Clinical Epidemiology and Global Health 28 (2024) 101677

Contents lists available at ScienceDirect

Clinical Epidemiology and Global Health

journal homepage: www.elsevier.com/locate/cegh

Original article

# Exploring the prevalence of depression, anxiety, and stress among university students in Bangladesh and their determinants

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ARTICLE INFO

*Keywords:*
Depression
Anxiety
Stress
University student
Bangladesh

ABSTRACT

*Background:* Depression, anxiety and stress among university students present a growing global challenge. This study aims to explore the prevalence of depression, anxiety, and stress and identifying their associated factors among university students in Bangladesh.

*Methods:* We analyzed data of 738 university students collected through a cross-sectional survey. Outcome variables considered were depression, anxiety, and stress levels. Explanatory variables considered were several socio-demographic characteristics. Multinomial logistic regression analysis was employed to explore the association of the outcome variables with explanatory variables.

*Results:* We found a notable prevalence of moderate to severe levels of depression, anxiety, and stress among university students in Bangladesh, ranging from 25 % to 71 %. Among students from extended families, there was a 32 % lower likelihood of experiencing moderate depression (relative risk ratio [RRR], 0.68; 95 % confidence interval [CI], 0.47–0.97) and a 35 % lower likelihood of experiencing stress (RRR, 0.65; 95 % CI, 0.44–0.97) compared to their counterparts without depression and stress. Furthermore, students enrolled in the business faculty reported a significantly higher likelihood of stress, with a 2.28 times greater odds (95 % CI, 1.32–3.93) compared to students in the Science and Engineering faculty.

*Conclusion:* This study underscores the pressing necessity for tailored interventions to address the elevated prevalence of depression, anxiety, and stress among university students in Bangladesh. The findings accentuate the importance of recognizing diverse risk factors and implementing mental health support programs.

## 1. Introduction

Globally, one in eight individuals grapples with mental health disorders. A staggering 82 % of these cases are concentrated in low- and middle-income countries (LMICs), including Bangladesh.[1–3] This surge in mental health disorders can be attributed to the heightened prevalence of conditions like depression, anxiety, and stress, driven by rapidly evolving lifestyles.[3] Paradoxically, at the individual level, the far-reaching consequences of these disorders often go unnoticed, largely due to the pervasive notion that well-being solely encompasses physical fitness and freedom from physical ailments.[4] However, the adverse effects of depression, anxiety, and stress on overall health outcomes are significant and cannot be underestimated.[5] These mental health disorders can lead to a range of detrimental physiological and psychological consequences.[2] Physical health can be compromised as immune function may be impaired, making individuals more susceptible to illnesses.[6] Additionally, the cardiovascular system can be adversely affected, potentially leading to increased risk of heart diseases.[7] The intricate connection between mental and physical well-being highlights the necessity of addressing mental health concerns holistically.[8] In light of these complexities, it becomes imperative to not only identify the determinants of mental health disorders but also to acknowledge and

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https://doi.org/10.1016/j.cegh.2024.101677
Received 6 November 2023; Received in revised form 29 January 2024; Accepted 10 June 2024
Available online 13 June 2024
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address their profound impacts on health outcomes. By doing so, evidence-based policies and programs can be developed to create a more comprehensive approach to well-being that encompasses both physical and mental health.

University students in Bangladesh find themselves vulnerable to various factors, including the challenges of relocating from their usual place of residence, often leaving their parental homes.[9] The weight of academic demands and the adjustment to a distinct lifestyle post-enrolment further compound these pressures.[10] The emergence of informal relationships and an increasing incidence of breakups among university students is a contemporary phenomenon.[11] Regrettably, these trends may heighten the susceptibility of university students to experiences of depression, anxiety, and stress.[12] While the evidence linking these trends to mental health issues is compelling, comprehensive empirical support remains notably absent. The alarming surge in suicide cases among university students underscores the potential accuracy of this correlation.[13]

Prior investigations in Bangladesh and other LMICs have examined the prevalence of depression, anxiety, and stress within the general population, identifying key determinants.[14–18] Nevertheless, the distinct circumstances of university students, marked by separation from family and exposure to unique environments, necessitate a more nuanced understanding.[18,19] As such, the prevailing prevalence and influential factors as observed in the general population may not hold true for university students in Bangladesh. To address this critical knowledge gap, we conducted this study to explore the prevalence of depression, anxiety, and stress among university students in Bangladesh and the socio-demographic factors associated with these mental health issues.

## 2. Methods

### 2.1. Study design and setting

The data were procured through a cross-sectional survey carried out in two deliberately chosen universities: Rajshahi University (RU) and Varendra University (VU). These universities are both situated within the Rajshahi division of Bangladesh, which occupies the northern region of the country. Renowned throughout Bangladesh, these institutions offer comprehensive educational programs encompassing a wide array of disciplines at both undergraduate and post-graduate levels. Among them RU is a public university and VU is a private university. The survey encompassed a total of 738 students, with 380 from RU and 358 from VU. The determination of this sample size adhered to established standard procedures for sample selection.[20] Students hailing from diverse departments, semesters, and gender categories actively participated in the study.

### 2.2. Data collection

The primary data collection phase spanned from January 01 to March 20, 2021, employing a pre-developed and pre-tested structured questionnaire designed to capture raw data (Supplementary file 1). For the field data collection, individuals possessing post-graduate degrees were enlisted and underwent thorough training. This data collection process was conducted under the vigilant guidance of the first author, a seasoned research expert with more than two decades of teaching experience. Respondents contributed to the data collection process through a two-part questionnaire. The initial section was meticulously structured to encompass socio-demographic attributes, including age, gender, marital status, height, weight, parental occupation and income, family type, and field of study. This section aimed to comprehensively delineate the participants' characteristics. The second segment of the questionnaire featured the Depression, Anxiety, and Stress Scale (DASS-42), formulated by Lovibond (1995).[21] This scale was employed to gauge the levels of depression, anxiety, and stress among university students in Bangladesh. Prior to data collection, verbal consent was obtained from participants, enlightening them about the study's objectives and seeking their willingness to contribute. Informed written consent was obtained from the respondents or from their parents (for the respondents under age 18). Ethical clearance for this study was secured from the Ethical Review Committee of XX (this will be made available after acceptance) under reference number: XX (this will be made available after acceptance).

### 2.3. Outcome variable

The Depression, Anxiety, and Stress Scale (DASS-42) is a comprehensive self-reported instrument consisting of 42 items designed to assess prevailing symptoms experienced within the past week. Each of the three scales (Depression, Anxiety, and Stress) comprises 14 items, allowing respondents to provide responses on a scale of 0–3. This scale ranges from "did not apply to me at all" to "applied to me very much or much of the time".[21] The potential score range for each scale is from 0 to 42, and composite scores are derived from the collective scores of the 14 individual elements. To enhance clarity, we categorized these scores into three distinct levels: normal/mild (scores 0–13), moderate (scores 14–20), and severe/extremely severe (scores 21 or higher). This categorization provides a nuanced understanding of the degrees of depression, anxiety, and stress experienced by the participants. In cases where the scale is administered multiple times, symptoms can be graphed over time for a comprehensive view. Each of the three symptom clusters (Depression, Anxiety, and Stress) is described, encompassing various elements that contribute to a thorough understanding of the participants' mental health experiences. These clusters include dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia, inertia for Depression; autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect for Anxiety; and levels of chronic nonspecific arousal, difficulty relaxing, nervous arousal, being easily upset/agitated, irritable/over-reactive, and impatient for Stress.

### 2.4. Explanatory variables

The explanatory variables of this study comprised several socio-demographic factors. They were selected through a comprehensive and relevant literature search encompassing LMICs and Bangladesh.[14–19] They were respondent's age (17–20, 21–23, 24 and above), respondent's sex (male vs female), respondent's marital status (married vs unmarried), respondent's BMI (underweight, normal weight, overweight), and respondent's family type (nuclear vs extended). The respondent's parental variables encompassed respondent's father occupation (service, teaching, business, other), respondent's mother occupation (service, teaching, business, other), and respondent's parent income level (low, middle, high). Additionally, university-related variables for the respondents included the type of university (public vs private) and the name of the faculty where respondents studying (science and engineering, arts and social science, business).

### 2.5. Statistical analysis

Descriptive statistics were employed to portray the attributes of the respondents. To explore the connections between the outcome variables under consideration and the explanatory variables, a multinomial logistic regression model was applied. Three distinct models were executed, each dedicated to a specific outcome variable. The outcomes were quantified as Relative Risk Ratio (RRR), accompanied by their corresponding 95 % confidence intervals (95 % CIs). All statistical analyses for this study were conducted using Stata software version 14.0 (StataCorp.org, College Station, Texas, USA).

## 3. Results

### 3.1. Background characteristics of the respondents

Table 1 provides an overview of the background characteristics of the respondents. Notably, around 51 % of the total respondents were enrolled in a public university. Additionally, over 44 % of the respondents were affiliated with the arts and social science discipline. Age-wise, approximately 58 % of participants fell within the 21 to 23-year age bracket, while a majority (67.21 %) identified as male. In terms of paternal occupation, business was reported by 39 % of the respondents. Moreover, nearly 57 % of the participants hailed from a nuclear family structure.

### 3.2. Prevalence of depression, anxiety, and stress level among university students

Table 2 illustrates the distribution of percentages and frequencies related to depression, anxiety, and stress levels. It shows that 57.45 % of respondents do not suffer from depression, 29 % are free from anxiety, and 74.39 % do not experience stress. The average scores for depression, anxiety, and stress were measured at 13.78, 13.87, and 15.22, respectively. Notably, close to 57 % of the total respondents were categorized as experiencing a normal level of depression, while 28 % reported a moderate level and 15 % indicated severe depression. Furthermore, approximately one-third of university students exhibited symptoms indicative of an anxiety syndrome. Nearly 25 % of the respondents showcased signs of a stress syndrome, with almost 75 % of participants classified within the normal stress level category. A substantial correlation has been observed between Depression and Anxiety score (r = 0.658), as well as between Depression and Stress score (r = 0.684). Additionally, Anxiety and Stress score are also significantly correlated (r = 0.610). These correlations are all significant at the 1 % level (Table 2).

**Table 1**
Background characteristics of the respondents, N = 738.

| Characteristics | Frequency (n = 738) | Percentage (%) |
|---|---|---|
| **Type of university** | | |
| Public | 380 | 51.49 |
| Private | 358 | 48.51 |
| **Name of faculty** | | |
| Science and Engineering | 289 | 39.16 |
| Arts and social science | 328 | 44.44 |
| Business | 121 | 16.40 |
| **Respondent's age** | | |
| Age 17-20 | 245 | 33.20 |
| Age 21-23 | 426 | 57.72 |
| Age 24+ | 67 | 9.08 |
| **Sex** | | |
| Male | 496 | 67.21 |
| Female | 242 | 32.79 |
| **Marital status** | | |
| Married | 33 | 4.47 |
| Single | 705 | 95.53 |
| **Father's occupation** | | |
| Service | 135 | 18.29 |
| Teaching | 105 | 14.23 |
| Business | 286 | 38.75 |
| Other | 212 | 28.73 |
| **Mother's occupation** | | |
| Service | 15 | 2.03 |
| Teaching | 60 | 8.13 |
| Business | 641 | 86.86 |
| Other | 22 | 2.98 |
| **Parent's income level** | | |
| Low | 178 | 24.12 |
| Middle | 366 | 49.59 |
| High | 194 | 26.29 |
| **Type of family** | | |
| Nuclear | 424 | 57.45 |
| Extend | 314 | 42.55 |
| **BMI category** | | |
| Under-weight | 97 | 13.14 |
| Normal-weight | 541 | 73.31 |
| Over-weight/obesity | 100 | 13.55 |

**Table 2**
Prevalence of depression, anxiety, and stress among university students in Bangladesh, N = 738.

| Characteristics | Frequency (n) | Percentage (%) |
|---|---|---|
| **Depression level (mean, ±SD)** | | 13.78 (±6.88) |
| Normal | 424 | 57.45 |
| Moderate | 204 | 27.64 |
| Severe | 110 | 14.91 |
| **Anxiety level (mean, ±SD)** | | 13.87 (±5.80) |
| Normal | 214 | 29.00 |
| Moderate | 258 | 34.96 |
| Severe | 266 | 36.04 |
| **Stress level (mean, ±SD)** | | 15.22 (±6.89) |
| Normal | 549 | 74.39 |
| Moderate | 145 | 19.65 |
| Severe | 44 | 5.96 |

Correlations Matrix

| Characteristics | Depression Score | Anxiety Score | Stress Score |
|---|---|---|---|
| **Depression Score** | 1 | 0.658[a] | 0.684[a] |
| **Anxiety Score** | 0.658[a] | 1 | 0.610[a] |
| **Stress Score** | 0.684[a] | 0.610[a] | 1 |

[a] Correlation is significant at the 0.01 level (2-tailed).

### 3.3. Distribution of depression, anxiety, and stress levels by socio-demographic characteristics

Table 3 presents the distribution of depression, anxiety, and stress levels among respondents across various socio-demographic characteristics. The analysis revealed that depression was more prevalent among individuals aged 24 or older, females, unmarried respondents, those with fathers in service or other occupations, those with higher parental income, and those enrolled in private universities. Notably, a higher prevalence of anxiety was observed among respondents aged 24 or older, followed by those aged 21–23 years. Additionally, higher prevalence of anxiety was reported by female respondents, unmarried participants, underweight individuals, and those studying in private universities. The stress level exhibited a higher prevalence among respondents aged 21–23 years, unmarried individuals, females, and those belonging to families with four or fewer members. **Multinomial regression model to identify determinants of depression, anxiety, and stress among university students in Bangladesh.**

The factors associated with depression, anxiety, and stress levels among university students in Bangladesh have been determined through a multinomial logistic regression model, and the results are presented in Table 4. We found that the moderate level of depression was 32 % lower (RRR: 0.68, 95 % CI: 0.47–0.97) among students with an extended family background as compared to their counterparts from nuclear families. Similarly, the likelihood of a moderate level of stress among the same cohort of students was also found to be 35 % lower (RRR: 0.65, 95 % CI: 0.44–0.97) when compared to students from nuclear families. Moreover, we observed 2.28 times higher likelihoods of stress among students from the business faculty (95 % CI: 1.32–3.93) compared to students from the science and engineering faculty. Additionally, the likelihood of experiencing a severe level of anxiety was found to be 2.50 (95 % CI, 0.98–6.39) times higher among single students compared to married students.

## 4. Discussion

The objective of this study was to ascertain the prevalence of depression, anxiety, and stress among university students in Bangladesh

**Table 3**
Prevalence of depression, anxiety, and stress across respondents' socio-demographic characteristics.

| Characteristics | Depression | | | Anxiety | | | Stress | | |
|---|---|---|---|---|---|---|---|---|---|
| | Normal | Moderate | Severe | Normal | Moderate | Severe | Normal | Moderate | Severe |
| **Respondent's age** | | | | | | | | | |
| Age 17-20 | 57.96 | 27.76 | 14.29 | 29.39 | 33.47 | 37.14 | 74.69 | 21.63 | 3.67 |
| Age 21-23 | 57.04 | 28.17 | 14.79 | 27.10 | 37.32 | 34.98 | 73.94 | 18.54 | 7.51 |
| Age 24+ | 58.21 | 23.88 | 17.91 | 35.82 | 25.37 | 38.81 | 76.12 | 19.40 | 4.48 |
| **Sex** | | | | | | | | | |
| Male | 58.67 | 26.21 | 15.12 | 30.24 | 35.48 | 34.27 | 75.81 | 17.94 | 6.25 |
| Female | 54.96 | 30.58 | 14.46 | 26.45 | 33.88 | 39.67 | 71.49 | 23.14 | 5.37 |
| **Marital status** | | | | | | | | | |
| Married | 66.67 | 24.24 | 9.09 | 42.42 | 30.30 | 27.27 | 75.76 | 18.18 | 6.06 |
| Single | 57.02 | 27.80 | 15.18 | 28.37 | 35.18 | 36.45 | 74.33 | 19.72 | 5.96 |
| **Father's occupation** | | | | | | | | | |
| Service | 54.07 | 28.89 | 17.04 | 25.19 | 38.52 | 36.30 | 69.63 | 22.96 | 7.41 |
| Teaching | 61.90 | 28.57 | 9.52 | 26.67 | 37.14 | 36.19 | 79.05 | 14.29 | 6.67 |
| Business | 59.79 | 28.32 | 11.89 | 31.47 | 33.92 | 34.62 | 74.13 | 20.28 | 5.59 |
| Other | 54.25 | 25.47 | 20.28 | 29.25 | 33.02 | 37.74 | 75.47 | 19.34 | 5.19 |
| **Mother's occupation** | | | | | | | | | |
| Service | 53.33 | 26.67 | 20.00 | 26.67 | 20.00 | 53.33 | 73.33 | 26.67 | 0.00 |
| Teaching | 61.67 | 33.33 | 5.00 | 36.67 | 38.33 | 25.00 | 81.67 | 15.00 | 3.33 |
| Business | 56.94 | 27.30 | 15.76 | 27.93 | 35.26 | 36.82 | 73.63 | 19.81 | 6.55 |
| Other | 63.64 | 22.73 | 13.64 | 40.91 | 27.27 | 31.82 | 77.27 | 22.73 | 0.00 |
| **Parent's income level** | | | | | | | | | |
| Low | 60.11 | 25.84 | 14.04 | 28.09 | 34.83 | 37.08 | 71.35 | 20.79 | 7.87 |
| Middle | 57.65 | 27.87 | 14.48 | 28.69 | 36.89 | 34.43 | 74.04 | 20.22 | 5.74 |
| High | 54.64 | 28.87 | 16.49 | 30.41 | 31.44 | 38.14 | 77.84 | 17.53 | 4.64 |
| **Type of family** | | | | | | | | | |
| Nuclear | 53.77 | 30.42 | 15.80 | 29.72 | 33.49 | 36.79 | 71.23 | 21.46 | 7.31 |
| Extend | 62.42 | 23.89 | 13.69 | 28.03 | 36.94 | 35.03 | 78.66 | 17.20 | 4.14 |
| **BMI category** | | | | | | | | | |
| Under-weight | 57.73 | 30.93 | 11.34 | 24.74 | 41.24 | 34.02 | 72.16 | 20.62 | 7.22 |
| Normal-weight | 56.56 | 28.10 | 15.34 | 29.39 | 33.09 | 37.52 | 73.01 | 21.26 | 5.73 |
| Over-weight/obesity | 62.00 | 22.00 | 16.00 | 31.00 | 39.00 | 30.00 | 84.00 | 10.00 | 6.00 |
| **Type of university** | | | | | | | | | |
| Public | 58.42 | 27.11 | 14.47 | 30.00 | 34.74 | 35.26 | 75.00 | 19.21 | 5.79 |
| Private | 56.42 | 28.21 | 15.36 | 27.93 | 35.20 | 36.87 | 73.74 | 20.11 | 6.15 |
| **Name of faculty** | | | | | | | | | |
| Science & Engineering | 59.86 | 26.64 | 13.49 | 31.49 | 33.91 | 34.60 | 77.51 | 16.61 | 5.88 |
| Arts & social science | 56.10 | 28.96 | 14.94 | 27.74 | 35.37 | 36.89 | 74.09 | 19.21 | 6.71 |
| Business | 55.37 | 26.45 | 1818 | 26.45 | 36.36 | 37.19 | 67.77 | 28.10 | 4.13 |

while investigating their corresponding socio-demographic factors. The investigation revealed that 25.61 % of university students experience a moderate to severe level of stress, 71 % encounter a moderate to severe level of anxiety, and 43 % grapple with a moderate to severe level of depression. Noteworthy trends emerged when assessing the impact of socio-demographic factors. The risk of experiencing depression and stress was found to be lower among students with extended family backgrounds in comparison to those from nuclear family backgrounds. Additionally, students with a business-oriented academic background exhibited an increased likelihood of experiencing stress. The robustness of these findings is underscored by the substantial dataset, collected from a sizable and comparable sample pool spanning both public and private universities. Furthermore, the analysis employed sophisticated methodologies. These significant findings hold substantial implications. By recognizing those at risk, the study outcomes can guide stakeholders towards the development of effective mitigation strategies. This promises to enhance the overall well-being of university students, contributing to their academic and personal success.

The prevalence of depression, anxiety, and stress in this study has been revealed to be markedly higher than previous reports in both LMICs and Bangladesh.[15,16,18] This stark difference prompts an exploration into the intricate reasons underlying this disparity, shedding light on the multifaceted factors contributing to the elevated prevalence of these mental health issues among university students.[19] The transition to university life acts as a crucible for stressors, combining a new environment with academic pressures.[22] The sudden shift from familiar settings to an unfamiliar context, often far from the support systems of family and friends, can be emotionally challenging.[23] Additionally, the pursuit of higher education introduces uncertainties about identity and future prospects.[25] This pressure intensifies over the years at the university, especially as students begin contemplating their careers in the highly competitive job market of Bangladesh, characterized by a very high unsuccess rate. Coupled with demanding academic requirements and a competitive academic environment, the expectation to excel can become overwhelming, heightening susceptibility to depression, anxiety, and stress at the later ages of the university.[10,15]

Moreover, the rise of digital platforms and social media introduces a culture of constant comparison, contributing to feelings of isolation and inadequacy.[10] Balancing newfound independence with the responsibilities of adult life, often in an unfamiliar setting, can amplify stressors and contribute to mental health struggles.[24] These difficulties are even more challenging for the students who are backgrounded by the nuclear family who usually have lack of family support network. On the other hand, students backgrounded by the extended family enjoy larger support networks. The support provided by parents, siblings, and relatives, who traditionally offer emotional guidance and a sense of belonging, can bring comfort, thereby reducing the risk of facing mental health issues.[26] On the other hand, separation from the nuclear family can lead to feelings of detachment and uncertainty, as students navigate the challenges of university life without the familiar pillars of emotional support.[26] The absence of daily interactions and shared experiences with nuclear family members can also amplify feelings of loneliness, exacerbating mental health concerns.[19] In essence, the emotional distance from the extended family, a pivotal source of emotional grounding, can leave students vulnerable to the emotional strains that often characterize the university experience.[27]

**Table 4**
Multinomial regression model to explore predictors of depression, anxiety, and stress among university students in Bangladesh.

| Characteristics | Depression (ref: Normal) | | Anxiety (ref: Normal) | | Stress (ref: Normal) | |
|---|---|---|---|---|---|---|
| | Moderate (95 % CI) | Severe (95 % CI) | Moderate (95 % CI) | Severe (95 % CI) | Moderate (95 % CI) | Severe (95 % CI) |
| **Respondent's age (ref: age 17–20)** | | | | | | |
| Age 21-23 | 1.04 (0.72–1.52) | 1.09 (0.67–1.76) | 1.28 (0.85–1.93) | 1.05 (0.70–1.58) | 0.93 (0.62–1.41) | 2.03 (0.93–4.44) |
| Age 24+ | 0.98 (0.49–1.95) | 1.51 (0.67–3.38) | 0.81 (0.38–1.70) | 1.10 (0.56–2.19) | 1.18 (0.57–2.44) | 1.50 (0.37–6.11) |
| **Sex (ref: male)** | | | | | | |
| Female | 1.18 (0.80–1.73) | 1.11 (0.68–1.83) | 1.10 (0.71–1.69) | 1.41 (0.92–2.15) | 1.41 (0.93–2.15) | 0.78 (0.37–1.63) |
| **Marital status (ref: married)** | | | | | | |
| Single | 1.41 (0.58–3.43) | 2.49 (0.66–9.35) | 1.69 (0.68–4.20) | 2.50 (0.98–6.39) ** | 1.24 (0.46–3.34) | 1.06 (0.22–5.14) |
| **Father's occupation (ref: Service)** | | | | | | |
| Teaching | 0.87 (0.48–1.58) | 0.50 (0.22–1.17) | 0.95 (0.49–1.86) | 1.06 (0.54–2.09) | 0.61 (0.30–1.23) | 0.68 (0.24–1.94) |
| Business | 0.98 (0.60–1.59) | 0.62 (0.34–1.15) | 0.69 (0.40–1.17) | 0.73 (0.43–1.26) | 0.88 (0.52–1.50) | 0.65 (0.27–1.53) |
| Other | 1.01 (0.59–1.74) | 1.31 (0.69–2.47) | 0.74 (0.41–1.34) | 0.88 (0.49–1.59) | 0.81 (0.46–1.45) | 0.54 (0.20–1.45) |
| **Mother's occupation (ref: Service)** | | | | | | |
| Teaching | 1.04 (0.27–3.96) | 0.22 (0.04–1.34) | 1.22 (0.24–6.28) | 0.30 (0.07–1.20) | 0.51 (0.13–2.04) | na |
| Business | 0.94 (0.27–3.25) | 0.83 (0.21–3.34) | 1.45 (0.15–5.95) | 0.64 (0.18–2.25) | 0.61 (0.18–2.03) | na |
| Other | 0.71 (0.14–3.51) | 0.50 (0.08–3.22) | 0.94 (0.15–5.95) | 0.42 (0.09–2.06) | 0.74 (0.16–3.51) | na |
| **Parent's income level (ref: low)** | | | | | | |
| Middle | 1.12 (0.71–1.77) | 1.34 (0.75–2.40) | 0.91 (0.56–1.49) | 0.86 (0.53–1.40) | 0.91 (0.56–1.50) | 0.55 (0.25–1.21) |
| High | 1.20 (0.70–2.04) | 1.60 (0.83–3.09) | 0.76 (0.42–1.37) | 0.95 (0.54–1.69) | 0.67 (0.37–1.22) | 0.55 (0.21–1.44) |
| **Type of family (ref: nuclear)** | | | | | | |
| Extend | 0.68 (0.47–0.97) ** | 0.71 (0.45–1.11) | 1.26 (0.86–1.85) | 1.05 (0.72–1.54) | 0.65 (0.44–0.97) ** | 0.54 (0.27–1.09) |
| **BMI category (ref: under-weight)** | | | | | | |
| Normal-weight | 1.00 (0.60–1.67) | 1.47 (0.71–3.04) | 0.74 (0.41–1.32) | 1.05 (0.58–1.90) | 1.15 (0.65–2.05) | 0.69 (0.28–1.73) |
| Over-weight/obesity | 0.71 (0.35–1.42) | 1.38 (0.56–3.38) | 0.87 (0.42–1.81) | 0.86 (0.40–1.86) | 0.49 (0.20–1.16) | 0.64 (0.19–2.13) |
| **Type of university (ref: Public)** | | | | | | |
| Private | 0.99 (0.68–1.44) | 0.97 (0.60–1.56) | 1.17 (0.78–1.76) | 1.14 (0.76–1.70) | 0.92 (0.61–1.39) | 1.12 (0.57–2.20) |
| **Name of faculty (ref: Science & Engineering)** | | | | | | |
| Arts & social science | 1.16 (0.80–1.69) | 1.16 (0.71–1.88) | 1.18 (0.79–1.78) | 1.18 (0.79–1.77) | 1.26 (0.81–1.93) | 1.23 (0.63–2.43) |
| Business | 1.12 (0.66–1.89) | 1.36 (0.72–2.57) | 1.22 (0.69–4.73) | 1.23 (0.70–2.17) | 2.28 (1.32–3.93) *** | 1.01 (0.34–2.96) |

**Note:** **$p < 0.05$, ***$p < 0.01$.

This study also revealed a noteworthy correlation between students from a business background and higher levels of stress. This association could be attributed to a confluence of factors inherent to the business curriculum and its demands. Business education often places emphasis on competitiveness, rigorous coursework, and performance-driven evaluations.[28] The pursuit of academic excellence in this context may engender an environment of heightened pressure and constant evaluation.[28] Furthermore, business students might grapple with the anticipation of entering a competitive job market upon graduation, which could intensify stress levels as they strive to secure a prosperous future.[29,30] The challenges of balancing academic commitments, extracurricular activities, and potential internships or part-time jobs within a demanding business program can contribute to an overwhelming sense of responsibility.[30] As a result, these cumulative pressures within the business academic realm might contribute to the observed higher stress levels among students of this background, warranting targeted interventions and support mechanisms.

This study presents several notable strengths alongside a few limitations. A significant strength lies in its pioneering role as the first examination of depression, anxiety, and stress among university students in Bangladesh. These critical mental health parameters were assessed using the widely recognized DASS-42 scale, enhancing the study's validity and comparability on a global scale. The collected data underwent thorough analysis, employing advanced statistical methodologies and incorporating an extensive range of explanatory variables. As a result, the study's findings can be confidently considered reliable, holding promise for their integration into national policy and program development. However, certain limitations warrant consideration. Notably, this study is based on cross-sectional data, implying that the observed findings are correlational rather than indicative of causal relationships. The retrospective nature of data collection, accompanied by self-reported responses without external validation, introduces the potential for recall bias. Furthermore, while the analysis did take into account a range of influential factors, it's important to acknowledge that other factors, such as previous mental health history, coping mechanisms, and social support systems as well as environmental influences also contribute to depression, anxiety, and stress levels. Therefore, they are important to be considered in the analysis. However, due to the absence of pertinent variables within the survey, these external factors could not be incorporated into the model. Despite these limitations, the study offers a significant contribution to our understanding of mental health among university students in Bangladesh, serving as a cornerstone for further research and policy considerations.

## 5. Conclusion

This study reported a moderate to severe level of depression, anxiety, and stress ranging from 25 % to 71 % among university students in Bangladesh. The likelihood of depression, anxiety, and stress was found to be lower among students from an extended family background, whereas the likelihood of stress was found to be higher among business-level students. The significantly higher prevalence of depression, anxiety, and stress among university students highlights the necessity for tailored programs to improve their mental health. This may involve the implementation of mental health programs and raising awareness about the importance of mental health, with priority given to high-risk students. It is essential to prioritize the inclusion of parental and family engagement in these efforts.

## Author's contribution

Md. Kamruzzaman: Conceptualized and designed the research, supervised data collection, result processing and result interpretation, principal investigator and management of the project. Md Nuruzzaman Khan wrote the first and final draft of the manuscript along with analysis of data. Ahammad Hossain, Md. Aminul Islam and Md. Shakil Ahmed: Acquisition of data, data analysis, draft report preparation and interpretation of the results and Enamul Kabir: reviewed the draft manuscript and contributed to the final version of the manuscript with checking concept, methodology, writing strategy and conclusion section.

## Funding

This research was conducted without external funding.

## Availability of data and materials

The data analyzed during the course of this study are available from the corresponding authors upon reasonable request. We cannot share this data publicly because of the restriction imposed by the ethical approval broad.

## Ethics approval and consent to participate

This study obtained ethical approval from the Ethical Review Committee of Varendra University [Ref. VU/ERC/2019–2020/02]. Prior to the commencement of the study, informed written consent was obtained from the respondents or their parents (for respondents aged under 18). Before doing so, they participants and/or their parents were provided with a clear understanding of the study's objectives and their right to participate or decline without any discomfort.

## Declaration of competing interest

The authors declare that there is no conflict of interest associated with this study.

## Acknowledgement

We acknowledge the support of Institute of Bangladesh Studies of the University of Rajshahi, Bangladesh where this research was conducted.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cegh.2024.101677.

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