

# Prevalence of depression, anxiety, stress, and their associated factors among university students in Bangladesh

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## Article

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# Abstract

## Background

Life at higher educational institutions is very challenging and stressful due to the very nature, structure, and functions of the institutions. It is well established that the prevalence of various mental illnesses, such as depression, anxiety, and stress, is high among university students around the world. But little is known about the prevalence of the phenomenon in the context of a developing country, like Bangladesh.

## Aims

The goal of this research is to investigate the prevalence of depression, anxiety, and stress levels among students of a public and a private university in Bangladesh.

## Methods

This cross-sectional study was conducted among sampled two universities located in Rajshahi city, about 300km northwest of Bangladesh capital Dhaka. A total of 738 students (380 from Rajshahi University (RU, public) and 358 from Varendra University (VU, private) took part in the study. Data were collected through a face-to-face questionnaire survey from January to March 2020. The Depression Anxiety and Stress Scale (DASS-42) was used to measure the depression, anxiety, and stress levels among the participants. Bivariate and multivariate techniques were used to analyze the data.

## Results

The results indicate that private university students are more likely to suffer from depression, anxiety, and stress compared to the students of public universities due to various contributing factors. Female students from both public and private universities are more likely to suffer from severe/extreme levels of anxiety compared to male students.

## Conclusion

There exists a high prevalence of mental illnesses among university students in Bangladesh. The university authorities should build up an effective support system such as setting up of counseling center, raising awareness of seeking help, and measures for reducing mental illness stigma on the campuses.

## Introduction

Poor mental health among university students is a global concern today. The prevalence of depression, anxiety, and stress among university students are pervasive, impacting the quality of life, academic success, and achievement [1, 2, 3]. Depression is caused by a variety of factors, including genetics, the social environment, psychology, and social issues, and is usually caused by adverse events in life [2, 11, 12]. It affects the thoughts, decisions, and actions of a person [6, 13, 14]. Moreover, loss of concentration, sorrow, feelings of guilt or low self-worth, troubled sleep or appetite, and extreme drowsiness are some of the most common symptoms among people who suffer from depression [6, 15, 16]. Meanwhile, anxiety is the body's reaction to an apparent danger induced by a person's thoughts, moods, and emotions and characterized by worrying feelings, tension, heightened blood pressure, heart rate, breathing rate, sweating, swallowing trouble, dizziness, and chest pain [6, 21]. On the other hand, chronic stress is one of the risk factors of depression among university students [26]. Several key factors that generate stress among university students include exam anxiety, financial issues, high expectation from parents, and relationship break up on the campus.

Previous researchers indicated that university students around the world have high rates of psychological morbidity, especially depression and anxiety [38, 39, 40]. Most of the studies on depression, anxiety, and stress based on cross-sectional studies include prevalence and associations of students' demographic characteristics and academic performance [27, 28, 29, 30]. The main stressors were exams, academic overload, lack of time, and high expectations [28, 29, 30]. Living with depression and anxiety often leads to low self-esteem, self-blame, hopelessness, thoughts of suicide, frustration, and peevishness [33, 34] among young people. Several studies indicate that first-year students are at high risk of various mental illnesses as they encounter many new stressors at the beginning of their university life [36, 42]. Psychological distresses among the students often result in withdrawal from the study [47]. Adlaf et al. (2001) found that the likelihood of dropout among first-year students is twice compared to the students in the second and third years.

Meanwhile, Eva et al. (2015) found that more than half of the medical students in Bangladesh suffer from measurable academic stress [43]. On the other hand, Islam, Akter, Sikder, and Griffiths (2020) found that the prevalence of depression and anxiety levels is high among first-year university students in Bangladesh [54]. In a study at a private university, Ahmmed, Babu, and Salim found that multiple factors contribute to depression among university students in the country [31]. Some of the factors include skin complexion, economic insolvency, inability to fulfill expectations of parents, lack of social-cultural-emotional resilience on the campus, and satisfaction with the university program.

With the growing economy of Bangladesh, the demand for skilled workforces has been increased in the past few decades in the country, which also increased the demand for tertiary education. According to the University Grants Commission (UGC), there are 158 universities in Bangladesh. Of those 53 are public universities and 105 are private universities. Fierce competition for the job market has created a competitive environment in the country's tertiary education system. Moreover, parents who are mostly from the middle and upper-income classes, consider enrolling their children at private universities as an investment for their future social security. Meanwhile, there is a high expectation from the parents that their children will take the responsibility of running the family soon after their graduation. Besides the competitive academic environment, family expectations and economic burdens lead to negative mental health outcomes among university students in Bangladesh.

Therefore, this study aims to investigate at finding out the prevalence of depression, anxiety, and stress with respect to socio-demographic factors; assessing the impacts of academic performances for depression, anxiety, and stress, and comparing the variations of the nexus on depression, anxiety, and stress among the public and private universities. The universities include the University of Rajshahi (RU), one of the largest public universities of Bangladesh; and Verendra University (RU), the first and largest private university in the Rajshahi division. The structure, functions, and nature of the RU are similar to other public universities located in different parts of the country. Meanwhile, the VU is one of the fast-growing private universities in the country. There were 24493 students in 63 departments under eleven faculties in RU at the time of the survey [48]. Meanwhile, the total number of undergraduate and master's students at VU was 5134 in 11 departments under three faculties [49]. Both universities are located in Rajshahi city, about 300 km northwest of Bangladesh's capital Dhaka.

## Methodology

Ethical approval for this study was obtained from the Ethical Review Committee of Varendra University [Ref. VU/ERC/2019-2020/02]. Verbal consent was taken from the participants by explaining the objectives of the study, the risk and benefit of participation, and the right to remain or opt out of the study at any stage.

### Participants

A total of 738 students (380 from RU and 358 from VU) took part in the study. Students from different departments, semesters, and gender groups took part in the study.

### Sample

All the students who were enrolled during the study period are considered possible study participants. The required sample was determined by the following formula [52]:

$$n = \frac{Z^2 \times P \times (1 - P)}{C^2} (1)$$

Where, Z is the value of confidence interval (e.g. Z = 1.96 for 95% confidence level), P is the percentage picking a choice, expressed as a decimal (0.5 used in this study as of highly scattered population), and C is allowable error level at a percentage, expressed as a decimal (e.g., C = 0.035). For known population size (total students, N = 29627), new sample size, n\* is calculated as,

$$n^* = \frac{n}{1 + \frac{n-1}{N}} (2)$$

At 5% level of significance with 95% confidence interval, the required sample size is as follows in Table 1.

### Table 1. Sample size determination

C	Z (5%)	P	$\alpha$	n	n*
0.035	1.96	0.5	0.05	758	738

## Data collection

Data were collected from randomly selected students from the two universities. A semi-structured questionnaire, which contained information about students' social status, demography, and academic records, was used to collect data. The status of mental health of the participants was measured using the Depression, Anxiety and Stress Scales (DASS) developed by Lovibond and Lovibond [4, 5]. It is a 42-item self-reported tool that measures current symptoms of depression, anxiety, and stress (within the past week). Each of the three scales consists of 14 items replied using a scale of 0 - 3, where 0 = did not apply to me at all, and 3 = applied to me very much or much of the time (the range of potential scores is 0 - 42 for each scale). Scores for the measures of depression, anxiety, and stress are determined by the combined scores of the 14 elements involved. The scores below indicate the levels of depression, anxiety, and stress.

Categories	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34+

We, however, we calculated the scores as follows:

Categories	Depression	Anxiety	Stress
Normal/Mild	0-13	0-9	0-18
Moderate	14-20	10-14	19-25
Severe/ Extremely Severe	21+	15+	26+

Normal and mild categories are merged to normal/mild category and severe and extremely severe categories are merged to severe/extremely severe category due to insufficient frequencies in these cells and reliabilities of classification.

## Data analyses

Statistical analyses such as frequency distribution, severity scores, and relevant tests were performed using IBM SPSS version 24. Bivariate analysis of the association between associated factors and depression, anxiety, and stress levels is conducted using the Chi-square test [50]. Multivariate analysis of the association between associated factors and depression, anxiety, and stress levels is conducted using multinomial logistic regression [51].

## Results

### Depression, anxiety, and stress level

In general, there are different levels of depression, anxiety, and stress among the students from both university groups. But the prevalence of severe/extremely severe levels of mental illness is higher among the students of the private university (VU) than the students from public university students (RU). Data in the Table 2 show that 15.4% of students of VU suffer from a severe or extremely severe level of depression, while the prevalence of the illness is 14.50% among the students of RU. On the other hand, 36.9% of students of VU suffered from a severe or extremely severe level of anxiety, whereas 35.30% of the RU students suffered from a similar level of anxiety. It is evident that students from private students tend to suffer from higher levels of stress than students from public universities. Details are shown in Table 2.

**Table 2. Depression, anxiety and stress levels among RU and VU students**

Characteristics		RU		VU	
		n	%	n	%
Depression Level	Normal/Mild	222	58.40	202	56.40
	Moderate	103	27.10	101	28.2
	Severe/Extremely Severe	55	14.50	55	15.4
Anxiety Level	Normal/Mild	114	30.00	100	27.9
	Moderate	132	34.70	126	35.2
	Severe/Extremely Severe	134	35.30	132	36.9
Stress Level	Normal/Mild	285	75.00	264	73.7
	Moderate	73	19.20	72	20.1
	Severe/Extremely Severe	22	5.80	22	6.1

### Bivariate association between depression level and its associated characteristics

Table 3 provides the distribution of socio-demographic characteristics—gender, father’s occupation, mother’s occupation, family status, playing status, marital status, faculty, age group, academic performance, music listening, and BMI class for the sample students from both public and private university, and their association with depression.

In general, male students (15.5%) from public universities tend to suffer from a severe level of depression compared to female students (11.8%). But the prevalence of moderate levels of depression among the female students (33.3%) is higher than that of male students (24.8%). Interestingly, female students from private universities tend to suffer more different levels of depression (moderate to severe/extremely severe) compared to their male counterparts. For example, 16.4% of female students from private universities reported that they suffered from severe/extremely severe levels of depression, while the percentage among male students was 14.7%.

The bivariate analysis shows that depression was significantly associated with the family type ( $p=0.081$ ) and academic performance ( $p=0.065$ ) of the students of the private university. 22.8% of the students who came from large families suffered from severe or extremely severe level depression. There exists a severe or extremely severe level of depression who came from extended (11.5%) and nuclear families (15.9%). Meanwhile, the prevalence of depression among public universities was found to be associated with their age ( $p=0.045$ ) and habit of listening to music ( $p=0.066$ ). Some 17.1% of the students who were aged more than 20 years were found to be suffered from severe or extremely severe depression. On the other hand, of those who do not listen to music, 21.6% of them suffered from a similar level of depression.

It was found that depression was not associated with the participants’ sex, occupation of their parents, playing habits, marital status, faculty in which they were studying, and their BMI classes for both cohorts of students.

**Table 3. Bivariate association between depression level and its associated characteristics**

Characteristics		Depression Level							
		RU (n=380)				VU (n=358)			
		Normal/ Mild (n, %)	Moderate (n, %)	Severe/ Extremely Severe (n, %)	P-value	Normal/ Mild (n, %)	Moderate (n, %)	Severe/ Extremely Severe (n, %)	P- value
<b>Sex</b>	Male	166 (59.7%)	69 (24.8%)	43 (15.5%)	0.223	125 (57.3%)	61 (28%)	32 (14.7%)	0.877
	Female	56 (54.9%)	34 (33.3%)	12 (11.8%)		77 (55.0%)	40 (28.6%)	23 (16.4%)	
<b>Father's Occupation</b>	Teaching/ Others	65 (56.0%)	35 (30.2%)	16 (13.8%)	0.121	73 (58.9%)	34 (27.4%)	17 (13.7%)	0.733
	Business	96 (61.5%)	44 (28.2%)	16 (10.3%)		75 (57.7%)	37 (28.5%)	18 (13.8%)	
	Govt. Service	61 (56.5%)	24 (22.2%)	23 (21.3%)		54 (51.9%)	30 (28.8%)	20 (19.2%)	
<b>Mother's Occupation</b>	Govt. Service/ Teaching	28 (70.0%)	10 (25.0%)	2 (5.0%)	0.144	17 (48.6%)	14 (40.0%)	4 (11.4%)	0.256
	Wife/Others	194 (57.1%)	93 (27.4%)	53 (15.6%)		185 (57.3%)	87 (26.9%)	51 (15.8%)	
<b>Family Status</b>	Large/Others	28 (59.6%)	12 (25.5%)	7 (14.9%)	0.853	20 (57.1%)	7 (20.0%)	8 (22.8%)	0.081*
	Extended	84 (61.8%)	35 (25.7%)	17 (12.5%)		64 (66.7%)	21 (21.9%)	11 (11.5%)	
	Nuclear	110 (55.8%)	56 (28.4%)	31 (15.7%)		118 (52.0%)	73 (32.2%)	36 (15.9%)	
<b>Sports and physical activities</b>	Always	85 (58.2%)	42 (28.8%)	19 (13.0%)	0.788	83 (59.3%)	38 (27.1%)	19 (13.6%)	0.345
	Frequently	41 (54.7%)	20 (26.7%)	14 (18.7%)		17 (41.5%)	15 (36.6%)	9 (22.0%)	
	Sometimes/ Never	96 (60.4%)	41 (25.8%)	22 (13.8%)		102 (57.6%)	48 (27.1%)	27 (15.3%)	
<b>Marital Status</b>	Married	3 (50.0%)	2 (33.3)	1 (16.7%)	0.913	19 (70.4%)	6 (22.2%)	2 (7.4%)	0.275
	Un-married	219 (58.6%)	101 (27.0%)	54 (14.4%)		183 (55.3%)	95 (28.7%)	53 (16.0%)	
<b>Faculty</b>	Science/ Engineering	99 (63.9%)	37 (23.9%)	19 (12.3%)	0.303	74 (55.2%)	40 (29.9%)	20 (14.9%)	0.987
	Arts/Social Science	105	57	28		79	38	21	

		(55.3%)	(30.0%)	(14.7%)		(57.2%)	(27.5%)	(15.2%)	
	Business	18	9	8		49	23	14	
		(51.4%)	(25.7%)	(22.9%)		(57.0%)	(26.7%)	(16.3%)	
<b>Age Group</b>	>20	121	44	34		68	47	22	0.91
		(60.8%)	(22.1%)	(17.1%)	0.045**	(49.6%)	(34.3%)	(16.1%)	
	<=20	101	59	21		134	54	33	
		(55.8%)	(32.6%)	(11.6%)		(60.6%)	(24.4%)	(14.9%)	
<b>Academic Performance</b>	Satisfactory	193	93	46		171	81	39	0.065*
		(58.1%)	(28.0%)	(13.9%)	0.466	(58.8%)	(27.8%)	(13.4%)	
	Unsatisfactory	29	10	9		31	20	16	
		(60.4%)	(20.8%)	(18.8%)		(46.3%)	(29.9%)	(23.9%)	
<b>Music listening habit</b>	Yes	207	89	47		190	93	49	0.433
		(60.3%)	(25.9%)	(13.7%)	0.066*	(57.2%)	(28.0%)	(14.8%)	
	No	15	14	8		12	8	6	
		(40.5%)	(37.8%)	(21.6%)		(46.2%)	(30.8%)	(23.1%)	
<b>BMI Class</b>	Under Weight	18	8	4		40	22	7	0.222
		(60.0%)	(26.7%)	(13.3%)		(58.0%)	(31.9%)	(10.1%)	
	Over Weight/Obese	35	15	5		25	7	10	
		(63.6%)	(27.3%)	(9.1%)		(59.5%)	(16.7%)	(23.8%)	
	Normal Weight	169	80	46	0.787	137	72	38	
		(57.3%)	(27.1%)	(15.6%)		(55.5%)	(29.1%)	(15.4%)	

Note: \* and \*\* indicate the significant at 10% and 5% level respectively.

#### Bivariate association between anxiety level and its associated characteristics

Table 4 demonstrates bivariate association between anxiety and some key features of the participants from both public and private university. The features of the students include socio-demographic characteristics such as sex, parents' occupation, family status, sports and physical activities, age group, academic performance, habits of listening music, and BMI class.

Overall, more female students from both public and private universities tend to suffer from severe/extremely level of anxiety compared to male students. Some 39.2% female students from public university reported that they suffered from severe/extremely severe level anxiety, while the percentage for male students was 33.8%. On the other hand, 40.0% female students from private university (VU) suffered from severe/extremely severe level of anxiety, meanwhile the same level of anxiety was prevalent among 34.9% male students.

The bivariate analysis indicates that there is a significant association between taking part in sports and performing exercises activities with stress among the students of public university ( $p=0.046$ ). Some 5.78% students of RU who took part in sports and perform physical exercises sometimes or never reported that they suffered from severe or extremely severe level of anxiety. Meanwhile, similar level of anxiety was prevalent among 7.54% of VU student. On the other hand, 8.68% students from RU and 7.82% students from VU who took part in sports and performed physical exercises always or frequently reported that they suffered from severe or extremely severe level of anxiety. Meanwhile anxiety is associated with academic performance ( $p=0.025$ ) of the students of the sample private university in Bangladesh. The students whose academic performances are satisfactory, 10.4% of them suffered from severe or extremely severe level of anxiety, while the students whose academic performances are not satisfactory, 3.39% of them suffered from severe or extremely severe level of anxiety. Details are shown in the Table 4.

**Table 4. Bivariate association between anxiety level and its associated characteristics**

Characteristics		RU (n=380)				VU (n=358)			
		Anxiety Level				Anxiety Level			
		Normal/ Mild (n, %)	Moderate (n, %)	Severe/ Extremely Severe (n, %)	P-value	Normal/ Mild (n, %)	Moderate (n, %)	Severe/ Extremely Severe (n, %)	P-value
<b>Sex</b>	Male	87 (31.3%)	97 (34.9%)	94 (33.8%)	0.548	63 (28.9%)	79 (36.2%)	76 (34.9%)	0.616
	Female	27 (26.5%)	35 (34.3%)	40 (39.2%)		37 (26.4%)	47 (33.6%)	56 (40.0%)	
<b>Father's Occupation</b>	Teaching & others	27 (23.3%)	44 (37.9%)	45 (38.8%)	0.262	35 (28.2%)	47 (37.9%)	42 (33.9%)	0.912
	Business	55 (35.3%)	53 (34.0%)	48 (30.8%)		35 (26.9%)	44 (33.8%)	51 (39.2%)	
	Govt. Service	32 (29.6%)	35 (32.4%)	41 (38.0%)		30 (28.8%)	35 (33.7%)	39 (37.5%)	
<b>Mother's Occupation</b>	Govt. Service & Teaching	14 (35.0%)	15 (37.5%)	11 (27.5%)	0.539	12 (34.3%)	11 (31.4%)	12 (34.3%)	0.675
	Wife & Others	100 (29.4%)	117 (34.4%)	123 (36.2%)		88 (27.2%)	115 (35.6%)	120 (37.2%)	
<b>Family Status</b>	Large & others	12 (25.5%)	20 (42.6%)	15 (31.9%)	0.343	14 (40.0%)	9 (25.7%)	12 (34.3%)	0.525
	Extended	37 (27.2%)	53 (39.0%)	46 (33.8%)		25 (26.0%)	34 (35.4%)	37 (38.5%)	
	Nuclear	65 (33.0%)	59 (29.9%)	73 (37.1%)		61 (26.9%)	83 (36.6%)	83 (36.6%)	
<b>Sports and physical activities</b>	Always	36 (24.7%)	59 (40.4%)	51 (34.9%)	0.046**	42 (30.0%)	43 (30.7%)	55 (39.3%)	0.570
	Frequently	27 (36.0%)	29 (38.7%)	19 (25.3%)		9 (22.0%)	18 (43.9%)	14 (34.1%)	
	Sometimes & never	51 (32.1%)	44 (27.7%)	64 (40.3%)		49 (27.7%)	65 (36.7%)	63 (35.6%)	
<b>Marital Status</b>	Married	2 (33.3%)	2 (33.3%)	2 (33.3%)	0.984	12 (44.4%)	8 (29.6%)	7 (25.9%)	0.132
	Un-married	112 (29.9%)	130 (34.8%)	132 (35.3%)		88 (26.6%)	118 (35.6%)	125 (37.8%)	
<b>Faculty</b>	Science & Engineering	51 (32.9%)	52 (33.5%)	52 (33.5%)	0.583	40 (29.9%)	46 (34.3%)	48 (35.8%)	0.717
	Arts & Social Science	50	70	70		41	46	51	



		(26.3%)	(36.8%)	(36.8%)		(29.7%)	(33.3%)	(37.0%)	
	Business	13	10	12		19	34	33	
		(37.1%)	(28.6%)	(34.3%)		(22.1%)	(39.5%)	(38.4%)	
<b>Age Group</b>	>20	61	65	73	0.941	39	43	55	0.453
		(30.7%)	(32.7%)	(36.7%)		(28.5%)	(31.4%)	(40.1%)	
	<=20	53	67	61		61	83	77	
		(29.3%)	(37.0%)	(33.7%)		(27.6%)	(37.6%)	(34.8%)	
<b>Academic Performance</b>	Satisfactory	100	116	116		89	103	99	0.025**
		(30.1%)	(34.9%)	(34.9%)		(30.6%)	(35.4%)	(34.0%)	
	Unsatisfactory	14	16	18	0.941	11	23	33	
		(29.2%)	(33.3%)	(37.5%)		(16.4%)	(34.3%)	(49.3%)	
<b>Music listening habit</b>	Yes	103	119	121	0.998	97	116	119	0.129
		(30.0%)	(34.7%)	(35.3%)		(29.2%)	(34.9%)	(35.8%)	
	No	11	13	13		3	10	13	
		(29.7%)	(35.1%)	(35.1%)		(11.5%)	(38.5%)	(50.0%)	
<b>BMI Class</b>	Under Weight	10	12	8	0.512	15	28	26	0.745
		(33.3%)	(40.0%)	(26.7%)		(21.7%)	(40.6%)	(37.7%)	
	Over Weight & Obese	18	22	15		13	14	15	
		(32.7%)	(40.0%)	(27.3%)		(31.0%)	(33.3%)	(35.7%)	
	Normal Weight	86	98	111		72	84	91	
		(29.2%)	(33.2%)	(37.6%)		(29.1%)	(34.0%)	(36.8%)	

Note: \*\* indicates the significant at 5% level.

#### Bivariate association between characteristics and stress level

Table 5 presents the distribution of socio-demographic information, academic information and BMI classes, and their association with prevalence of stress among the students of public and private universities in Bangladesh. Overall, female students (6.9%) from public university suffer from stress compared to male students (5.4%). On the other hand, more male students from private university (7.3%) suffer from severe/extremely severe level of stress compared to female students (4.3%).

The bivariate analysis show that stress is significantly associated with academic performance and the level of stress prevalent among the students of the both universities—RU ( $p=0.075$ ) and VU ( $p=0.098$ ). Among the public university's students who have satisfactory academic performance, 6.0% of them suffered severe or extremely severe level of stress, meanwhile the level of stress was prevalent among 4.2% students who did not have satisfactory academic performance. The prevalence of stress among the students of public university was also significantly associated with BMI status ( $p=0.017$ ). Interestingly, underweight and overweight did not affect the stress level severely as 63.3% student who were underweight reported that they encountered normal or mild level stress; the similar level of stress was prevalent among 90.9% who had overweight and obese.

On the other hand, more students of private university tend to suffer from stress mainly due to their poor academic performance. Some, 10.4% students who did not have satisfactory academic performance suffered from severe or extremely severe level of stress. Moreover, the level stress was significantly associated with family status ( $p=0.025$ ) and taking part in sports and physical exercise ( $p=0.018$ ).

**Table 5. Bivariate association between characteristics and stress level**

Characteristics		RU (n=380)				VU (n=358)			
		Stress Level			P-value	Stress Level			P-value
		Normal/ Mild (n, %)	Moderate (n, %)	Severe/ Extremely Severe (n, %)		Normal/ Mild (n, %)	Moderate (n, %)	Severe/ Extremely Severe (n, %)	
Sex	Male	211 (75.9%)	52 (18.7%)	15 (5.4%)	0.768	165 (75.7%)	37 (17.0%)	16 (7.3%)	0.116
	Female	74 (72.5%)	21 (20.6%)	7 (6.9%)		99 (70.7%)	35 (25.0%)	6 (4.3%)	
Father's occupation	Teaching & others	88 (75.9%)	20 (17.2%)	8 (6.9%)	0.946	89 (71.8%)	26 (21.0%)	9 (7.3%)	0.907
	Business	117 (75.0%)	31 (19.9%)	8 (5.1%)		95 (73.1%)	27 (20.8%)	8 (6.2%)	
	Govt. Service	80 (74.1%)	22 (20.4%)	6 (5.6%)		80 (76.9%)	19 (18.3%)	5 (4.8%)	
Mother's occupation	Govt. Service & Teaching	31 (77.5%)	8 (20.0%)	1 (2.5%)	0.642	29 (82.9%)	5 (14.3%)	1 (2.9%)	0.412
	Wife & Others	254 (74.7%)	65 (19.1%)	21 (6.2%)		235 (72.8%)	67 (20.7%)	21 (6.5%)	
Family Status	Large & others	37 (78.7%)	9 (19.1%)	1 (2.1%)	0.685	23 (65.7%)	9 (25.7%)	3 (8.6%)	0.025**
	Extended	105 (77.2%)	23 (16.9%)	8 (5.9%)		82 (85.4%)	13 (13.5%)	1 (1.0%)	
	Nuclear	143 (72.6%)	41 (20.8%)	13 (6.6%)		159 (70.0%)	50 (22.0%)	18 (7.9%)	
Sports and physical exercise	Always	110 (75.3%)	31 (21.2%)	5 (3.4%)	0.136	104 (74.3%)	22 (15.7%)	14 (10.0%)	0.018**
	Frequently	50 (66.7%)	19 (25.3%)	6 (8.0%)		26 (63.4%)	11 (26.8%)	4 (9.8%)	
	Sometimes & never	125 (78.6%)	23 (14.5%)	11 (6.9%)		134 (75.7%)	39 (22.0%)	4 (2.3%)	
Marital Status	Married	4 (66.7%)	2 (33.3%)	0 (0.0%)	0.594	21 (77.8%)	4 (14.8%)	2 (7.4%)	0.760
	Un-married	281 (75.1%)	71 (19.0%)	22 (5.9%)		243 (73.4%)	68 (20.5%)	20 (6.0%)	
Faculty	Science & Engineering	119 (76.8%)	26 (16.8%)	10 (6.5%)	0.122	105 (78.4%)	22 (16.4%)	7 (5.2%)	0.113
	Arts & Social Science	146	35	9		97	28	13	

		(76.8%)	(18.4%)	(4.7%)		(70.3%)	(20.3%)	(9.4%)	
	Business	20	12	3		62	22	2	
		(57.1%)	(34.3%)	(8.6%)		(72.1%)	(25.6%)	(2.3%)	
Age Group	>20	152	32	15	0.108	94	33	10	0.221
		(76.4%)	(16.1%)	(7.5%)		(68.6%)	(24.1%)	(7.3%)	
	<=20	133	41	7		170	39	12	
		(73.5%)	(22.7%)	(3.9%)		(76.9%)	(17.6%)	(5.4%)	
Academic Performance	Satisfactory	254	58	20	0.075*	221	55	15	0.098*
		(76.5%)	(17.5%)	(6.0%)		(75.9%)	(18.9%)	(5.2%)	
	Unsatisfactory	31	15	2		43	17	7	
		(64.6%)	(31.2%)	(4.2%)		(64.2%)	(25.4%)	(10.4%)	
Enjoy Playing Music	Yes	262	62	19	0.162	249	64	19	0.143
		(76.4%)	(18.1%)	(5.5%)		(75.0%)	(19.3%)	(5.7%)	
	No	23	11	3		15	8	3	
		(62.2%)	(29.7%)	(8.1%)		(57.7%)	(30.8%)	(11.5%)	
BMI Class	Under Weight	19	8	3	0.017**	52	13	4	0.965
		(63.3%)	(26.7%)	(10.0%)		(75.4%)	(18.8%)	(5.8%)	
	Over Weight & Obese	50	2	3		32	7	3	
		(90.9%)	(3.6%)	(5.5%)		(76.2%)	(16.7%)	(7.1%)	
	Normal Weight	216	63	16		180	52	15	
		(73.2%)	(21.4%)	(5.4%)		(72.9%)	(21.1%)	(6.1%)	

*Note: \* and \*\* indicate the significant at 10% and 5% level respectively.*

### Factors associated with depression, anxiety and stress

#### Factors associated with Depression

Table 6 illustrates the factors associated with depression among students of both private and public universities in Bangladesh. Private university students are more likely to suffer from depression compared to the students of public university. The results indicate that students' gender, faculty of education, is not a significant predictor of depression levels among the participants irrespective of their universities.

It was found that parent's occupation, family type and habit of playing sports and performing physical exercises are important predictor of depression of students irrespective of university types. Students whose fathers are government service holder are less likely to suffer from moderate level of depression and more likely to suffer from Severe/Extremely Severe level of depression compared to the students whose parents are businessmen. But those mothers are government service holders are more likely to suffer from moderate level of depression than those of housewife mothers. Students from nuclear families are more likely to suffer from different levels of depression compared to the students who came from large and extended families. Details are shown in the Table 6.

**Table 6. Depression and associated factors**

Variable	Level of depression (ref = Normal/Mild)					
	Moderate			Severe/Extremely Severe		
	Estimate	OR	90% CI	Estimate	OR	90% CI
Sex (ref: Female)						
Male	-0.222	0.801	0.556-1.074	-0.169	0.844	0.507-1.189
Father's occupation (ref: Govt. Service)						
Teaching & Others	-0.006	0.994	0.683-1.443	-0.417	0.659	0.418-1.031
Business	0.021	1.022	0.708-1.446	-0.614 <sup>b</sup>	0.541	0.342-0.823
Mother's occupation (ref: Housewife/Other)						
Govt. Service/Teaching	0.095	1.100	0.696-1.726	-0.759 <sup>c</sup>	0.468	0.217-0.987
Family status (ref: Nuclear)						
Larger/Other	-0.379	0.684	0.417-1.25	-0.052	0.949	0.540-1.690
Extended	-0.420 <sup>b</sup>	0.657	0.474-0.911	-0.495 <sup>c</sup>	0.610	0.396-0.934
Did you take part in sports and physical exercise? (ref: Sometimes & Never)						
Always	0.161	1.174	0.845-1.615	0.034	1.034	0.671-1.551
Frequently	0.355	1.426	0.928-2.171	0.579 <sup>c</sup>	1.784	1.065-2.959
Faculty (ref: Business)						
Science & Engineering	-0.173	0.841	0.547-1.315	-0.425	0.654	0.395-1.153
Arts & Social Science	-0.042	0.959	0.623-1.492	-0.253	0.776	0.464-1.347
Age group (ref: <=20)						
>22	0.040	1.041	0.797-1.441	0.286	1.331	0.973-2.059
Academic performance (ref: Unsatisfactory)						
Satisfactory	-0.090	0.914	0.607-1.368	-0.567 <sup>b</sup>	0.567	0.360-0.975
Did you listen music ?(ref: No)						
Yes	-0.572 <sup>c</sup>	0.564	0.337-0.932	-0.638 <sup>c</sup>	0.528	0.287-0.960
BMI class (ref: Normal Weight)						
Under Weight	-0.028	0.973	0.622-1.462	-0.432	0.649	0.338-1.140
Over Weight /Obese	-0.360	0.698	0.451-1.115	-0.183	0.833	0.501-1.480
Types of the university (ref: Public)						
Private	0.031	1.031	0.781-1.438	0.078	1.082	0.778-1.700

<sup>a</sup> $p < 0.01$ ; <sup>b</sup> $p < 0.05$ ; and <sup>c</sup> $p < 0.10$  indicate significant at 1%, 5% and 10% level respectively.

### Factors associated with anxiety

Table 7 presents a summary of multinomial logistic regression results of anxiety and its associated factors. Private university students are more likely to suffer from anxiety compared to the students of public university but not significant. The data indicate that in general, male students are less likely to suffer from anxiety compared to female students and are statistically significant. Occupation of parents also affects mental health negatively. Students aged more than 22 years were more likely to suffer from severe or extremely severe level of anxiety compared to the students who are aged 20 years or bellow. Academic performance was found to be an important determinant

of anxiety among the students and is statistically significant. Students with satisfactory academic performance are 46% less likely to suffer from severe or extremely severe level of anxiety. However, family types, taking part in sports and physical exercises, faculty of education are not significant determinants of anxiety among the participants. Details are shown in the Table 7.

**Table 7. Anxiety with associated factors**

Variable	Level of Anxiety (ref = Normal & Mild)					
	Moderate			Severe & Extremely Severe		
	Estimate	OR	90% CI	Estimate	OR	90% CI
<b>Sex (ref: Female)</b>						
Male	-0.098	0.907	0.591-1.237	-0.361 <sup>c</sup>	0.698	0.442-0.917
<b>Father's occupation (ref: Govt. Service)</b>						
Teaching & Others	0.307	1.360	0.902-2.033	0.141	1.152	0.766-1.720
Business	-0.054	0.948	0.636-1.359	-0.143	0.867	0.580-1.231
<b>Mother's occupation (ref: Housewife/Other)</b>						
Govt. Service/Teaching	-0.311	0.733	0.443-1.196	-0.426	0.653	0.388-1.082
<b>Family status (ref: Nuclear)</b>						
Larger/Other	0.003	1.003	0.604-1.666	-0.134	0.875	0.524-1.466
Extended	0.260	1.296	0.911-1.841	0.131	1.140	0.801-1.626
<b>Did you take part in sports and physical exercise? (ref: Sometimes &amp; Never)</b>						
Always	0.234	1.263	0.881-1.788	0.222	1.249	0.870-1.751
Frequently	0.175	1.192	0.759-1.844	-0.289	0.749	0.463-1.185
<b>Faculty (ref: Business)</b>						
Science & Engineering	-0.185	0.831	0.526-1.356	-0.269	0.764	0.488-1.259
Arts & Social science	-0.057	0.944	0.590-1.534	-0.093	0.911	0.574-1.490
<b>Age group (ref: &lt;=20)</b>						
>22	-0.160	0.852	0.646-1.226	0.110	1.116	0.867-1.641
<b>Academic performance (ref: Unsatisfactory)</b>						
Satisfactory	-0.284	0.753	0.473-1.188	-0.576 <sup>b</sup>	0.562	0.358-0.870
<b>Did you listen music?(ref: No)</b>						
Yes	-0.393	0.675	0.368-1.214	-0.575	0.562	0.307-0.999
<b>BMI class (ref: Normal Weight)</b>						
Under Weight	0.252	1.287	0.774-2.018	-0.093	0.911	0.530-1.420
Over Weight /Obese	-0.008	0.992	0.647-1.596	-0.285	0.752	0.490-1.252
<b>Types of the university (ref: Public)</b>						
Private	0.015	1.015	0.760-1.480	0.017	1.017	0.780-1.516

<sup>a</sup> $p < 0.01$ ; <sup>b</sup> $p < 0.05$ ; and <sup>c</sup> $p < 0.10$  indicate significant at 1%, 5% and 10% level respectively.

**Factors associated with stress**

Table 8 illustrates results from multinomial logistic regression of stress level and its associated factors. Students of the private university are more likely to suffer from stress at a severe or extremely severe level compared to the students of public universities but not significant. Male students are more likely to suffer from severe & extremely severe stress compared to female students (not significant). However, male students are 35% less likely to suffer from moderate stress compared to female students and are significant at 10% level of significance. Academic performance, the type of family, faculty of education, habits of taking part in sports and physical exercises, and age also severely affected stress levels. Our results indicate that the occupation of their parents have very little impact on stress level among the students. Those fathers' occupation is Govt. Service is less likely to suffer from all level of stress than those of teaching, business and others. But those mothers' occupation is housewife/other is less likely to suffer from all levels of stress than those students whose mother occupation is Govt. Service/Teaching. Students from extended family are about 55% less likely to suffer from severe stress compared to those who are from larger/other family. Science and Engineering or Arts and Social science students are moderately less stressed compared to the students from business faculty. Irrespective of university type, satisfactory performance students are less stressed, and it is also significant. Music lover are about 54% less likely to be moderately stressed. Surprisingly, underweight, and overweight students are less stressed.

**Table 8. Stress and its associated factors**

Variable	Level of Stress (ref=Normal &Mild)					
	Moderate			Severe & Extremely Severe		
	Estimate	OR	90% CI	Estimate	OR	90% CI
<b>Sex (ref: Female)</b>						
Male	-0.425 <sup>c</sup>	0.654	0.448-0.926	0.004	1.004	0.527-1.855
<b>Father's occupation (ref: Govt. Service)</b>						
Teaching & Others	0.028	1.028	0.679-1.564	0.336	1.400	0.708-2.771
Business	0.154	1.167	0.785-1.732	0.090	1.094	0.548-2.160
<b>Mother's occupation (ref: Housewife/Other)</b>						
Govt. Service/Teaching	-0.231	0.794	0.455-1.377	-1.017	0.362	0.106-1.233
<b>Family status (ref: Nuclear)</b>						
Larger/Other	-0.207	0.813	0.485-1.360	-0.392	0.676	0.264-1.735
Extended	-0.617 <sup>a</sup>	0.539	0.368-0.789	-0.780 <sup>c</sup>	0.458	0.236-0.891
<b>Did you take part in sports and physical exercise? (ref: Sometimes &amp; Never)</b>						
Always	0.268	1.307	0.899-1.884	0.540	1.717	0.923-3.177
Frequently	0.670 <sup>b</sup>	1.955	1.240-3.067	0.909 <sup>b</sup>	2.482	1.187-5.199
<b>Faculty (ref: Business)</b>						
Science & Engineering	-0.853 <sup>a</sup>	0.426	0.270-0.674	0.043	1.044	0.425-2.598
Arts & Social science	-0.653 <sup>b</sup>	0.520	0.333-0.817	0.203	1.225	0.501-3.019
<b>Age group (ref: &lt;=20)</b>						
>22	0.099	1.104	0.801-1.554	0.527	1.693	0.987-2.977
<b>Academic performance (ref: Unsatisfactory)</b>						
Satisfactory	-0.686 <sup>a</sup>	0.504	0.335-0.755	-0.547	0.579	0.296-1.137
<b>Did you listen music? (ref: No)</b>						
Yes	-0.776 <sup>b</sup>	0.460	0.273-0.773	-0.754	0.470	0.208-1.063
<b>BMI class (ref: Normal Weight)</b>						
Under Weight	-0.119	0.888	0.547-1.415	0.264	1.302	0.602-2.781
Over Weight /Obese	-1.116 <sup>a</sup>	0.327	0.176-0.615	-0.258	0.773	0.353-1.709
<b>Types of the university (ref: Public)</b>						
Private	-0.088	0.916	0.658-1.300	0.115	1.122	0.642-2.010

<sup>a</sup> $p < 0.01$ ; <sup>b</sup> $p < 0.05$ ; and <sup>c</sup> $p < 0.10$  indicate significant at 1%, 5% and 10% level respectively.

## Discussion

This study expands previous research work by providing further evidence to support the high prevalence of different mental illnesses such as depression, anxiety, and stress [58, 60, 61, 62, 64] at higher educational institutions. It also reveals the factors associated with the prevalence of mental illnesses among the students in the context of Bangladesh [59, 67].

From the overall result, it is evident that the prevalence of depression, anxiety, and stress is higher among the students of private universities compared to the students of the public universities in Bangladesh. Our results indicate that the prevalence of different levels of depression (moderate to severe/extremely severe) is relatively higher among female students compared to their male counterparts at private universities. However, severe/extremely severe level anxiety is more prevalent among female students compared to male students from both public and private universities. Meanwhile, female students of public universities tend to suffer from more stress compared to male students. On the other hand, among private university students, stress is more prevalent among male students compared to female students.

Our results show that depression, anxiety, and stress were significantly associated with family type and academic performance of the students of the private universities. Meanwhile, the prevalence of depression among public universities was found to be associated with their age. However, depression was not associated with the students' sex, occupation of their parents, playing habits, marital status, faculty in which they were studying, and their BMI classes. There is a significant association between taking part in sports and performing exercises activities and stress among the students of the public university. There is a significant association between the academic performance of students and the levels of stress of both university types. Academic performance, the type of their family, faculty of education, habits of taking part in sports and physical exercises, and age also severely affected stress levels.

Our results support some previous studies in the context of Bangladesh. For example, Haque (2015) found that private university students at the undergraduate level suffer from anxiety, depression, and panic episodes at different points of time in their campus life [64]. Islam, Akter, Sikder, and Griffiths (2020) found that the prevalence of depression and anxiety levels is high among first-year university students in the country [54]. They also found that the prevalence rates of moderate to extremely severe levels of depression and anxiety were 69.5% and 61%, respectively. Another study found that lower-class family status, taking cigarettes, and not being engaged in adequate physical exercise are some of the common risk factors for depression. Meanwhile, being in a relationship is one of the risk factors for anxiety and stress for university students in Bangladesh [67]. Another study found that females, having a lower or middle-class household, being in a relationship, poor academic performance, lack of adequate sleep, and excessive use internet are some of the key predictors for the high prevalence of depression, anxiety, and stress among the university students [59]. The psychological sufferings are also associated with spending quality time with family members, consuming balanced foods, and adequate regular sleep [60]. Moreover, the social and lifestyle variables contribute to the increased risk of psychological suffering among the students [65]. Another study argued that high pressure from family and relatives for getting a job, lack of availability of desired and full-time job are significant risk factors for depression and anxiety [68].

Our findings are unique in many ways than previous studies. The previous studies were focused either only on a public [63, 67] or a private university students [62, 64, 66]. Meanwhile, some of the studies investigated only either first-year students or final students or students who are in the job market [67, 68]. And some of the studies were conducted only at one university. There was no study that compared the prevalence and factors associated with mental illness among students of both public and private universities in Bangladesh.

However, we investigated the phenomena not only among the first students; rather our focus was on the students from different academic sessions/years, different socio-economic backgrounds. We also tried to find out the prevalence and factors of mental illness among the students of both public and private university students.

With the growing economy, the demand for skilled workforces has been increased in the past few decades in the country. Due to policy support from the government, private sector entrepreneurs have come forward to establish private universities. Fierce competition for the job market has created a competitive environment in the country's tertiary education system. Moreover, parents of the student, who are mostly from the middle and upper-income class, of private universities see enrolling their children at the institutions as an investment for their future security. Meanwhile, there is a high expectation from the parents of students of a public university that their children will take the responsibility of running the family soon after their graduation. In addition, a competitive academic environment, family expectations, and economic burdens lead to negative mental health outcomes among university students in Bangladesh.

However, our study has some limitations and the results may not be generalized to the whole country as it was conducted at only two universities in a city. The sample size was also small. So, it is recommended that future research should be conducted among the larger population. Moreover, future studies should also focus on the mental healthcare support system at university campuses in the country.

## Conclusion



Private university students are more likely to suffer from depression, anxiety, and stress compared to the students of public universities due to various contributing factors such as family structure, academic performance, and habit of taking part in sports and physical activities. Female students from both public and private universities are more likely to suffer from severe/extreme levels of anxiety compared to male students. There are some differences in risks factors for depression, anxiety, and stress. As there is a high prevalence of mental illnesses among university students in Bangladesh, the authorities should build up an effective support system such as setting up of counseling center, raising awareness of seeking help, and measures for reducing mental illness stigma on the campuses.

## Abbreviations

RU: Rajshahi University

VU: Varendra University

UGC: University Grants Commission

DASS: Depression, Anxiety and Stress Scales

## Declarations

### Human Ethics Statement

Ethical approval of this study was obtained from the Human Ethical Review Committee of Varendra University [Ref. VU/ERC/2019-2020/02]. Informed consent was obtained from all subjects and/or their legal guardian(s). We confirm that all methods were carried out in accordance with relevant guidelines and regulations of the Human Ethical Review Committee of Varendra University.

### Availability of data and materials

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

### Consent for publication

Not applicable

### Conflict of interest

The authors declare that they have no conflict of interest.

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