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Research Article

Interplay of Psychological Distress, Obesity, and Insomnia among Hypertensive Patients: A Cross-Sectional Study in Bangladesh

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Background: Hypertension is a critical global health challenge, closely interlinked with obesity, insomnia, and psychological distress. In Bangladesh, rising urbanization and lifestyle changes exacerbate these conditions, yet limited research has explored their combined impact, particularly among hypertensive patients. This study investigates the interconnections between psychological distress, obesity, and insomnia among hypertensive patients in Bangladesh, aiming to identify risk factors and inform interventions for holistic health management.

Methods: A cross-sectional study was conducted from September to December 2024, involving 739 hypertensive patients (400 males and 339 females) aged 18 and above. Data collection utilized a Personal Information Form, the Bengali Kessler Psychological Distress Scale (K6), and the Bangla Insomnia Severity Index (ISI). BMI was calculated from self-reported weight and height. Data were analyzed using SPSS, employing descriptive statistics, chi-square tests, and regression analyses to examine associations.

Results: The majority of participants (65.1%) experienced moderate psychological distress, with severe insomnia reported by 8.5%. Significant associations were found between psychological distress and socioeconomic status, education, and urban-rural residency (p < 0.05). Obesity and insomnia were strong predictors of distress, creating a bidirectional relationship.

Conclusion: Psychological distress significantly influences obesity and insomnia in hypertensive patients, highlighting the need for integrated mental health and lifestyle interventions. Addressing socio-economic and demographic disparities is critical for effective hypertension management in Bangladesh. Corresponding author: MD. Faisal Ahmed, faisal.biihr@gmail.com

1. Introduction

Hypertension is a significant global health issue affecting millions of people worldwide and is a major risk factor for cardiovascular diseases such as heart attack and stroke. It often remains undiagnosed until severe cardiovascular damage occurs, earning it the label "silent killer"^[1]. Hypertension may result from medical conditions such as chronic kidney disease, sleep apnea, or hormonal imbalances, and can also be induced by certain medications^[2]. Obesity contributes to hypertension by increasing vascular resistance and heart rate, in addition to releasing chemicals that disrupt blood pressure regulation^{[3][4]}. Even modest weight loss has been shown to significantly reduce blood pressure, highlighting the importance of weight management in preventing and treating hypertension. Obesity and insomnia can coexist in a vicious cycle. Insomnia, a sleep disorder characterized by difficulty falling or staying asleep, is closely linked to hypertension. Studies indicate that individuals with insomnia are at a greater risk of developing hypertension, suggesting a bidirectional relationship between these two conditions^[5]. Obesity, insomnia, and hypertension are interconnected disorders with profound implications for health and well-being.

Psychological distress is an overwhelming emotional experience that reflects an individual's emotional struggles^[6]. Psychological distress often manifests in the form of anxiety, depression, and a general sense of being emotionally imbalanced^[6]. Common indicators of psychological distress include the following: anxiety, which makes individuals feel constantly uneasy or fearful^[7]. People dealing with psychological distress worry about things that others might not even notice, leading to a racing heart, trouble concentrating, or restlessness. Depression is characterized by prolonged feelings of sadness. It is a deep sense of hopelessness. It affects sleep patterns, appetite, and overall motivation. Mood swings and irritability can be caused by this distress. The quick change in mood leads a person to experience emotional instability. Such mood swings can exacerbate psychological distress. Recognizing psychological distress early is essential for healthcare professionals to provide holistic care, addressing both physical and mental well-being^[7].

Psychological distress acts as a catalyst for the development or worsening of various chronic conditions^[8]. These often lead to negative impacts on the body, making certain health issues more severe to manage. Psychological distress is closely related to increased blood pressure. Obesity can be caused by distress. Psychological stress often leads people to turn to food as a coping mechanism. Additionally,

distress can disrupt the balance of hormones that regulate appetite, such as increasing levels of ghrelin, which stimulates hunger, and decreasing levels of leptin, which signals fullness, resulting in obesity. Psychological distress is a well-known contributor to sleep disturbances, including insomnia. Mentally or emotionally distressed people may have difficulty falling asleep or staying asleep through the night. In summary, as Liu et al. described, psychological distress has tangible effects on physical health by contributing to the development and progression of conditions such as hypertension, obesity, and insomnia^{[8][9]}.

From previous studies, we found that nonspecific psychological distress and high scores for feeling "nervous" over the past 30 days were notable indicators of the development of hypertension in a Black population, regardless of alcohol consumption. Moreover, less psychological distress can lead to better self-care and increase the likelihood of optimal HTN control^{[2][10][11]}. Moreover, from the previous studies, we also reported a relationship between insomnia and psychological distress, with insomnia being associated with 9.82 times more clinically significant depression and 17.35 times more clinically significant anxiety^{[12][13]}. Anxiety and depression cause insomnia, which leads to increased anxiety and depression, and the relationship is bidirectional^{[12][14][15]}. Obesity significantly increases the risk of essential hypertension, diabetes, and other conditions that contribute to kidney disease^{[3][16]}.

Hypertension affects approximately 25% of adults in Bangladesh and is driven by dietary changes, stress, and sedentary lifestyles^{[17][18][16]}. It is a key risk factor for cardiovascular diseases, which are major causes of morbidity and mortality^[19]. On the other hand, obesity is increasing, with nearly 10% of adults classified as obese, largely due to increased caloric intake and decreased physical activity^{[3][20]}. Approximately 25% of adults in Bangladesh experience insomnia, which is worsened by stress and anxiety^[21]. Psychological distress, including stress, anxiety, and depression, exacerbates hypertension, obesity, and insomnia. Research shows that stress often leads to unhealthy behaviors, worsening these conditions^[18].

Most current research focuses on larger population groups or different geographical settings, leaving a gap in understanding the unique challenges faced by patients with hypertension in Bangladesh. Environments in urban areas are related to specific pressures such as greater socioeconomic pressures, lifestyle changes, and decreased physical activity, which can contribute to a complex interplay between mental and physical health. This longitudinal study is necessary to monitor the progress of these

doi.org/10.32388/3VG3VJ.3

conditions. Furthermore, successful techniques for handling mental distress were discovered to lessen the impact of obesity and sleeplessness on individuals with high blood pressure.

This study aims to unpack the tridirectional effects of the psychological distress-obesity-insomnia path. There are no prevalence studies on the psychological burden linked to cognitive, psycho-dysthymia, and mood disorders in urban Bangladesh. The underlying pathophysiological consequences of the associations between psychological distress and hypertension, obesity, and insomnia have yet to be elucidated. The relevant research outcome is scant and restricted; samples come from minority groups. Social stressors due to socioeconomic demands, changing lifestyles, and physical inactivity–all the pathways connecting psych outcomes–are still not clearly understood. The study suggests ways to improve well-being by identifying major risk factors via the triad relationship.

2. Methods and Materials

2.1. Study Design and Participants

This cross-sectional study, conducted between September 26, 2024, and December 5, 2024, examined the impact of psychological distress on obesity and insomnia among hypertensive patients. The study involved 739 participants (400 male, 339 female) aged 18 years and above, and convenience sampling techniques were used to select them. Adults aged 18 years and older with a diagnosis of hypertension who could complete a survey in Bengali were included. The exclusion criteria included people under 18 years of age, individuals who are not diagnosed with hypertension, and those who would not be able to finish the online survey.

2.2. Data Collection Tools

A *Personal Information Form (PIF)* collected data on age, gender, socioeconomic status, educational background, income, residential area, occupational status, monthly income, and self-reported blood pressure. *Body mass index (BMI)* was calculated by using participants' self-reported weight and height, based on the standard formula: weight (kg)/height (m²).

Psychological distress was measured by the *Kessler Psychological Distress Scale (K6)* by Kessler et al.^[22]. The Bangla adaptation by Khan et al. was employed, which has six questions that measure symptoms such as nervousness, hopelessness, restlessness, and worthlessness within the last four weeks^[23]. The

results were measured on a five-point Likert scale from 0 (none of the time) to 4 (all of the time) to yield a summary score of distress severity.

The *Insomnia Severity Index (ISI)*, originally developed by Bastien et al., was translated and validated into Bangla by Mamun et al.^{[24][25]}. This seven-item scale evaluates the intensity of insomnia symptoms on a five-point Likert scale, with total scores ranging from 0 to 28. Scores were categorized as no insomnia (0–7), subthreshold insomnia (8–14), moderate insomnia (15–21), or severe insomnia (22–28).

2.3. Data Collection Procedure

The participants were selected through convenience sampling, social media, online-based platforms, and healthcare institution connectiveness. After rapport building, the participants were advised on the purpose and processes of the study and were assured of anonymity and the option of withdrawal from the study at any time. The data were collected through the Google Form, which consists of the Personal Information Form, the Bangla version of the Kessler Psychological Distress Scale (K6), and the Insomnia Severity Index (ISI). Ethical approval for the study was granted by the Institutional Review Board of the Bangladesh Institute of Innovative Health Research (IRB Protocol: BIIHR-2024-008), adhering to the Declaration of Helsinki^[26]. The participants agreed to participate in the study voluntarily, and no personal data, including names or identifying information, were disclosed.

2.4. Statistical Analysis

Data analysis was conducted via SPSS (version 26.0) to explore the associations among psychological distress, obesity, insomnia, and hypertension. Descriptive statistics summarized participant demographics and health characteristics, including frequencies, percentages, means, and standard deviations. Chi-square tests were used to assess associations between psychological distress and categorical variables such as gender, socioeconomic status, and residential area. Ordinal regression analysis identified predictors of psychological distress, BMI, and insomnia severity, with odds ratios and confidence intervals reported. Multiple linear regression was used to examine the effects of sociodemographic factors on BMI, insomnia severity, and psychological distress scores. Statistical significance was set at p < 0.05. All analyses were conducted with appropriate checks for normality and multicollinearity to ensure the robustness of the findings.

3. Results

This study examined the relationship between psychological distress and its potential impact on obesity and insomnia among patients diagnosed with hypertension. Understanding these interactions can provide valuable insights into the multidimensional challenges faced by hypertensive individuals and inform targeted interventions to address their physical and mental health needs.

3.1. Participant Characteristics

The study involved participants with diverse demographic and socioeconomic backgrounds, as detailed in Table 1. The mean age was 45.19 years (SD = 16.13). The gender distribution included 54.1% male and 45.9% female participants. Socioeconomic status (SES) varied, with the majority classified as middle class (52.0%), followed by higher-middle class (19.4%) and lower-middle class (16.1%). Other SES categories included lower class (5.5%) and higher class (7.0%).

In terms of BMI classifications, 18.1% were underweight, 35.5% were of normal weight, 25.3% were overweight, and 21.1% were obese. The prevalence of psychological distress was moderate among 65.1% of the participants, whereas 26.9% experienced severe distress. Insomnia severity levels varied, with subthreshold insomnia reported in 46.1% of participants, moderate insomnia reported in 36.1%, and severe insomnia reported in 8.5% (TABLE 1).

Variable	N	%	Mean ± SD (Range)
Age (in years)	-	-	45.19 ± 16.13 (219)
Gender			
Male	400	54.1	-
Female	339	45.9	-
Socioeconomic Status			
Lower Class	41	5.5	-
Lower-Middle Class	119	16.1	-
Middle Class	384	52.0	-
Higher-Middle Class	143	19.4	-
Higher Class	52	7.0	-
Height (in cm)	-	-	165.58 ± 8.47 (51.82)
Weight (in kg)	-	-	66.45 ± 11.94 (72)
Residential Division			
Dhaka	228	30.9	-
Chittagong	156	21.1	-
Rajshahi	22	3.0	-
Sylhet	19	2.6	-
Khulna	284	38.4	-
Barishal	8	1.1	-
Rangpur	7	0.9	-
Mymensingh	15	2.0	-
Residential Place			
Rural	342	46.3	-
Sub-Urban	65	8.8	-
Urban	332	44.9	-

Variable	N	%	Mean ± SD (Range)
Educational Qualification			
No Formal Education	41	5.5	-
Primary	120	16.2	-
Secondary	153	20.7	-
Higher Secondary	131	17.7	_
Undergraduate	176	23.8	-
Graduate	118	16.0	-
Occupation			
Student	149	20.2	-
Unemployed	292	39.5	-
Govt. Employee	108	16.6	-
Private Employee	190	25.7	-
Monthly Income			
<20000 BDT	199	26.9	-
20000 - 30000 BDT	197	26.7	-
30000 - 50000 BDT	194	26.3	-
>50000 BDT	149	20.2	-
Systolic Blood Pressure	-	-	147.42 ± 16.07 (92)
Diastolic Blood Pressure	-	-	91.22 ± 10.05 (80)
BMI			
Underweight	134	18.1	-
Normal	262	35.5	_
Overweight	187	25.3	-
Obese	156	21.1	_
Psychological Distress			

Variable	Ν	%	Mean ± SD (Range)
Low	59	8.0	-
Moderate	481	65.1	-
Severe	199	26.9	-
Insomnia Severity			
Absence of Insomnia	68	9.2	-
Sub-threshold Insomnia	341	46.1	-
Moderate Insomnia	267	36.1	-
Severe Insomnia	63	8.5	-

Table 1. Participant Demographics and Health Characteristics (n=739).

3.2. Associations Between Psychological Distress and Demographic Variables

Table 2 presents the associations between psychological distress and various demographic variables. Gender, SES, residential division, and educational qualifications were significantly associated with psychological distress. Notably, males were more likely to experience severe psychological distress (30.5%) than females were (22.7%) (χ^2 = 9.820, p =.007). Higher SES was inversely associated with severe distress (p <.001), with individuals from higher-class backgrounds reporting lower levels of distress. Residential division and place of residence (urban vs. rural) were also significantly associated with psychological distress, with urban residents experiencing lower levels of distress (χ^2 = 74.642, p <.001) (TABLE 2).

Variable	Psychological Distress							
Low; n (%) Moderate		Moderate; n (%)	Severe; n (%)	χ ² (p)				
Gender								
Male	23 (5.75%)	255 (63.75%)	122 (30.5%)	0 820 (0 007)				
Female	36 (10.62%)	226 (66.67%)	77 (22.71%)	9.820 (0.007)				
	Soci	ioeconomic Status						
Lower Class	Lower Class 1 (2.44%) 26 (63.41%) 14 (34.15%)							
Lower-Middle Class	6 (5.04%)	66 (55.46%)	47 (39.50%)					
Middle Class	26 (6.77%)	257 (66.93%)	101 (26.30%)	26.208 (<0.001)				
Higher-Middle Class	19 (13.29%)	94 (65.73%)	30 (20.98%)					
Higher Class	7 (13.46%)	38 (73.08%)	38 (73.08%) 7 (13.46%)					
	Res	sidential Division						
Dhaka	51 (22.37%)	167 (73.25%)	10 (4.39%)					
Chittagong	5 (3.21%)	120 (76.92%)	31 (19.87%)					
Rajshahi	0 (0.00%)	6 (27.27%)	16 (72.72%)					
Khulna	2 (0.70%)	159 (55.99%)	123 (43.31%)	246 106 (20 001)				
Sylhet	0 (0.00%)	1 (5.26%)	18 (94.74%)	240.100 (<0.001)				
Barishal	1 (12.50%)	7 (87.5%)	0 (0.00%)					
Rangpur	0 (0.00%)	7 ((100.00%)	0 (0.00%)					
Mymensingh	0 (0.00%)	14 (93.33%)	1 (6.67%)					
	R	esidential Place						
Rural	9 (2.63%)	198 (57.89%)	135 (39.47%)					
Sub-Urban	4 (6.15%)	42 (64.62%)	19 (29.23%)	74642 (<0.001)				
Urban	46 (14.76%)	241 (72.59%)	45 (13.55%)					
	Educa	tional Qualification						
No Formal Education	0 (0.00%)	28 (68.29%)	13 (31.70%)	58.047 (<0.001)				

Wasiahla		Psychological Distress				
variable	Low; n (%)	Moderate; n (%)	Severe; n (%)	χ ² (p)		
Primary	2 (1.67%)	63 (52.50%)	55 (45.83%)			
Secondary	12 (7.83%)	93 (60.78%)	48 (31.37%)			
Higher Secondary	10 (7.63%)	82 (62.59%)	39 (29.77%)			
Undergraduate	25 (14.20%)	125 (71.02%)	26 (14.77%)			
Graduate	10 (8.47%)	90 (76.27%)	18 (15.25%)			
		Occupation				
Student	18 (12.08%)	107 (71.81%)	24 (16.11%)			
Unemployed	21 (7.19%)	169 (57.88%)	102 (34.93%)	24.064 (20.001)		
Govt. Employee	11 (10.19%)	73 (67.59%)	24 (22.22%)	24.964 (<0.001)		
Private Employee	9 (4.74%)	132 (69.47%)	49 (25.79%)			
	Ν	Aonthly Income				
<20000 BDT	4 (2.01%)	113 (56.78%)	82 (41.21%)			
20000 - 30000 BDT	14 (7.11%)	130 (65.99%)	53 (26.90%)	(2.11/ (-0.001)		
30000 - 50000 BDT	22 (11.34%)	137 (70.62%)	35 (18.04%)	43.114 (<0.001)		
>50000 BDT	19 (12.75%)	101 (67.79%)	29 (19.46%)			
		BMI				
Underweight	9 (6.72%)	80 (59.70%)	45 (33.58%)			
Normal	14 (5.34%)	176 (67.18%)	72 (27.48%)	10 (12 (0 109)		
Overweight	22 (11.76%)	120 (64.17%)	45 (24.06%)	10.412 (0.108)		
Obese	14 (8.97%)	105 (67.31%)	37 (23.72%)			
	In	somnia Severity				
Absence of Insomnia	7 (10.29%)	52 (76.47%)	9 (13.24%)	25.510 (<0.001)		
Sub-threshold Insomnia	38 (11.14%)	223 (65.40%)	80 (23.46%)			
Moderate Insomnia	13 (4.87%)	162 (60.67%)	92 (34.46%)			

Variable	Psychological Distress					
	Low; n (%) Moderate; n (%)		Severe; n (%)	χ^2 (p)		
Severe Insomnia	1 (1.59%)	44 (69.84%)	18 (28.57%)			

Table 2. Associations Between Psychological Distress and Demographic Variables.

3.3. Predictive Analysis of Psychological Distress and Health Variables

Table 3 presents odds ratios for predicting psychological distress on the basis of BMI and insomnia severity. Compared with obese individuals, normal and underweight individuals had a slightly lower, though nonsignificant, likelihood of distress. With respect to insomnia severity, participants with no insomnia were more likely to report low levels of psychological distress (OR = 14.00, p =.021), indicating a strong link between insomnia severity and psychological distress (**TABLE 3**).

Variable	Psychological Distress	Odds Ratio (OR)	95% CI for OR	р			
BMI ^a							
	Low	0.529	0.206-1.358	0.185			
Underweight	Moderate	0.626	0.371-1.057	0.080			
	Severe (Redundant)						
	Low	0.514	0.222-1.191	0.120			
Normal	Moderate	0.861	0.541-1.370	0.529			
	Severe (Redundant)						
	Low	1.292	0.581-2.872	0.530			
Overweight	Moderate	0.940	0.566-1.561	0.810			
	Severe (Redundant)						
	Insomnia Sever	ity ^b					
	Low	14.00	1.486-131.885	0.021			
Absence of Insomnia	Moderate	2.364	0.966-5.786	0.060			
	Severe (Redundant)						
	Low	8.550	1.100-66.440	.040			
Sub-threshold Insomnia	Moderate	1.140	0.623-2.088	0.670			
	Severe (Redundant)						
	Low	2.543	0.313-20.682	0.383			
Moderate Insomnia	Moderate	0.720	0.393-1.319	0.288			
	Severe (Redundant)						

 Table 3. Odds Ratios for Predicting Psychological Distress by BMI and Insomnia Severity.

^a The reference category is: Obese

^b The reference category is: Severe Insomnia

3.4. Influence of Sociodemographic Variables on BMI, Psychological Distress, and Insomnia Severity

Table 4 provides insights from a multiple linear regression, examining the effects of various sociodemographic variables on BMI, psychological distress, and insomnia severity. Weight and height significantly predicted BMI (p <.001), whereas residential division and psychological distress significantly predicted insomnia severity (p <.001). Age was significantly associated with insomnia severity (p =.009), suggesting that older individuals tend to experience more severe insomnia (**TABLE 4**).

Dependent Variable	Predictor Variable	в	Standard Error (SE)	Standardized Coefficient (Beta)	t	р
	Age	-0.001	0.001	-0.015	-1.191	0.234
Dependent Variable	Gender	0.032	0.028	0.016	1.148	0.251
	Height	-0.050	0.003	-0.419	-16.746	<0.001
	Weight	0.047	0.002	0.550	22.811	<0.001
	Residential Division	-0.001	0.010	-0.002	-0.115	0.909
	riablePredictor VariableBSAge-0.0011Gender0.03211Height-0.0501Residential Division-0.0011Residential Place0.0211Diastolic Blood Pressure0.0011Diastolic Blood Pressure0.0011Pressure0.0011Insomnia Severity-0.0011Gender-0.0021Insomnia Severity-0.0021Height-0.0021Residential Place0.0001Residential Place0.0001Insomnia Severity-0.0021Gender-0.0021Residential Place-0.0021Systolic Blood Pressure-0.0021Diastolic Blood Pressure-0.0021Diastolic Blood Pressure-0.0021Diastolic Blood Pressure-0.0021Diastolic Blood 	0.017	0.020	1.242	0.215	
BMI	Systolic Blood Pressure	0.001	0.001	0.014	1.204	0.229
	Diastolic Blood Pressure	0.001	0.001	0.001 0.009		0.439
	Psychological Distress	0.030	0.024	0.016	1.244	0.214
	Predictor Variable B Standard Error (SE) Standard Error (SE) Standard Error (SE) Standard Error (SE) Age -0.001 0.001 -0.01 Age -0.01 0.001 -0.01 Gender 0.032 0.028 0.001 Height 0.050 0.003 0.001 Weight 0.047 0.002 0.010 Residential Division -0.001 0.010 0.010 Residential Place 0.021 0.017 0.001 Pressure 0.001 0.001 0.001 Pressure 0.001 0.001 0.001 Psychological Distress 0.001 0.010 0.001 Insomnia Severity -0.010 0.017 0.001 Gender -0.018 0.043 -0.019 Height -0.002 0.001 0.015 Kesidential Division 0.15 0.015 0.015 Metight -0.002 0.001 0.017 0.017 Keighti <t< th=""><th>-0.007</th><th>-0.586</th><th>0.558</th></t<>	-0.007	-0.586	0.558		
	Age	0.000	0.001	0.012	0.335	0.738
	Gender	-0.108	0.043	-0.097	-2.544	0.011
	Height	-0.002	0.005	-0.026	-0.311	0.756
	Weight	-0.006	0.004	-0.136	-1.539	0.124
Dependent Variable BMI BMI Psychological Distress	Residential Division	0.105	0.015	0.305	7.053	<0.001
Psychological	Residential Place	-0.055	0.026	-0.093	-2.111	0.035
Distress	Systolic Blood Pressure	-0.002	0.001	-0.048	-1.432	0.152
	Diastolic Blood Pressure	-0.002	0.002	-0.028	-0.809	0.419
BMI Psychological Distress	BMI	0.071	0.057	0.129	1.244	0.214
	Insomnia Severity	0.110	0.025	0.152	4.297	<0.001

Dependent Variable	Predictor Variable	В	Standard Error (SE)	Standardized Coefficient (Beta)	t	р
	Age	0.004	0.002	0.093	2.632	0.009
	Gender	0.195	0.061	0.125	3.189	0.001
	Height	-0.005	0.008	-0.050	-0.586	0.558
	Weight	-0.003	0.006	-0.051	-0.555	0.579
	Residential Division	-0.139	0.036	-0.292	-6.487	<0.001
	Residential Place	-0.244	0.008	-0.301	-6.745	<0.001
Insomnia Severity	Systolic Blood Pressure	0.000	0.002	-0.008	-0.215	0.830
	Diastolic Blood Pressure	-0.002	0.003	-0.027	-0.771	0.441
	BMI	-0.048	0.082	-0.063	-0.586	0.558
	Psychological Distress	0.226	0.053	0.163	4.297	<0.001

 Table 4. Multiple Linear Regression Analysis of Sociodemographic Factors on BMI, Psychological Distress, and

 Insomnia Severity.

Table 5 shows the model summary for predicting BMI, psychological distress, and insomnia severity. The BMI model demonstrated a strong predictive capacity (R^2 =.896), whereas the models for psychological distress and insomnia severity showed moderate predictive power (R^2 =.181 and.121, respectively) (**TABLE** 5).

Dependent Variable	R ²	Adjusted R ²	F-Value	р
BMI	0.896	0.894	626.512	0.000
Psychological Distress	0.181	0.181	16.129	<0.001
Insomnia Severity	0.121	0.108	9.977	<0.001

 Table 5. Model Summary for Predicting BMI, Psychological Distress, and Insomnia Severity.

3.5. Predictors of Psychological Distress, BMI, and Insomnia Severity

Table 6 presents ordinal regression results, indicating the associations between BMI and sociodemographic factors. Socioeconomic status and educational qualifications were significant predictors of BMI. Compared with private employees, middle class participants were more likely to be obese (OR = 2.083, p =.016), whereas students and unemployed individuals had significantly different BMI levels (p =.011 and p <.001, respectively) (**TABLE 6**).

Dependent Variable	Predictor Variable	Estimate (B)	Standard Error (SE)	Wald χ^2	Odds Ratio (Exp(B))	р
BMI		Socio	economic Status			
	Lower Class	0.735	0.472	2.428	2.085	0.119
	Lower-Middle Class	0.536	0.366	2.140	1.709	0.144
	Middle Class	0.734	0.304	5.840	2.083	0.016
	Higher-Middle Class	0.462	0.311	2.216	1.587	0.137
	Higher Class (Redundant)	-	-	-	-	-
		Educat	ional Qualification			
	No Formal Education	0.433	0.430	1.013	1.542	0.314
	Primary	0.172	0.328	0.274	1.188	0.601
	Secondary	0.068	0.289	0.056	1.070	0.813
	Higher Secondary	0.254	0.257	0.978	1.289	0.323
	Undergraduate	0.384	0.242	2.519	1.468	0.112
	Graduate (Redundant)	_	_	_	-	-
			Occupation			
	Student	0.568	0.224	6.459	1.765	0.011
	Unemployed	0.684	0.195	12.323	1.982	<0.001
	Govt. Employee	-0.410	0.254	2.599	0.664	0.107
	Private Employee (Redundant)	-	_	-	_	-
	Monthly Income					
	<20000 BDT	-0.354	0.273	1.680	0.702	0.195
	20000 - 30000 BDT	0.011	0.240	0.002	1.011	0.964
	30000 - 50000 BDT	0.291	0.211	1.897	1.338	0.168
	>50000 BDT (Redundant)	-	-	-	-	-

Dependent Variable	Predictor Variable	Estimate (B)	Standard Error (SE)	Wald χ^2	Odds Ratio (Exp(B))	р		
		Psychological Distress						
	Low	0.356	0.284	1.574	1.427	0.210		
	Moderate	0.177	0.160	1.225	1.194	0.268		
	Severe (Redundant)	-	-	-	-	-		
	Insomnia Severity							
	Absence of Insomnia	0.262	0.337	0.602	1.300	0.438		
	Sub-threshold Insomnia	0.158	0.269	0.345	1.171	0.557		
	Moderate Insomnia	-0.232	0.261	0.787	0.793	0.375		
	Severe Insomnia (Redundant)	_	_	-	-	-		

Table 6. Ordinal Regression Analysis of Sociodemographic Factors Predicting BMI.

Table 7 focuses on the influence of sociodemographic factors on psychological distress. The primary education level was associated with greater odds of experiencing psychological distress (OR = 2.237, p = .036). Monthly income was also significant, with those earning less than 20,000 BDT showing higher distress levels (p = .018). Compared with private employees, occupation was significant, as students were less likely to experience psychological distress (OR = .442, p = .002) (TABLE 7).

Dependent Variable	Predictor Variable	Estimate (B)	Standard Error (SE)	Wald χ^2	Odds Ratio (Exp(B))	р	
Psychological	Socioeconomic Status						
Distress	Lower Class	0.274	0.548	0.250	1.276	0.617	
	Lower-Middle Class	0.543	0.434	1.567	1.721	0.211	
	Middle Class	0.591	0.365	2.617	1.806	0.106	
	Higher-Middle Class	0.218	0.374	0.338	1.246	0.561	
	Higher Class (Redundant)	-	-	-	-	_	
		Educati	onal Qualification				
	No Formal Education	0.611	0.500	1.493	1.842	0.222	
	Primary	0.805	0.383	4.418	2.237	0.036	
	Secondary	0.118	0.343	0.118	1.125	0.731	
	Higher Secondary	0.568	0.307	3.437	1.765	0.064	
	Undergraduate	-0.122	0.293	0.174	0.885	0.677	
	Graduate (Redundant)	-	-	-	-	-	
	Occupation						
	Student	-0.816	0.268	9.239	0.442	0.002	
	Unemployed	-0.274	0.229	1.426	0.760	0.232	
	Govt. Employee	0.101	0.303	0.111	1.106	0.739	
	Private Employee (Redundant)	_	-	_	-	-	
	Monthly Income						
	<20000 BDT	0.755	0.320	5.560	2.128	0.018	
	20000 - 30000 BDT	0.151	0.286	0.281	1.163	0.596	
	30000 - 50000 BDT	-0.238	0.254	0.876	0.788	0.349	
	>50000 BDT (Redundant)	-	-	-	-	-	

Dependent Variable	Predictor Variable	Estimate (B)	Standard Error (SE)	Wald χ^2	Odds Ratio (Exp(B))	р	
	BMI						
	Underweight	0.386	0.257	2.253	1.471	0.133	
	Normal	0.068	0.223	0.093	1.070	0.760	
	Overweight	-0.025	0.235	0.012	0.975	0.914	
	Obese (Redundant)	-	-	-	-	-	
	Insomnia Severity						
	Absence of Insomnia	-0.626	0.397	2.480	0.535	0.115	
	Sub-threshold Insomnia	-0.053	0.310	0.029	0.948	0.866	
	Moderate Insomnia	0.181	0.300	0.364	1.198	0.546	
	Severe Insomnia (Redundant)	-	-	-	-	-	

 Table 7. Ordinal Regression Analysis of Sociodemographic Factors Predicting Psychological Distress.

Table 8 shows the sociodemographic variables influencing insomnia severity. Lower education levels, specifically primary and secondary education, were associated with significantly greater insomnia severity (p < .001). Unemployed individuals were more likely to experience severe insomnia than private employees were (OR = 2.678, p < .001) (TABLE 8).

Dependent Variable	Predictor Variable	Estimate (B)	Standard Error (SE)	Wald χ^2	Odds Ratio (Exp(B))	р		
Insomnia	Socioeconomic Status							
Severity	Lower Class	0.117	0.503	0.054	1.124	0.816		
	Lower-Middle Class	-0.021	0.392	0.003	0.979	0.957		
	Middle Class	-0.192	0.326	0.347	0.825	0.556		
	Higher-Middle Class	-0.115	0.334	0.119	0.891	0.730		
	Higher Class (Redundant)	-	-	-	-	-		
	Educational Qualification							
	No Formal Education	1.420	0.456	9.684	4.137	0.002		
	Primary	1.700	0.351	23.407	5.474	<0.001		
	Secondary	1.484	0.310	22.912	4.411	<0.001		
	Higher Secondary	0.658	0.279	5.578	1.931	0.018		
	Undergraduate	0.146	0.263	0.307	1.157	0.579		
	Graduate (Redundant)	-	-	-	-	-		
	Occupation							
	Student	0.176	0.242	0.532	1.192	0.466		
	Unemployed	0.985	0.208	22.327	2.678	<0.001		
	Govt. Employee	-0.481	0.272	3.138	0.618	0.076		
	Private Employee (Redundant)	_	-	-	-	-		
	Monthly Income							
	<20000 BDT	-0.316	0.293	0.532	0.729	0.466		
	20000 - 30000 BDT	0.124	0.208	22.327	1.132	<0.001		
	30000 - 50000 BDT	0.357	0.272	3.138	1.429	0.076		
	>50000 BDT (Redundant)	-	-	-	_	-		

Dependent Variable	Predictor Variable	Estimate (B)	Standard Error (SE)	Wald χ^2	Odds Ratio (Exp(B))	р		
	BMI							
	Underweight	0.263	0.236	1.242	1.301	0.265		
	Normal	0.342	0.203	2.836	1.408	0.092		
	Overweight	-0.010	0.214	0.002	0.990	0.964		
	Obese (Redundant)	-	-	-	-	-		
	Psychological Distress							
	Low	-0.694	0.306	5.181	0.499	0.023		
	Moderate	-0.066	0.170	0.149	0.936	0.699		
	Severe (Redundant)	-	-	-	-	-		

Table 8. Ordinal Regression Analysis of Sociodemographic Factors Predicting Insomnia Severity.

Table 9 provides the overall model summaries, showing strong fit for predicting insomnia severity (Nagelkerke R^2 =.234) and psychological distress (Nagelkerke R^2 =.143). These results indicate a moderate association between the examined sociodemographic and health-related variables and the severity of insomnia and psychological distress in the sample (**TABLE 9**).

Dependent Variable	-2 Log Likelihood	Cox & Snell R ²	Nagelkerke R ²	χ^2 (Overall Model)	р
BMI	1422.428	0.083	0.089	64.378	<0.001
Psychological Distress	898.621	0.116	0.143	91.330	<0.001
Insomnia Severity	1225.403	0.211	0.234	174.940	<0.001

Table 9. Model Summary of Regression Analysis for BMI, Psychological Distress, and Insomnia Severity.

4. Discussion

The findings revealed significant correlations between psychological distress, obesity, insomnia, and hypertension, which were influenced by socioeconomic and demographic factors. Compared with males, females reported lower levels of psychological distress, suggesting the presence of gender-specific stressors. Nevertheless, in this study, psychological distress was greater in women with low education and those who were mainly housewives; therefore, we can see a more complex relationship between gender and socioeconomic status. SES and psychological distress were inversely correlated, with higher levels of SES associated with lower distress levels. Furthermore, participants living in urban areas reported lower scores for psychological distress than those living in rural areas did, which might point to inequalities in mental health care in addition to environmental pressures.

These findings align with those of Liu et al., who reported strong correlations between depression, sleep disturbances, and hypertension^[27]. In the present study, Araghi et al. reported that lower education level, obesity, and severe insomnia were positively correlated with each other^[28]. Furthermore, Bose et al. described the effect of the HPA axis on cortisol irregularity and discussed the complex relationships among stress, obesity, and sleep disruption^[29]. We did find a few differences compared with other studies from around the world. In contrast to prior studies revealing consistently elevated distress levels in females, our results suggest that this difference might be defined by education level and occupational status, thus varying across cultures and regions.

Additionally, the research highlights the strong links between socioeconomic and education levels, and between psychological well-being and sleep patterns. There was a positive relationship between financial status and level of education on the one hand, and between psychological distress and insomnia on the other hand. Again, employment status, which was characterized by high unemployment and high proportions of homemakers, also experienced high levels of distress, probably due to social and economic factors. These findings accord well with other studies of the association between unemployment and mental health issues in the general population. This disparity can cause distress and may be affected by targeted interventions, including community-based education.

The study revealed psychosocial and physiological pathways of symptoms of psychological distress with obesity and insomnia. HPA axis activity in response to stress interferes with the cortisol balance by promoting fat deposition and reducing sleep quantity and quality. Moreover, distress is associated with diet, high levels of sedentarism, and sleep irregularities. These factors form a loop whereby elevated psychological distress intensifies obesity, coupled with insomnia, to worsen hypertension. By targeting these mechanisms through stress reduction, diet modification, exercise, and other aspects of patient care related to hypertension, it could lead to enormous improvements.

The results of this research have clinical and public health relevance. It is, therefore, important to introduce psychological screening as part of standard hypertension management across potential risk factors, including low income from rural backgrounds. Stress management techniques, including training, sleep therapy, and behavioral counseling, can help address the intertwined challenges of distress, obesity, and insomnia. Certainly, mental health stigma is still rife in Bangladesh–a factor that frustrates people from seeking assistance when it is needed. Efforts for destigmatization will lead to early treatment, hence improving both mental health and the chances of controlling hypertension.

The use of a cross-sectional design limits the determination of causality, as well as the fact that actual BMI and insomnia data were collected via self-reports, which are under- or overestimations. The sample size ensured that the study achieved its aim but was convenience-based, which has a methodological weakness in terms of generalizability. However, the inclusion of more patients in the study also enhances the external generalizability of the results, which sheds light on the associations among psychological distress, obesity, and insomnia in patients with hypertension.

Subsequent studies should employ longitudinal designs to establish whether psychological distress causes obesity and poor sleep or does the other way around, or both. Implementing targeted interventions such as mindfulness-based stress reduction (MBSR) programs or cognitive-behavioral therapy (CBT) tailored for hypertensive patients could effectively address the combined challenges of psychological distress, obesity, and insomnia. Future research should explore how stress management interventions impact diabetes outcomes, such as glycemic control, or examine the interplay between psychological distress and cardiovascular disease progression to uncover shared mechanisms and intervention opportunities.

5. Conclusion

This study highlights the critical interplay between psychological distress, obesity, and insomnia in hypertensive patients, underscoring the influence of socioeconomic and demographic factors. Furthermore, the results illustrate the reciprocation of these variables wherein psychological distress is not only a precursor of obesity and sleep disturbances but also a booster of hypertension. In particular, the study highlights how restricted access to and perceived appropriateness of mental health care can be

explained by inequalities in poverty, limited education, and living in rural areas, highlighting systemic inequalities in mental health care access. The incorporation of screening for psychological issues in hypertension patients and the aspiration to adopt stress management and other behavior modifications serve the purpose of increasing the rate of effectiveness for such a disease. It is, therefore, clear that there is much that needs to be done in terms of eradicating stigma related to mental health in Bangladesh and ensuring early intervention and improved efficiency in controlling hypertension. Future research should explore causal pathways and evaluate the effectiveness of targeted interventions to address these interconnected health challenges.

Statements and Declarations

Data Availability

The datasets analyzed during the current study are available in anonymized form from the corresponding author upon reasonable request.

Author Contributions

- SA: Methodology, Writing-Original Draft, Data Curation, Formal Analysis, Project Administration
- ARA: Methodology, Writing-Original Draft, Data Curation, Formal Analysis, Validation
- MFA: Conceptualization, Investigation, Methodology, Writing-Original Draft, Writing-Review & Editing
- JMA: Investigation, Methodology, Writing-Original Draft, Data Curation, Formal Analysis
- FNN: Investigation, Methodology, Writing-Original Draft, Data Curation, Formal Analysis
- MM: Investigation, Methodology, Writing-Original Draft, Data Curation, Formal Analysis
- RD: Investigation, Methodology, Writing-Original Draft, Data Curation, Formal Analysis
- TI: Investigation, Methodology, Writing-Original Draft, Data Curation, Formal Analysis

Declaration of Generative AI and AI-Assisted Technologies in the Writing

During the preparation of this work, the authors used ChatGPT in order to assist with refining the writing process. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

Acknowledgements

We would like to express our heartfelt gratitude to Sheikh Arafat Islam, Kszi Jannatun Nayeem, and Rahat Alam for their invaluable assistance in data collection. Their dedication and hard work were instrumental in ensuring the success of this study. We sincerely appreciate their commitment to this research and their contributions to its completion.

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Supplementary data: available at https://doi.org/10.32388/3VG3VJ.3

Declarations

Funding: No specific funding was received for this work.

Potential competing interests: No potential competing interests to declare.