Exam Anxiety and Its Associated Risk Factors Among Indian Medical Undergraduates

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A B S T R A C T

Background: Exam anxiety is a global troublesome psychological problem, impairing the academic performance of medical students. This study was planned to estimate the prevalence and associated risk factors of Exam anxiety among Indian medical students

Methodology: A cross-sectional analytical study was conducted among 230 Indian medical undergraduate students. Westside Test Anxiety Inventory (WTAI) was used to estimate the level of Exam anxiety among medical students. We utilized multivariable logistic regression to identify independent risk factors among medical students.

Results: The prevalence of high Exam Anxiety among medical students was 49.6 % (95% CI 43.9-57.0). The mean age of the students was 21.3 years. Multivariable logistic regression revealed the presence of excessive course load [AOR=2.22,95% CI:(1.03,4.78)], the presence of psychological stress [AOR=2.89,95% CI:(1.51,5.48)] and low self-esteem [AOR=8.15,95% CI:(1.51,43.96)] to be independent risk factors for exam anxiety.

Conclusions: Our study findings suggest that the prevalence of Exam anxiety is very high among Indian undergraduate medical students. Our study also showed that the perception of excessive course load, psychological stress and low self-esteem were the independent risk factors in medical students.

Keywords: Test anxiety, medical students, Prevalence, India, Psychological Distress, self-concept

How to cite this article:

Sharma A, Singh SP, Saket S, Kushwaha P, Gahlot A. Exam Anxiety and Its Associated Risk Factors Among Indian Medical Undergraduates. Natl J Community Med 2023;14(6):348-356. DOI: 10.55489/njcm.140620232774

INTRODUCTION

Anxiety is defined as "an unpleasant emotional state characterized by subjective feelings of tension, apprehension and activation of the autonomic nervous system".[1] Anxiety level among medical students is of rising concern in the present days. A systematic review with aim of estimating the global prevalence of anxiety among Medical students reported it to be around 33.8 percent which means one in three suffering from high anxiety levels.[2] Whether the examination system among medical students mostly in the form of one single assessment after finishing the whole syllabus is the main cause of anxiety has not been adequately researched. Previous studies among medical undergraduates suggest that Exam anxiety prevalence ranges between 25 to 50%.[3,4] There is a paucity of data regarding the prevalence of Exam related anxiety among Indian Medical students.

Exam anxiety also called test anxiety is a psychological condition in which people experience extreme distress and anxiety in testing situations.[5] This distress can be in response to the Exam or its outcome.[6] When this distress is excessive in nature, it has been found to be impairing learning experience and test performance.[7,8] Exam anxiety manifestations can be in the form of physical symptoms like palpitation, sweating or in the form of cognitive symptoms like inability to recall what has been learned well or in form of mood-related symptoms like feeling depression, withdrawal symptoms.[9,10] Some studies suggest that the COVID-19 pandemic has generated a higher level of exam anxiety.[11] Impact of COVID-19 on Exam Anxiety among Indian Medical Undergraduates has not been reported.

Many predictors of Exam anxiety have been studied. Few studies suggest that a lack of self-esteem is associated with High Exam anxiety.[12,13] Social support has been found to be negatively correlated with Exam Anxiety.[14] Lack of time management skills has been found to contribute to Exam Anxiety.[15] Some studies report excessive academic pressure to be associated with Exam Anxiety.[16,17] However, these factors have never been collectively studied among Indian Medical Undergraduates. Therefore, this study was planned to estimate the prevalence of Exam Anxiety among Indian Medical students and to determine the associated risk factors with Exam Anxiety.

METHODOLOGY

Study design and settings: We conducted an institutional based cross-sectional analytical study at Rama University. An institutional cross-sectional analytical was conducted at Rama University. The study was conducted for a period of 7 months from December 2021 to June 2022. All medical undergraduates enrolled in the university were eligible to participate in the study.

Sample size determination and sampling technique: The required sample size to estimate the prevalence of test anxiety among the medical students was done through sample size estimation for single proportion formula. The adequate sample size for single is calculated by formula; $n = \frac{z^2_{(1-\alpha/2)}P(1-p)}{d^2}$; where n= adequate sample size, p= percentage, d=desired level of precision and Z=standard normal value at the level of confidence desired, usually at 95% confidence level. We assumed the prevalence of exam anxiety to be 33 % based on the finding of an Indian study.[18] 95% confidence interval was used. Absolute precision of 5% between the sample and the parameter was taken. Finite population correction was done since total undergraduates studying in the medical college were 450. Response rate of 85% was considered. Putting these values into the formula, we found the estimated sample size to be 228.We rounded the sample size to 230.

Sampling technique employed in the study was stratified random sampling. The number of study participant selected from each of the four batch was based on its population proportion relative to total.

Data collection procedure: Data was collected through the use of self-reported and structured questionnaire. This self-reported question was developed in five sections. The first section assessed sociodemographic profile of the medical students. The second section comprised academic related variables like percentage marks obtained in last attempted annual examination, perception of academic course load etc. The third section assessed the lifestyle related characteristics of the study participant. The fourth section assessed psychological state of the study participants using **Rosenberg self-esteem scale** [19], **Oslo 3-item social support scale**[20] and **Kessler Psychological Distress Scale**[21]. The fifth section assessed test anxiety using **Westside Test Anxiety Inventory**[22]. Pilot testing of the questionnaire was done on 15 nursing students of the institution; the results of the pilot study was not included in main study. The questionnaire was modified according to the pilot testing findings. This form was later designed in the electric platform of Google forms. The link of this form was mailed to the randomly selected 230 students.

Measures used in the study: Exam anxiety was the dependent variable in the study. It was assessed using **Westside Test Anxiety Inventory**[22] (WTAI). This inventory was developed Richard Driscoll. It is a self-reported questionnaire of 10 items. Respondents were asked regarding their feelings before, during and after exam. Each statement response is recorded on 5 -point Likert scale. Response of 10 questions is summed. This summed value is divided by 10 to obtain an individual's test anxiety score. Participants are attributed to 6 levels of Exam anxiety based on WTAI score: 1.0-1.9 as comfortably low-test anxiety; 2.0-2.4 as normal or average test anxiety; 2.5-2.9 as high normal test anxiety; 3.0-3.4 as moderately high;

3.5-3.9 as high-test anxiety and 4.0 -5 as extremely high anxiety shown in **Table 1**. Internal consistency as measured through Cronbach Alpha was found in 0.94 in medical student population[23].

Self-esteem- Self-esteem of the medical students was assessed through the Rosenberg Self-esteem scale (RSS).[19] It comprises of 10 items. 5 items are positive statements and the other five are negative statements. The responses are in 4-point Likert scale. Scores can range from 10 to 40. Self-esteem level is categorized as low (10-25), medium level (26-29) and high level (30-40).

Social support- Social support system of the medical students was assessed by Oslo 3-item social Support scale (OSSS-3)[20]. The sum score ranges from 3 to 14. Score between 3-8 were categorized as poor, moderate between 9-11 and strong social support between 12-14.[20] It has satisfactory internal consistency with Cronbach alpha of 0.640.

Psychological distress- Psychological distress was assessed using Kessler Psychological Distress Scale (K-10)[21]. It has 10 items. Responses are in 5-point Likert scale. Scores can range from 0 to 50. Higher score implies higher level of psychological distress. Score between 20-50 implies presence of psychological distress.

Data processing and analysis: Data collection was done through the online platform of Google forms. This platform helped the in collection of clean data as data validation tools were applied in the form. Data from the Google forms was downloaded into Google sheets. Data was then imported to SPSS 21 for analysis. Qualitative variables were presented as frequencies and percentages. Quantitative variables were first checked for normality of distribution with the help of Q-Q plot in SPSS software. Normally distributed quantitative data was presented as Mean and Standard deviation whereas in case of skewed data Median and inter quartile range were used. Chi square test was employed for inferential statistics among qualitative variables. A *p*-value of less than 0.05 was considered as significant. In the analysis's later part, we merged categories for simplification. Comfortably low Exam Anxiety, normal or average Exam anxiety and high normal exam anxiety (Score range- 1 upto 2.9) have been merged as Low Exam Anxiety. Moderately high, High Exam Anxiety and Extremely high anxiety (Score range- 3.0 upto 5) were merged as High Exam Anxiety Levels Bivariate and multivariable logistic regression analysis was conducted to find out independent risk factors of Exam anxiety among the medical students.

Ethical consideration: This study was reviewed and approved by Institutional Ethics Committee of Rama Medical College and Hospital & Research Centre, Kanpur (RMCHRC/Ethics/2022/2021-A). Informed consent was collected from each study participant. Study participants were provided Participant information sheet and they were also orally informed regarding the purpose of study. The participants were informed that their participation was completely voluntary. Personal identifiers of the study participant were not collected. The participants were also informed that data collected would be kept confidential and would be used for research purpose only.

RESULTS

A total of 230 students participated in the study. The mean age in years was 21.3 ± 1.9. Seventy (30.3 %) students were from the first academic year. Another 60 (26.2%) were from the second year, 56 (24.2%) from the third year and 44 (19.3%) were from the Fourth academic year. Males were 114 and constituted nearly half of the study population (49.6%) shown in **Table 2**.

The mean Exam Anxiety score was found to be 2.98 ± 1.0 with a range of 1 to 5. Category wise 40(17%) had comfortably low Exam Anxiety. Normal or average test anxiety was seen in 42(18%). High normal Exam anxiety was seen in 34 (15%) participants. Moderately high Exam Anxiety was seen in 45(20%) participants. Another 29(13%) and 40 (17%) had high Exam Anxiety and extremely high Exam anxiety respectively shown in **Figure 1**. In the analysis's later part, we merged categories for simplification. Comfortably low Exam Anxiety, normal or average Exam anxiety and high normal exam anxiety have been merged as Low Exam Anxiety. Moderately high, High Exam Anxiety and Extremely high anxiety were merged as High Exam Anxiety levels. High exam anxiety levels were seen in 114 (49.6%) of the students.

Response to every 10 questions of the Westside test anxiety scale has been presented in **Figure 2**. The Westside test anxiety reliability was assessed in medical students through Cronbach Alpha. The Cronbach alpha value was found to be 0.917. Exploratory factor analysis was performed to assess the Construct validity of the Westside Test anxiety scale in the Indian medical student population. Questionnaire was found to be one-dimensional as assessed by principal axis rotation (Varimax) with Eigen value>1 and total variance of 53.3%. Marks obtained (%) in last attempted annual final examination was elicited by a scatter plot, which revealed an inverse linear relationship shown in **Figure 3**.

Bivariate analysis was conducted to find out the association between various demographic and behavioural risk factors with Exam anxiety. The feeling of excessive course load, poor time management, psychological distress, lack of social support and low level of self-esteem were significantly associated with High Exam Anxiety. We also assessed the strength of the association through Cramer's V value in the case of significant associations. A strong relationship is reported when Cramer's V is greater than 0.25.[24] Excessive course load, psychological distress and low esteem had a Cramer's V higher than 0.25. However, gender and age did not have a significant association with Exam Anxiety as shown in **Table 3**.

Table 1: Westside Test Anxiety Scale scores

Severity	Score
Comfortably low-test anxiety	1.0-1.9
Normal or average test anxiety	2.0-2.4
High normal test anxiety	2.5-2.9
Moderately high	3.0-3.4
High test anxiety	3.5-3.9
Extremely high anxiety	4.0 -5

Table 2: General characteristics of medical students (n=230)

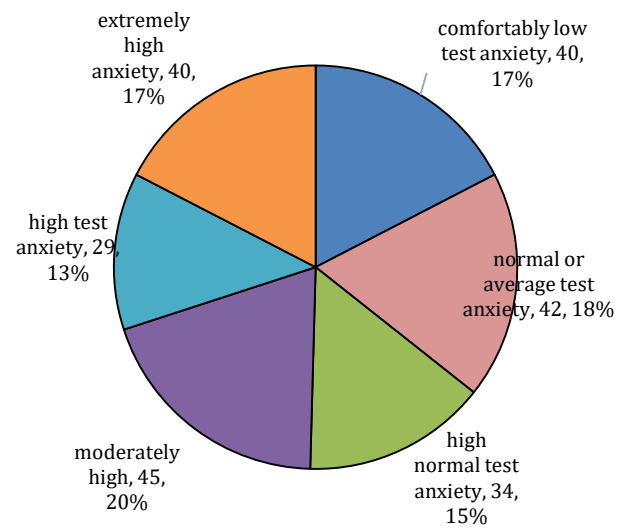| Variables	Students (%)
Age in years (Mean ± SD)	21.3 ± 1.9
Gender	
Male	114 (49.6)
Female	116 (50.4)
Academic year	
First	70(30.3)
Second	60(26.2)
Third	56(24.2)
Fourth	44 (19.3)
Mean Exam Anxiety Score	2.98± 1.0
Maximum	5
Minimum	1
% in last year final exam (Median-IQR)	79 (68-87)
Exam Anxiety	
Low	116 (50.4)
High	114 (49.6)

Figure 1: Exam Anxiety levels among medical students

In order to obtain independent risk factors for Exam anxiety among medical students, multivariable logistic regression was performed. In multivariable logistic regression model, independent variable with p value <0.2 were included. The findings have been presented in **Table 4**.
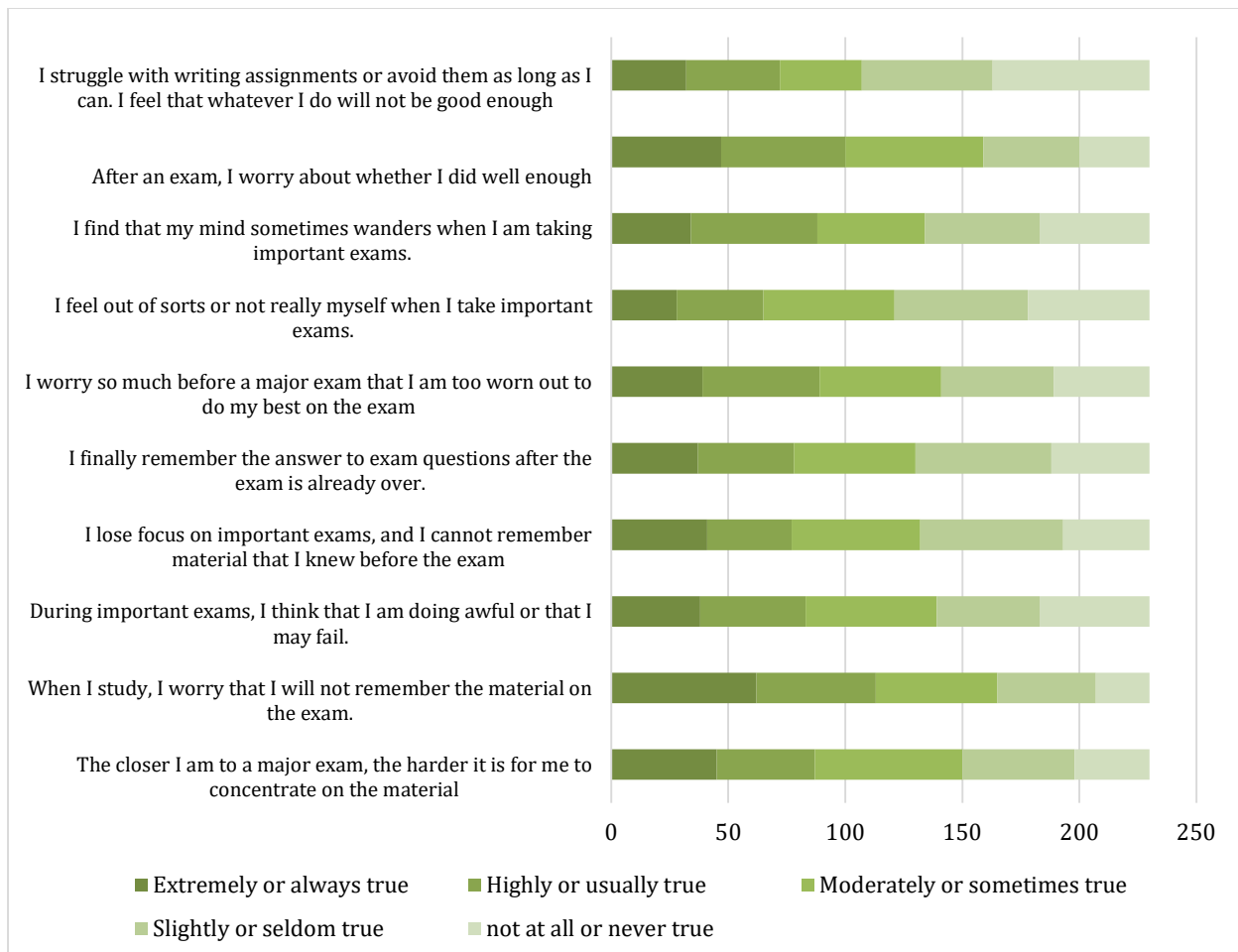

Figure 2: Stack bar chart showing responses to Westside Exam Anxiety scale
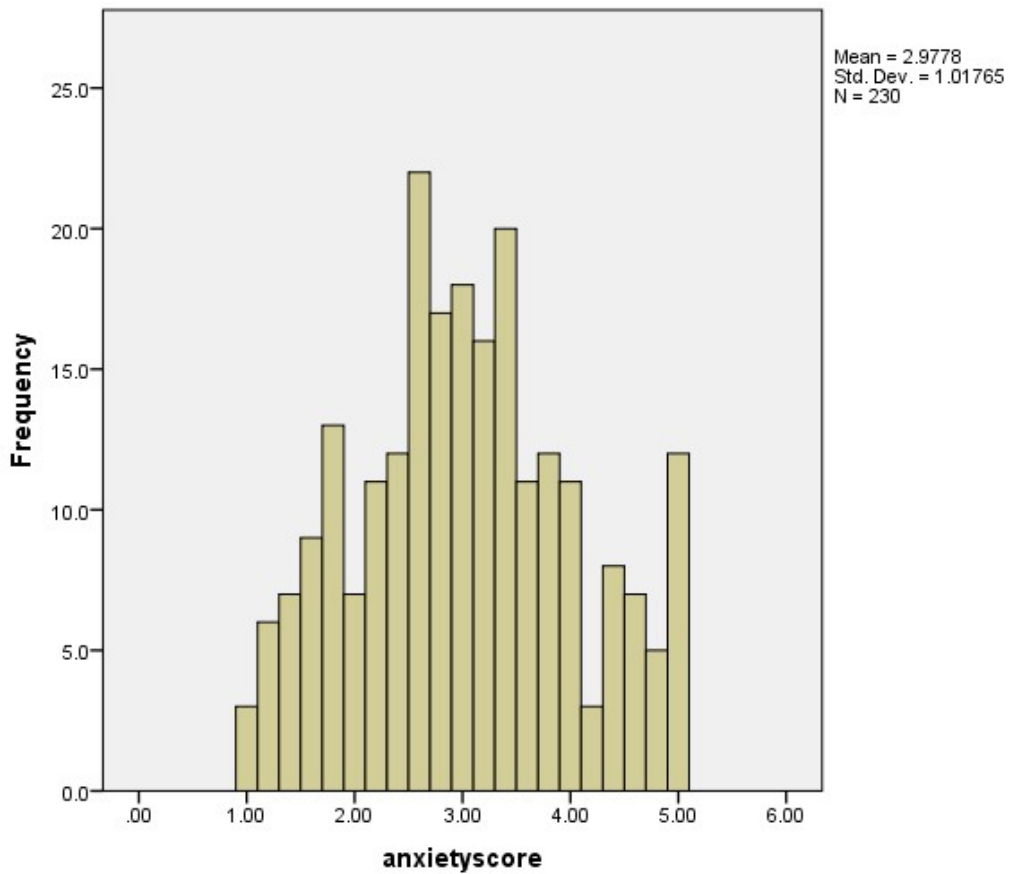
Figure 3: Histogram showing Exam Anxiety scores among medical students
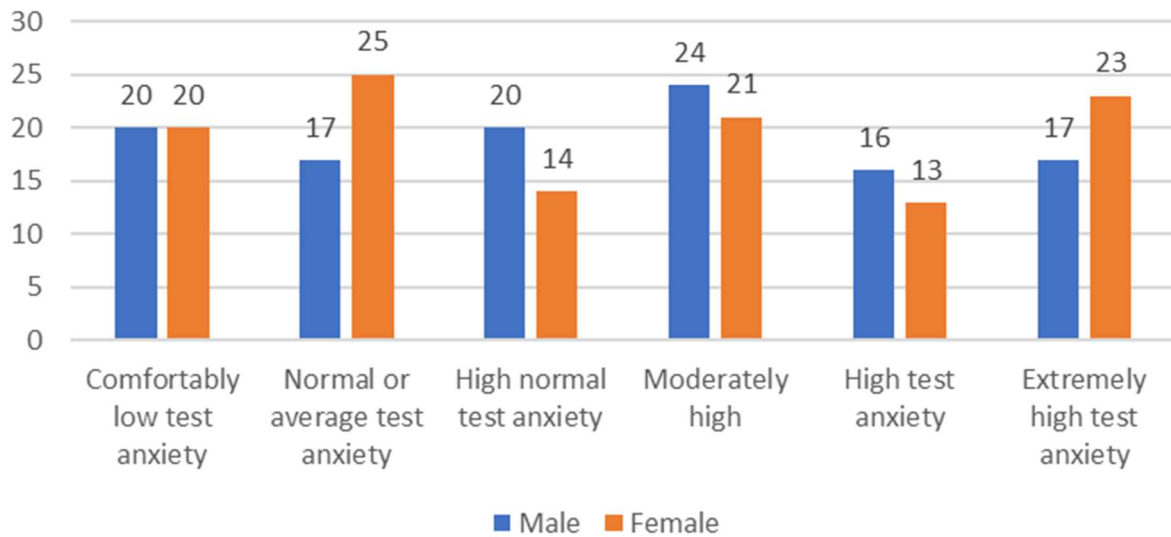

Figure 4: Anxiety levels across male and female medical students

In the first 3 columns of the table, findings of simple logistic regression have been presented followed by Multivariable logistic regression. So, for each independent variable we obtain Crude Odd's ratio from Simple Logistic Regression and an Adjusted Odd's Ratio from Multivariable logistic Regression. The Overall model test was highly significant which suggests regarding acceptability of the Multivariable logistic model. The Negelkerke R square value for the model was 0.244 which means 24.4 percent of variance in the Exam Anxiety among the medical students can be explained by these independent variables. Presence of excessive course load [AOR=2.22,95% CI:(1.03,4.78)], presence of psychological stress [AOR=2.89,95% CI:(1.51,5.48)], Low self-esteem [AOR=8.15,95% CI:(1.51,43.96)] were significant predictors of Exam Anxiety among the medical students.

Table 3: Association of various demographic and behavioural risk factors with Exam Anxiety among medical students

	High Exam Anxiety		P value	Effect size
	Low (n = 116) (%)	High (n = 114) (%)		
Gender				
Male	57 (50.0)	57 (50.0)	0.896	Not Applicable
Female	59 (50.9)	57 (49.1)		
Age in years	21.2±1.91	21.5±1.85	0.239	NA
Feeling of excessive course load				
No	41 (71.9)	16 (28.1)	<0.001	0.247
Yes	75 (43.4)	98 (56.6)		
Having a study plan				
Yes	67 (55.4)	54 (44.6)	0.115	NA
No	49 (45)	60 (55.0)		
Enough Revision times				
No	77 (48.1)	83 (51.9)	0.289	NA
Yes	39 (55.7)	31 (44.3)		
Time management				
Good	64 (58.2)	46 (41.8)	0.024	0.148
Poor	52 (43.3)	68 (56.7)		
Psychological Distress				
No	74 (69.8)	32 (30.2)	<0.001	0.358
Yes	42 (33.9)	82 (66.1)		
Social Support				
Moderate	68 (48.9)	71 (51.1)	0.015	0.191
Poor	9 (31.0)	20 (69.0)		
Strong	39 (62.9)	23 (37.1)		
Self esteem				
Average	75 (51.0)	72 (49.0)	<0.0001	0.303
High	39 (65.0)	21 (35.0)		
Low	2 (8.7)	21 (91.3)		
Did you suffer from COVID-19 this year				
No	89 (51.4)	84 (48.6)	0.593	NA
Yes	27 (47.4)	30 (52.6)		
Did any of the close family member suffer from COVID-19 this year				
No	64 (53.3)	56 (46.7)	0.358	NA
Yes	52 (47.3)	58 (52.7)		
Do you use tobacco products (cigarettes/ smokeless tobacco)				
No	108 (51.4)	102 (48.6)	0.329	NA
Yes	8 (40.0)	12 (60.0)		
Do you regularly consume alcoholic products				
No	110 (50.5)	108 (49.5)	0.975	NA
Yes	6 (50.0)	6 (50.0)		
% mark in last final year exam in mean ± SD	78.9±10.8	75.3±12.7	0.025	0.307
Exercise duration per week				
< than 150 minutes	61 (46.6)	70 (53.4)	0.177	NA
≥ 150 minutes	55 (55.6)	44 (44.4)		
Daily internet use				
Up to 1 hour	30 (54.5)	25 (45.5)	0.485	NA
>1 hour	86 (49.1)	89 (50.9)		

Table 4: Multivariable logistic regression for predictors of Exam Anxiety among medical students

Predictors	Simple logistic Regression			Multivariable logistic Regression		
	OR	95% (CI)	P value	AOR	95% (CI)	P value
Excessive course load (Yes vs No)	3.348	1.746-6.422	<0.001	2.222	1.0336-4.776	0.041
Study plan (No vs Yes)	1.519	0.903-2.56	0.115	1.064	0.5568-2.034	0.851
Time management (Poor vs Good)	1.819	1.078-3.07	0.025	0.948	0.4843-1.857	0.877
Psychological stress (Yes vs No)	4.515	2.587-7.881	<0.001	2.878	1.5108-5.481	0.001
Social support						
Moderate versus strong	1.77	0.959-3.269	0.068	1.427	0.6936-2.935	0.334
Poor versus strong	3.768	1.471-9.651	0.006	1.348	0.4469-4.067	0.596
Self esteem						
Average versus High	1.783	0.958-3.318	0.068	0.994	0.4667-2.117	0.987
Low versus High	19.5	4.164-91.321	<0.001	8.149	1.5107-43.96	0.015
Exercise (<150 min/week vs ≥150 min / week)	1.434	0.849-2.42	0.178	0.851	0.4612-1.570	0.606

Negelkerke R square= 0.244, Overall model test; Chi square-46.6 *P* -<0.001
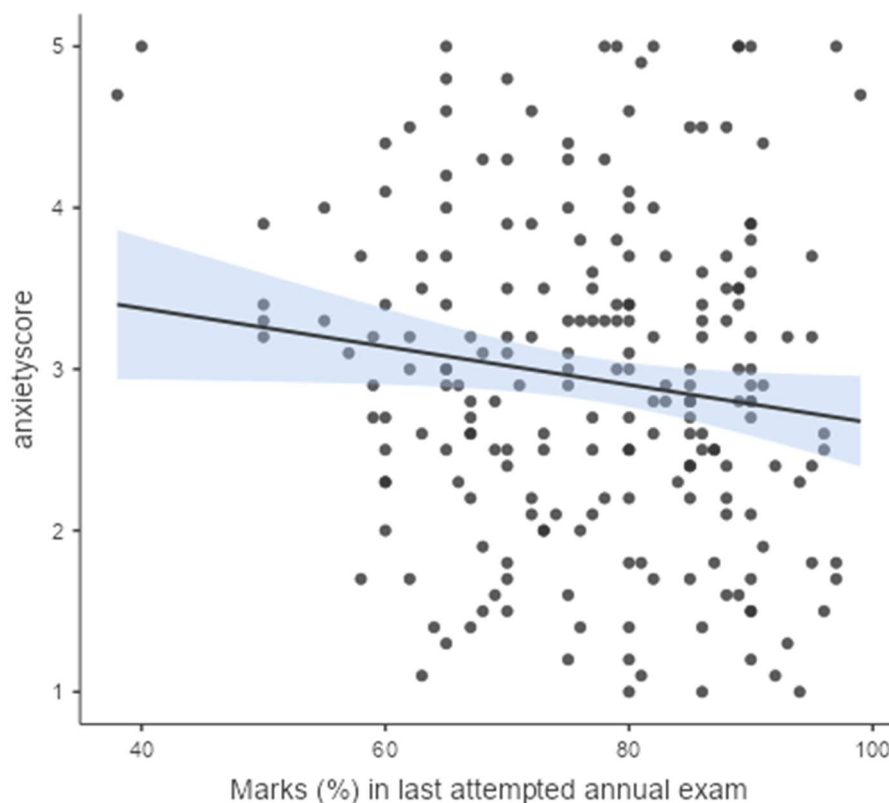OR- Odd's ratio; AOR- Adjusted Odd's Ratio; CI- Confidence Interval

Figure 3: Scatterplot reflecting relationship between marks obtained (in %) in last attempted final annual exam and Exam anxiety score

DISCUSSION

This study was conducted to estimate the prevalence of Exam Anxiety among medical students and also to determine its risk factors. A total of 230 medical students participated in this study. The mean age of students was 21 years.

In our study, one out of every two medical student was suffering from high Exam anxiety (prevalence- 49.6%). Tsegay L et al. conducted a similar study among medical students in Addis Ababa Ethiopia. They conducted their study using Westside Test Anxiety Inventory as used by us.[23]Prevalence of problematic Exam Anxiety was seen in 52.3 percent. Another study By Saravanan C et al. among Malaysian medical students reported the prevalence to be 28 percent.[4]Patil S G et al. conducted a study among Indian Medical students in the Vijayapura district. It was found that the prevalence of high exam anxiety among phases I-III was 37 %, 28 % and 32%, respectively.[18] Another study by Nazir MA et al. among medical and dental students in the Punjab province of Pakistan found that almost half the sample scored high on test anxiety.[25] So, our study's high prevalence of Exam anxiety among medical students confirms previous reports.

The excessive course load was found to be an independent risk factor for Exam Anxiety among medical students in our study. Our findings are consistent with previous studies among medical students.

Tsegay L et al. in their study of medical students in Adis Ababa, Ethiopia reported that female sex, having low grades, being in the first year, having excessive course load and taking oral examinations were found to be independent predictors of exam anxiety.[23] In a study done by Patil SS et al. among medical interns at Government Medical College, Nagpur reported that excessive course was the most common factor contributing to Exam anxiety. Tassadaq MM et al.; in their study among medical students in the United Arab Emirates reported that the perception of the course load as heavy was significantly associated with high Exam anxiety.[26]The feeling of excessive course load among medical students may be due to the vastness of medical courses. In a span of four and half years, medical students are trained and educated in 19 medical subjects. Another factor for the feeling of excessive course load among Indian medical students could be due to Examination patterns. The medical examination is mostly summative in nature in the form of annual examinations. The syllabus for these examinations is generally all the academic material taught over the year. However, the National Medical Council has introduced Formative assessment in the medical curriculum which is gradually been adopted across medical colleges.[27] This change in Examination pattern might reduce Examination related anxiety among Indian medical students upon successful implementation of formative assessment.

In our study, psychological distress was an independent predictor for Exam anxiety. This association

is line with previous studies dome among medical students across different parts of world.[13,23,28,29] This finding emphasizes on the fact Exam anxiety is not a separate psychological entity. It is related to background mental health. The students entering medical education should be initially as well as periodically assessed regarding psychological health by the Experts. This will lead to early detection and treatment of psychological distress and ultimately better learning outcome among medical students.

Low self-esteem was also found to be an independent predictor of Exam anxiety. Self-esteem has been defined as "subjective evaluation of his or her worth as person".[30] Self-esteem involves feeling of self-respect and self-acceptance. Our findings are in line with a south Indian study among nursing students.[31] Interventions like Cognitive-behavioural therapy which have been found to increasing self-esteem should be tried on medical students.[32] It is a scope for future research as there is paucity of intervention-based study improving self-esteem among the medical students.

In our study, gender of the student did not have significant association with Exam anxiety prevalence. However, one Indian study conducted in western part found that female students had a higher exam anxiety as compared to males.[33] Another study in Eastern India reported a contrast findings where males were higher prevalence of exam anxiety.[34] A clear relationship between gender and exam anxiety can be explored with a pan Indian study.

While interpreting the results of the present study, certain limitations should be considered. The study sample represents medical students from one medical university. The findings of this study need to be replicated in a more representative pan-India study. Another limitation of the study is that research data was gathered with the help of self-reports, which might be biased due to self-perceptions. The study is cross-sectional in nature so it does not explain the temporality and causality of association. Future studies could include more variables (e.g., Examination patterns and academic performance). Despite these limitations, the present study provided new evidence regarding Exam Anxiety among medical students especially as it can contribute to understanding Exam anxiety determinants in Indian settings. The findings of the study can be used to develop counselling programs for medical students to improve their self-esteem of the students.

CONCLUSION

Our study findings suggest that the prevalence of Exam anxiety is very high among Indian undergraduate medical students. Our study also showed that the perception of excessive course load, psychological stress and low self-esteem were the independent risk factors in medical students. Interventional studies which propose to modify these risk factors should be conducted among medical students in order to bring out effective interventions which decrease Exam anxiety among medical students.

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