

RESEARCH ARTICLE

Prevalence of depression and its associated factors among undergraduate admission candidates in Bangladesh: A nation-wide cross-sectional study

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Data Availability Statement: The data has been subject to restrictions set by the ethics committee and is available in the records of the ethical committee. Here is the contact address to send a reasonable request to provide data. Chief, Biostatistics and epidemiology research team Department of Statistics School of Physical Sciences Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh Email: sta@sust.edu Phone: +88-0821-713491 (ext. 2257)

Abstract

Background

The undergraduate admission test is one of the most stressful assessments in a student's life, as it is required for admission to any of Bangladesh's public universities or medical colleges. Those taking the admissions test are under a lot of pressure to perform well. This study aimed to determine the prevalence of clinical depression among Bangladeshi admission candidates and the factors that contribute to it.

Methodology

Patient Health Questionnaire (PHQ-9) and other socio-demographic information were collected from 5263 students from all over Bangladesh. Apart from descriptive statistics and chi-square tests, an ordinal logistic regression model was also applied to determine the factors associated with depression.

Results

The study revealed that among the undergraduate admission applicants, 74% of individuals were affected by depression, while 26% experienced moderate depression, 26% experienced moderately severe depression, and 22% experienced severe depression. The level of depression among females was 1.8 times higher than the male admission candidates. Our analyses found that gender ($p < 0.001$), exercise ($p < 0.001$), pre-marital relationships ($p < 0.001$), daily study time less than 3 hours ($p < 0.001$), practice of religion ($p < 0.001$), victim of blackmail ($p < 0.001$), family unrest ($p < 0.001$), major illness ($p < 0.001$), COVID-19 infection ($p < 0.001$), GPA in higher secondary ($p < 0.001$), mental problem ($p < 0.001$), all

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categories of the variable confidence level for exam preparation ($p < 0.001$) had a significant impact on increasing depression.

Conclusion

The research found a severe rate of depression among Bangladeshi undergraduate admission candidates. Interactive mental health care programs must include family and teachers to tackle the problem. To alleviate mental stress and depression, students should learn to nurture their mental health.

Introduction

There is a growing body of research that indicates an increasing incidence of mental health disorders among students, particularly those attending secondary schools and institutions of higher education [1]. The transition from high school to university entails a multitude of transformations across various domains, encompassing social, educational, and emotional aspects of development [2]. In numerous nations, such as Bangladesh, India, Germany, Russia, and France, it is customary for individuals who have completed their secondary education to undergo an entrance examination to secure admission into higher education institutions, and acquisition of a university degree is widely regarded as a noteworthy achievement, as it provides individuals with novel frameworks and proficiencies, enabling them to delve into an extensive reservoir of knowledge [3].

The undergraduate admission examination is one of the most stressful parts of a student's life because this test is the first step toward achieving a career goal, particularly in Bangladesh. Due to the restricted number of available seats, even those students who are eligible to apply and take the admissions exam are not guaranteed admission to the institution [3]. Students must overcome the obstacle of the admissions exams and pass the exam to secure their places. For example, in the academic year 2021–22, about 1.4 million students throughout the nation participated in high school and equivalent examinations, with 189,169 achieving the highest grade of 5 [4]. Bangladesh has a total of 51 public universities and 56 public medical and dental colleges. Approximately 60,000 places are available at universities, while another 5,000 are available at medical and dental colleges [5]. These limited seats cause enormous psychological pressure on the admission candidates [6]. The majority of applicants fail it, and consequently, they are denied admission. Many of them even commit suicide for not getting admission to the institutions [7,8]. Most of the students participating in the admission test are adolescents.

It had been reported by researchers that the prevalence rate of depression among adolescents in India are 25.8 percent [9]. Iran had a rate of 52.6 percent [10], which is much higher than Pakistan's 17.2 percent [11], which stands in comparison to Malaysia's 26.2 percent [12] and Sri Lanka's 36 percent [13], 33 percent in China [14], and around 40 percent in South Korea [15]. Moreover, among adolescents, depression was associated with anxiety, GPA, major physical illness, smoking, drug or alcohol, decreasing academic excellence, self-injurious behaviors, and suicidal thought [16–18].

Several researchers have studied the mental condition of the undergrad (either university or medical colleges) admission candidates. The level of depression is associated with gender, result grade, family income, study time, and social activities [19,20]. High self-reported symptoms of depression reflect exam-related stress, expectations from society, worrying about future performance connected to university placement uncertainties, etc [21].

Pandemic caused by the Covid-19 virus has had a profound influence on both physical and mental health, as has been thoroughly documented by researchers from all around the world, Bangladesh was not an exception [22]. The mental well-being of adolescents was significantly impacted by the pandemic, leading to the emergence of depression and various other mental health conditions [23]. Due to the miserable conditions caused by the pandemic, it became necessary to reschedule the university entrance exams [24].

All the previous studies that have been conducted on depression in Bangladesh are too specified, either school-college or undergraduate medical-university students. A few studies have covered one of the most crucial periods for adolescents after passing college, the undergraduate admission time, but the researchers hardly found any study conducted to assess the significant factors as well as covid-19. This study aims to fill this study gap. Hence, the main objective of the study was to assess the prevalence of depression among undergraduate admission candidates in Bangladesh. The study also aimed to identify the impact of several socio-demographic factors, including covid-19 on the current mental health of undergraduate admission candidates in Bangladesh.

Methodology

Study design, study settings, data collection procedure and sample size

A cross-sectional study was conducted in all administrative divisions of Bangladesh from April/June 2022 through July/October 2022. The data was collected using stratified cluster sampling technique. The administrative divisions were considered as stratum where the various coaching institutes within the divisions were taken as clusters. Our respondents were students who attained undergraduate admission tests for the academic year 2021–2022. Data was collected online using Google Forms. The data enumerator visited the institutes and distributed via institutional groups in social media (Telegram, WhatsApp, Messenger, and Facebook) comprising of the students at the institute. In the questionnaire, socio-demographic and Patient Health Questionnaire (PHQ-9) items were included. The PHQ-9 questions were valid and reliable for this data as Cronbach's alpha value of 0.78. To establish the practicability and efficacy of the research, a pilot study consisting of fifty-one students was carried out. After that, they were disregarded in the further examination of the data. The questionnaire passed through a few rounds of edits before the final research was ever carried out to make sure it met all of the requirements.

The Sample size (n) was calculated as follows:

$$\text{Sample Size} = \frac{\frac{z^2 \cdot p(1-p)}{e^2}}{1 + \frac{z^2 \cdot p(1-p)}{e^2 N}} = 4211$$

If 20% non-response (80% response) then the final sample size will be: $n = 4211 / 0.80 = 5263$

Where,

N = 1.4 million; the total number of students who attained undergraduate admission test

Z = 1.96, Z value for 95% confidence limits,

P = Assumed prevalence (i.e., 0.50 for 50%)

e = Desired precision (e.g., 0.02).

Ethical approval

Biostatistics, epidemiology, and public health research group, Department of Statistics, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh, has approved the ethics

application (Ref: PR-003). Ethical guidelines established by the institution's or country's research committee, as well as the 1964 Helsinki Declaration and the later amendments of it or other equivalent ethical norms, guided every step of the process. Those who ensured written consent to participate in the study were included in this study.

Inclusion and exclusion criteria

The inclusion criteria used in this research were as follows: i) Individuals seeking admission to a university who have completed the Higher Secondary Certificate (HSC) test during the 2021–22 academic session. ii) Individuals applying for admission to a university who possess Bangladeshi nationality. The exclusion criteria used in this investigation were as follows: i) Students enrolled in educational institutions that use English as the language of instruction; ii) Students in Vocational curriculums, iii) Students those studied abroad In Bangladeshi curriculum.

Socio-demographic variable

Age, district name, marital status (married, unmarried), gender (male, female), family economic condition (lower class, lower middle class, middle class, middle-upper class, upper class), uses of social media (yes, no), religion (Islam, Hinduism, Others), any types of addiction (yes, no), pre-marital affair (yes, no), sexual experience (yes, no), regular physical activities (yes, no), duration of the study (below three hours, three to four hours, four to five hours, five to six hours, above six hours), religiosity (yes, no), smoking (yes, no), a victim of any types of blackmail (yes, no), family unrest (yes, no), major physical illness (yes, no), affected by covid-19 (yes, no), GPA (GPA-3, GPA-4, GPA-5), exam preparation status (not confident, less confident, confident, more confident), family mental illness history (yes, no) were considered as socio-demographic variables.

Outcome variables

The Patient Health Questionnaire was used to gauge the degree of depression experienced by the respondent (PHQ-9). When it comes to diagnosing depression in a person, the PHQ-9 is one of the most well-known and easy-to-use questionnaires. For PHQ-9 questions, the 4-point Likert scale ranges from “0 = not at all” to “3 = almost every day”. Based on scores ranging from 0 to 4, 5 to 9, 10 to 14, 15 to 19, and 20 to 27, respectively, the severity of depression was assigned to one of five groups: None-minimal, mild, moderate, moderately severe, and severe. Whereas, score more than 10 was counted as depressed category [25]. [S1 Appendix](#) is a list of all the questions and scales used in the PHQ-9 questionnaires.

Statistical analysis

The descriptive analysis was used to summarize the socio-demographic and depression measuring variables. Respondents were categorized into various levels of depression by measuring score bands of PHQ-9 Likert scale. Pearson Chi-square test was used to assess the association between different variables with depression. An ordinal logistic regression model was fitted between depression categories as dependent variable and all the other variables as independent variables. Odds ratios (OR) and 95% confidence intervals for the OR were derived for all the categorical variables. The distributions of depression according to “gender”, “use of social media”, “ever blackmailed”, and “having family problems” were presented in bar charts. A Pie chart presents the percentage of admission students suffering from various levels of depression.

A Multivariable adjusted ordinal logistic regression model was fitted to this data to assess the relationship between various explanatory variables and the dependent variable which was the depression level. We used an ordinal logistic regression model as the response for depression levels which are in a natural order. Among various types of ordinal logistic regression models, we decided to use the Proportional Odds model which seeks to forecast the likelihood that a case will fall within or exceed a certain level of a response variable, which is the complementary direction from one or more explanatory variables. Various computer programs parameterize this model as the function given below:

$$\ln\left(\frac{\Pr(y \leq j)}{\Pr(y > j)}\right) = \ln(\text{odds}(y \leq j)) = \theta_j - (\beta_1 X_1 + \dots + \beta_k X_k)$$

The function above resulted in a more consistent reading with how one would generally interpret the trend of effects in the framework of linear regression, where $\Pr(y \leq j)$ is denoted as the cumulative probability of an event ($y \leq j$); θ_j is the respective constant term/intercepts; and β_k are the of regression coefficients that corresponds to the X_k covariates.

Assuming that categories on the dependent variable were ordered ascendingly, that was, moving from lower to higher values on the dependent variable, we could interpret an estimated regression slope as the predicted change in the log odds or logits of a case falling above a given category j on the dependent variable while holding the other predictors constant.

Higher scores on X are related with a larger likelihood that a case would fall into group j , as compared to lower category. If a negative slope (β_k) is inserted into the preceding equation, the result is (β_k), which indicates that higher X scores are linked with a larger risk of dropping at or below group j and a lower probability of being in a higher category j . Lastly, each threshold represented the cumulative log odds of an instance falling into group j or below, when the predictors were zero.

Results

Demographic variables

Table 1 showed the demographic of this research. A total of 5263 respondents were included in the survey. Among the participants, 62.3% were female and 37.7% were male, 6.8% believe in Hinduism, 92.9% were Muslim and 0.3 believed in others. 97.8% were unmarried and the rest were married. The mean age of the respondents was 19.31 (SD = 1.114) years, whereas the age range of the respondents was 16–24 years. Additionally, **Fig 1** illustrated the geographic distribution of respondents across 8 administrative divisions of Bangladesh. It indicated that the Dhaka division had the highest number of respondents at 25.40%, followed by Chittagong with 22.82%. On the other hand, Sylhet had the lowest number of respondents at 5.21%. In this study, we did not consider 'division' as a factor to assess depression.

Prevalence of depression

Fig 2 outlined the prevalence of depression among the participants. We found 74% suffered from depression, while 26% were from moderate, 26% moderately severe, and 22% were suffering from severe levels of depression.

Fig 3 showed the distribution of depression levels according to genders, exam preparation, blackmail (recently experienced or not) and family problems (whether there is unrest in the family). The opposite trend of depression between males and females, not confident & more confident, blackmailed or not and having a family problem & not having a family problem were very apparent in the bar chart.

Table 1. Socio-demographical variable's distribution by different level of depression.

Variables	Levels	None Minimal Depression	Mild Depression	Moderate Depression	Moderately Severe Depression	Severe Depression	P-Value
		Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	
Age	Mean age 19.31, SD = 1.114						
Gender	Female	166 (3.2)	491 (9.3)	799 (15.2)	951 (18.1)	873 (16.6)	<0.001
	Male	212 (4)	480 (9.1)	573 (10.9)	436 (8.3)	282 (5.4)	
Family Income	Lower-middle class	67 (1.3)	168 (3.2)	249 (4.7)	254 (4.8)	172 (3.3)	<0.001
	Middle class	77 (1.5)	227 (4.3)	315 (6)	300 (5.7)	211 (4)	
	Middle-upper class	86 (1.6)	199 (3.8)	329 (6.3)	331 (6.3)	303 (5.8)	
	Upper class	65 (1.2)	187 (3.6)	249 (4.7)	279 (5.3)	279 (5.3)	
	Lower class	83 (1.6)	190 (3.6)	230 (4.4)	223 (4.2)	190 (3.6)	
Use of social media	No	45 (0.9)	54 (1)	81 (1.5)	79 (1.5)	83 (1.6)	<0.001
	Yes	333 (6.3)	917 (17.4)	1291 (24.5)	1308 (24.9)	1072 (20.4)	
Religion	Hinduism	40 (0.8)	65 (1.2)	90 (1.7)	93 (1.8)	69 (1.3)	0.11
	Islam	337 (6.4)	904 (17.2)	1278 (24.3)	1290 (24.5)	1079 (20.5)	
	Other	1 (0)	2 (0)	4 (0.1)	4 (0.1)	7 (0.1)	
Exercise	No	267 (5.1)	783 (14.9)	1178 (22.4)	1256 (23.9)	1096 (20.8)	<0.001
	Yes	111 (2.1)	188 (3.6)	194 (3.7)	131 (2.5)	59 (1.1)	
Pre-marital relationship	No	328 (6.2)	802 (15.2)	1108 (21.1)	1029 (19.6)	837 (15.9)	<0.001
	Yes	50 (1)	169 (3.2)	264 (5)	358 (6.8)	318 (6)	
Study time	3 to 4 hours	40 (0.8)	123 (2.3)	188 (3.6)	187 (3.6)	132 (2.5)	<0.001
	4 to 5 hours	41 (0.8)	121 (2.3)	204 (3.9)	211 (4)	134 (2.5)	
	5 to 6 hours	64 (1.2)	155 (2.9)	241 (4.6)	237 (4.5)	156 (3)	
	Below 3 hours	39 (0.7)	131 (2.5)	224 (4.3)	306 (5.8)	371 (7)	
	More than 6 hours	194 (3.7)	441 (8.4)	515 (9.8)	446 (8.5)	362 (6.9)	
Practice religion	No	21 (0.4)	67 (1.3)	116 (2.2)	179 (3.4)	196 (3.7)	<0.001
	Yes	357 (6.8)	904 (17.2)	1256 (23.9)	1208 (23)	959 (18.2)	
Smoking	No	362 (6.9)	925 (17.6)	1321 (25.1)	1330 (25.3)	1111 (21.1)	0.78
	Yes	16 (0.3)	46 (0.9)	51 (1)	57 (1.1)	44 (0.8)	
Experienced any type of blackmailing recently	No	370 (7)	931 (17.7)	1283 (24.4)	1246 (23.7)	961 (18.3)	<0.001
	Yes	8 (0.2)	40 (0.8)	89 (1.7)	141 (2.7)	194 (3.7)	
Family problem	No	331 (6.3)	736 (14)	851 (16.2)	640 (12.2)	366 (7)	<0.001
	Yes	47 (0.9)	235 (4.5)	521 (9.9)	747 (14.2)	789 (15)	
Sickness	No	361 (6.9)	895 (17)	1225 (23.3)	1187 (22.6)	901 (17.1)	<0.001
	Yes	17 (0.3)	76 (1.4)	147 (2.8)	200 (3.8)	254 (4.8)	
Addressed COVID-19 infection	No	319 (6.1)	760 (14.4)	1073 (20.4)	1021 (19.4)	795 (15.1)	<0.001
	Yes	59 (1.1)	211 (4)	299 (5.7)	366 (7)	360 (6.8)	
Mental problem	No	359 (6.8)	918 (17.4)	1259 (23.9)	1240 (23.6)	978 (18.6)	<0.001
	Yes	19 (0.4)	53 (1)	113 (2.1)	147 (2.8)	177 (3.4)	
Exam Preparation	Confident	188 (3.6)	501 (9.5)	764 (14.5)	754 (14.3)	596 (11.3)	<0.001
	Less More confident	88 (1.7)	277 (5.3)	388 (7.4)	386 (7.3)	255 (4.8)	
	More confident	91 (1.7)	154 (2.9)	126 (2.4)	73 (1.4)	53 (1)	
	Not confident	11 (0.2)	39 (0.7)	94 (1.8)	174 (3.3)	251 (4.8)	
Sexual experience	No	347 (6.6)	885 (16.8)	1220 (23.2)	1246 (23.7)	979 (18.6)	<0.001
	Yes	31 (0.6)	86 (1.6)	152 (2.9)	141 (2.7)	176 (3.3)	

(Continued)

Table 1. (Continued)

Variables	Levels	None Minimal Depression	Mild Depression	Moderate Depression	Moderately Severe Depression	Severe Depression	P-Value
		Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	
Age	Mean age 19.31, SD = 1.114						
Marital status	Married	9 (0.2)	23 (0.4)	29 (0.6)	29 (0.6)	26 (0.5)	0.99
	Unmarried	369 (7)	948 (18)	1343 (25.5)	1358 (25.8)	1129 (21.5)	
SSC GPA	GPA-5	158 (3)	470 (8.9)	731 (13.9)	852 (16.2)	804 (15.3)	<0.001
	Not GPA-5	220 (4.2)	501 (9.5)	641 (12.2)	535 (10.2)	351 (6.7)	

<https://doi.org/10.1371/journal.pone.0295143.t001>

From **Table 1** we found that 49.9% of female and 24.6% of male students were depressed. Among the females, 15.2% suffered from moderate depression, 18.1% from moderately severe, and 16.6% suffered a from severe level of depression. Whereas 10.9%, 8.3%, and 5.4% were suffering from moderate, moderately severe, and levels of depression, respectively ($p < 0.001$). Family income ($p < 0.001$), use of social media ($p < 0.001$), exercise ($p < 0.001$), pre-marital relationships ($p < 0.001$), practice of religion ($p < 0.001$), victim of Blackmail ($p < 0.001$), family unrest ($p < 0.001$), major illness ($p < 0.001$), all categories of exam preparation ($p < 0.001$), GPA ($p < 0.001$) had significant effect on increasing depression among the undergrad admission candidates of Bangladesh.

Factors associated with depression

Table 2 portrayed the estimates, log odds and P-values of the fitted ordinal logistic model. The dependent variable had 5 depression levels as None or minimal, Mild, Moderate, Moderate to severe, and severe. The levels of depression represented lower to higher levels of depression among the respondents for which we fitted the ordinal logistic regression model to predict the relationship between depression and various explanatory variables.

As the model predicted cumulative odds for an instance to be in higher levels as opposed to the lower levels of the dependent variable for changing from reference to other categories of explanatory variables, we observed from the table that, the cumulative odds for female admission candidates to be in higher levels of depression than lower levels of depression are approximately 1.8 times (95% CI (1.595–1.981) higher than that of male candidates.

Candidates who did not practice physical exercise were almost 2 times (95% CI (1.681–2.273), P-value < 0.001) more likely to be in higher depression levels as opposed to the candidates who do physical exercise. In addition, those are engaged in pre-marital relationships had 1.2 times (95% CI (1.09–1.391), P-value < 0.001) higher odds of being in higher levels of depression as opposed to lower levels than the candidates who did not have pre-marital relationships.

In various study durations only one level was found to be statistically significant, candidates who study less than 3 hours were 1.4 times (95% CI (1.205–1.626), P-value < 0.001) more likely to be in higher depression levels than the candidates who had a study time of more than 6 hours. The cumulative odds of participants being in higher levels of depression who were less practicing religion is 1.4 times (95% CI (1.203–1.677), P-value < 0.001) higher than those practicing ones.

The cumulative odds of being in higher levels of depression as opposed to lower levels of depression increased by almost 2 times, (95% CI (1.653–2.384), P-value < 0.001) for students who had experienced blackmailing recently, and almost 3 times for candidates that were suffering from family problems. Similarly, for applicants who had a major sickness, affected by COVID-19, or had mental problems, the probabilities of being in greater levels of depression

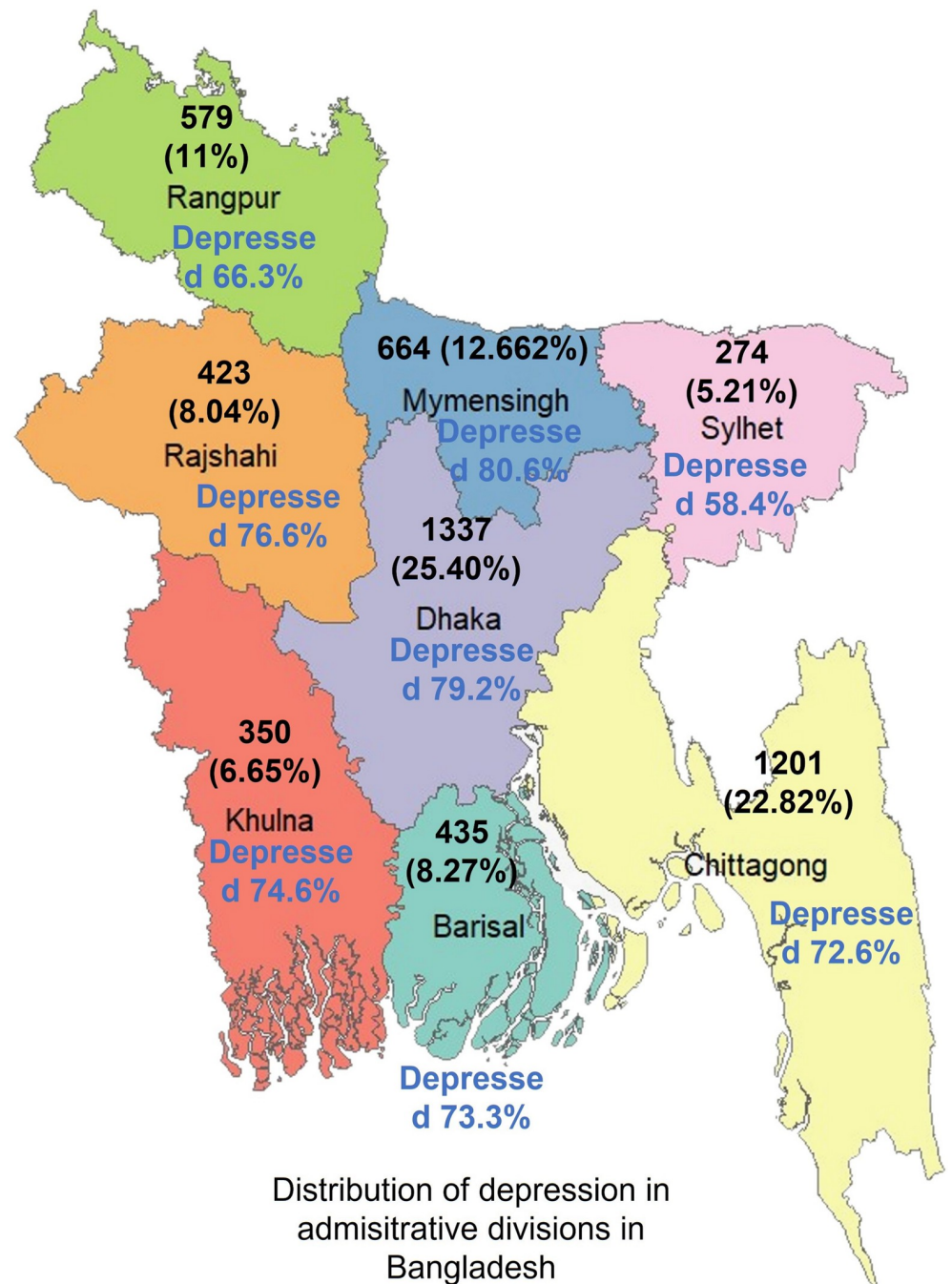


Fig 1.

<https://doi.org/10.1371/journal.pone.0295143.g001>

as compared to lower levels vary by cumulative factors of 1.8 times (95% CI (1.557–2.107), P-value <0.001) and 1.25 times (95% CI (1.06–1.50), P-value <0.001), respectively.

Applicants who were more confident about the exam had fewer odds of being in higher levels of depression than less confident candidates. In the log odds scale by taking the reciprocal of the tabulated odds we found that the cumulative odds that candidates who were “Not confident” with the exam preparation are 4 (1/0.53) times more likely to be in higher depression

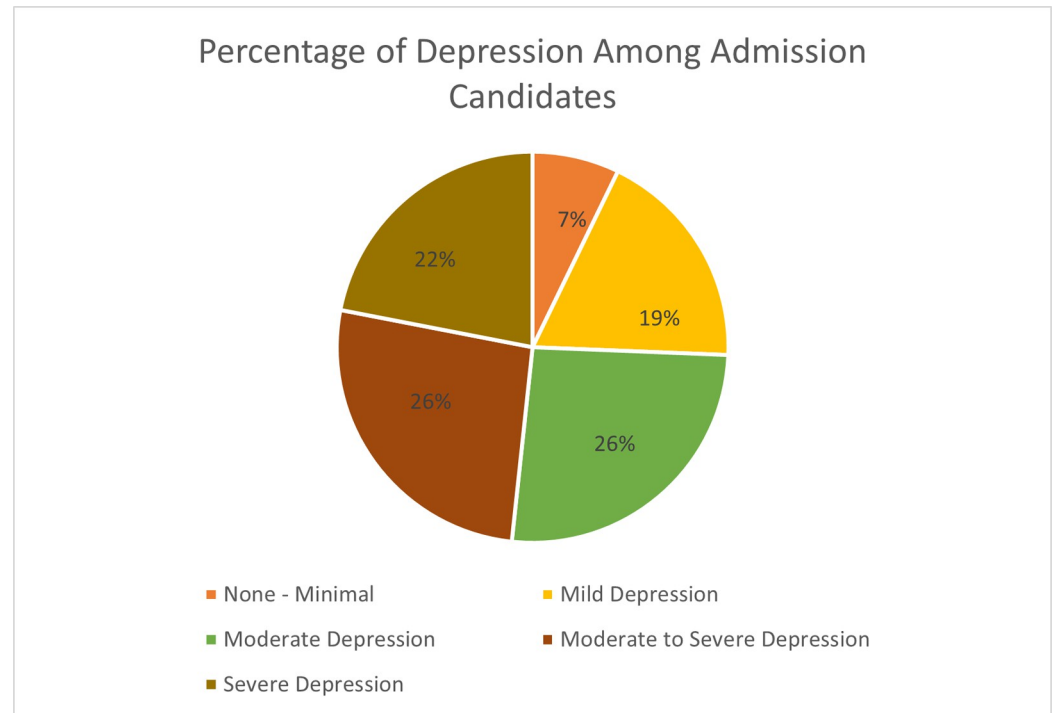


Fig 2.

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levels than “More confident” candidates. Applicants with higher GPA in HSC had higher cumulative odds of being in higher depression levels by a factor of 1.4 times (95% CI (1.32–1.67), P-value <0.001). Age was statistically insignificant based on the data set.

The most important assumption for ordinal logistic regression was the proportional odds assumption. Which indicated whether the effects of the explanatory variables on the cumulative likelihood of moving up a category on the dependent variable were constant across categories, the test of this assumption came insignificant at a 95% level of significance with p-value = 0.082 (Chi squared 68.986, df 54). Which successfully met the assumption of the model.

Stratified analysis based on gender

The data set was split into two parts based on the gender of the respondents, and the ordinal logistic regression model is fitted. In a test of parallel lines only the models for male respondents had fulfilled the assumption at a 5% level of significance (Male, Chi-square 42.194, P-value 0.805), and for female’ model did not (Female, Chi square 89.012, p-value 0.001). Among the variables that were both significant among both genders, the odds ratios showed a similar trend of depression which was demonstrated in [Table 3](#). Only the variable about mental problems came insignificant in the male’s model (OR = 1.18, 95% CI (0.630–1.126), P-value = 0.24).

Discussion

The research was meant to find the prevalence of depressive symptoms among undergraduate admission candidates in Bangladesh, as well as to examine the influence of various socio-demographic factors, including the impacts of the Covid-19 pandemic, on these symptoms. The findings of our analyses indicated that a significant proportion, specifically 74%, of

Percentage of depression among genders, exam preparation, blackmail, family problem.

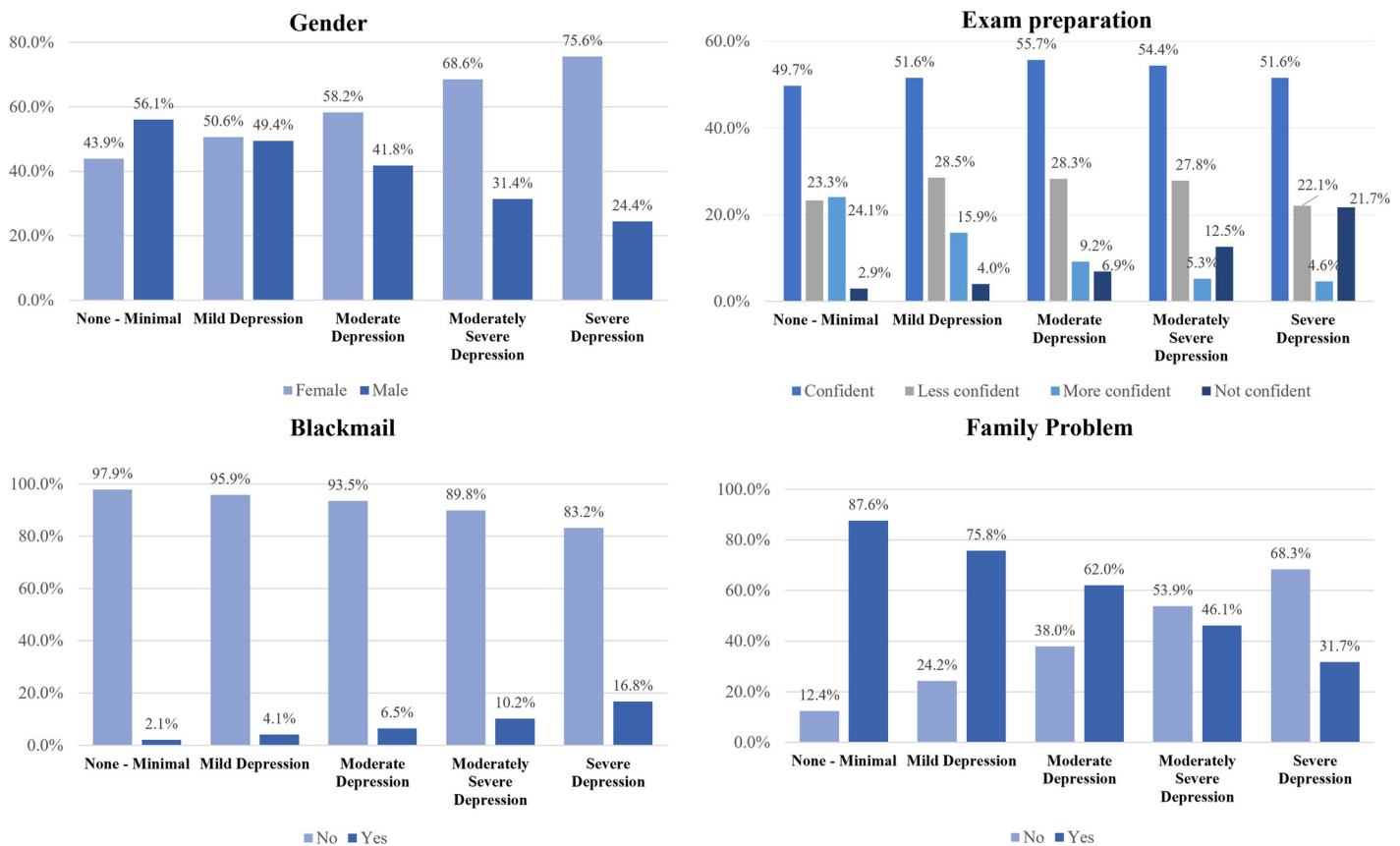


Fig 3.

<https://doi.org/10.1371/journal.pone.0295143.g003>

individuals who submitted applications for undergraduate study at universities reported experiencing symptoms indicative of depression. The survey findings also indicated a significant association between depression and 11 out of the 21 potential factors. The variables considered in this study encompassed gender, frequency of daily exercise, engagement in pre-marital affairs, number of daily study hours, religious practices, experiences of blackmail, family unrest, significant illnesses, COVID-19 infection status, GPA, presence of any mental health issues, and level of confidence for the admission test.

A study conducted in China among admission seekers, revealed that 47% of individuals seeking admission experienced symptoms of depression [26]. Another research conducted in Bangladesh revealed that approximately 50% of students experience symptoms of depression [27]. The current investigation revealed a rate of 74%. This finding demonstrates a significant increase compared to previous research.

Several studies found gender as a determinant of depression among adolescents, as well as admission seekers [28,29]. There is evidence to support the presence of gender-related subtypes of depression, among which the developmental subtype seems to have the most significant potential in contributing to the gender difference [30]. One of the significant findings of the study was that female students were found more depressed than male students.

Family has a great impact on the mental well-being of the human species [31]. Researchers concluded that conflict within the family and a strained connection with one's parents were

Table 2. Estimates of multivariable adjusted ordinal logistic regression model.

VARIABLES	LEVELS	ESTIMATES	OR (95% CI)	P- Value
Age		-0.01	0.985 (0.936–1.035)	0.53
Gender	Female	0.58	1.79 (1.595–1.981)	<0.001
	Male	0	1	
Exercise	No	0.67	1.946 (1.681–2.273)	<0.001
	Yes	0	1	
In a pre-marital Relationship	Yes	0.21	1.23 (1.09–1.391)	<0.001
	No	0	1	
Daily study time	3 to 4 hours	0.04	1.036 (0.882–1.218)	0.66
	4 to 5 hours	0.07	1.074 (0.917–1.256)	0.38
	5 to 6 hours	0.09	1.093 (0.946–1.267)	0.22
	Below 3 hours	0.33	1.393 (1.205–1.626)	<0.001
	More than 6 hours	0	1	
Practice religion	No	0.34	1.402 (1.203–1.677)	<0.001
	Yes	0	1	
Experienced any type of blackmailing recently	Yes	0.68	1.972 (1.653–2.384)	<0.001
	No	0	1	
Having family problem	Yes	1.06	2.885 (2.597–3.216)	<0.001
	No	0	1	
Suffering from any kind of major sickness	Yes	0.58	1.786 (1.557–2.107)	<0.001
	No	0	1	
Covid infected	Yes	0.22	1.24 (1.11–1.40)	<0.001
	No	0	1	
GPA in HSC	GPA5	0.40	1.48 (1.32–1.67)	<0.001
	Not GPA5	0	1	
Suffering from any kind of mental problem	Yes	0.23	1.25 (1.06–1.50)	<0.001
	No	0	1	
Confidence level for exam preparation	Confident	-0.63	0.53 (0.44–0.64)	<0.001
	Less confident	-0.79	0.46 (0.38–0.55)	<0.001
	More confident	-1.43	0.24 (0.19–0.3)	<0.001
	Not confident	0	1	

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significantly connected to an increased incidence of depression in adolescents [32]. Participants of our study had family unrest, and we found it as one of the potential factors for increasing depression among the participants. Those who had family problems were about 3 times more prone to depression.

The global pandemic resulting from the Covid-19 virus has had a significant impact on the physical and emotional well-being of individuals worldwide. Adolescents suffered from several mental health disorders including depression, anxiety, and even suicide [33]. The narrative assessment of research articles yielded the finding that the mental well-being of adolescents was adversely affected because of the preventive measures implemented during the pandemic [34]. The participants of our study also greatly suffered from the covid-19, and the infected students were more depressed than the students who were not affected by the virus.

According to research, exercise had not appeared to prevent adolescents from developing depressive symptoms [35]. Other researchers, however, found a link between depression and physical exercise [36,37]. The results of the present research provided empirical evidence in support of the notion that a significant association exists between physical exercise and

Table 3. Stratified analysis based on gender.

VARIABLES	LEVELS	MALE		FEMALE	
		OR (95% CI)	P-value	OR (95% CI)	P-value
Age	Mean age 19	1.02 (0.951–1.106)	0.5	0.96 (0.89–1.02)	0.19
Exercise	No	1.98 (1.623–2.416)	<0.001	1.95 (1.54–2.46)	<0.001
	Yes	1		1	
In a pre-marital Relationship	Yes	1.28 (1.051–1.572)	0.01	1.2 (1.03–1.4)	0.02
	No	1		1	
Daily study time	3 to 4 hours	1.01 (0.781–1.308)	0.93	1.04 (0.85–1.29)	0.68
	4 to 5 hours	1.04 (0.803–1.351)	0.75	1.1 (0.9–1.34)	0.36
	5 to 6 hours	1.08 (0.852–1.376)	0.51	1.1 (0.91–1.32)	0.32
	Below 3 hours	1.36 (1.071–1.731)	<0.001	1.41 (1.16–1.71)	<0.001
	More than 6 hours	1		1	
Practice religion	No	1.29 (1.021–1.633)	0.03	1.51 (1.2–1.92)	<0.001
	Yes	1		1	
Experienced any type of blackmailing recently	Yes	2.31 (1.699–3.155)	<0.001	1.81 (1.44–2.27)	<0.001
	No	1		1	
Having family prob	Yes	2.61 (2.193–3.109)	<0.001	3.07 (2.68–3.52)	<0.001
	No	1		1	
Suffering from any kind of major sickness	Yes	1.83 (1.425–2.372)	<0.001	1.77 (1.46–2.13)	<0.001
	No	1		1	
Covid infected	Yes	1.21 (0.991–1.49)	0.06	1.28 (1.11–1.47)	<0.001
	No	1		1	
GPA in HSC	GPA5	1.47 (1.238–1.760)	<0.001	1.49 (1.27–1.75)	<0.001
	Not GPA5	1		1	
Suffering from any kind of mental problem	Yes	1.18 (0.630–1.126)	0.24	1.3 (0.62–0.96)	0.02
	No	1		1	
Confidence level for exam preparation	Confident	0.62 (0.461–0.847)	<0.001	0.48 (0.38–0.61)	<0.001
	Less confident	0.51 (0.375–0.709)	<0.001	0.43 (0.33–0.55)	<0.001
	More confident	0.30 (0.210–0.439)	<0.001	0.19 (0.14–0.27)	<0.001
	Not confident	1		1	

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depression. The findings of the study indicated that those who engaged in daily exercise had lower levels of depression compared to individuals who did not engage in regular exercise.

There is growing evidence that frequent use of social media may have a negative influence on users' mental health, particularly among younger generations. A systematic review of 13 studies concluded that frequent use of social media by adolescents was associated with a higher likelihood of developing mental health disorders such as low self-esteem, stress, anxiety, and depression [38]. Even though the use of social media as a variable was not found to be significant in our ordinal logistic model, Pearson Chi-squared test identified a significant association between social media use and depression.

The result of the previous academic examination (GPA) is also an important factor for the undergraduate entrance exam [39]. This study exhibits GPA as a significant factor in depression. Higher GPA boosts the confidence level of admission candidates, and thus it helped to reduce depression and lower GPA candidates had a higher rate of depression. A previous study also found GPA as a promising factor for entrance test participants and adolescents [40].

This study's findings implied that study time influences depression. The length of the study boosts candidates' confidence. According to a study, confidence levels reduced depression [41]. The research undertaken on the entry participants yielded the same results [42]. Those

who spend more time studying, on the other hand, have a higher level of confidence. Those who studied less exhibited lower levels of confidence. And, as indicated by another study [43], this was directly related to depression among the candidates.

One study looked at latent religiosity in nonreligious thirteen to fifteen-year-olds in England and Wales, considering attachment to Christian passage rituals as one example of implicit religion. The study showed that young people who adhere to implicit religion have greater psychological health [44]. The participants in this study expressed a strong desire to practice religion which reduced their depression. Those who practiced religion had less depression than those who did not practice religion so well.

Researchers mentioned pre-marital relationships as one of the key factors of adolescent depression [45]. It also increased suicidal behavior among adolescents [46]. This research corroborated the previously established observation that there is a greater prevalence of depression among married teenagers who had engaged in pre-marital relationships. One potential explanation might be attributed to the prevailing social and cultural norms surrounding arranged marriages.

The psychological well-being of adolescents was also significantly affected when they are the targets of blackmailing [47]. Researchers pointed out a direct link between blackmailing and the rise in the level of depression. This study also assessed blackmailing as a potential factor that contributes to depression among the participants to increase. The act of engaging in blackmailing or any kind of victimization might result in increased susceptibility to abnormal stress sensitivity among victims, hence potentially exacerbating mental health issues such as depression and anxiety [48].

Though some studies defined smoking, age, living area, and family income as enhancers of depression [49–52]; this research had not inaugurated any significant interaction with these factors. In the present study, there was no significant relation between age, smoking, living area, economic condition of family, and depression among the undergrad admission candidates of Bangladesh.

Limitations

The key strength of this research was its sample size. It was conducted on primary data with a large sample size (over 5000 responses) that considers various socio-demographic variables, variables regarding academic conditions, personal habits, as well as mental health measurements, providing new perspectives on potential factors of depression among stressed-out students. The vast majority of the nation's population may be accounted for as responders were taken from a variety of areas. In certain instances, an online questionnaire may result in a misunderstanding of the question, leaving the replies susceptible to lack of integrity. The interpretation of findings from an ordinal logistic model is very complex and difficult to grasp. The cross-sectional design of this study was also a limitation. Number of 2nd time examinees was substantially less in number than that of 1st time, hence insufficient to compare as a factor of depression. It is anticipated that this topic will be addressed in future studies. Notwithstanding these limitations, this research presents, for the first instance, comprehensive depression benchmarking outcomes at the group level.

Conclusion

Our analysis reveals that many Bangladeshi undergraduate admission candidates have clinical depression or are at risk for it. The level of confidence in being admitted, the length of their study period, the possibility of blackmail, pre-marital relationship, their result, family unrest, and religiosity all affect their mental health. Stakeholders (such as family and teachers) need to

work together to provide mental health care programs to lessen the severity of the issue. To reduce the burden on their minds and overcome depression, students should learn to deal with their mental stabilities. They should increase religiosity and physical exercise and try to avoid the complexities of pre-marital relationships, and if anyone is facing any kind of black-mail, they should talk with the valid authorities.

Supporting information

S1 Appendix.
(DOCX)

Author Contributions

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