



Original Article

Socio-demographic and psychological predictors of overweight and obesity in women

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ABSTRACT

Objectives: This study aimed to examine the socio-demographic and psychological predictors of overweight and obesity among Bangladeshi women of reproductive age. It focused on understanding the associations between body mass index (BMI) and mental health outcomes, specifically depression, anxiety, and stress (DAS), while considering key socio-demographic factors.

Material and Methods: A cross-sectional study was conducted between September and December 2024 among 405 women aged 15 years and older in Chittagong, Bangladesh. Participants were selected using purposive sampling to capture diverse socio-demographic groups within an urban population and completed an online survey via Google Forms. BMI was calculated from self-reported height and weight, and the mental health status was assessed using the Depression, Anxiety, and Stress Scale (DASS-21). Associations between BMI, DAS, and socio-demographic variables such as age, marital status, educational attainment, employment, and residential location were analysed using the chi-square test and logistic regression.

Results: Overweight and obesity were prevalent among 55.3% of participants, while 44.7% had normal BMI. Depression (64.9%), anxiety (62.2%), and stress (52.1%) were common. A weak positive association was found between BMI and depressive symptoms. Age, marital status, and education significantly influenced BMI, with older, married, and highly educated women more likely to be overweight or obese. Urban residents reported higher levels of depression and stress compared to their rural counterparts. However, no significant associations were observed between BMI and anxiety or stress independently.

Conclusion: BMI and mental health are intricately linked, influenced by socio-demographic factors. Policymakers should develop integrated programs combining obesity prevention with community-based mental health services tailored for urban women. Future research should include objective BMI measurements and a longitudinal approach.

Keywords: Anxiety, Body mass index, Depression, Stress, Women's mental health

INTRODUCTION

Body mass index (BMI), a widely recognised measure of weight relative to height, is a critical indicator for identifying nutritional status and classifying individuals as underweight, normal weight, overweight, or obese.^[1] Since the 1990s, the prevalence of unhealthy BMI categories has escalated into a pressing global public health issue. This phenomenon, termed the "double burden of malnutrition," encompasses both undernutrition and overnutrition, affecting millions globally and presenting unique challenges in low- and middle-income countries like Bangladesh.^[2] While obesity has traditionally been associated with high-income nations, recent trends reveal a growing burden in urban areas of low-income countries, driven by rapid urbanisation, lifestyle changes, and shifting dietary patterns.^[3,4]

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This is specifically valid concerning the factors contributing to the increase in obesity. Based on World Health Organization (WHO) data, by the end of 2022, the overall prevalence of obesity increased to 213 million females and 677 million males among a 2.5 billion adult population. This translates to a rise in obesity levels across the world since 1990, and according to statistics, a third of the world population could be overweight or obese by the year 2035.^[5] Bangladesh is among the countries worst affected by the double burden of malnutrition. Current literature suggests that more than 40% of Bangladeshi women are malnourished, which means they are both obese and underweight and that socio-economic inequalities that affect women seem to be worse in this country.^[6-8]

The implications of unhealthy BMI extend beyond physical health. Obesity and undernutrition are linked to increased risks of chronic diseases such as cardiovascular disease, type 2 diabetes, and cancer.^[9-11] More critically, BMI is strongly associated with mental health disorders, including depression, anxiety, and stress (DAS).^[12,13] Women are particularly vulnerable to these conditions, as they are more likely than men to experience anxiety and depressive disorders.^[14] Studies have shown a U-shaped relationship between BMI and depression, with underweight and obese individuals at heightened risk.^[15] Furthermore, high BMI has been linked to body dissatisfaction and low self-esteem in women, exacerbating the psychological burden.^[16] Recent studies from South Asia confirm rising overweight prevalence and depression comorbidity among young and middle-aged women.^[7,17,18]

Bangladesh presents a unique context for examining these associations. The rapid urbanisation and socio-economic transitions in the country have reshaped traditional dietary and physical activity patterns, leading to a surge in obesity, particularly in urban areas.^[7] Compounding this challenge is the limited focus on mental health in public health initiatives, despite evidence linking malnutrition to mental health disorders such as depression and anxiety.^[19] Moreover, cultural norms and societal expectations play a critical role in shaping body image and mental health outcomes in Bangladeshi women, underscoring the need for context-specific research.

Previous studies have primarily examined the relationship between BMI and depression, often neglecting other mental health disorders such as anxiety and stress. For instance, while studies in Western contexts have highlighted significant correlations between obesity and depression, the findings are not always generalisable to Asian populations due to cultural differences in body image and lifestyle.^[20,21] Research from Bangladesh remains sparse, with most studies focusing on pregnant women or general adult populations rather than

reproductive-aged, non-pregnant women, a demographic particularly susceptible to mental health issues.^[22]

The current study seeks to fill these gaps by systematically investigating the associations between BMI and mental health outcomes, specifically (DAS), among urban Bangladeshi women aged 15–45 years or older. In addition to exploring the direct relationship between BMI and mental health, this study incorporates key socio-demographic factors such as age, marital status, educational background, employment, and residential location to provide a holistic understanding of these dynamics.

Understanding these associations is critical for several reasons. First, women in this demographic face unique health challenges related to both reproductive and mental health, making them a priority population for targeted interventions. Second, the findings can inform culturally tailored public health strategies to address the double burden of malnutrition and its mental health consequences. Lastly, this study provides an opportunity to contribute to the growing body of literature on the intersection of BMI and mental health, with a focus on a low-middle-income country context that has been largely underrepresented in global research.

This study has the potential to yield significant insights into the socio-demographic and psychological factors influencing BMI and mental health in Bangladeshi women, offering a foundation for public health initiatives. By addressing the gaps in existing literature and considering the unique cultural and socio-economic context of Bangladesh, this study aims to contribute to the development of effective, evidence-based strategies to improve women's health outcomes. The study targeted women aged 15–45+, aligning with the reproductive age span and a period associated with significant physiological and psychological transitions. Additionally, this study investigates associations between BMI and DAS among women aged 15–45+, examining the role of socio-demographic predictors. Through these efforts, it is hoped that policymakers and healthcare practitioners will be better equipped to combat the growing mental health and malnutrition challenges faced by Bangladeshi women.

MATERIAL AND METHODS

Study design and participants

The study utilised a cross-sectional design conducted over four months, from September 5, 2024 to December 20, 2024. A total of 405 women aged 15 years and older from Chittagong metropolitan area were recruited using purposive sampling to ensure inclusion of women across different age groups, marital status, education levels, and employment backgrounds within the city. [Figure 1]. Eligibility criteria included women residing in Chittagong metropolitan area,



Figure 1: Map of study area (Chittagong metropolitan area). The left panel shows the location of the study area within Bangladesh. The square marks the specific region selected for closer inspection. The right panel presents a magnified view of the selected region, providing finer spatial detail relevant to the study.

capable of providing informed consent, and without a history of major psychiatric disorders prior to the study. Exclusion criteria encompassed pregnant women, individuals with severe physical disabilities, and those unwilling or unable to participate due to cognitive impairments or language barriers. The sample size ($N = 405$) was selected based on prior studies of BMI and psychological health, ensuring adequate power to detect small to moderate effect sizes.

Measures

Sociodemographic questionnaire

This questionnaire was used to collect information on participants' age, marital status, residential location, educational qualification, employment status, and household income.

BMI

BMI was calculated via self-reported height and weight, following the standard formula: weight (kg)/height (m^2). The BMI was categorised into two groups: Normal and Overweight/Obesity, based on the WHO-recommended BMI cut-off points for Asians.^[23] According to these cut-offs, a BMI

of 18.5–22.9 kg/m^2 was classified as Normal, while a BMI of 23 kg/m^2 or higher, including both overweight (23–24.9 kg/m^2) and obesity (≥ 25 kg/m^2), was classified as Overweight/Obesity. Individuals with a BMI below 18.5 kg/m^2 were excluded from the analysis. We used WHO-recommended BMI cut-offs for Asian populations, where BMI ≥ 23 kg/m^2 is considered overweight due to higher health risks at lower BMI levels among Asians.^[23]

Depression, anxiety, and stress scale (DASS-21)

The DASS-21 is one of the reliable self-report instruments for evaluating the prevalence of DAS. It has 21 items, which are further categorised into three subdomains that include DAS domains; every domain consists of seven items that are marked on a rating scale of four points. On the scale, 0 indicates never, and three indicates always.^[24] In this study, the validated Bangla version of the DASS-21 was used.^[25] DAS were categorised into two groups: 'Absent' and 'Present'. Scores meeting the thresholds for moderate, severe, or extremely severe levels were classified as Present for each subscale: depression (≥ 14), anxiety (≥ 10), and stress (≥ 19) (Lovibond and Lovibond, 1995). In the present study, the DASS-21 showed high reliability with the Cronbach alpha

coefficients ranging from 0.909, for the depression subscale, 0.893 for anxiety subscale, 0.892 for stress subscale, and 0.958 overall.

Data collection process

This study employed an online survey using Google Forms, and participants were recruited over a two-month period. Before the participation, the explicit information about the purpose and aim of the study, the possibility of harm or loss in connection with the study procedures, possible advantages deriving from the study, and the non-essentiality of the participants' participation was shared with all the participants. They then filled in a survey on sociodemographic factors BMI, and validated the 21-item DASS-21; prior to this, informed consent was sought. BMI was derived from self-reported data, which may introduce recall or reporting bias. The ethical clearance for the study was obtained from the IRB of the Bangladesh Institute of Innovative Health Research under the protocol No.: BIIHR-2024-006; the study adhered to the tenets of the Declaration of Helsinki.^[26] Informed consent was upheld, whereby respondents were free to withdraw at any time with no explanations needed, and all responses collected conform to the highest ethical standards. No personal identifiers were collected, ensuring anonymity. Participation was voluntary, and participants could exit the survey at any point.

Statistical analysis

Data were analysed using SPSS version 26.0. Descriptive statistics, including frequencies and percentages, were used to summarise socio-demographic and psychological variables. The chi-square test was performed to examine the associations between BMI status and categorical variables. Logistic regression analysis was employed to identify significant predictors of overweight/obesity, with results reported as odds ratios (OR) and 95% confidence intervals (CI). Binary logistic regression was employed to examine predictors of overweight/obesity. Statistical significance was set at $p < 0.05$ for all tests.

RESULTS

Participants characteristics

A total of 405 participants were included in the study, with their socio-demographic, psychological, and BMI-related characteristics summarised in Table 1. Most participants (74.6%) were aged 15–29 years, while only 8.9% were 45 years or older. Most were single (73.8%) and resided in urban areas (83.0%). Educational attainment was high, with 67.9% reporting higher studies. A significant proportion (86.7%) were unemployed, and household income was evenly

distributed across the four income brackets. Regarding the BMI status, 44.7% were classified as having a normal BMI, while 55.3% were overweight or obese. Prevalence rates of DASS were 64.9%, 62.2%, and 52.1%, respectively [Table 1]. Figure 2 illustrates the distribution of BMI and DAS status. Notably, overweight/obesity was the most prevalent

Table 1: Descriptive statistics of socio-demographic, BMI, and psychological variables.

Variables	N	%
Age (in years)		
15 - <30	302	74.6
30 - <45	67	16.5
45 or older	36	8.9
Marital Status		
Single	299	73.8
In a relationship	106	26.2
Residential Location		
Urban	336	83.0
Rural	69	17.0
Educational Qualification		
Upto primary level	23	5.7
Secondary	107	26.4
Higher study	275	67.9
Employment Status		
Unemployed	351	86.7
Employed	54	13.3
Household Income		
<20000 BDT	107	26.4
20000 - 30000 BDT	66	16.3
30000 - 50000 BDT	125	30.9
>50000 BDT	107	26.4
BMI Status		
Normal	181	44.7
Overweight/Obesity	224	55.3
Depression Status		
Absent	142	35.1
Present	263	64.9
Anxiety Status		
Absent	153	37.8
Present	252	62.2
Stress Status		
Absent	194	47.9
Present	211	52.1

BDT: Bangladeshi taka, BMI: Body mass index

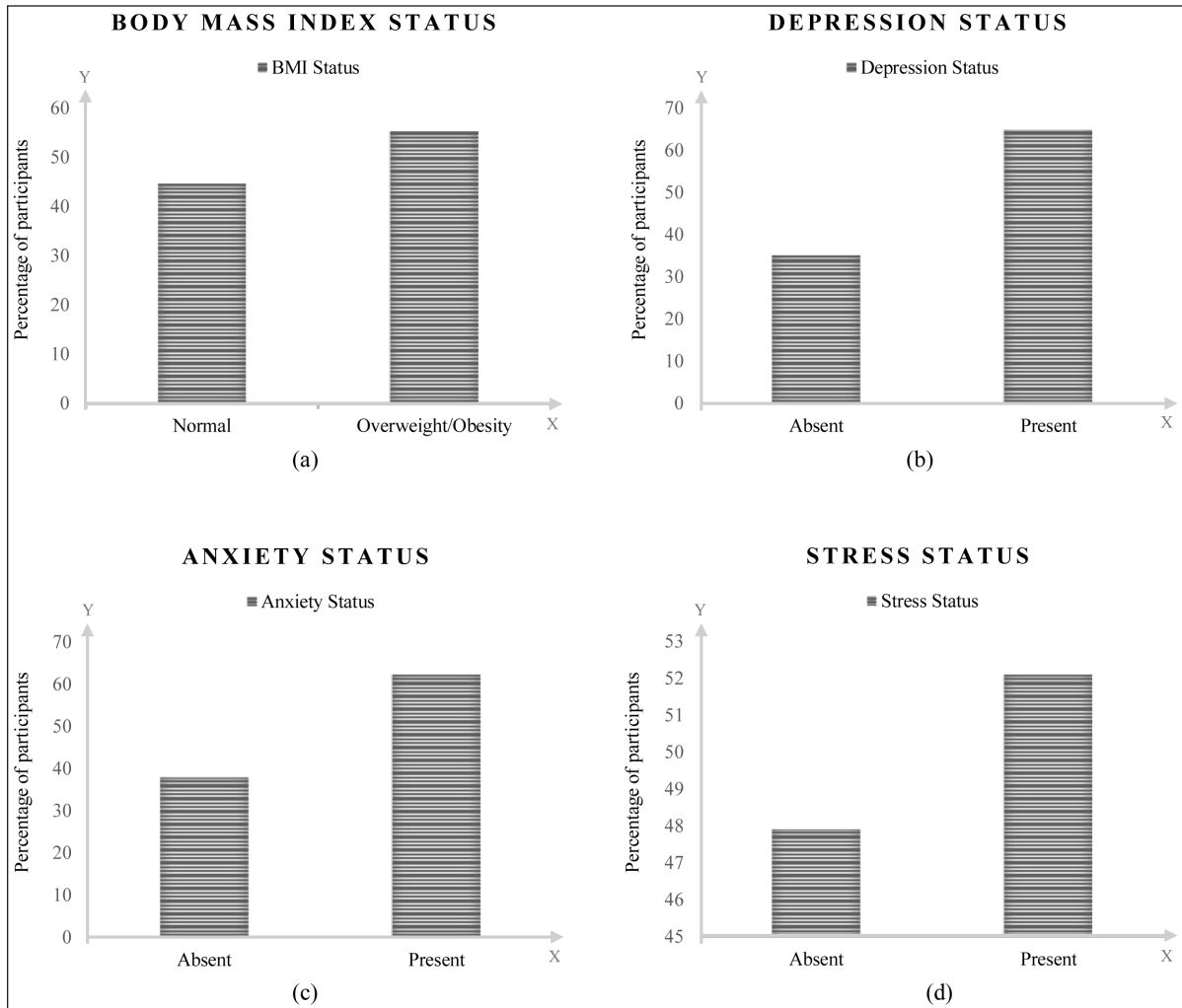


Figure 2: (a) Distribution of body mass index (BMI) status, (b) Distribution of depression status, (c) Distribution of anxiety status, and (d) Distribution of stress status.

BMI category [Figure 2a], and over half of the participants reported psychological distress [Figures 2b-d].

Associations between BMI and socio-demographic, psychological factors

Chi-square analyses identified significant associations between BMI status and several variables [Table 2]. Older participants were more likely to be overweight or obese ($\chi^2 = 19.837$, $p < 0.001$). Similarly, being in a relationship was associated with higher odds of overweight/obesity compared to being single ($\chi^2 = 7.914$, $p = 0.005$). Depression was also significantly associated with BMI status, with a higher prevalence among overweight/obese individuals ($\chi^2 = 3.991$, $p = 0.046$). However, no significant associations were found between BMI status and residential location, educational qualification, employment status, household income, or anxiety and stress statuses.

Predictors of overweight/obesity

Logistic regression analysis identified age as a significant predictor of BMI status [Table 3]. Participants aged 15–29 were less likely to be overweight or obese compared to those aged 45 or older (OR = 0.211, 95% CI = 0.076–0.581, $p = 0.003$). Although marital status approached significance, being single was associated with reduced odds of being overweight/obesity (OR = 0.632, $p = 0.099$). No significant associations were observed for residential location, educational qualification, employment status, household income, or psychological variables (DASS).

DISCUSSION

This study investigated the socio-demographic and psychological predictors of overweight and obesity among Bangladeshi women of reproductive age, focusing on their BMI and mental health status. Our findings contribute

Table 2: Association between socio-demographic, psychological factors, and BMI status

Variables	BMI Status		χ^2 (p)
	Normal (n, %)	Overweight/Obesity (n, %)	
Age (in years)			
15 - <30	152 (50.33)	150 (49.67)	19.837 (<0.001)
30 - <45	24 (35.82)	43 (64.18)	
45 or above	5 (13.89)	31 (86.11)	
Marital Status			
Single	146 (48.83)	153 (51.17)	7.914 (0.005)
In a relationship	35 (33.02)	71 (66.98)	
Residential Location			
Urban	153 (45.54)	183 (54.46)	0.569 (0.451)
Rural	28 (40.58)	41 (59.42)	
Educational Qualification			
Upto primary level	5 (21.74)	18 (78.26)	5.286 (0.071)
Secondary	48 (44.86)	59 (55.14)	
Higher study	128 (46.55)	147 (53.45)	
Employment Status			
Unemployed	159 (45.30)	192 (54.70)	0.393 (0.531)
Employed	22 (40.74)	32 (59.26)	
Household Income			
<20000 BDT	49 (45.79)	58 (54.21)	4.657 (0.199)
20000 - 30000 BDT	30 (45.45)	36 (54.55)	
30000 - 50000 BDT	63 (50.40)	62 (49.60)	
>50000 BDT	39 (36.45)	68 (63.55)	
Depression Status			
Absent	73 (51.41)	69 (48.59)	3.991 (0.046)
Present	108 (41.06)	155 (58.94)	
Anxiety Status			
Absent	71 (46.41)	82 (53.59)	0.292 (0.589)
Present	110 (43.65)	142 (56.35)	
Stress Status			
Absent	96 (49.48)	98 (50.52)	3.461 (0.063)
Present	85 (40.28)	126 (59.72)	

BDT: Bangladeshi taka, BMI: Body mass index

significantly to the understanding of the intricate relationship between BMI and mental health issues, including DAS, while highlighting the role of socio-demographic factors.

Based on the results of this study, it was confirmed that BMI and depressive disorders had a very weak positive relationship.

In contrast to the study by McPhie *et al.*, which reported that there was no significant relationship between BMI and anxiety or depression, our study shows that in Bangladeshi women, BMI is slightly related to stress and anxiety, which are the basic symptoms of depression.^[27] In support of this, Pelluri *et al.* found that obesity is a risk factor for increased onset of depression, especially among women.^[28] These results confirm previous postulations regarding a connection between obesity and mental health, although it is likely that the manifestation, intensity, and type of the relationship differ from one group to another.

Interestingly, our study revealed that while there was a relationship between BMI and depression, this correlation did not extend to stress or anxiety when analysed independently. This contrasts with Förster *et al.*, who identified strong correlations between BMI and psychological well-being in younger populations.^[29] This discrepancy underscores the complex interplay between BMI and mental health and suggests that other factors, such as socio-demographic characteristics, may moderate these relationships.

Age, marital status, education, and employment were the socio-demographic indicators that predicted BMI in the present study. Similar to the findings of Henriques *et al.* and Biswas *et al.*, the present study also showed that married women and women with higher education had significantly higher BMI.^[7,30] Marital status, on the other hand, did not have any influence on psychological distress, as demonstrated by Shabu *et al.*, who alluded to the fact that although there was a strong positive though and significant correlation between marital status and body weight perception, it did not affect anxiety or stress levels.^[31] This differential effect of marital status on BMI compared to mental health underscores the need for selective intervention. Although socio-demographic variables such as age and marital status appeared to influence BMI and mental health outcomes, this study did not formally assess moderation or mediation effects. Future research using path or structural models could explore these indirect relationships.

Residential location was another variable that significantly affected mental health and BMI. Specifically, female participants living in urban settings presented more depressive and stress scores compared to female participants living in rural areas, which is consistent with quantitative studies by Xu *et al.* and Chan *et al.*^[32,33] Limited access to open spaces and high population density in urban areas have been proposed as probable reasons for this difference. These environmental stressors should be addressed through urban planning and better psychiatric services, as this increased burden suggests that people living in metropolitan areas suffer from worse mental health. Another factor that significantly explained

Table 3: Logistic regression analysis of factors associated with overweight/obesity.

Outcome (vs. Normal)	Predictors	B (Coefficient)	Wald	p-value	Odds ratio (OR)	95% CI for OR	
Overweight/obesity	Age	15 - <30	-1.558	9.043	0.003	0.211	0.076-0.581
		30 - <45	-1.035	3.329	0.068	0.355	0.117-1.080
		45 or above	Ref	Ref	Ref	Ref	Ref
	Marital status	Single	-0.458	2.714	0.099	0.632	0.367-1.091
		In a relationship	Ref	Ref	Ref	Ref	Ref
	Residential location	Urban	0.123	0.150	0.699	1.131	0.605-2.114
		Rural	Ref	Ref	Ref	Ref	Ref
	Educational qualification	Upto primary level	0.899	2.215	0.137	2.456	0.752-8.022
		Secondary	0.016	0.004	0.948	1.016	0.627-1.647
		Higher study	Ref	Ref	Ref	Ref	Ref
	Employment status	Unemployed	-0.052	0.022	0.882	0.949	0.477-1.888
		Employed	Ref	Ref	Ref	Ref	Ref
	Household income	<20000 BDT	-0.534	2.997	0.083	0.586	0.320-1.073
		20000 - 30000 BDT	-0.429	1.620	0.203	0.651	0.336-1.261
		30000 - 50000 BDT	-0.518	3.340	0.068	0.596	0.342-1.038
		>50000 BDT	Ref	Ref	Ref	Ref	Ref
	Depression status	Absent	-0.617	3.173	0.075	0.539	0.274-1.064
		Present	Ref	Ref	Ref	Ref	Ref
	Anxiety status	Absent	0.493	1.873	0.171	1.637	0.808-3.316
		Present	Ref	Ref	Ref	Ref	Ref
Stress status	Absent	-0.363	1.345	0.246	0.695	0.376-1.285	
	Present	Ref	Ref	Ref	Ref	Ref	

Reference categories — Age: ≥45 years, Marital status: In a relationship, Residential location: Rural, Educational qualification: Higher study, Employment: Employed, Income: >50000 BDT; Psychological Variables: Present. Ref: Reference, CI : Confidence interval.

the mental health status was the employment status of the respondents. A comparison between the unemployed and the employed women showed that unemployed women had a higher depression score, similar to the study conducted by Nam *et al.*^[34] Nevertheless, this finding concurs with the World Health Organization's research that recommended economic integration with good job prospects as chief determinants of women's mental health in reproductive age. While comparisons have been drawn with studies from Western populations, cultural norms, socioeconomic disparities, and lifestyle patterns in Bangladesh differ significantly. These contextual factors must be considered when interpreting associations between BMI and mental health across diverse settings.

Although no participants in our study were classified as underweight, existing literature highlights elevated mental health risks in this group, particularly in low-resource settings. This contextual reference underscores the need for inclusive health strategies across the complete BMI spectrum. This is contrary to Mond *et al.* and Goldney *et al.*, who demonstrated

that further improved mental health status correlated with further lowered BMI levels.^[35,36] It is possible that this may be due to cultural or economic variations because underweight women in Bangladesh receive lower standards of nutrition and are economically disadvantaged, which leads to deterioration of psychological well-being. This clearly indicates the need to practice health and mental well-being, irrespective of the BMI status, ranging from underweight to overweight/obese categories. That is, educational attainment is deemed to be a determinant of BMI among women by this study, a finding that is quite unique in the literature. McCrea *et al.* found no moderation of the BMI-mental health relationship with education.^[37] For our study, the results highlighted that the higher the education level, the higher the prevalence of higher BMI rates among Bangladeshi women. This could be due to changes in lifestyle corresponding to a higher standard of education, for instance, less physical activity and dietary changes. Such results indicate the necessity of developing effective prevention strategies to support healthy behaviours for educated women.

These findings are therefore important in informing future research concerning BMI and mental health in Bangladeshi women because previous research in this area is quite limited. It is our conclusion, therefore, that efforts to keep one's BMI in check could go a long way towards preventing mental health problems like DAS. Other disease preventive and control measures that are recommendable to be taken by public health organisations include the screening and counselling services of female candidates who are at risk of developing obesity or underweight ailments. In addition, integrating factors like marital status, education level, and employment status, which are considered determinants of BMI, will have a greater impact on women's health. Stakeholders managing health promotion programs should review socio-demographics to ensure that interventions are culturally and economically appropriate.

It is, however, important to understand the limitations that this study has in its process of arriving at a conclusion. First, height and weight were self-reported to determine BMI, generating reporting bias and potentially misclassifying BMI. Second, the sample was collected only from the Chittagong metropolitan city, so the result might not be generalisable to other regions of Bangladesh, especially to rural areas or to another city with different socioeconomic characteristics. Moreover, a cross-sectional study design can only estimate the associations between BMI and mental health but cannot determine temporal and causal relationships between the two, which require more longitudinal designs. In addition, this study found that there are still other sources of bias, like diet and genetics have not been taken into consideration in the study and are therefore suggested for future research. Nonetheless, the current research offers useful information on the huge impact of socio-demographic variables and key psychological constructs on Bangladeshi women and BMI.

CONCLUSION

This study highlights the multifaceted relationships between socio-demographic, psychological, and BMI-related factors among Bangladeshi women of reproductive age. Findings suggest that overweight and obesity are marginally associated with depressive symptoms, while key socio-demographic variables, such as age, marital status, education, and employment, play significant roles in predicting BMI status. Women residing in urban areas and those who are married or more highly educated were more likely to be overweight or obese. Importantly, underweight women, though not represented in this study, are known from the literature to experience similar or even greater mental health vulnerabilities, reinforcing the importance of targeting all BMI categories in health promotion efforts. Public health strategies must prioritise integrated interventions that address both physical and psychological well-being. These could include

routine mental health screening in primary care, community-based physical activity programs, nutritional counselling, and psychosocial support systems tailored for urban women. Finally, this study underscores the need for future longitudinal research using objective anthropometric data and a more representative national sample. Incorporating variables such as diet, physical activity, and genetic background will further enhance our understanding of the interplay between body weight and mental health among women in low- and middle-income countries.

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