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Lifestyle Factors and the Rising Burden of Hypertension in Urban Youth: A Cross-Sectional Study

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ABSTRACT
Background: The global health landscape is witnessing a significant epidemiological transition, with non-communicable diseases (NCDs) becoming a leading cause of morbidity and mortality. Hypertension, a primary modifiable risk factor for cardiovascular disease, is increasingly being detected in younger populations, particularly in rapidly urbanizing regions of low- and middle-income countries. This trend poses a substantial future public health threat. **Objective:**This study aimed to determine the prevalence of hypertension and its association with key modifiable lifestyle factors among urban youth in Dhaka, Bangladesh.**Methods:** A cross-sectional study was conducted between January and June 2024. A total of 300 participants, aged 18-29 years, were recruited from Dhaka city using a multi-stage random sampling technique. Data on socio-demographic characteristics, dietary habits, physical activity, and perceived stress were collected through an interviewer-administered, structured questionnaire. Dietary intake was assessed using a semi-quantitative Food Frequency Questionnaire, physical activity using the International Physical Activity Questionnaire-Short Form (IPAQ-SF), and stress levels using the 10-item Perceived Stress Scale (PSS-10). Anthropometric and blood pressure (BP) measurements were performed following standardized protocols. Hypertension was defined according to the 2017 ACC/AHA guidelines (Systolic BP $\geq$ 130 mmHg or Diastolic BP $\geq$ 80 mmHg). Bivariate analysis using Chi-square tests and multivariate binary logistic regression were performed to identify factors associated with hypertension.**Results:** The overall prevalence of hypertension (Stage 1 or Stage 2) was 24.0% (n=72). Additionally, 25.0% (n=75) of participants had elevated blood pressure. The prevalence of hypertension was significantly higher in males (28.5%) than females (18.5%) (p=0.038). After adjusting for potential confounders in a multivariate logistic regression model, several lifestyle factors remained significant independent predictors of hypertension. These included high intake of processed foods (Adjusted Odds Ratio [aOR]: 2.75; 95% CI: 1.68-4.49), low physical activity (aOR: 2.10; 95% CI: 1.30-3.39), and high perceived stress (aOR: 2.41; 95% CI: 1.48-3.92). A higher Body Mass Index (BMI) was also strongly associated with hypertension (aOR: 3.15; 95% CI: 1.95-5.09).**Conclusion:** This study reveals an alarmingly high prevalence of hypertension and elevated blood pressure among the urban youth of Dhaka. The strong and independent association with modifiable risk factors such as poor diet, physical inactivity, and high stress highlights a critical window of opportunity for public health intervention. Urgent, multi-faceted strategies focusing on primordial and primary prevention through lifestyle modification are imperative to avert a future epidemic of cardiovascular disease in this vulnerable population.
Keywords: Hypertension, Urban Youth, Lifestyle Factors, Prevalence, Cross-Sectional Study, Bangladesh, Non-Communicable Diseases

I. INTRODUCTION

Hypertension, or high blood pressure, stands as the single most significant contributor to the global burden of disease and mortality, primarily through its role as a precursor to cardiovascular diseases (CVDs) such as myocardial infarction, stroke, heart failure, and renal disease [1]. The World Health Organization (WHO) estimates that 1.28 billion adults aged 30-79 years worldwide have hypertension, with two-thirds living in low- and middle-income countries (LMICs) [2]. For decades, it was predominantly considered a condition affecting older adults. However, a paradigm shift is occurring, with accumulating evidence pointing towards a concerning rise in the prevalence of hypertension among children, adolescents, and young adults [3,4]. Hypertension in youth is particularly pernicious as it tracks into adulthood, resulting in a longer lifetime exposure to elevated vascular pressure and a substantially increased risk of premature morbidity and mortality [5].

Bangladesh, like many nations in South Asia, is undergoing a rapid epidemiological transition. The burden of disease is shifting from communicable, maternal, and nutritional diseases to a landscape dominated by NCDs[6]. This transition is inextricably linked to profound socio-economic, demographic, and lifestyle changes. Urbanization is at the forefront of this transformation. Dhaka, the capital of Bangladesh, is one of the world's most densely populated megacities, experiencing unprecedented and often unplanned growth. This has led to a dramatic alteration in the living environment and daily habits of its residents [7].

The urban environment fosters a confluence of risk factors for hypertension. A key driver is the "nutrition transition," characterized by a shift away from traditional, plant-based diets towards energy-dense, nutrient-poor diets. There is widespread availability and aggressive marketing of processed and ultra-processed foods, fast foods, and sugar-sweetened beverages, all of which are typically high in sodium, unhealthy fats, and refined carbohydrates key culprits in elevating blood pressure [8,9].

Simultaneously, urbanization promotes sedentary behavior. Mechanization, reliance on motorized transport due to traffic congestion and lack of pedestrian-friendly infrastructure, and a shift towards office-based, less physically demanding occupations contribute to a sharp decline in overall physical activity [10]. Regular physical activity is known to exert a protective effect on blood pressure through various mechanisms, including improved endothelial function, weight management, and reduced sympathetic nervous system activity [11].

Furthermore, the urban milieu is often associated with heightened psychosocial stress. The fast-paced lifestyle, socioeconomic pressures, academic and professional competition, and social isolation can lead to chronic activation of the body's stress response systems, namely the sympathetic-adrenal-medullary (SAM) axis and the hypothalamic-pituitary-adrenal (HPA) axis. This results in sustained increases in heart rate, cardiac output, and peripheral vascular resistance, contributing directly to the pathophysiology of hypertension [12,13,14].

While the link between these lifestyle factors and hypertension is well-established globally, there is a paucity of robust, contemporary data specifically focusing on the youth demographic within the unique urban context of Dhaka. Much of the existing local research has either focused on older populations or has not used standardized methodologies to comprehensively assess the interplay of multiple lifestyle factors. Understanding the magnitude of the problem and identifying the key modifiable risk factors in this specific population is a critical first step for designing effective and targeted public health interventions.

OBJECTIVE

This study aimed to determine the prevalence of hypertension and its association with key modifiable lifestyle factors among urban youth in Dhaka, Bangladesh.

II. METHODOLOGY

Study Design and Setting

A descriptive, cross-sectional study was conducted in Dhaka, the capital city of Bangladesh, over a six-month period from January 1, 2024, to June 30, 2024.

Study Population and Sampling

The study population comprised young adults of both genders, aged between 18 and 29 years, who had been permanent residents of Dhaka city for at least one year. Inclusion and exclusion criteria were established to ensure a homogenous study group.

Sample Size Calculation

The sample size was calculated using Cochran's formula for cross-sectional studies:

$$n=(Z^2 * p * q)/d^2$$

Using an estimated prevalence (p) of 15% based on regional studies (14), a 95% confidence level (Z=1.96), and a margin of error (d) of 4%, the required sample size was calculated to be approximately 306. A total of 300 participants were successfully recruited for the study, which was considered adequate for the study's objectives.

Sampling Technique

A multi-stage random sampling technique was employed to ensure a representative sample from different parts of Dhaka city, involving the random selection of administrative zones, neighborhoods, households, and finally, individual participants using a Kish grid.

Data Collection Tools and Procedure

Data were collected by trained research assistants using a pre-tested, structured, interviewer-administered questionnaire translated

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into Bengali. Standardized tools were used for all assessments:

- Dietary Assessment: A semi-quantitative Food Frequency Questionnaire (FFQ) adapted for local diets.
- Physical Activity Assessment: The International Physical Activity Questionnaire-Short Form (IPAQ-SF) [15].
- Perceived Stress Assessment: The 10-item Perceived Stress Scale (PSS-10) [16].
- Anthropometric Measurements: Height and weight were measured to calculate Body Mass Index (BMI) based on WHO Asian cut-offs [17].
- Blood Pressure Measurement: Measured with strict adherence to the 2017 American College of Cardiology/American Heart Association (ACC/AHA) guidelines using a calibrated automated device [18].

Statistical Analysis

Data were analyzed using SPSS version 25.0. Descriptive statistics were generated. Bivariate analysis (Chi-square test) and multivariate binary logistic regression were performed. A p-value of <0.05 was considered statistically significant.

III. RESULTS

Participant Characteristics

A total of 300 individuals participated, with a mean age of 23.9 ± 3.4 years. The sample included 165 (55.0%) males and 135 (45.0%) females. Over half of the participants (55.0%) were either overweight or obese according to Asian BMI standards. Detailed demographic and clinical characteristics are shown in Table 1**.**

Table 1: Socio-demographic and Clinical Characteristics of the Study Participants (N=300)

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	165	55.0
	Female	135	45.0
Education Level	Up to Secondary	83	27.7
	Higher Secondary/Diploma	127	42.3
	Graduate/Post-graduate	90	30.0
BMI Category (Asian)	Underweight (<18.5)	24	8.0
	Normal (18.5–22.9)	111	37.0
	Overweight (23.0–27.4)	116	38.7
	Obese (≥27.5)	49	16.3
Smoking Status	Non-smoker	237	79.0
	Current smoker	63	21.0

Prevalence of Hypertension

The overall prevalence of hypertension (Stage 1 or 2) was 24.0% (n=72). An additional 25.0% (n=75) had elevated blood pressure. This left only 51.0% (n=153) of the sample with normal blood pressure. Stage 1 hypertension was present in 15.0% (n=45) and Stage 2 in 9.0% (n=27) of participants.

Table 2: Prevalence of Hypertension Among Study Participants (N=300)

Blood Pressure Category	Frequency (n)	Percentage (%)
Normal BP	153	51.0
Elevated BP	75	25.0
Stage 1 Hypertension	45	15.0
Stage 2 Hypertension	27	9.0
Total Hypertension (Stage 1 + Stage 2)	72	24.0

Bivariate Association with Hypertension

Table 3 details the association between key lifestyle factors and hypertension status. Participants with hypertension were significantly more likely to be overweight/obese and report unhealthy lifestyle practices. High processed food intake (66.7% vs. 32.5%), low physical activity (59.7% vs. 30.3%), and high perceived stress (55.6% vs. 27.2%) were all significantly associated with a higher prevalence of hypertension (p<0.001 for all).

Table 3: Bivariate Analysis of Factors Associated with Hypertension

Variable	Hypertensive (n=72)	Normotensive (n=228)	p-value
Gender			0.038
- Male	47 (65.3%)	118 (51.8%)	
- Female	25 (34.7%)	110 (48.2%)	
BMI Category			<0.001
- Underweight/Normal	9 (12.5%)	126 (55.3%)	
- Overweight/Obese	63 (87.5%)	102 (44.7%)	
Smoking Status			0.003
- Non-smoker	48 (66.7%)	189 (82.9%)	
- Smoker	24 (33.3%)	39 (17.1%)	
High Processed Food Intake	48 (66.7%)	74 (32.5%)	<0.001
Low Physical Activity	43 (59.7%)	69 (30.3%)	<0.001
High Perceived Stress	40 (55.6%)	62 (27.2%)	<0.001

Independent Predictors of Hypertension

The results of the multivariate logistic regression are presented in Table 4. After adjusting for all other variables in the model, being overweight/obese remained the strongest predictor of hypertension. High processed food intake, low physical activity, and high perceived stress were all confirmed as significant, independent predictors of hypertension in this youth population.

Table 4: Multivariate Logistic Regression Analysis of Predictors for Hypertension

Variable	Adjusted OR (aOR)	95% CI for aOR	p-value
Gender (Male vs. Female)	1.65	1.02–2.67	0.041
BMI (Overweight/Obese vs. Normal)	3.15	1.95–5.09	<0.001
Smoking (Current vs. Non-smoker)	1.58	0.91–2.73	0.102
High Processed Food Intake (Yes vs. No)	2.75	1.68–4.49	<0.001
Low Physical Activity (Yes vs. No)	2.10	1.30–3.39	0.002
High Perceived Stress (Yes vs. No)	2.41	1.48–3.92	<0.001

IV. DISCUSSION

This study provides critical insights into the burgeoning public health challenge of hypertension among young adults in an urban South Asian setting. The principal finding is the alarmingly high prevalence of hypertension (24.0%) and elevated blood pressure (25.0%) in individuals aged 18-29 in Dhaka. Cumulatively, this means that nearly half (49.0%) of the urban youth surveyed have blood pressure levels above the optimal range, a silent harbinger of future cardiovascular disease risk. This finding, in a population traditionally considered low-risk, signals a profound and troubling public health shift.

The 24.0% prevalence of hypertension found in our cohort is substantially higher than figures reported for similar age groups in many Western nations [4]. It is, however, consistent with an emerging body of evidence from other urban centres in South Asia, which suggests a regional susceptibility to the early onset of cardiovascular risk factors [14, 19]. The use of the 2017 ACC/AHA guidelines, which define Stage 1 hypertension at a lower threshold of 130/80 mmHg, partially contributes to this higher figure compared to older studies [18]. This is not merely a reclassification; it reflects a contemporary understanding that cardiovascular risk begins to accumulate at lower blood pressure levels. The high prevalence of elevated blood pressure (25.0%) is perhaps even more concerning, as it represents a large reservoir of young individuals on a clear trajectory towards developing clinical hypertension if urgent preventive measures are not implemented.

The strength of our study lies in the robust demonstration that unhealthy lifestyle choices are not merely correlated with but are strong independent predictors of hypertension in this population. After adjusting for confounding variables, the link between lifestyle and hypertension remained clear and significant. The finding that a high intake of processed foods increased the odds of hypertension by nearly threefold (aOR: 2.75) is particularly telling. This reflects the ongoing "nutrition transition" in urban Bangladesh, where traditional diets are supplanted by energy-dense, nutrient-poor options [8]. The high sodium content in these foods is a primary physiological driver of elevated blood pressure, a mechanism well-documented in nutritional science [9].

Congruently, low physical activity more than doubled the odds of having hypertension (aOR: 2.10). This aligns with established knowledge on the myriad benefits of exercise, which include improving endothelial function, managing weight, and reducing sympathetic nervous system tone [11]. This finding must be viewed through the lens of the urban environment of Dhaka, where a sedentary lifestyle is often not a choice but a consequence of traffic congestion, a lack of safe recreational spaces, and the nature of modern employment [10].

A crucial and often-underestimated factor is the role of mental health. Our results showed that high perceived stress was a powerful independent predictor of hypertension (aOR: 2.41). This supports a growing body of literature linking chronic psychosocial stress to the pathophysiology of cardiovascular disease through sustained activation of the sympatho-adrenal and hypothalamic-pituitary-adrenal axes [12, 13]. The competitive, fast-paced, and often precarious living conditions in a megacity like Dhaka can foster a state of chronic stress, which translates directly into physiological harm. This highlights the inadequacy of prevention strategies that focus only on diet and exercise while ignoring mental well-being.

As expected, a high Body Mass Index was the strongest single predictor of hypertension (aOR: 3.15), consistent with WHO reports on the link between excess weight and cardiovascular risk [17]. Obesity acts as a powerful mediator through which poor diet and inactivity are translated into clinical disease. However, it is vital to note that diet, physical activity, and stress remained significant predictors independent of BMI. This indicates that their detrimental effects are not solely due to causing weight gain; they also exert direct, independent adverse effects on the cardiovascular system.

These findings have profound implications for public health policy and practice in Bangladesh. The focus must pivot towards primordial and primary prevention targeting the young. It is imperative to institutionalize opportunistic blood pressure screening in settings frequented by youth, such as universities and workplaces. Furthermore, health education campaigns must be coupled with assertive policy-level interventions. These could include front-of-pack food labelling to warn consumers about high salt content, fiscal policies such as taxes on sugar-sweetened beverages, and urban planning that prioritizes the creation of safe, accessible public spaces for physical activity.

This study has several strengths, including its focus on a critical and understudied demographic, the use of a random sampling method to enhance generalizability within Dhaka, and the application of standardized, validated tools for data collection. Nevertheless, some limitations must be acknowledged. The cross-sectional design precludes any inference of causality. Data on lifestyle were self-reported and may be subject to recall or social desirability bias. Furthermore, the modest sample size of 300 participants may limit the statistical power to detect weaker associations and can lead to wider confidence intervals. Finally, as the study was conducted solely in Dhaka, the findings may not be generalizable to the rural youth of Bangladesh, who face a different set of lifestyle challenges and health determinants.

V. CONCLUSION

The burden of hypertension is already substantial in the urban youth of Dhaka, driven by a triad of modifiable lifestyle risk factors: poor diet, sedentary behavior, and high stress. This represents a critical public health failure in progress. Without immediate, decisive, and multi-faceted interventions aimed at primordial and primary prevention, Bangladesh is poised to face a crippling epidemic of premature cardiovascular disease, with devastating social and economic consequences.

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