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Original Research Article

Prevalence of hypertension and its association with obesity and socio-demographic factors among adults attending a tertiary care hospital in Bangladesh: a cross-sectional study

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ABSTRACT

Background: Hypertension is a major non-communicable disease and a leading risk factor for cardiovascular morbidity and mortality worldwide. Obesity is a well-established modifiable risk factor for hypertension, yet hospital-based evidence from Bangladesh remains limited. This study aimed to determine the prevalence of hypertension and its association with obesity and socio-demographic factors among adults attending a tertiary care hospital.

Methods: A facility-based cross-sectional study was conducted among 340 adults attending a tertiary care hospital in Bangladesh. Participants were selected using simple random sampling. Data were collected through a structured questionnaire, along with anthropometric measurements and blood pressure assessment. Data were analyzed using SPSS version 26. Chi-square test and multivariable logistic regression were performed and $p < 0.05$ was considered statistically significant.

Results: The prevalence of hypertension was 27.4%. A significant association was observed between BMI and hypertension ($p=0.004$). Participants aged >45 years had higher odds of hypertension (AOR=2.05, 95% CI: 1.20–3.50). Obesity was a strong independent predictor of hypertension (AOR=2.60, 95% CI: 1.50–4.50). Physical inactivity was also significantly associated with hypertension (AOR=1.60, 95% CI: 1.00–2.50). No significant association was found with gender, residence or religion.

Conclusions: Hypertension is highly prevalent among adults attending tertiary care hospitals in Bangladesh and is significantly associated with obesity, older age and physical inactivity. Early screening and lifestyle modification strategies are essential to reduce the burden of hypertension.

Keywords: Adults, Bangladesh, Body mass index, Cross-sectional study, Hypertension, Obesity

INTRODUCTION

Hypertension is a major non-communicable disease and a leading risk factor for cardiovascular morbidity and mortality worldwide.¹ It is responsible for a substantial proportion of stroke, ischemic heart disease, heart failure and chronic kidney disease cases globally. The burden of hypertension is particularly high in low- and middle-income countries, where rapid urbanization, dietary transitions and lifestyle modifications have contributed to an increasing prevalence of cardiometabolic disorders.^{2,3}

Recent global estimates indicate that the prevalence of hypertension continues to rise, with a significant proportion of affected individuals remaining undiagnosed or poorly controlled. This situation is more pronounced in South Asian countries, including Bangladesh, where population-based studies have reported a steady increase in hypertension prevalence over the past decade.^{4,5} The combination of limited screening coverage, lifestyle changes and health system constraints has further intensified the burden of disease in these settings. Obesity has emerged as one of the most important modifiable

determinants of hypertension. Excess adiposity contributes to elevated blood pressure through multiple interrelated mechanisms, including activation of the sympathetic nervous system, stimulation of the renin–angiotensin–aldosterone system, insulin resistance, renal sodium retention and chronic low-grade inflammation.^{6,7} In addition, adipose tissue functions as an active endocrine organ that secretes adipokines such as leptin and inflammatory cytokines, which impair vascular endothelial function and increase arterial stiffness.^{7,8} These pathophysiological processes collectively contribute to sustained elevation of blood pressure in individuals with overweight and obesity.⁹ Epidemiological evidence from recent studies consistently demonstrates a positive and dose-dependent relationship between BMI and hypertension risk. Both general and central obesity have been identified as independent predictors of elevated blood pressure across diverse populations.^{8,10} Furthermore, lifestyle factors such as physical inactivity and unhealthy dietary patterns significantly exacerbate the risk of developing hypertension, particularly in urban populations undergoing rapid nutritional transition.^{3,11} Despite the growing burden of hypertension and obesity in Bangladesh, there is still a lack of recent hospital-based studies that simultaneously assess the prevalence of hypertension and its association with obesity and other socio-demographic factors among adult patients attending tertiary care settings. Most available evidence is derived from community-based surveys, which may not adequately reflect the clinical burden seen in healthcare facilities. Hospital-based studies are essential for identifying high-risk individuals and informing targeted intervention strategies in clinical practice.

Therefore, the present study aimed to assess the prevalence of hypertension and its association with obesity and other socio-demographic and lifestyle factors among adults attending a tertiary care hospital in Bangladesh. The findings of this study are expected to provide updated evidence to support early detection, risk stratification and preventive strategies for hypertension.

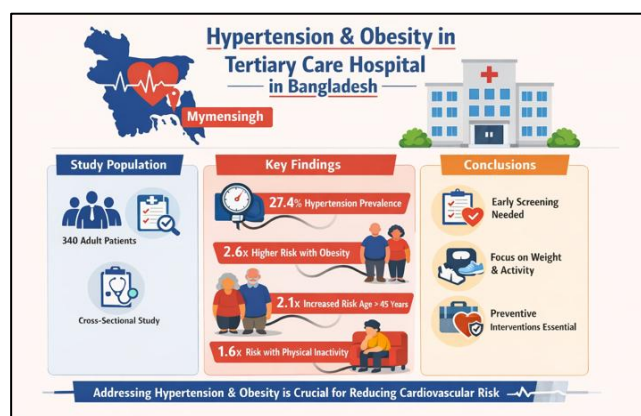


Figure 1: Graphical presentation of the key results of Hypertension and obesity in the study.

METHODS

This facility-based cross-sectional study was conducted among adult patients attending the outpatient and inpatient departments of a tertiary care hospital located in Mymensingh. The study was carried out over a period of January 2025 to June 2025.

The study population comprised adults aged 18 years and above who attended the hospital during the study period. Participants who provided informed written consent were included. Pregnant women, critically ill patients and individuals with known endocrine disorders (e.g., Cushing's syndrome, hypothyroidism) that could influence body weight were excluded. The sample size was calculated using the single population proportion formula $n = (z^2 \times P \times (1-P)) / d^2$, considering a hypertension prevalence of 27.43% based on a previous study conducted in Bangladesh, with a 95% confidence level and 5% margin of error.¹² The minimum calculated sample size was 306. After adjusting for a 10% non-response rate, the final sample size was determined to be 340 participants. A simple random sampling technique was applied to recruit participants from eligible patients attending the hospital.

Data were collected using a structured, pre-tested questionnaire administered through face-to-face interviews. The questionnaire included information on socio-demographic characteristics, lifestyle factors and relevant medical history. Body weight was measured using a calibrated digital weighing scale with participants wearing light clothing and no shoes. Height was measured using a stadiometer. BMI was calculated as weight in kilograms divided by the square of height in meters (kg/m^2). Participants were categorized according to world health organization (WHO) BMI classification: underweight ($<18.5 \text{ kg}/\text{m}^2$), normal ($18.5\text{--}24.9 \text{ kg}/\text{m}^2$), overweight ($25.0\text{--}29.9 \text{ kg}/\text{m}^2$) and obese ($\geq 30.0 \text{ kg}/\text{m}^2$).¹³ Blood pressure was measured using a calibrated sphygmomanometer following standard procedures. Participants were seated and rested for at least 5 minutes before measurement. Two readings were taken at an interval of 5 minutes and the average was recorded. Hypertension was defined as systolic blood pressure $\geq 140 \text{ mmHg}$ and/or diastolic blood pressure $\geq 90 \text{ mmHg}$ or current use of antihypertensive medication.¹⁴

Data were entered, cleaned and analyzed using SPSS version 26. Descriptive statistics were presented as mean $\pm$ standard deviation (SD) for continuous variables and frequency with percentage for categorical variables. The association between categorical variables, including BMI and hypertension status, was assessed using the Chi-square test. Variables with p value < 0.05 in bivariate analysis were included in a multivariable logistic regression model to identify independent predictors of hypertension. Adjusted odds ratios (AORs) with 95%

confidence intervals (CIs) were reported and statistical significance was set at $p < 0.05$.

RESULTS

The majority of participants were aged 31–45 years and male. Most respondents resided in urban areas. In terms of religion, the study population was predominantly Muslim (88.2%), reflecting the national demographic distribution of Bangladesh (Table 1). More than half of the participants (58.8%) were either overweight or obese, reflecting a substantial burden of elevated BMI. Only a small proportion (5.3%) were underweight, while about one-third had normal BMI (Table 2). The overall prevalence of hypertension was 27.4%, which is consistent with previously reported national estimates.

Approximately one in four participants was hypertensive (Table 3). Bivariate analysis showed that age, BMI and physical activity were significantly associated with hypertension ($p < 0.05$). Participants aged >45 years and those with higher BMI had a significantly higher prevalence of hypertension. Physical inactivity was also associated with increased hypertension risk. However, gender, residence and religion were not significantly associated (Table 4). Multivariable logistic regression analysis showed that age above 45 years, overweight, obesity and physical inactivity were significantly associated with hypertension. Obese individuals had 2.6 times higher odds of developing hypertension compared to those with normal BMI. Gender was not significantly associated with hypertension (Table 5).

Table 1: Socio-demographic characteristics of the study participants (n=340).

Variables	Category	N	%
Age (in years)	18-30	95	27.9
	31-45	115	33.8
	46-60	80	23.5
	>60	50	14.7
Gender	Male	178	52.4
	Female	162	47.6
Residence	Urban	205	60.3
	Rural	135	39.7
Religion	Islam	300	88.2
	Hinduism	35	10.3
	Others	5	1.5

Table 2: Distribution of body mass index (BMI) among participants (n=340).

BMI categories	BMI range (kg/m ²)	N	%
Underweight	<18.5	18	5.3
Normal weight	18.5–24.9	122	35.9
Overweight	25.0–29.9	115	33.8
Obese	≥ 30.0	85	25.0

Table 3: Prevalence of hypertension among participants (n=340).

Hypertension status	N	%
Hypertensive	93	27.4
Normotensive	247	72.6

Table 4: Bivariate analysis (Chi-square test) of factors associated with hypertension (n=340).

Variables	Category	Hypertensive n (%)	Normotensive n (%)	P value
Age (in years)	≤ 45	40 (19.0)	170 (81.0)	<0.001
	>45	53 (40.8)	77 (59.2)	
Gender	Male	55 (30.9)	123 (69.1)	0.210
	Female	38 (23.5)	124 (76.5)	
Residence	Urban	60 (29.3)	145 (70.7)	0.320
	Rural	33 (24.4)	102 (75.6)	
Religion	Islam	83 (27.7)	217 (72.3)	0.870
	Others	10 (25.0)	30 (75.0)	

Continued.

Variables	Category	Hypertensive n (%)	Normotensive n (%)	P value
BMI	Normal	25 (20.5)	97 (79.5)	0.004
	Overweight	35 (30.4)	80 (69.6)	
	Obese	33 (38.8)	52 (61.2)	
Physical activity	Active	35 (20.6)	135 (79.4)	0.010
	Inactive	58 (34.1)	112 (65.9)	

Table 5: Multivariable logistic regression analysis of factors associated with hypertension (n=340).

Variables	Category	AOR	95% CI	P value
Age (in years)	≤45	1 (Ref)	—	—
	>45	2.05	1.20–3.50	0.006
Gender	Female	1 (Ref)	—	—
	Male	1.30	0.80–2.10	0.210
BMI	Normal	1 (Ref)	—	—
	Overweight	1.70	1.00–2.80	0.048
	Obese	2.60	1.50–4.50	0.001
Physical activity	Active	1 (Ref)	—	—
	Inactive	1.60	1.00–2.50	0.042

DISCUSSION

This study evaluated the prevalence and determinants of hypertension among adults attending a tertiary care hospital in Mymensingh and found an overall prevalence of 27.4%. This finding is consistent with previously reported national estimates in Bangladesh and comparable settings, reinforcing the growing burden of hypertension in low- and middle-income countries.⁴ The observed prevalence highlights the ongoing epidemiological transition driven by urbanization, lifestyle changes and population aging.

A key finding of this study was the strong and statistically significant association between body mass index (BMI) and hypertension. The prevalence and odds of hypertension increased progressively from normal-weight to overweight and obese individuals. This is consistent with a growing body of recent evidence demonstrating that both general and central obesity are major contributors to elevated blood pressure.^{8,11,15} Mechanistically, obesity is known to promote hypertension through multiple pathways, including activation of the renin–angiotensin–aldosterone system, increased sympathetic nervous system activity and insulin resistance.^{6,7} Recent large-scale analyses have further confirmed that obesity-related indices are robust predictors of hypertension across diverse populations.¹⁰

These findings underscore the importance of weight management as a central strategy for hypertension prevention. Age was another significant determinant identified in this study, with individuals aged above 45 years showing significantly higher odds of hypertension. This aligns with extensive epidemiological evidence indicating that blood pressure increases with age due to arterial stiffness, endothelial dysfunction and prolonged

exposure to cardiovascular risk factors.^{11,16} The consistency of this finding across different populations highlights the need for targeted screening and early intervention among older adults. Physical inactivity also emerged as a significant modifiable risk factor for hypertension. Participants with low levels of physical activity were more likely to be hypertensive, which is in agreement with recent studies emphasizing the protective role of regular physical activity in cardiovascular health.^{6,10} Physical activity contributes to blood pressure regulation through improved vascular function, reduced systemic inflammation and better metabolic control. These findings support global recommendations advocating increased physical activity as a cost-effective strategy to reduce hypertension risk.

In contrast, this study did not find statistically significant associations between hypertension and gender, residence or religion. While some studies have reported higher hypertension prevalence among males or urban populations, recent evidence suggests that these differences are diminishing, possibly due to the widespread adoption of sedentary lifestyles and dietary transitions across all population groups.^{4,17} The lack of association with religion is expected, as hypertension is primarily influenced by biological and lifestyle factors rather than cultural or religious affiliation.

Overall, the findings of this study highlight the substantial burden of hypertension and its strong association with modifiable risk factors, particularly obesity and physical inactivity. These results are consistent with recent global evidence indicating that hypertension prevention requires integrated approaches focusing on lifestyle modification, early detection and risk stratification.^{17,18} From a public health perspective, interventions aimed at promoting healthy weight, increasing physical activity and

strengthening routine screening services especially in tertiary care settings are essential to mitigate the growing impact of hypertension.

CONCLUSION

The present study demonstrated that hypertension is highly prevalent among adults attending a tertiary care hospital in Bangladesh, affecting more than one-fourth of the study participants. Increasing age, overweight, obesity and physical inactivity were identified as significant predictors of hypertension. In particular, obesity showed a strong independent association with elevated blood pressure, highlighting the growing impact of lifestyle-related risk factors in the Bangladeshi population. These findings emphasize the importance of routine hypertension screening, early identification of high-risk individuals and implementation of lifestyle-based preventive strategies, including weight management and promotion of regular physical activity. Strengthening awareness and preventive interventions at both clinical and community levels may help reduce the burden of hypertension and its related complications in Bangladesh.

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