Prevalence and Factors Associated with Depression and Anxiety Among Undergraduate students in Barishal University: A cross-sectional study

Submitted By

UMME KULSUM

Class Roll : 19 STA 002

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Department : Statistics

Supervised By

Dr. Tania Islam

Assistant Professor,

Computer science & Engineering

University of Barishal.

Abstract

University students' mental health issues have recently become a major worldwide public health concern. The present study investigates the prevalence of anxiety and depression among Barishal University students as well as their potential underlying factors. A total of 380 students have been selected by undertaking the procedure of purposive sampling. There were no gender differences in the prevalence rates of moderate to extremely severe levels of anxiety and depression, which were 26% and 43.6%, respectively. Unsatisfactory sleep quality, feeling loneliness in university environment, lack of physical exercise and dissatisfaction with subject, dissatisfaction with future career, financial condition and current education were risk factors for depression. The primary risk factors for anxiety were excessive internet use and feeling lonely in university environment. These results suggest the importance of intervention programs and raising students' awareness about mental health problems.

Keywords: Prevalence, Depression, Anxiety, Undergraduates.

Acknowledgment

At first, all praise to the almighty Allah keeping me physically and mentally fit to complete this humble work. I express my scared gratitude to the omnipotent and omniscient Allah, who gave us the wisdom of creation and without his blessing this great task, could not be ended.

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1 Introduction

1.1 Background of the Study

"Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity," according to the definition provided by the World Health Organization. Many individuals neglect the significance of mental health because they believe that being health means being physically good and free from illness. As a result, mental well-being is a crucial component of a healthy life. Numerous life-threatening illnesses, including cancer, which has only been linked to psychological distress at higher degrees, as well as deaths from external causes and cardiovascular disease, will result from poor mental health.

Depression and anxiety are regarded as major indicators of mental health in the community. Depression and anxiety are serious mental health problem that can have an impact on person’s day-to-day life. Unfortunately, if these mental illnesses are not identified and treated, mental health disorders may rise. The university life of a student is the most emotionally and intellectually stressful period of their life. A student experiences a great deal of obstacles at this stage that can lead to physical, social and emotional difficulties.

1.2 Research Problem and Motivation

The prevalence of depression and anxiety among undergraduate students become a major global health concern, affecting both their general well-being and academic performance. This study aims to investigate the prevalence of depression and anxiety and associated factors among Barishal University students.

The motivation for undertaking this study stems from a genuine concern for the well-being of undergraduate students at Barisal University. As the university environment plays an important role in the development of young people's lives, it is important to create a supportive atmosphere that supports both academic and mental well-being. By gaining insights into the specific factors influencing depression and anxiety in this context, we aim to contribute valuable knowledge that can inform the development of targeted interventions.

Furthermore, the motivation is grounded in the belief that tackling mental health issues at Barisal University will not only benefit the current student population but will also have a positive impact on the university community as a whole. Recognizing the interconnectedness of mental health and academic success, the study seeks to provide evidence that can empower university administrators, educators, and mental health professionals to implement proactive measures that foster a more nurturing and conducive environment for learning and personal growth.

1.3 Objectives of the Study

The objectives of this study are as follows:

1. To determine the prevalence of depression and anxiety among Barishal University students.
2. To identify associated factors contributing to depression and anxiety among the students.

2 Literature Review

Mental health problem has become of great public health concern in the world. Choon Khim Teh et al. (2015) investigates the prevalence of stress, anxiety and depression among undergraduate students in Melaka Manipal Medical College in Malaysia. In this study, prevalence rates for moderate to extremely severe stress, anxiety and depression are 16.6%, 55.5%, and 30.7% respectively. This study indicates strong associations between social life, relationship status and total family income per month with depression and anxiety associated with only ethnicity. In order to increase undergraduate students' quality of life, this study emphasizes the need to provide them with appropriate attention. Shamsuddin, K. et al. (2013) determine that the percentages are 23.7%, 63.0% and 37.2%, for stress, anxiety and depression among Malaysian university students. The prevalence of anxiety and stress scores was higher among female students and first- and second-year students among a group of Turkish university students had higher depression, anxiety and stress scores than the others. The prevalence of depression, anxiety and stress levels of moderate severity or higher was found in 27.1%, 47.1% and 27% respectively (Nuran Bayram et al., 2008).

Ayat R. Abdallah and Hala M. Gabr (2014) identify the associated factors and prevalence of stress, anxiety and depression among first-year medical students at Menoufiya University. Various social, behavioral, demographic, and educational

factors associated with psychological illness; among them, gender, residence, feeling loneliness, studying in the English language, problem with exam criteria were common. First-year students have a new place of residence, a new curriculum, a new daily food pattern, new friends. They found that the prevalence of depression, anxiety and stress among students was 63.6%, 78.4%, and 57.8% respectively. Academic, financial insecurity and professional uncertainty raise depression and anxiety among university students during the COVID-19 pandemic in Bangladesh. Students were experiencing mild to severe anxiety (87.7%) and depression (82.4%) (Md. Akhtarul Islam et al.,2020). Saiful Islam et al (2020) determined that the prevalence rates of moderate to extremely severe levels of anxiety and depression were 61% and 69.5% respectively among first-year students in Bangladesh as well as contributing factors. First year students were more susceptible to mental issues due to ragging and other problems. Unsatisfactory sleep quality, and a lack of physical exercise were the primary risk factor for depression and excessive internet use was the main risk factor for anxiety. The prevalence rate of anxiety was 58.1% and depression was 52.2% among university students in Bangladesh (Mamun et al.,2019).

Numerous research studies have examined anxiety and depression in student populations. According to reports, the prevalence rate of anxiety is 68.6% in India (Kumari et al., 2019), and 63% in Saudi Arabia (Kulsoom & Afsar, 2015). According to reports, the prevalence rate of depression is as follows: be 43.7% in India (Kumari et al., 2019), 43% in Saudi Arabia (Kulsoom & Afsar, 2015). There is currently a knowledge gap because there has been no prior research examining the prevalence of anxiety and depression among Barishal University students. Furthermore, the motivation is grounded in the belief that tackling mental health issues at Barishal University will not only benefit the current student population but will also have a positive impact on the university community as a whole. So, it is necessary to determine the factors associated with anxiety and depression among undergraduate students at Barishal University.

3 Methodology

3.1 Sampling Design

For statistical analysis, appropriate sampling design is very important. Analysis is based on the finite subset of the population instead of considering total students. In my study, I have selected sample by using purposive sampling technique which is non-probability

sampling technique. I used slovin's sample size determination formula to calculate the sample size from the Barishal University students. The formula is given below:

$$n = \frac{N}{1 + Ne^2}$$

Where, n = sample size

N = population size = 8000

e= margin of error = 0.05

Then, calculate the sample size, I have taken 380 sample from Barishal university.

3.2 Preparation of Questionnaire and Data Collection

Under the supervision of my honorable supervisor, a questionnaire was prepared in accordance with the purpose of my study. After this, correction was allowed. At last, a standardized questionnaire was generated and I collected my data both online and offline. Using google form and share this link through social media- Facebook, Messenger. There are different types of question, which are-multiple choice questions, short type questions. I have tried my best to avoid complex and dubious questions and avoid unfamiliar word.

3.3 Patient Health Questionnaire (PHQ-9)

The PHQ-9 scale is convenient tool that used to assess the level of depression. This scale consists of 9 items on a four-point Likert scale assigning scores of 0,1,2, and 3, to the response categories of-not at all, several days, more than half the days, nearly every day, respectively. The level of depression was categorized into four groups such as minimal, mild, moderate, moderately severe, and severe based on scoring 0-4,5-9,10-14,15-19, and 20-27, respectively.

3.4 Generalized Anxiety Disorder Assessment (GAD-7)

The GAD-7 scale is convenient tool that used to assess the level of anxiety. This scale consists of 7 items on a four-point Likert scale assigning scores of 0,1,2, and 3, to the response categories of-not at all, several days, more than half the days, nearly every day, respectively. The level of depression was categorized into four groups such as minimal, mild, moderate, and severe based on scoring 0-4,5-9,10-14, and 15-21 respectively.

3.5 Data Preprocessing

To write a project report, data processing is a key factor for conducting research. Data processing includes cleaning, encoding, Feature Engineering. Data cleaning is a crucial part of data preprocessing, which is applied to enhance the quality of the dataset. Feature engineering is a crucial part of data preprocessing, which means creating, transforming, or selecting relevant data features for improving performance.

3.6 Statistical Analysis

Descriptive statistics are calculated for various variables such as mean, median, range, percentage and frequency. Binary logistic regression and chi-square test were executed to determine significant association between categorical variables. This project report is written by using the following statistical software python programming, SPSS, MS-Office Excel, MS-word.

3.7 Binary Logistic Regression

To identify significant predictors of depression and anxiety, binary logistic regression was used due to the binary nature of the dependent variables (presence or absence of depression/anxiety). Separate logistic regression models were created for depression and anxiety as dependent variables. Each independent variable was included in the models, and odds ratios (OR) with 95% confidence intervals were reported for statistically significant predictors

3.8 Random Forest Analysis

To further examine the relationships and identify key predictive factors, a random forest classifier was implemented. Random forest was chosen for its ability to handle complex, non-linear relationships and rank variable importance.

The dataset was split into training and testing sets (typically an 70/30 split). A random forest model was trained on the training data to classify students with or without depression and anxiety.

The importance of each predictor variable was assessed based on the mean decrease in accuracy or Gini impurity. This helped identify which factors had the most substantial influence on mental health outcomes.

3.9 Decision Tree Analysis

To visually interpret the relationships between predictors and mental health outcomes, a decision tree model was employed. Decision trees allow for a hierarchical representation of factors and highlight primary predictors at different branch. The decision tree was trained on the dataset to create a model that predicted depression and anxiety based on independent variables. The tree's structure helped identify how variables interact and contribute to mental health outcomes. Key nodes in the decision tree indicated the most significant splitting factors, providing insights into the most influential combinations of factors associated with depression and anxiety.

3.10 Model Evaluation

Each model's accuracy was assessed using metrics such as **accuracy**, **precision**, and **recall**, **f1-score**.

4 Results and Discussion

In this study, 40.3% of respondents are male and 59.7% are female. The mean age of the respondents is 22.28 years, where the maximum age and minimum age are 18 and 25 years respectively.

Table 1 Frequency table for different selected variables

Variables		**Frequency**	**Percentage**
Gender	Female	227	59.7
	Male	153	40.3
Father's occupation	Farmer	70	18.4
	Government employee	72	18.9
	Non-govt. employee	93	24.5
	Migrant	16	4.2
	Dead	43	11.3
	Businessman	86	22.6
	Lower class (<10,000 BDT)	77	20.3

Monthly family income	Middle class (10,000-20,000 BDT)	211	55.5
	Upper class (>20,000 BDT)	92	24.2
Marital status	Single	259	68.2
	In a relationship	75	19.7
	Breakup then single	20	5.3
	Married	26	6.8
Studying year	1st year	55	14.5
	2nd year	112	29.5
	3rd year	103	27.1
	4th year	110	28.9
Engaged in physical exercise	No	232	61.1
	Yes	148	38.9
Dissatisfaction with current education, financial condition and future career.	No	139	36.6
	Yes	241	63.4
Sleeping status	Less than normal	163	42.9
	Normal (6-8 hours)	198	52.1
	More than normal	19	5.0
Sleeping satisfaction	No	162	42.6
	Yes	218	57.4
Daily internet use (hours)	<2 hours	85	22.4
	2-4 hours	128	33.7
	>4 hours	167	43.9
Satisfaction with subject	No	156	41.1
	Yes	224	58.9
Depression	No	210	55.3
	Yes	170	44.7
Anxiety	No	230	60.5
	Yes	150	39.5

The above **Table 1** shows that the majority of respondents (55.5%) in this study came from middle class families and the majority of students (61.1%) did not engage in regular physical exercise. 42.6% of respondents are not satisfied with sleep, and the majority (43.9%) use the internet more than 4 hours. 41.1% of respondents are not satisfied with their subject and 58.9% are satisfied with the subject.

4.1 Binary Logistic Regression Model for Depression

To fit the binary logistics regression model, we use depression as a response variable. The result of the logistic regression model is given below:

Table 2 *Binary logistic Regression model predicting depression*

Independent variables	**Coefficient**	**Significance**	**Odds ratio (OR)**	**95% Confidence interval**	
				lower	**Upper**
Gender					
Male			reference		
Female	-0.210	0.627	0.811	0.349	1.887
Father's occupation					
Farmer			reference		
Govt. employee	-0.188	0.792	0.829	0.206	3.335
Non-govt. employee	0.165	0.795	1.180	0.339	4.103
Migrant	0.850	0.514	2.340	0.182	30.098
Dead	-0.198	0.772	0.820	0.214	3.141
Businessman	0.806	0.199	0.446	0.130	1.528
Monthly family income					
Lower class			reference		
Middle class	-0.249	0.635	0.780	0.279	2.179
Upper class	0.002	0.997	1.002	0.268	3.746
Satisfaction with subject					

Yes	-0.903	**0.041**	0.405	0.171	0.963
No			reference		
Feel isolated or lonely in university environment					
Yes	1.766	**<0.001**	5.849	2.654	12.890
No			reference		
Dissatisfaction with future career, financial condition and current education					
Yes	1.419	**0.004**	4.132	1.576	10.833
No			reference		
Engaged in physical exercise					
Yes	-1.509	**0.001**	0.221	0.091	0.539
No			reference		
Sleeping satisfaction					
Yes	-1.742	**0.002**	0.175	0.059	0.522
No			reference		
Daily internet use					
<2 hours			reference		
2-4 hours	0.339	0.629	1.404	0.355	5.548
>4 hours	0.097	0.888	1.102	0.284	4.273
Constant	-0.424	0.749	0.654		

The above **Table 2** shows that satisfaction with the subject, feeling isolated or lonely in the university environment, dissatisfaction with a future career, financial condition and current education, engaging in physical exercise and sleeping satisfaction are significant ($p < 0.05$) at 5% level of significance. So, these factors are associated with depression. The model as a whole explained between 55.6% (Cox and Snell R square) and 74.4% (Nagelkerke R squared) of the variance in depression.

The respondents who were satisfied with the subject were 0.405 times less likely to be depressed than the respondents who were not satisfied with the subject (OR=0.405, CI=0.171-2.963). The odds ratio of 4.132 for dissatisfaction with future career, financial condition and current education indicates that the respondents were 4.132 times more likely to be depressed than those who were satisfied with future career, financial condition and current education. The respondents who were satisfied with sleep quality were 0.175 times less likely to be depressed than the respondents who had unsatisfied sleep quality (OR=0.175, CI=0.059-0.522). Then the respondents who were engaging in physical exercise, 0.221 times less likely to be depressed than the respondents not engaging in physical exercise (OR=0.221, CI=0.091-0.539).

4.2 Binary Logistic Regression Model for Anxiety

Again, to fit the binary logistic regression, we use anxiety as a response variable. The result of the logistic regression model is given below:

Table 3 Binary logistic Regression model predicting anxiety

Independent variables	**Coefficient**	**Significance**	**Odds ratio (OR)**	**95% Confidence interval**	
				lower	**Upper**
Gender					
Male			reference		
Female	0.912	0.06	2.490	1.306	4.747
Father's occupation					
Farmer			reference		
Govt. employee	0.079	0.876	1.082	0.401	2.922
Non-govt. employee	0.893	0.071	2.444	0.926	6.446
Migrant	0.602	0.178	1.826	0.760	4.392
Dead	1.130	0.183	3.096	0.586	16.366
Businessman	0.662	0.244	1.938	0.636	5.900
Monthly family income					
Lower class			reference		
	-0.377	0.355	0.686	0.308	1.526

Middle class Upper class	-0.518	0.362	0.596	0.196	1.814
Satisfaction with subject					
Yes	0.042	0.914	1.043	0.484	2.249
No			reference		
Feel isolated or lonely in university environment					
Yes	1.191	**0.002**	3.291	1.566	6.917
No			reference		
Dissatisfaction with future career, financial condition and current education					
Yes	0.983	**0.014**	2.673	1.225	5.831
No			reference		
Engaged in physical exercise					
Yes	-0.342	0.358	0.711	0.343	1.472
No			reference		
Sleeping satisfaction					
Yes	0.676	0.216	1.965	0.674	5.733
No			reference		
Daily internet use					
<2 hours			reference		
2-4 hours	1.177	**0.040**	3.245	1.002	10.511
>4 hours	3.242	**<0.001**	25.588	7.907	82.803
Constant	-4.731	<0.001	0.009		

From the above **Table 3**, we observed that students feel isolated or lonely in university environment, dissatisfaction with their future career, financial condition and current

education, daily internet use is significant ($p<0.05$) at 5% level of significance. So, these factors are associated with anxiety and there is no statistically significant association between any of the socio-demographic variables and anxiety. The model as a whole explained between 40.2% (Cox and Snell R square) and 54.5% (Nagelkerke R squared) of the variance in anxiety.

The respondents who feel isolated or lonely in university environment 3.291 times more likely to have anxiety than the respondents who do not (OR=3.291, CI=1.566-6.917). The odds ratio of 2.673 for dissatisfaction with future career, financial condition and current education indicates that respondents were 2.673 times more likely to have anxiety than those who were satisfied with future career, financial condition and current education. The respondents who used the internet for more than 4 hours were 25.588 times more likely to have anxiety than the respondents who used the internet for less than 2 hours daily (OR=25.588, CI=7.907-82.803). The respondents using the internet for 2-4 hours were 3.245 times more likely to have anxiety than the respondents using the internet for less than 2 hours daily (OR=3.245, CI=1.002-10.511).

4.3 Random Forest Analysis

The random forest analysis identified key predictors associated with depression and anxiety among students. The random forest model for depression achieved an accuracy of 90 % on the testing data. Precision and recall values for each class were 93% and 84%, indicating a strong predictive performance for identifying students at risk of depression. The most influential variables for depression were satisfaction with the subject, feeling isolated or lonely in the university environment, dissatisfaction with a future career, financial condition and current education, engaging in physical exercise and sleeping satisfaction.

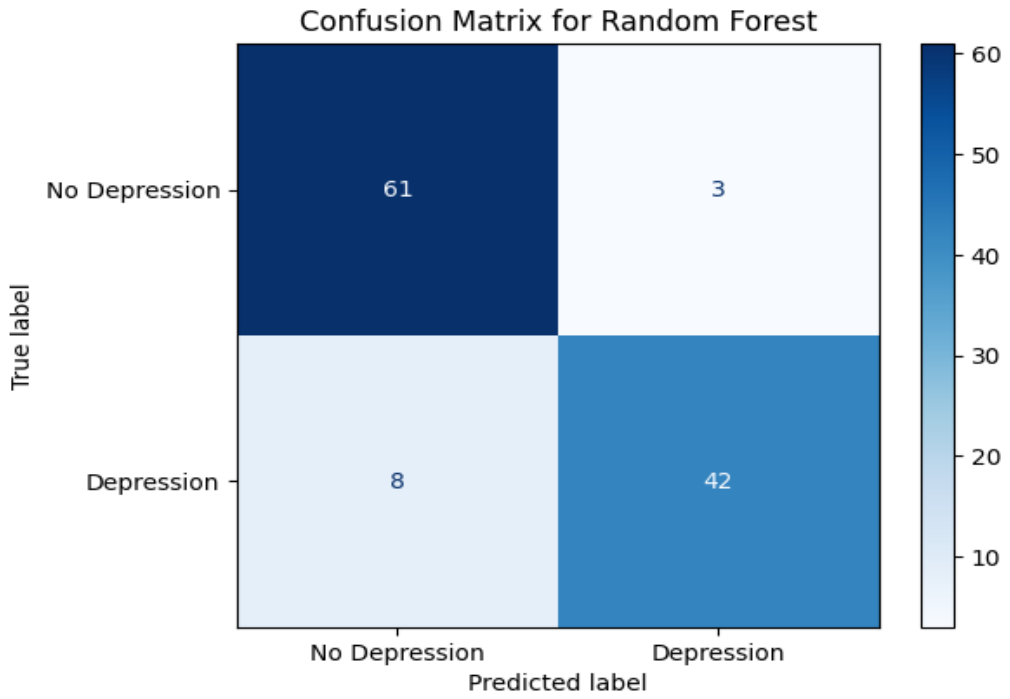

Figure 1 Confusion Matrix of Random Forest for Depression

The random forest model for anxiety achieved an accuracy of 78 % on the testing data. Precision and recall values for each class were 90% and 55% indicating a strong predictive performance for identifying students at risk of anxiety.

The most influential variables for anxiety were feel isolated or lonely in university environment, dissatisfaction with their future career, financial condition and current education, daily internet use.

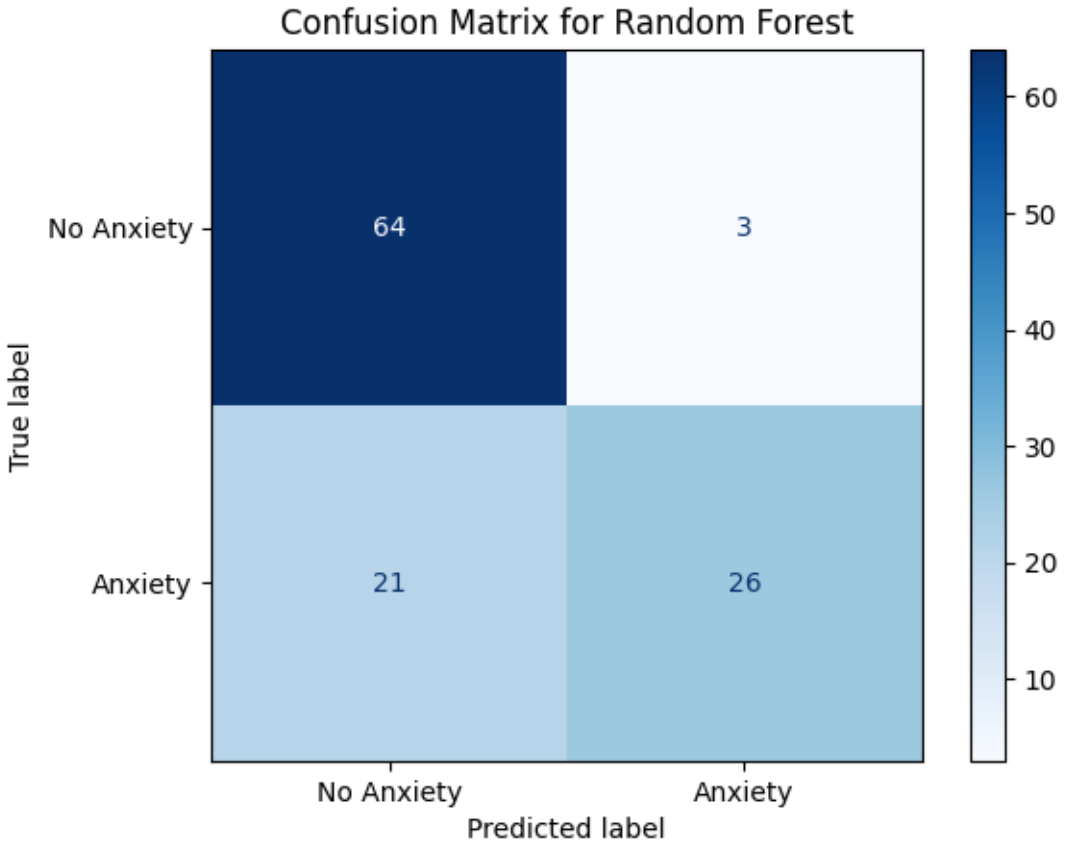

Figure 2 Confusion Matrix of Random Forest for Anxiety

4.4 Decision Tree Analysis

The decision tree provided a hierarchical view of the factors contributing to depression and anxiety, interpretative manner.

The first splitting node in the decision tree was daily internet use, separating students into low-risk and high-risk groups based on their online engagement.

For students who had high daily internet use, factors like academic workload and family income appeared as additional nodes. These branches highlighted those students with both high internet use and high academic workload had an increased likelihood of experiencing depression or anxiety. The tree structure visually represented interactions between predictors, revealing how certain combinations of factors elevate mental health risks.

Result Analysis for Machine Learning Model

Table 4 Performance Matrices for depression

ML Model	Accuracy	precision	Recall	F1 Score
Logistic Regression	84%	86%	86%	86 %
Random forest	90%	88%	95%	92%
Decision Tree	81%	84%	83%	83%

Table 5 Performance Matrices for anxiety

ML Model	Accuracy	precision	Recall	F1 Score
Logistic Regression	79%	77%	93%	84%
Random forest	78%	75%	96%	84%
Decision Tree	98%	89%	98%	88%

4.5 Prevalence of Depression and Anxiety

According to the PHQ-9 scale, depression levels were 35.8% for minimal depression, 20.5% for mild depression, 29.7% for moderate depression, 12.1% for moderately severe depression, 1.8% for severe depression. The prevalence rates of moderate to extremely severe levels of depression are 43.6%. According to the GAD-7 scale, anxiety levels were 50.5% for minimal anxiety, 23.4% for mild anxiety, 22.1% for moderate anxiety and 3.9% for severe anxiety. The prevalence rates of mild to extremely severe levels of anxiety are 49.4%. The following bar chart shows the prevalence of depression and anxiety according to the PHQ-9 scale and GAD-7 scale.

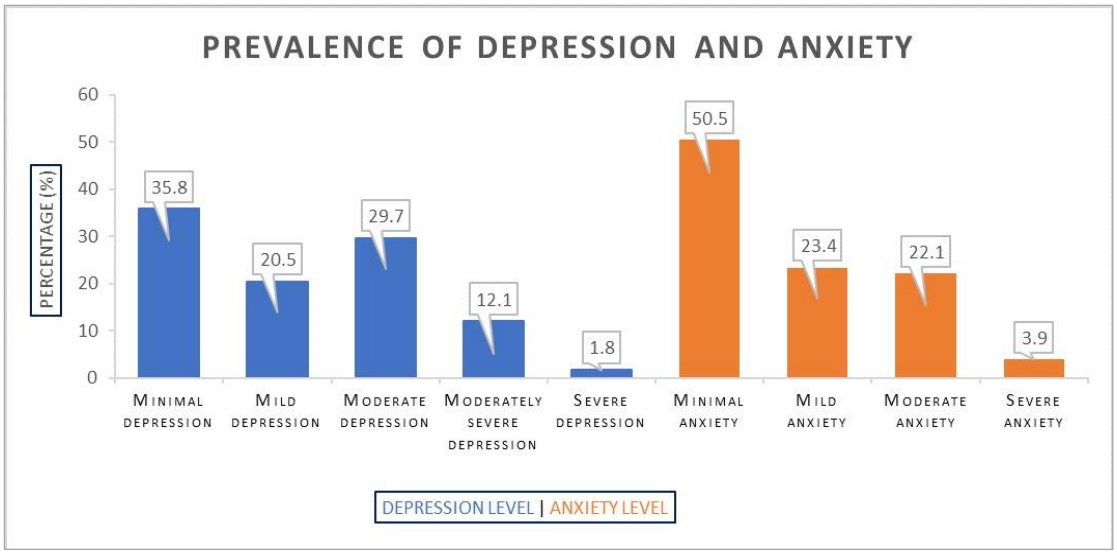

Figure 3 Prevalence of depression and anxiety

5 Conclusion

In Bangladesh, mental illness among undergraduate students at a university is a neglected public health issue. The objective of this study was to determine the factors associated with anxiety and depression among undergraduates' students at Barishal University. These findings confirm that feeling of loneliness, dissatisfaction with the subject, lack of physical exercise, dissatisfaction with a future career and current education, financial condition, excessive internet use, and dissatisfaction with sleep quality were significantly associated with anxiety and depression. The prevalence rates of moderate to extremely severe levels of anxiety and depression are 26% and 43.6%, respectively.

Considering the rates of anxiety and depression among Barishal University students, it is necessary that university authorities and healthcare professionals pay careful attention to these conditions in order to prevent mental health disorders and to increase student knowledge of mental health, improve sleep quality, intake physical exercise, and moderate internet use. Mental health-related programs should be organized on the Barishal University campus to raise awareness among the students and mental health specialists, which is essential to establishing a holistic approach to mental health within the university setting.

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