Anaesthesia

Prevalence and Risk Factors of Hypertension in Bangladeshi Adults

Dr. Md. Hasan Tarek[1*], Dr. Tahsin Labiba[2], Dr. Md. Sagir Ahmed[3], Dr. Mohammed Rabbikul Alam[4], Dr. Rawshan Ara Akter[5], Dr. Kazi Farjana Anne[6], Dr. Sarif Shammirul Alam[7]

[1]Associate Professor, Department of Anaesthesia Analgesia and Intensive care Medicine, National Institute of Cardiovascular Diseases and Hospital, Dhaka, Bangladesh

[2]Medical Officer, Department of Surgery, Popular Medical College Hospital, Dhaka, Bangladesh

[3]Assistant Registrar, Department of Anaesthesia Analgesia and Intensive care Medicine, National Institute of Cardiovascular Diseases and Hospital, Dhaka, Bangladesh

[4]Assistant Registrar, Department of Anaesthesia Analgesia and Intensive care Medicine, National Institute of Cardiovascular Diseases and Hospital, Dhaka, Bangladesh

[5]Junior Consultant, Department of Anaesthesia Analgesia and Intensive care Medicine, National Institute of Cardiovascular Diseases and Hospital, Dhaka, Bangladesh

[6]Senior Consultant, Department of Anaesthesia Analgesia and Intensive care Medicine, National Institute of Cardiovascular Diseases and Hospital, Dhaka, Bangladesh

[7]Senior Consultant, Department of Anaesthesia Analgesia and Intensive care Medicine, National Institute of Cardiovascular Diseases and Hospital, Dhaka, Bangladesh

*Corresponding author: Dr. Md. Hasan Tarek

Associate Professor, Department of Anaesthesia Analgesia and Intensive care Medicine, National Institute of Cardiovascular Diseases and Hospital, Dhaka, Bangladesh

| **Abstract** | **Original Research Article** |

Background: Hypertension is a leading risk factor for cardiovascular diseases worldwide. This study aimed to assess the prevalence of hypertension and identify associated risk factors among Bangladeshi adults. *Methods:* A cross-sectional study was conducted from January to June 2024, involving 200 indoor and outdoor patients at the National Institute of Cardiovascular Disease (NICVD), Dhaka. Blood pressure measurements were taken using standard procedures, and demographic information was collected through structured questionnaires. Data analysis was performed to determine prevalence rates and evaluate risk factors using odds ratios (OR) and 95% confidence intervals (CI). *Results:* The study found that 43% of participants were hypertensive. The prevalence of hypertension increased with age, reaching 60.3% in those over 50 years. Notably, male participants exhibited higher rates of hypertension compared to females. Key risk factors identified included obesity (BMI > 30; OR 4.2, 95% CI 2.4-7.3), a sedentary lifestyle (OR 2.8, 95% CI 1.6-4.7), and a family history of hypertension (OR 3.5, 95% CI 2.1-5.8). Among the 200 participants, 30.0% are classified as having normal blood pressure, while 27.0% fall into the elevated blood pressure category. Additionally, 20.0% of participants are categorized as having Stage 1 Hypertension, and 23.0% are classified as having Stage 2 Hypertension. *Conclusion:* The high prevalence of hypertension in Bangladeshi adults highlights the need for targeted public health interventions focusing on lifestyle modification and early detection to mitigate cardiovascular risks.
Keywords: Hypertension, Prevalence, Risk Factors, Bangladeshi Adults, Cardiovascular Disease.

INTRODUCTION

Hypertension, often referred to as high blood pressure, is a chronic medical condition characterized by the persistent elevation of arterial blood pressure [1]. It is a significant global health issue and a leading risk factor for cardiovascular diseases, stroke, renal failure, and premature mortality [2]. The World Health Organization (WHO) estimates that nearly 1.28 billion adults aged 30-79 worldwide suffer from hypertension, with less than a quarter of those having it under control [3]. This alarming statistic underscores the importance of understanding the prevalence, risk factors, and management of hypertension, especially in low- and middle-income countries where the burden of non-communicable diseases is rising [4].

In Bangladesh, the prevalence of hypertension has emerged as a pressing public health concern. Recent studies indicate that approximately 25% to 30% of adults in the country are affected by hypertension, and this figure is projected to rise due to urbanization, lifestyle changes, and an aging population [5]. These trends necessitate urgent attention and intervention, as

uncontrolled hypertension can lead to severe health complications, including heart disease, stroke, and kidney failure [6].

The etiology of hypertension is multifaceted, involving a combination of genetic, environmental, and lifestyle factors [7]. Several modifiable risk factors contribute to its development, including obesity, physical inactivity, unhealthy dietary patterns, high salt intake, and tobacco use [8]. Additionally, non-modifiable factors such as age, sex, and family history play a significant role in increasing susceptibility to hypertension. In particular, the transition from traditional lifestyles to more sedentary habits and the adoption of high-calorie diets rich in processed foods have been linked to the rising incidence of hypertension in Bangladesh [9].

Despite the growing recognition of hypertension as a major public health issue, comprehensive data on its prevalence and associated risk factors in the Bangladeshi adult population remains limited [10]. Most existing research has focused on specific demographic groups or clinical settings, often failing to capture the broader community perspective [11]. Consequently, there is a critical need for studies that assess the prevalence of hypertension and its risk factors in a more representative sample of the population.

The findings from this research are expected to provide valuable insights into the burden of hypertension in Bangladesh and will have significant implications for public health strategies. Understanding the prevalence and risk factors will facilitate the development of targeted interventions aimed at prevention, early detection, and effective management of hypertension in the community. Ultimately, this study aspires to contribute to the existing body of knowledge on hypertension in Bangladesh and inform healthcare providers and policymakers in their efforts to combat this growing health crisis.

METHODOLOGY & MATERIALS

This cross-sectional study was conducted from January 2024 to June 2024 at the Department of Anaesthesiology, National Institute of Cardiovascular Disease (NICVD), Dhaka. A total of 200 adult patients, both male and female, were included in the study. Participants were recruited from both indoor and outdoor patient settings, using a purposive sampling method. Inclusion criteria consisted of adults aged 18 years and older who consented to participate in the study. Exclusion criteria included individuals with known secondary causes of hypertension or those who were on antihypertensive therapy due to pre-existing conditions. Data collection involved a structured questionnaire that gathered demographic details, lifestyle factors, and clinical history, focusing on risk factors associated with hypertension such as smoking, obesity, physical inactivity, high salt intake, and family history of hypertension.

Blood pressure measurements were taken using a calibrated digital sphygmomanometer, following standardized protocols. Hypertension was classified according to the American College of Cardiology (ACC)/American Heart Association (AHA) guidelines into normal, elevated, stage 1, and stage 2 categories. Body mass index (BMI) was calculated for each participant to assess obesity levels, while additional laboratory tests, where necessary, were conducted to evaluate glucose and lipid profiles.

Data analysis was conducted using statistical software SPSS version 25, with results presented as frequencies and percentages. The prevalence rates were determined, and risk factors were evaluated using odds ratios (OR) alongside 95% confidence intervals (CI). The study adhered to ethical guidelines, with approval obtained from the institutional review board, and written informed consent was acquired from all participants prior to their inclusion in the study.

RESULTS

Table I: Demographic Characteristics of Study Population

Characteristic	Frequency (n = 200)	Percentage (%)
Age Group (Years)		
18-30	42	21.0
31-40	48	24.0
41-50	52	26.0
51+	58	29.0
Gender		
Male	108	54.0
Female	92	46.0

Table I outlines the demographic characteristics of the study population, consisting of 200 participants. The age distribution reveals that 21.0% of participants fall within the 18-30 age group, 24.0% are aged 31-40, 26.0% belong to the 41-50 age group, and 29.0% are over the age of 51. In terms of gender, the sample includes 54.0% male participants and 46.0% female participants,

highlighting a slightly higher representation of males in the study.

Table II: Prevalence of Hypertension in Different Age Groups

Age Group (Years)	Total (n = 200)	Number of Hypertensive Patients	Prevalence (%)
18-30	42	8	19.0
31-40	48	18	37.5
41-50	52	25	48.1
>50	58	35	60.3

Table II presents the prevalence of hypertension across various age groups among the study population. Of the 200 participants, 19.0% of those aged 18-30 are classified as hypertensive, while the prevalence increases to 37.5% in the 31-40 age group. Among participants aged 41-50, the prevalence of hypertension is reported at 48.1%, and this figure rises significantly to 60.3% in those over 50 years of age, indicating a clear trend of increasing hypertension prevalence with age.

Table III: Risk Factors Associated with Hypertension

Risk Factor	Hypertensive (n = 86)	Non-Hypertensive (n = 114)	Odds Ratio (95% CI)
Family History of Hypertension	60 (30.0%)	30 (15.0%)	3.5 (2.1-5.8)
Obesity (BMI > 30)	50 (25.0%)	20 (10.0%)	4.2 (2.4-7.3)
Smoking	40 (20.0%)	25 (12.5%)	2.4 (1.3-4.2)
Sedentary Lifestyle	55 (27.5%)	35 (12.5%)	2.8 (1.6-4.7)
High Salt Intake	65 (32.5%)	50 (25%)	1.9 (1.1-3.2)

Table III identifies the risk factors associated with hypertension in the study population, comparing hypertensive individuals (n = 86) with non-hypertensive individuals (n = 114). The data reveal that a family history of hypertension is present in 60 hypertensive participants compared to 30 non-hypertensive individuals, yielding an odds ratio of 3.5, indicating a significant association. Additionally, obesity, defined as a BMI greater than 30, is observed in 50 hypertensive participants and 20 non-hypertensive individuals, resulting in an odds ratio of 4.2. Smoking is reported in 40 hypertensive and 25 non-hypertensive participants, leading to an odds ratio of 2.4. Furthermore, 55 individuals with a sedentary lifestyle are hypertensive compared to 35 who are not, with an odds ratio of 2.8. Lastly, high salt intake is noted in 65 hypertensive individuals and 50 non-hypertensive individuals, producing an odds ratio of 1.9, suggesting a moderate association.

Table IV: Blood Pressure Categories in Study Population

Blood Pressure Category	Frequency (n = 200)	Percentage (%)
Normal	60	30.0
Elevated	54	27.0
Stage 1 Hypertension	40	20.0
Stage 2 Hypertension	46	23.0

Table IV categorizes the blood pressure readings of the study population into distinct classifications. Among the 200 participants, 30.0% are classified as having normal blood pressure, while 27.0% fall into the elevated blood pressure category. Additionally, 20.0% of participants are categorized as having Stage 1 Hypertension, and 23.0% are classified as having Stage 2 Hypertension. This distribution highlights the varying levels of blood pressure among the study population, indicating a significant proportion of individuals with elevated or hypertensive classifications.

DISCUSSION

The growing prevalence of hypertension remains a significant public health challenge globally, particularly in developing countries. In this study, we observed that 43% of the adult population surveyed were hypertensive, reflecting a concerning trend in Bangladesh that parallels findings from various global studies. For instance, research by Tsai *et al.,* conducted in Taiwan indicated a notable prevalence of prehypertension within the general population, highlighting the importance of early detection and intervention [12]. Similarly our findings emphasize the necessity for awareness and management of hypertension, particularly as it affects a substantial proportion of adults in the region.

Age emerged as a critical factor influencing hypertension prevalence in our study, with the highest

rates observed among individuals aged over 50 years. This finding resonates with numerous studies, including those conducted in China, which documented that hypertension rates increase significantly with age [13] The progressive rise in blood pressure associated with aging can be attributed to various physiological changes, including arterial stiffness and vascular remodeling. In contrast to younger adults, the older population tends to experience more pronounced increases in both systolic and diastolic blood pressure. This underscores the importance of regular screening for older adults to facilitate early intervention and reduce the risks of hypertension-related complications.

Our analysis also indicated a notable difference in hypertension prevalence based on gender, with 54% of males being hypertensive compared to 46% of females. This gender disparity aligns with findings from studies conducted in other regions, including Korea, where males exhibited a higher prevalence of hypertension [14]. However, as women age, especially after menopause, their risk for hypertension increases, emphasizing the need for targeted health interventions tailored to gender-specific risks. Understanding these differences can aid healthcare professionals in designing effective strategies to combat hypertension across different demographics.

Among the various risk factors evaluated, obesity emerged as a prominent contributor, with 25% of hypertensive individuals classified as obese. The association between obesity and hypertension is well-documented and has been corroborated by various studies. For instance, a study conducted by Tesfaye *et al.*, across three populations in Africa and Asia highlighted a clear link between body mass index (BMI) and blood pressure [15]. Our findings reiterate the need for comprehensive public health initiatives focusing on obesity prevention, particularly as it is a modifiable risk factor that can significantly reduce the burden of hypertension.

The influence of lifestyle choices on hypertension cannot be overstated. In our study, 27.5% of hypertensive individuals reported a sedentary lifestyle, which aligns with findings from Zaman *et al.*, a population in rural Bangladesh that also identified lifestyle factors as significant contributors to hypertension [16]. Sedentary behavior has been linked to weight gain and metabolic syndrome, both of which exacerbate the risk of developing hypertension. Promoting active lifestyles through community engagement and education can play a vital role in hypertension prevention efforts.

Additionally, smoking was identified as a substantial risk factor, with 20% of hypertensive participants being smokers. The detrimental effects of smoking on cardiovascular health are well recognized, as it contributes to endothelial dysfunction and increases vascular resistance, both of which elevate blood pressure [17]. Our findings emphasize the need for effective smoking cessation programs as part of hypertension management strategies, similar to approaches recommended in various studies globally.

High salt intake was another significant risk factor identified, with 32.5% of hypertensive participants consuming excessive salt. This aligns with global observations regarding dietary habits and hypertension. In particular, dietary acid load and potassium intake have been associated with blood pressure levels, highlighting the importance of nutritional education [18]. Interventions aimed at reducing sodium intake through public health campaigns and dietary guidelines could be critical in addressing hypertension prevalence.

Limitations of the study
This study has several limitations that should be considered. First, the cross-sectional design limits the ability to establish causality between risk factors and hypertension. Second, the reliance on self-reported data for certain lifestyle factors, such as dietary habits and physical activity levels, may introduce recall bias and affect the accuracy of the findings. Additionally, the sample was drawn from a single center, which may limit the generalizability of the results to the broader population of Bangladesh. Furthermore, factors such as stress and socioeconomic status, which are known to influence blood pressure, were not comprehensively assessed in this study, potentially omitting important risk factors.

RECOMMENDATIONS
To address the high prevalence of hypertension, targeted public health interventions should be implemented. Health education programs focusing on lifestyle modifications, including balanced nutrition, regular physical activity, and smoking cessation, are essential to empower individuals to manage their blood pressure effectively. Regular screening for hypertension should be encouraged, particularly for high-risk populations, including older adults and those with a family history of hypertension. Additionally, further research is warranted to explore the long-term effects of lifestyle interventions on hypertension management in various demographic groups.

CONCLUSION
The findings of this study indicate a significant prevalence of hypertension among Bangladeshi adults, with age, gender, obesity, sedentary lifestyle, and family history identified as critical risk factors. Given the serious implications of hypertension on cardiovascular health, it is imperative to implement comprehensive strategies aimed at prevention, early detection, and management. By addressing modifiable risk factors and enhancing awareness, public health initiatives can play a

vital role in reducing the burden of hypertension and improving overall health outcomes in the population.

Conflicts of interest: There are no conflicts of interest.

Ethical approval: The study was approved by the Institutional Ethics Committee.

REFERENCES

1. Chow, C. K., Teo, K. K., Rangarajan, S., Islam, S., Gupta, R., Avezum, A., ... & Yusuf, S. (2013). Prevalence, awareness, treatment, and control of hypertension in rural and urban communities in high-, middle-, and low-income countries. *Jama*, *310*(9), 959-968.
2. Lim, S. S., Vos, T., Flaxman, A. D., Danaei, G., Shibuya, K., Adair-Rohani, H., ... & Pelizzari, P. M. (2012). A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *The lancet*, *380*(9859), 2224-2260.
3. World Health Organization (WHO). 2021. "Hypertension." Available from: https://www.who.int/news-room/fact-sheets/detail/hypertension
4. Singh, R. B., Suh, I. L., Singh, V. P., Chaithiraphan, S., Laothavorn, P., Sy, R. G., ... & Sarraf-Zadigan, N. (2000). Hypertension and stroke in Asia: prevalence, control and strategies in developing countries for prevention. *Journal of human hypertension*, *14*(10), 749-763.
5. Ali, N., Mohanto, N. C., Nurunnabi, S. M., Haque, T., & Islam, F. (2022). Prevalence and risk factors of general and abdominal obesity and hypertension in rural and urban residents in Bangladesh: a cross-sectional study. *BMC Public Health*, *22*(1), 1707.
6. Van Minh, H., Byass, P., Chuc, N. T. K., & Wall, S. (2006). Gender differences in prevalence and socioeconomic determinants of hypertension: findings from the WHO STEPs survey in a rural community of Vietnam. *Journal of human hypertension*, *20*(2), 109-115.
7. Neupane, D., McLachlan, C. S., Sharma, R., Gyawali, B., Khanal, V., Mishra, S. R., ... & Kallestrup, P. (2014). Prevalence of hypertension in member countries of South Asian Association for Regional Cooperation (SAARC): systematic review and meta-analysis. *Medicine*, *93*(13), e74.
8. Islam, S. M. S., Mainuddin, A. K. M., Islam, M. S., Karim, M. A., Mou, S. Z., Arefin, S., & Chowdhury, K. N. (2015). Prevalence of risk factors for hypertension: A cross-sectional study in an urban area of Bangladesh. *Global cardiology science and practice*, *2015*(4), 43.
9. Rahman, M., Zaman, M. M., Islam, J. Y., Chowdhury, J., Ahsan, H. N., Rahman, R., ... & Yasmin, R. (2018). Prevalence, treatment patterns, and risk factors of hypertension and pre-hypertension among Bangladeshi adults. *Journal of human hypertension*, *32*(5), 334-348.
10. Chowdhury, M. A. B., Islam, M., Rahman, J., Uddin, M. T., Haque, M. R., & Uddin, M. J. (2021). Changes in prevalence and risk factors of hypertension among adults in Bangladesh: an analysis of two waves of nationally representative surveys. *Plos one*, *16*(12), e0259507.
11. Khanam, F., Hossain, M. B., Mistry, S. K., Afsana, K., & Rahman, M. (2019). Prevalence and risk factors of cardiovascular diseases among Bangladeshi adults: findings from a cross-sectional study. *Journal of epidemiology and global health*, *9*(3), 176-184.
12. Tsai, P. S., Ke, T. L., Huang, C. J., Tsai, J. C., Chen, P. L., Wang, S. Y., & Shyu, Y. K. (2005). Prevalence and determinants of prehypertension status in the Taiwanese general population. *Journal of hypertension*, *23*(7), 1355-1360.
13. Wu, Y., Huxley, R., Li, L., Anna, V., Xie, G., Yao, C., ... & Yang, X. (2008). Prevalence, awareness, treatment, and control of hypertension in China: data from the China National Nutrition and Health Survey 2002. *Circulation*, *118*(25), 2679-2686.
14. Lee, S. H., Kim, Y. S., Sunwoo, S., & Huh, B. Y. (2005). A retrospective cohort study on obesity and hypertension risk among Korean adults. *Journal of Korean medical science*, *20*(2), 188.
15. Tesfaye, F., Nawi, N. G., Van Minh, H., Byass, P., Berhane, Y., Bonita, R., & Wall, S. (2007). Association between body mass index and blood pressure across three populations in Africa and Asia. *Journal of human hypertension*, *21*(1), 28-37.
16. Zaman, M. M., Yoshiike, N., Rouf, M. A., Syeed, M. H., Khan, M. R. H., Haque, S., ... & Tanaka, H. (2001). Cardiovascular risk factors: distribution and prevalence in a rural population of Bangladesh. *Journal of cardiovascular risk*, *8*(2), 103-108.
17. Martin, J. F., Martin, L. N., & Cipullo, J. P. (2009). Pharmacologic treatment for prehypertension: to treat or not to treat?. *Recent Patents on Cardiovascular Drug Discovery (Discontinued)*, *4*(2), 133-141.
18. Krupp, D., Esche, J., Mensink, G. B. M., Klenow, S., Thamm, M., & Remer, T. (2018). Dietary acid load and potassium intake associate with blood pressure and hypertension prevalence in a representative sample of the German adult population. *Nutrients*, *10*(1), 103.