

The Association between Obesity and Depression, Anxiety, and Stress Disorders among University Students at Rajshahi City in Bangladesh

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Abstract

Background: Mental disorders like Depression, Anxiety, and Stress (DAS) are extremely prevalent in developed countries. DAS disorders are hypothesized to be associated with obesity, the relationship between the two conditions, however, is not conclusive. The aims of this study were to explore the association between obesity and DAS disorders among university students at Rajshahi City.

Methods: Cross-sectional survey designs were used with students from Rajshahi University (RU) and Varendra University (VU). The data were collected from 738 randomly selected students from RU and VU. DAS Scale-42 (DASS-42) items were intended to measure DAS. We conducted bivariate and multivariate analyses of obesity and DAS disorders, as well as other socio-demographic variables.

Results: An examination of cross-sectional data indicated a significant connection between obesity and stress disorders. The larger odds of obesity were found for severe and extremely severe levels of DAS disorder compared to normal and mild types.

Conclusion: Obesity appears to be positively associated with DAS disorders on a moderate level of evidence. There still remains a question concerning the role of obesity severity and DAS level. Obesity cannot be ruled out as a causal factor in DAS disorders. Further, clinical research is recommended.

Keywords: Obesity; Depression; Anxiety, Stress; University students

Introduction

In the world today, obesity is the leading contributor to chronic diseases, such as type 2 diabetes, hypertension, and cancer [1]. In order to prevent and treat obesity, we must understand its mechanisms. A common physical ailment of modern society is obesity, while depression is a common psychological problem [2]. In developed countries like the United States and Europe, anxiety disorders are the most common mental illness [3]. Stress is a negative perception of a person's emotional state when they are adjusting to or dealing with life's events [4]. Chronic stress increases mortality and morbidity in patients with coronary artery disease, as well as cardiovascular disease [5]. In today's world, Depression, Anxiety, and Stress (DAS) are the most important mental health problems [6]. People with DAS exhibit difficulties with their emotional, cognitive, and communal abilities, resulting in underemployment and diminished mental and physical capabilities [7,8]. Physical symptoms of anxiety disorder include fatigue, heart palpitations, and tension, as well as psychological symptoms like excessive worry, fear, and apprehension.

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Anxiety disorders comprise panic syndromes, post-traumatic strain illness, generalized anxiety disorder, and specific phobias [9]. During the depression, an individual's judgments, emotions, and behavior are affected [10,11]. Symptoms of depression include loss of concentration or pleasure, sadness, guilt, and low self-esteem, sleeping difficulties, excessive drowsiness, and inability to concentrate [12]. Chronic stress has the outcome of damaging the endothelium by activating macrophages, promoting foam cell growth, and forming plaque [5]. Students with DAS experience adverse effects on their academic performance and quality of life [13-15]. Obesity is related to the development of numerous diseases, including hypertension, type-2 diabetes, dyslipidemia, and cancer [1]. In other words, obesity disrupts homeostasis. Therefore, obesity can be considered a stress inducer for the body [16]. The two most important factors in preventing and treating obesity have traditionally been diet and physical activity [1]. DAS disorders may be associated with obesity. The burden of obesity in the developed world has increased dramatically [17]. A condition characterized by excess body weight, which is one of the leading causes of disease [18]. A variety of risk factors promote obesity-associated DAS disorders. Discrimination and stigma related to obesity can cause significant distress among obese people [19,20]. Furthermore, obesity may have detrimental effects on health and quality of life [21-23]. Both pathways could eventually lead to DAS disorders. Obesity and DAS disorders are not clearly linked; though some studies have shown a link, others haven't [24]. Despite the possibility of no association between obesity and DAS disorders, the heterogeneity of obesity and DAS disorders may reflect weak or mixed results. The relationship between obesity and DAS disorders may be different among subgroups of the population with different socio-demographic, behavioral, and biological features [23,24]. Among universities in Bangladesh, there are mainly two types: public (government-run) and private (privately owned). In order to develop human resources effectively, a university education plays a crucial role. In recent years, poor mental health has become a major concern among students at universities all over the world. As a result, the quality of university graduates and the human capital of the country is negatively impacted. Bangladesh is a country in South Asia with a population of about 16 million, and universities provide most of the skilled labor. Education is a priority area for the Bangladeshi government, which is committed to its development. In addition to advancing human capabilities, alleviating poverty, and promoting socio-economic development, university education is a significant contributor to national development. Among students suffering DAS due to obesity, university education negatively impacts human resource development. In the country, there has not yet been a study conducted on DAS for obesity among public and private university students. Therefore, the purpose of this study was to systematically examine the relationship between

obesity and DAS disorders among university students from Rajshahi City, Bangladesh. Comprehensive systematic reviews provide an objective evaluation of study quality and an unbiased selection of studies. It is important to understand obesity as a possible risk factor for DAS disorders, not only so we can learn more about this prevalent mental illness, but also so we can reduce the weight burden that university students suffer because of obesity. Accordingly, this study examined the prevalence of DAS among public and private university students at Rajshahi city, as well as obesity and other socio-demographic factors, including student sex, age group, type of university, marital status, and faculty of education.

Methodology

Data source

We studied students from Rajshahi University (RU), located in the north of the country, and Varendra University (VU), located in the same region, from a variety of academic sessions. A survey conducted in 2020 found that there were 24493 students in 63 departments across eleven faculties at the University of Rajshahi. As of 2020, Varendra University had 5134 undergraduate and graduate students across three faculties and eleven departments. The data for this study were collected from primary sources, and the sample was randomly selected from two universities. 380 students from Rajshahi University and 358 students from Varendra University were randomly selected, a public and private university, respectively.

Survey questionnaires

This study used two types of questionnaires. We prepared a structured questionnaire in which we collected information about sex, age, height, university type, marital status, and faculty of education of the respondents. We also used DASS-42 structured questionnaires in our questionnaire survey approach [25,26].

Body Mass Index (BMI)

The Body Mass Index (BMI) can easily diagnose overweight or obesity with the help of only weight and height measurements. BMI can help identify people at greater risk of developing health problems because obesity carries an increased risk of diseases, such as heart disease, stroke, and diabetes. Weight in kilograms (kg/m²) divided by the square of the height in meters (m²/kg) is considered BMI. Based on WHO cutoff points it is categorized into four types: underweight (<18.5 kg/m²), normal weight (18.5–24.9 kg/m²), overweight (25–29.9 kg/m²), and obese (≥30 kg/m²). Due to insufficient observations, overweight and obese classes are combined.

DASS-42 scale

An aggregate DAS scale measures anxiety, stress, and depression together. The DASS was developed by Lovibond

and Lovibond and consists of 42 items that are self-reported [25,26]. The DASS is a 42-item assessment tool for assessing current depression, anxiety, and stress symptoms. Each scale contains 14 items ranging from 0 to 3 (range of possible scores: 0 to 42), where 0 means that none applied to me and 3 means that they applied mostly or very often. Scores for depression, anxiety, and stress are calculated by adding the scores for the relevant 14 items. Normal scores range from 0–9 on the depression scale, 0–7 on the anxiety scale, and 0–14 on the stress scale. Taking values above these ranges as a guide, we will see that this problem varies from mild to extreme [25,26]. DASS-42 scores for depression, anxiety, and stress are shown in Table 1.

Data analyses

IBM SPSS version 25 was used to conduct statistical analyses, such as cross-tabulation, severity scores, and relevant statistical tests. The bivariate association between obesity and DAS level was assessed using the Chi-square test [27-32]. To analyze the multivariate association between obesity and other associated factors, including DAS level, multinomial logistic regression was used [28,33,34-42].

Results

Bivariate analysis

The testing of hypotheses-. There is no association between obesity and DAS level, and each student's sex, age group, university type, marital status, and faculty of education. The cross tables of obesity indicators with χ^2 test are presented in Table 2.

Out of 738 students, 99 (13.4%) were underweight, 97 (13.1%) were overweight and obese, and 542 (73.4%) were normal weight. BMI and Sex ($\chi^2=37.988$, p. value=0.00) were significantly associated. Males were more overweight and obese than females, but females were more underweight. There was no significant association between BMI and depression level ($\chi^2=4.402$, p. value=0.670). Overweight, as well as obesity, is not responsible for developing depression. Anxiety level was not significantly associated with BMI ($\chi^2=4.047$, p. value=0.622). Being overweight or obese does not also lead to anxiety. There was almost a statistically significant association between BMI and stress at 13% level ($\chi^2=9.916$, p value=0.128). Stress increases the risk of obesity or being

overweight. Age was significantly associated with BMI ($\chi^2=7.071$, p. value=0.029). Age is responsible for obesity. Older respondents are likely to be obese or overweight. The type of university is significantly associated with BMI ($\chi^2=20.719$, p=0.00). Students at public universities were more likely to be underweight than students at private universities. Marital status was significantly associated with BMI at 35.7% level ($\chi^2=2.061$, p. value=0.357). It is evident that married students may become overweight or obese. A significant association was found between faculty of respondents and BMI ($\chi^2=11.953$, p. value=0.018). Arts and social science respondents were more likely to be overweight or obese.

Multivariate analysis

The Odds Ratios (ORs) and corresponding 95% Confidence Intervals (CI) according to DAS level and each student's sex, age group, university type, marital status, and faculty of education are reported in Table 3. The results indicate that sex was a significant factor in both underweight (OR=0.277, 95% CI 0.173-0.445), and overweight as well as obesity (OR=1.883, 95% CI 1.064-3.333). Females are more likely to suffer from underweight, while males are more likely to suffer from obesity and overweight. The presence of normal depression is a significant factor for being underweight (OR=2.502, 95% CI 0.974-6.429). The chances of underweight respondents developing normal depression are 2.502 times greater than those of developing severe or extremely severe depression. Overweight and obese respondents are more likely to suffer from severe and extremely severe levels of depression than those with normal depression; however, it is not statistically significant. Underweight respondents are 0.369 times less likely to develop mild depression than severely or extremely depressed respondents; and this is statistically significant at almost 13% level. Those with severe or extremely severe levels of depression are more likely to be overweight and obese than those with mild depression, but this is not statistically significant. Underweight respondents are 1.452 times more likely to develop moderate depression than severely or extremely depressed respondents; nevertheless, this is not statistically significant. Those with moderate levels of depression are more likely to be overweight and obese than those with severe or extremely severe levels of depression, and this is statistically significant at 11% level (OR=2.210, 95% CI 0.837-5.836). Underweight respondents are less likely to develop normal anxiety than severely or extremely severe anxious respondents; however, the difference is not statistically significant. Those with normal level of anxiety are more likely to be overweight and obese than those with severe and extremely severe level of anxiety, but this is not statistically significant. In terms of anxiety levels, respondents who are underweight have a higher chance of developing mild anxiety than those who are severely or extremely severe anxious; similarly, overweight and obese respondents are more likely to develop severely or extremely severe anxiety

Table 1: DASS-42 scoring of depression, anxiety, and stress.

Level	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+

Source: Lovibond and Lovibond, 1995

Table 2: The cross tables of obesity indicators with χ^2 test.

Variables		BMI, n (%)			
		Under Weight	Over Weight and Obese	Normal Weight	Total
Sex ($\chi^2=37.988$, p. value=0.00)	Male	41 (-8.30%)	77 (-15.50%)	378 (-76.20%)	496 (-67.20%)
	Female	58 (-24.00%)	20 (-8.30%)	164 (-67.80%)	242 (-32.80%)
	Total	99 9-13.40%	97 (-13.10%)	542 (-73.40%)	738 (-100.00%)
Depression Level ($\chi^2=4.047$, p. value=0.670)	Normal	43 (-14.40%)	45 (-15.10%)	211 (-70.60%)	299 (-40.50%)
	Mild	15 (-12.00%)	15 (-12.00%)	95 (-76.00%)	125 (-16.90%)
	Moderate	30 (-14.70%)	22 (-10.80%)	152 (-74.50%)	204 (-27.60%)
	Severe and Extremely Severe	11 (-10.00%)	15 (-13.60%)	84 (-76.40%)	110 (-14.90%)
	Total	99 (-13.40%)	97 (-13.10%)	542 (-73.40%)	738 (-100.00%)
Anxiety Level ($\chi^2=4.047$, p. value=0.622)	Normal	14 (-10.30%)	22 (-16.20%)	100 (-73.50%)	136 (-18.40%)
	Mild	11 (-14.10%)	9 (-11.50%)	58 (-74.40%)	78 (-10.60%)
	Moderate	40 (-15.50%)	36 (-14.00%)	182 (-70.50%)	258 (-35.00%)
	Severe and Extremely Severe	34 (-12.80%)	30 (-11.30%)	202 (-75.90%)	266 (-36.00%)
	Total	99 (-13.40%)	97 (-13.10%)	542 (-73.40%)	738 (-100.00%)
Stress Level ($\chi^2=9.916$, p. value=0.128)	Normal	55 (-13.60%)	56 (-13.80%)	294 (-72.60%)	405 (-54.90%)
	Mild	16 (-11.10%)	26 (-18.10%)	102 (-70.80%)	144 (-19.50%)
	Moderate	21 (-14.50%)	9 (-6.20%)	115 (-79.30%)	145 (-19.60%)
	Severe and Extremely Severe	7 (-15.90%)	6 (-13.60%)	31 (-70.50%)	44 (-6.00%)
	Total	99 (-13.40%)	97 (-13.10%)	542 (-73.40%)	738 (-100.00%)
Age (Mean=21.616, SD=3.268) ($\chi^2=7.071$, p. value=0.029)	>20 years	34 (-10.10%)	51 (-15.20%)	251 (-74.70%)	336 (-45.50%)
	<=20 years	65 (-16.20%)	46 (-11.40%)	291 (-72.40%)	402 (-54.50%)
	Total	99 (-13.40%)	97 (-13.10%)	542 (-73.40%)	738 (-100.00%)
University ($\chi^2=20.719$, p. value=0.00)	private	69 (-19.30%)	42 (-11.70%)	247 (-69.00%)	358 (-48.50%)
	Public	30 (-7.90%)	55 (-14.50%)	295 (-77.60%)	380 (-51.50%)
	Total	99 (-13.40%)	97 (-13.10%)	542 (-73.40%)	738 (-100.00%)
Marital Status ($\chi^2=2.061$, p. value=0.357) (2 cells have expected count less than 5. So likelihood Ratio χ^2 is reported)	Married	3 (-9.10%)	7 (-21.20%)	23 (-69.70%)	33 (-4.50%)
	Un-married	96 (-13.60%)	90 (-12.80%)	519 (-73.60%)	705 (-95.50%)
	Total	99 (-13.40%)	97 (-13.10%)	542 (-73.40%)	738 (-100.00%)
Faculty ($\chi^2=11.953$, p. value=0.018)	Science & Engineering	40 (-13.80%)	28 (-9.70%)	221 (-76.50%)	289 (-39.20%)
	Arts & Social science	36 (-11.00%)	56 (-17.10%)	236 (-72.00%)	328 (-44.40%)
	Business	23 (-19.00%)	13 (-10.70%)	85 (-70.20%)	121 (-16.40%)
	Total	99 (-13.40%)	97 (-13.10%)	542 (-73.40%)	738 (-100.00%)

than those who are mildly anxious, although these results are not significant. Respondents who are underweight or overweight, as well as obese, are more likely to develop moderate levels of anxiety than those who are severe and extremely severe anxious. However, these are not significant. Underweight respondents are less likely to develop normal stress compared to those who suffer from severe and extremely severe stress (OR=0.511, 95% CI 0.180-1.450) and this is significant at 20.7% level. Respondents who are underweight are less likely to experience mild stress (OR=0.454, 95% CI 0.173-0.445) compared with those under severe and

extremely severe stress and this is significant at the 15.4% level. Overweight and obese respondents are 1.527 times more likely to develop mild stress than those suffering from severe and extremely severe stress levels (OR=1.527, 95% CI 0.541-4.310); and this is significant at the 42.4% level. Respondents older than 20 years are less likely to suffer from normal weight than those younger than 20 years (OR=0.828, 95% CI 0.509-1.348), but that difference is not statistically significant. Consequently, those older than 20 years of age are more likely to be overweight as well as obese than those less than 20 years old (OR=1.188, 95% CI 0.753-1.875) which is

also not statistically significant. The married respondents are less likely to suffer from normal weight than the unmarried respondents (OR=0.581, 95% CI 0.165-2.043), which is not statistically significant. Furthermore, married respondents are 1.617 times more likely to be overweight as well as obese (OR = 1.617, 95% CI 0.636-4.111) than unmarried respondents with statistical significance at the 31.2% level. In science and engineering faculty, fewer respondents suffer from normal weight than business faculty respondents (OR=0.669, 95% CI 0.378-1.184) which is statistically significant at 16.7%. Science and engineering faculty respondents, however, are less likely to suffer from overweight or obesity than business faculty respondents (OR=0.828, 95% CI 0.410-1.674), which is not statistically significant. There was a lower prevalence of normal weight among arts and social sciences faculty respondents than among business faculty respondents (OR=0.564, 95% CI 0.316-1.006), which has statistical significance at the 5.2% level. Science and engineering faculty respondents, however, are less likely to suffer from overweight or obesity than business faculty respondents (OR=0.828, 95% CI 0.410-1.674), which is not statistically significant.

Discussion

An association between obesity and DAS has been demonstrated in several observational studies. The findings suggest that obesity and DAS are positively associated. In most studies, obese individuals have significantly higher odds of developing DAS disorders than non-obese individuals [24]. Despite this, the evidence of strength is moderate. Methodological problems limited many of the studies, and the majority of observed associations were weak or not significant. Furthermore, due to the cross sectional nature of the evidence, other plausible clarifications could not be ruled out. We found similar associations between obesity and DAS disorder [24,43]. A significant positive association for women has been found in most studies stratified by gender [24,44]. Bivariate analysis revealed significant associations between BMI and sex. In addition, other variables such as the degree of obesity and the type of anxiety are moderately associated [24]. Depression levels had no significant association with BMI [45]. Overweight and obesity are not associated with depression. Anxiety level had no significant association with BMI [46]. Anxiety is not caused by being overweight or obese. BMI and stress were associated with almost statistical

Table 3: Multinomial logistic regression results of obesity indicators with associated factors.

Variable	BMI (ref= Normal Weight)					
	Under Weight			Over Weight and Obese		
	OR	95% CI	P. Value	OR	95% CI	P. Value
Sex (ref: female)						
Male	0.28	0.173-0.445	0	1.88	1.064-3.333	0.03
Depression Level (ref: Severe and Extremely Severe)						
Normal	2.5	0.974-6.429	0.057	0.93	0.389-2.199	0.859
Mild	0.37	0.102-1.337	0.129	0.69	0.283-1.687	0.416
Moderate	1.45	0.539-3.910	0.461	2.21	0.837-5.836	0.11
Anxiety Level (ref: Severe and Extremely Severe)						
Normal	0.68	0.296-1.544	0.353	1.23	0.572-2.638	0.598
Mild	1.13	0.494-2.598	0.769	0.93	0.386-2.229	0.866
Moderate	1.3	0.733-2.307	0.37	1.25	0.695-2.230	0.462
Stress Level (ref: Severe and Extremely Severe)						
Normal	0.51	0.180-1.450	0.207	1.03	0.352-3.013	0.958
Mild	0.45	0.153-1.344	0.154	1.53	0.541-4.310	0.424
Moderate	0.6	0.220-1.636	0.318	0.47	0.151-1.459	0.191
Age Group (ref: <=20)						
>20	0.83	0.509-1.348	0.447	1.19	0.753-1.875	0.459
University (ref: Public)						
Private	2.49	1.521-4.066	0	0.99	0.616-1.585	0.959
Marital Status (ref: Unmarried)						
Married	0.58	0.165-2.043	0.398	1.62	0.636-4.111	0.312
Faculty (ref: Business)						
Science and Engineering	0.67	0.378-1.184	0.167	0.83	0.410-1.674	0.6
Arts and Social science	0.56	0.316-1.006	0.052	1.55	0.808-2.979	0.187

significance at a level of 13%. An increase in stress can lead to obesity or being overweight [47]. There was a significant association between age and BMI. Overweight and obesity are more prevalent among older respondents [48]. The type of university has a significant impact on BMI. Public university students were more likely to be underweight than students at private universities [49]. At the 35.7% level, marital status was significantly associated with BMI. It is evident that married students may gain weight [50]. University faculty of respondents was significantly associated with BMI. Art and social science respondents are more likely to be overweight or obese. In multivariate analysis, however, overweight and obesity are positively associated with severe and extremely severe levels of depression compared to normal and mild levels. In comparison to mild levels of anxiety, both overweight and obesity are positively associated with severe and extremely severe levels of anxiety. As compared to stress levels that are mild or normal, obesity and overweight are also positively associated with severe stress. There is evidence that severe obesity is linked to DAS disorders more than non-obese individuals [51-54]. Symptoms of anxiety and depression normally develop when an individual is exposed to stress, and depression becomes clinically significant when symptoms interfere with functioning. DAS disorders are therefore contextual in nature. The life decisions of obese people may differ significantly from those of normal-weight individuals because obese individuals may structure their lives to avoid the developing of DAS situations.

Conclusion

Neither depression nor anxiety levels were associated with BMI. Stress was significantly associated with BMI. Based on our careful analysis, we found moderate evidence that DAS and obesity are positively associated. There is no strong evidence to determine whether obesity causes DAS disorders. An appropriate longitudinal clinical study is needed.

Limitation

As it was conducted at only two universities in one city, the results cannot be widespread to the country as a whole. Accordingly, future studies should be conducted among a larger population. Furthermore, future studies should examine the mental healthcare support system at university campuses throughout the country.

Declarations

Consent to participate

As part of the study, participants were informed of the study objectives and of their right to stay in it or to opt-out if they felt uncomfortable. The study started with verbal consent from those who agreed to participate.

Consent for publication

Not applicable

Conflict of interest

The authors declare that there is no conflict of interest.

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Author's contribution

Each author contributed to the content of this article in a significant way.

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