



A Study of Blood Pressure Variation Between Sedentary and Active Individuals

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KEYWORDS

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ABSTRACT:

Background: Hypertension is a leading modifiable risk factor for cardiovascular disease in Bangladesh. Sedentary behavior and insufficient physical activity are increasingly recognized as key contributors to its development. This study aimed to compare blood pressure levels between sedentary and physically active adults and to assess the relationship between physical activity and blood pressure. **Methods:** A cross-sectional study was conducted at the Department of Physiology, Rajshahi Medical College, Rajshahi, Bangladesh, from July 2014 and June 2015. Seventy adults (35 sedentary and 35 active) aged 20–60 years were selected based on predefined criteria. Demographic and lifestyle data were collected using a structured questionnaire. Physical activity levels were assessed using the International Physical Activity Questionnaire (IPAQ). Blood pressure was measured using a calibrated digital sphygmomanometer under standardized conditions. Data were analyzed using SPSS version 25.0. **Results:** Sedentary participants demonstrated significantly higher mean systolic (132.8 ± 9.6 mmHg) and diastolic (84.2 ± 6.8 mmHg) pressures than active participants (120.4 ± 7.5 mmHg and 76.3 ± 5.7 mmHg, respectively; $p < 0.001$). The prevalence of hypertension was higher among sedentary individuals (48.6%) than among active individuals (17.2%). BMI was also higher among sedentary participants than among active participants (27.2 ± 3.8 vs. 23.6 ± 3.2 kg/m²). **Conclusion:** A Sedentary lifestyle was significantly associated with higher blood pressure and BMI. Promoting regular physical activity may serve as a cost-effective intervention for preventing hypertension in Bangladeshi adults.

INTRODUCTION

Hypertension remains one of the leading causes of global morbidity and mortality, accounting for an estimated 10.8 million deaths annually [1]. It is a major modifiable risk factor for cardiovascular disease, stroke, and renal failure. The World Health Organization reports that nearly one in four adults worldwide has elevated blood pressure, and this burden is disproportionately high in low- and middle-income countries (LMICs) such as Bangladesh [2,3]. In Bangladesh, hypertension prevalence has increased

from 18% in 2000 to nearly 30% in 2021, reflecting rapid urbanization and lifestyle transitions [4].

Sedentary behavior has emerged as a crucial determinant of hypertension and related metabolic disorders. The growing shift toward mechanized work, increased screen time, and reduced active commuting contribute to declining physical activity levels [5,6]. Physical inactivity leads to increased peripheral vascular resistance, sympathetic activity, and endothelial dysfunction key mechanisms elevating blood pressure [7]. Conversely, regular physical activity enhances



vascular compliance, improves cardiac efficiency, and reduces systemic inflammation, contributing to lower blood pressure [8].

Several studies in Bangladesh have explored the associations between physical activity and hypertension. Islam et al. reported that higher leisure-time physical activity was significantly correlated with lower systolic and diastolic pressures among adults with hypertension [9]. Similarly, Joardar et al. found that sedentary urban dwellers exhibited higher rates of hypertension compared to those engaged in moderate physical activity [10]. Kibria et al. demonstrated that sedentary occupations were independently associated with elevated blood pressure, diabetes, and obesity in Bangladesh, corroborating the adverse effects of inactivity [11].

However, there remains a research gap in comparative studies assessing blood pressure differences between sedentary and active individuals in controlled settings. Prior research has largely focused on hypertensive or patient populations, often overlooking apparently healthy adults. Moreover, evidence from Bangladesh is limited by regional variations and heterogeneous study design [12]. Addressing this gap is essential for guiding community-level preventive strategies and public health interventions.

This study, therefore, aims to investigate the variations in blood pressure between sedentary and active individuals in a Bangladeshi context, highlighting how lifestyle patterns influence cardiovascular risk. The findings are expected to provide empirical evidence supporting the promotion of regular physical activity as a preventive measure against hypertension and its sequelae.

METHODOLOGY & MATERIALS

This cross-sectional observational study was conducted at the Department of Physiology, Rajshahi Medical College, Rajshahi, Bangladesh, from July 2014 to June 2015. Seventy participants aged 20–60 years were selected equally from sedentary and physically active groups. Sedentary participants included office workers and homemakers, while active participants included individuals engaging in regular physical activity such as walking, jogging, or sports for at least 150 minutes per week.

RESULTS

Table 1: Baseline Characteristics of Study Participants (N = 70)

Variable	Category	Sedentary (n=35)	Active (n=35)
Age (years)	20–30	6 (17.1)	10 (28.6)
	31–40	12 (34.3)	15 (42.9)

Sample Selection

Inclusion Criteria:

- Adults aged 20–60 years.
- Willing to participate with informed consent.
- Sedentary individuals (≤ 600 MET-min/week) and active individuals (≥ 1500 MET-min/week) based on the International Physical Activity Questionnaire (IPAQ).

Exclusion Criteria:

- Known cases of hypertension, diabetes mellitus, or cardiovascular diseases.
- Current use of antihypertensive medication.
- Pregnant or lactating women.
- Individuals with chronic kidney or endocrine disorders.

Data Collection Procedure

Participants were recruited through purposive sampling from the local community. After obtaining informed written consent, detailed demographic and lifestyle information was collected using a structured questionnaire. Physical activity levels were assessed using the short form of the IPAQ. Anthropometric measurements, including height and weight, were taken using standardized equipment, and BMI was calculated. Blood pressure was measured in the right arm using a calibrated digital sphygmomanometer (Omron HEM-7120). Each participant was seated comfortably for at least 5 minutes before measurement, and three readings were recorded at 5-minute intervals; the mean of the last two readings was used for analysis.

Participants were classified into “active” or “sedentary” based on the WHO physical activity guidelines. All instruments were regularly calibrated, and data were collected by trained personnel to ensure accuracy and reliability. Informed consent was obtained from all the participants. Confidentiality was strictly maintained.

Statistical Analysis

Data were analyzed using SPSS version 25.0. Descriptive statistics (mean \pm SD, frequency, and percentage) were computed for baseline variables. Independent t-tests were used to compare blood pressure between groups, and chi-square tests assessed categorical variables. Pearson’s correlation coefficient examined relationships between physical activity and blood pressure parameters. A p-value < 0.05 was considered statistically significant.



	41–50	10 (28.6)	7 (20.0)
	51–60	7 (20.0)	3 (8.6)
	Mean ± SD	39.4 ± 10.1	37.8 ± 9.3
Gender	Male	19 (54.3)	20 (57.1)
	Female	16 (45.7)	15 (42.9)
BMI (kg/m²)	Mean ± SD	27.2 ± 3.8	23.6 ± 3.2
Smoking Habit	Smoker	12 (34.3)	8 (22.9)
	Non-smoker	23 (65.7)	27 (77.1)

Table 1 presents the baseline characteristics of the participants. The mean age of the sedentary group was 39.4 ± 10.1 years, while the active group averaged 37.8 ± 9.3 years. Although the gender distribution was

similar across groups, the sedentary participants had a higher mean BMI (27.2 ± 3.8 kg/m²) than active individuals (23.6 ± 3.2 kg/m²).

Table 2: Comparison of Mean Blood Pressure Between Sedentary and Active Groups

Parameter	Sedentary (Mean ± SD)	Active (Mean ± SD)	p-value
Systolic BP (mmHg)	132.8 ± 9.6	120.4 ± 7.5	<0.001
Diastolic BP (mmHg)	84.2 ± 6.8	76.3 ± 5.7	<0.001
Mean Arterial Pressure (mmHg)	100.4 ± 7.3	91.0 ± 6.1	<0.001

Table 2 compares the mean systolic, diastolic, and mean arterial pressures between the groups. Sedentary participants demonstrated significantly higher systolic (132.8 ± 9.6 mmHg) and diastolic (84.2 ± 6.8 mmHg)

blood pressures than active participants (120.4 ± 7.5 mmHg and 76.3 ± 5.7 mmHg, respectively), with all differences statistically significant ($p < 0.001$).

Table 3: Distribution of Blood Pressure Categories (Based on JNC 8 Criteria)

Category	Sedentary (n = 35)	Active (n = 35)	Total (N = 70)
Normal (<120/80 mmHg)	5 (14.3)	14 (40.0)	19 (27.1)
Prehypertensive (120–139/80–89 mmHg)	13 (37.1)	15 (42.9)	28 (40.0)
Stage 1 Hypertension (140–159/90–99 mmHg)	12 (34.3)	5 (14.3)	17 (24.3)
Stage 2 Hypertension ($\geq 160/\geq 100$ mmHg)	5 (14.3)	1 (2.9)	6 (8.6)

Table 3 shows the distribution of blood pressure categories based on JNC 8 criteria. Nearly half (48.6%) of sedentary participants were hypertensive compared to only 17.1% among the active group. Conversely, normal blood pressure was observed in 40% of active individuals but only 14.3% of sedentary participants.

DISCUSSION

The present study revealed that sedentary individuals exhibited significantly higher systolic and diastolic blood pressure compared with physically active participants. These findings highlight the crucial role of regular physical activity in maintaining normal blood pressure and preventing hypertension. The results align with previous national and international studies that consistently demonstrate an inverse relationship between physical activity and blood pressure regulation [8,9].

The mean systolic blood pressure in the sedentary group (132.8 mmHg) was substantially higher than in the

active group (120.4 mmHg). This difference mirrors the findings of Joardar et al., who observed that urban sedentary workers had a significantly higher prevalence of hypertension than those engaged in moderate to high physical activity [10]. Physical inactivity contributes to hemodynamic alterations by increasing sympathetic activity, systemic vascular resistance, and reducing arterial compliance, which leads to persistent blood pressure elevation [7]. On the other hand, regular physical activity induces adaptive cardiovascular changes, including improved endothelial function and increased nitric oxide production, resulting in vasodilation and reduced peripheral resistance.

BMI was also significantly higher among sedentary individuals, supporting the interrelationship between obesity, inactivity, and hypertension. Kibria et al. demonstrated that sedentary occupational patterns among Bangladeshi adults were closely linked with overweight and obesity, both of which are established risk factors for hypertension [11]. Hall et al. explained



the underlying mechanism, stating that excess adiposity increases blood volume, cardiac output, and renal sodium retention, which together contribute to elevated blood pressure [13]. Islam et al. similarly reported that even moderate physical activity could mitigate these risks by improving metabolic efficiency and reducing adiposity [12].

The distribution of blood pressure categories in this study showed that nearly half (48.6%) of the sedentary participants were hypertensive compared with only 17.1% of active individuals. This pattern aligns with findings from national-level data in Bangladesh. Biswas et al. identified insufficient physical activity as a key determinant of hypertension and metabolic disorders in the Bangladesh STEPS survey [4], while Chowdhury et al. confirmed the persistence of a high hypertension burden among physically inactive adults [3]. Such observations underscore the public health relevance of promoting regular physical activity in both rural and urban populations.

The blood pressure difference between groups observed in this study—over 10 mmHg in systolic and nearly 8 mmHg in diastolic pressure—has important clinical implications. Mills et al. and Cornelissen & Smart demonstrated that consistent moderate-intensity physical activity can reduce systolic pressure by 5–10 mmHg, comparable to the effect of standard antihypertensive medications [2,14]. Regular aerobic exercise has been shown to reduce resting heart rate, decrease total peripheral resistance, and enhance baroreceptor sensitivity, thus improving blood pressure control [7].

Inflammatory and metabolic pathways also explain part of the benefit of exercise. Hamer & Steptoe described how physical activity reduces circulating inflammatory cytokines such as interleukin-6 and tumor necrosis factor-alpha, thereby protecting vascular endothelium and reducing arterial stiffness [15]. Regular movement further enhances insulin sensitivity and lowers oxidative stress, contributing to improved vascular health. These mechanisms are relevant in Bangladesh, where dietary salt intake and obesity rates are increasing, compounding hypertension risk [5].

The lifestyle transition in Bangladesh over the past two decades, characterized by urbanization, mechanized transport, and office-based work, has substantially reduced daily energy expenditure. Uddin et al. found that less than half of adults in Bangladesh meet WHO physical activity recommendations [5]. Rahman et al. observed that sedentary time increased during the COVID-19 pandemic, resulting in rising hypertension prevalence [6]. These shifts emphasize that inactivity is

not only a personal choice but also a structural and societal issue requiring policy-level interventions.

The findings of the present study correspond with regional evidence from South Asia. Gupta et al. and Lee et al. demonstrated that physical inactivity was a major contributor to hypertension prevalence across India and Southeast Asia [16,17]. Similar to the Bangladeshi population, these studies identified sedentary work, obesity, and reduced outdoor activity as primary risk factors. Collectively, this evidence highlights the universality of the protective role of physical activity across populations and cultural contexts.

In summary, this study supports existing evidence that a sedentary lifestyle is a strong predictor of elevated blood pressure, while regular physical activity is protective. Active individuals exhibited significantly lower systolic and diastolic pressures, reinforcing the need for lifestyle modification in hypertension prevention strategies. These findings add to the growing body of literature advocating for the incorporation of physical activity into public health policies in Bangladesh.

Limitations of the study

The cross-sectional nature of this study limits the ability to infer causality between activity level and blood pressure. The relatively small sample size and self-reported physical activity levels may introduce recall bias.

CONCLUSION

Sedentary individuals demonstrated significantly higher blood pressure and BMI compared to active participants, confirming that physical inactivity contributes to hypertension. Regular physical activity was associated with lower systolic and diastolic pressures, highlighting its protective cardiovascular role. Promoting daily moderate-intensity exercise should be prioritized as a preventive strategy to mitigate the increasing hypertension burden in Bangladesh. Incorporating physical activity awareness and interventions into routine healthcare practices could effectively address this emerging public health concern.

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REFERENCES

1. World Health Organization. Assessing national capacity for the prevention and control of noncommunicable diseases: report of the 2021



- global survey. World Health Organization; 2023 Jul 5.
- Mills KT, Bundy JD, Kelly TN, Reed JE, Kearney PM, Reynolds K, Chen J, He J. Global disparities of hypertension prevalence and control: a systematic analysis of population-based studies from 90 countries. *Circulation*. 2016 Aug 9;134(6):441-50.
 - Chowdhury MA, Islam M, Rahman J, Uddin MT, Haque MR, Uddin MJ. Changes in prevalence and risk factors of hypertension among adults in Bangladesh: An analysis of two waves of nationally representative surveys. *Plos one*. 2021 Dec 2;16(12): e0259507.
 - Biswas RK, Chowdhury S, Hossain S, Chowdhury PB. Hypertension, diabetes, and hypercholesterolemia in Bangladesh: evaluating role of physical activity from cross-sectional STEPS 2018 survey. *Health Science Reports*. 2024 Jul;7(7): e2243.
 - Uddin R, Hasan M, Saif-Ur-Rahman KM, Mandic S, Khan A. Physical activity and sedentary behaviour in Bangladesh: a systematic scoping review. *Public Health*. 2020 Feb 1; 179:147-59.
 - Rahman ME, Islam MS, Bishwas MS, Moonajilin MS, Gozal D. Physical inactivity and sedentary behaviors in the Bangladeshi population during the COVID-19 pandemic: An online cross-sectional survey. *Heliyon*. 2020 Oct 1;6(10).
 - Pescatello LS, MacDonald HV, Lamberti L, Johnson BT. Exercise for hypertension: a prescription update integrating existing recommendations with emerging research. *Current hypertension reports*. 2015 Nov;17(11):87.
 - Shariful Islam M, Fardousi A, Sizar MI, Rabbani MG, Islam R, Saif-Ur-Rahman KM. Effect of leisure-time physical activity on blood pressure in people with hypertension: a systematic review and meta-analysis. *Scientific Reports*. 2023 Jun 30;13(1):10639.
 - Islam FM, Islam MA, Hosen MA, Lambert EA, Maddison R, Lambert GW, Thompson BR. Associations of physical activity levels, and attitudes towards physical activity with blood pressure among adults with high blood pressure in Bangladesh. *PloS one*. 2023 Feb 3;18(2):e0280879.
 - Joardar AI, Khaled MF, Mahabub SE, Singha CK, Haque MA. Factors Associated with Hypertension among Urban Dwellers with Sedentary Lifestyle: A Cross-Sectional Study. *Journal of National Institute of Neurosciences Bangladesh*. 2020 Dec 14;6(2):129-34.
 - Kibria GM, Hossen S, Gibson D. The burden of hypertension, diabetes, and overweight/obesity by sedentary work pattern in Bangladesh: Analysis of Demographic and Health Survey 2017–18. *PLOS Global Public Health*. 2024 Feb 6;4(2): e0002788.
 - Islam FM, Bhowmik J, Camera DM, Maddison R, Lambert GW. Concordance between Different Criteria for Self-Reported Physical Activity Levels and Risk Factors in People with High Blood Pressure in a Rural District in Bangladesh. *International Journal of Environmental Research and Public Health*. 2021 Oct 6;18(19):10487.
 - Hall JE, do Carmo JM, da Silva AA, Wang Z, Hall ME. Obesity, kidney dysfunction and hypertension: mechanistic links. *Nature reviews nephrology*. 2019 Jun;15(6):367-85.
 - Cornelissen VA, Smart NA. Exercise training for blood pressure: a systematic review and meta-analysis. *Journal of the American heart association*. 2013 Feb 1;2(1):e004473.
 - Hamer M, Steptoe A. Prospective study of physical fitness, adiposity, and inflammatory markers in healthy middle-aged men and women. *The American journal of clinical nutrition*. 2009 Jan 1;89(1):85-9.
 - Gupta R, Gaur K, S. Ram CV. Emerging trends in hypertension epidemiology in India. *Journal of human hypertension*. 2019 Aug;33(8):575-87.
 - Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *The lancet*. 2012 Jul 21;380(9838):219-29.