, putting them at higher risk. We see that students are at an all-time high risk of developing mental disorders due to various reasons, such as Genetic and Psychosocial Vulnerability (34), poor performance in exams, high workload, and coping strategies used (35), which is further intensified due to restrictions imposed during COVID-19 (36). COVID restrictions resulted in sudden changes in daily lifestyle that were dealt with major adaptations. Junior and senior year students regardless of the course were at high risk due to never-ending restrictions. For the freshmen, we could say that the impossibility of not being able to attend university, and the sudden switch to online classes and meeting with friends and partners could be some projected reasons. Students in their final years might be apprehensive about their future, especially students whose job profiles suit on-site work and maintaining study and home boundaries while at home. A study in Italy (37) and Germany (36) reported that students were suffering from the inability to meet friends, being distant from colleagues and attending university.

We also found that increased anxiety is significantly predicted by close friends or family members testing COVID positive. A study found that families of people testing COVID positive exhibited symptoms of anxiety and depression after a 12-month follow-up (38). Two studies reported that the relatives of people diagnosed with COVID-19 had heightened anxiety symptoms and mental health issues over those not diagnosed with COVID (39) and pandemic-related worries with lesser depressive symptoms (40). Another study conducted on adolescents reported frequent usage of electronic communication with friends to ameliorate the stress of isolation and depression (41) especially face-to-face contact or phone/video contact (42). During the pandemic, it was found that people who engaged in active lifestyles maintained healthy mental health. Ai et al. (43)

found that physical exercise during the pandemic enhanced happiness and decreased the symptoms of depression and other symptoms related to isolation or quarantine (44). A systematic review (45) of thirty-one studies suggested that people who followed an active routine of exercise during the first year of COVID alleviated the symptoms of negative mental health such as lowering symptoms of depression by increasing well-being with quality of life. It was further concluded that governments of respective states must advise their citizens to engage in exercise during stay-at-home orders.

We found significantly high depressive symptoms in individuals with less virtual contact with friends and a sedentary lifestyle. A study found alleviation of depressive symptoms among people who had online social support (46). Increased social media connectedness during COVID-19 had increased screen time among users which served as boon if used as a healthy digital habit (47)

Finally, we can say that the study demonstrated a relationship between gender (male and female), academic field, and academic course on mental health confirming previous studies where gender differences were observed for developing clinical symptoms of Anxiety. However, we also found that the field of study has an impact on mental health, especially interacting with the academic year. The increased levels of anxiety and depression in the senior and junior years should be a concern and immediate mitigation strategies should be imposed for better mental health of students.

4.1. Limitations and future directions

To our knowledge, this is the first study that identifies the risk of anxiety and depression in the undergraduate population of India emphasizing the vulnerability due to the year of the college course. The study was undertaken during the time India was dealing with extreme health emergencies related to COVID-19. The sample was representative of Indian undergraduates from Indian Technical Institutes or Central Universities. Limitations of the study are related to online snowball sampling and survey design preventing

casual interpretations of data. Other limitations were that the study did not rely on the clinical diagnosis of the respondents but on the measures (GAD-7 and CES-D) that have been standardized and commonly used.

5. Results

In this study, we found elevated levels of anxiety and depression among seniors, junior, and sophomore when compared to freshmen, which depended on the gender and the field of study chosen.

6. Conclusion

This study found an increased risk of anxiety and depression among undergraduate students. Gender differences prevailed in the levels of anxiety and depression. In general, students enrolled in different fields of study and their academic year also affected their mental health. We also found that symptoms of anxiety increase in individuals whose families or friends are diagnosed with COVID-19 and severe depression can be managed if virtual contact with friends is maintained and an active lifestyle is followed.

Author contributions

TP and MA conceived and designed the study. SS conducted research and collected and organized data. TP and MA wrote the draft of the manuscript. All authors approved the final draft of the article.

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