e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2025; 17(8); 1168-1171

Original Research Article

Correlation of Body Mass Index with Blood Pressure among Young Adults: A Cross-Sectional Study

Kanzariya Hardik Dayarambhai[1], Sonagara Kishan Dipakbhai[2], Shobha Vijaybhai Gadhia[3]

[1]MBBS, Shree M. P. Shah Government Medical College, Jamnagar, Gujarat, India
[2]MBBS, Rajshree Medical College & Research Institute, Bareilly, India
[3]MBBS, Narendra Modi Medical College, LG Hospital, Maninagar, Ahmedabad, India

Received: 01-05-2025 Revised: 15-06-2025 / Accepted: 21-07-2025
Corresponding author: Dr. Shobha Vijaybhai Gadhia
Conflict of interest: Nil

Abstract

Background: Hypertension, once considered a disorder of middle and old age, is increasingly being recognized among young adults. Body Mass Index (BMI) has emerged as a key modifiable determinant of blood pressure. Early evaluation of this relationship in Indian college students is important to identify at-risk groups and initiate preventive strategies.

Material and Methods: This cross-sectional study was conducted among 200 college students aged 18–25 years in Gujarat over six months. Sociodemographic details and lifestyle factors were collected using a structured questionnaire. Height and weight were measured to calculate BMI (kg/m²), classified according to WHO Asian cut-offs. Blood pressure was recorded using a validated automated sphygmomanometer after adequate rest, and categorized according to ACC/AHA 2017 guidelines. Data were analyzed using descriptive statistics, Pearson's correlation, t-test/ANOVA, and Chi-square test, with $p < 0.05$ considered significant.

Results: The mean age of participants was 20.4 ± 1.8 years; 54% were male. The mean BMI was 22.8 ± 3.5 kg/m², and the mean systolic and diastolic blood pressures were 118.9 ± 9.3 mmHg and 76.4 ± 7.2 mmHg, respectively. Based on BMI, 15% were underweight, 55% normal, 17% overweight, and 13% obese. According to ACC/AHA classification, 64% had normal BP, 15% elevated BP, 12% stage 1 hypertension, and 9% stage 2 hypertension. The overall prevalence of hypertension was 21%. BMI showed a significant positive correlation with SBP ($r = 0.34$, $p < 0.001$) and DBP ($r = 0.29$, $p < 0.001$). Mean BP values increased progressively from underweight to obese categories (ANOVA, $p < 0.05$). The prevalence of elevated BP and hypertension was significantly higher among overweight and obese students compared to those with normal BMI (Chi-square, $p < 0.01$).

Conclusion: BMI is significantly associated with both systolic and diastolic blood pressure among young adults, with overweight and obese individuals showing a higher prevalence of hypertension. These findings emphasize the need for early screening and lifestyle interventions in college populations to mitigate long-term cardiovascular risk.

Keywords: Body Mass Index, Blood Pressure, Hypertension, Young Adults.

Introduction

Hypertension is a major modifiable risk factor for cardiovascular morbidity and mortality worldwide. [1] Traditionally considered a disease of middle-aged and elderly populations, it is now increasingly recognized among younger adults, including those in their late teens and twenties. [2] Early elevation of blood pressure is of particular concern because blood pressure trajectories tend to persist into later life, predisposing individuals to premature atherosclerosis, left ventricular hypertrophy, stroke, and chronic kidney disease. [3] The epidemiological transition in India, with rapid urbanization, dietary shifts, and sedentary lifestyles, has accelerated this trend, bringing non-communicable diseases to the forefront of public health challenges even in younger age groups. [4]

Body Mass Index (BMI), defined as weight in kilograms divided by the square of height in meters, remains the most widely used anthropometric indicator of adiposity. [5] Elevated BMI is associated with multiple cardiovascular risk factors, including dyslipidemia, insulin resistance, and systemic inflammation. [6] One of the most consistent associations demonstrated in both developed and developing countries is the positive relationship between BMI and blood pressure. [7]

Mechanistic pathways proposed include increased sympathetic nervous system activity, activation of the renin–angiotensin–aldosterone system, higher circulating leptin and insulin levels, and endothelial dysfunction. Even modest increases in BMI within the so-called "normal" range have been associated with incremental rises in both systolic and diastolic blood pressure. [8]

Despite this well-established biological plausibility, there is limited consensus on the magnitude of the BMI–blood pressure relationship among Indian young adults. [9] Studies in campus or community cohorts have reported varying strengths of correlation, influenced by differences in sample size, methodology, cut-off values for BMI, and blood pressure classification guidelines applied. Some studies highlight a significant positive correlation, while others suggest only a weak or negligible association in this age group. This inconsistency warrants further exploration in local contexts, where genetic, cultural, and environmental factors may play a role in modifying the association. Moreover, the use of Asian-specific BMI cut-offs has particular relevance in Indian populations, who are known to develop cardiometabolic complications at lower BMI thresholds compared to their Western counterparts.10 Given the rising prevalence of overweight and obesity among Indian college-going youth, and the concurrent burden of undiagnosed hypertension, it is imperative to study this relationship in a structured manner.

Material and Methods

This cross-sectional study was conducted over six months among 200 college students aged 18–25 years in Gujarat. Participation was voluntary with written informed consent. Students with acute illness, pregnancy, or on anti-hypertensive or weight-altering drugs were excluded.

A structured questionnaire was used to record sociodemographic details, lifestyle factors, and family history of hypertension. Height and weight were measured using standard equipment and Body Mass Index (BMI) was calculated as kg/m², classified according to WHO Asian cut-offs. Blood pressure was recorded with an automated digital sphygmomanometer after five minutes of rest in a seated position, and the average of two readings was taken. Blood pressure was classified using ACC/AHA 2017 guidelines as normal, elevated, stage 1, or stage 2 hypertension.

Data were entered in Microsoft Excel and analyzed using descriptive statistics. Continuous variables were expressed as mean and standard deviation, while categorical variables were shown as frequencies and percentages.

The relationship between BMI and blood pressure was examined using Pearson's correlation, comparison of mean BP across BMI groups was done by t-test/ANOVA, and Chi-square test was used for associations. A p-value <0.05 was taken as statistically significant. Ethical approval was obtained from the Institutional Ethics Committee.

Results

A total of 200 young adults participated in the study, for which baseline data is shown in Table no. 1 below:

Table 1: Baseline characteristics

Variable	Mean ± SD / n (%)
Age (years)	20.4 ± 1.8
Male : Female	108 (54%) : 92 (46%)
Height (cm)	166.2 ± 8.7
Weight (kg)	62.9 ± 10.8
BMI (kg/m²)	22.8 ± 3.5
Systolic BP (mmHg)	118.9 ± 9.3
Diastolic BP (mmHg)	76.4 ± 7.2

Based on WHO Asian BMI cut-offs, and according to ACC/AHA 2017 guidelines distribution of participants by BMI and Blood pressure is shown in Table no 2 below:

Table 2: Distribution of participants by BMI and Blood Pressure categories

Category	n (%)
BMI	
Underweight	30 (15%)
Normal	110 (55%)
Overweight	34 (17%)
Obese	26 (13%)
Blood Pressure	
Normal	128 (64%)

Elevated	30 (15%)
Stage 1 HTN	24 (12%)
Stage 2 HTN	18 (9%)

A significant positive correlation was observed between BMI and both SBP ($r = 0.34$, $p < 0.001$) and DBP ($r = 0.29$, $p < 0.001$). Mean SBP and DBP values showed a stepwise rise across BMI categories. Underweight participants had the lowest mean SBP (112.6 ± 7.8 mmHg) and DBP (72.4 ± 6.2 mmHg), whereas obese participants recorded the highest mean SBP (125.8 ± 10.2 mmHg) and DBP (81.6 ± 7.1 mmHg). The differences across categories were statistically significant (ANOVA, $p < 0.05$).

The prevalence of elevated blood pressure and hypertension was markedly higher among overweight and obese participants. Among obese individuals, 18 (69%) had either elevated BP or hypertension, compared to only 28 (25%) in the normal BMI group. This association between BMI category and BP status was statistically significant (Chi-square test, $p < 0.01$).

Discussion

In this study of 200 Indian young adults (18–25 years), a moderate positive correlation was observed between BMI and both systolic blood pressure ($r = 0.34$) and diastolic blood pressure ($r = 0.29$), both statistically significant ($p < 0.001$). This magnitude aligns well with findings from prior research by Patel et al. (2025) [11] who reported a moderate correlation between BMI and SBP ($r = 0.48$, $p = 0.001$) and DBP ($r = 0.42$, $p = 0.003$) in a cohort of young adults, indicating a similar trend. Likewise, a larger cross-sectional study by Yusni et al. (2024) [12] among 1,107 young adults (aged 18–22 years) demonstrated a moderate correlation between BMI and SBP ($r = 0.488$) and DBP ($r = 0.358$), with significant p-values ($p < 0.001$). Together, these studies substantiate our finding that even within ostensibly healthy young populations, increasing BMI corresponds with higher blood pressure.

The prevalence of hypertension in this cohort—defined as stage 1 and stage 2 combined—was 21%. This is broadly consistent with urban and campus-based Indian studies.

A study by Mishra (2023) [13] reported a notable prevalence of both obesity and hypertension among young adults, especially males. Similarly, another urban Indian study by Brar et al. (2025) [14] reported a prevalence of hypertension among young adults at 9.2%; notably, over 70% of the hypertensive young were overweight or obese, underlining the BMI link. The range of 9–24% in young populations underscores that our finding of 21% fits firmly within emerging trends. Analysis across BMI categories showed a stepwise increase in both SBP and DBP from underweight to obese groups, with significant ANOVA p-values (SBP $p < 0.001$; DBP $p < 0.01$). This pattern mirrors findings from other Indian cohorts. Khan et al. (2023) [15] found a positive correlation between BMI and blood pressure indices in young adults, reflecting a rising BP trend with increasing BMI category. Similarly, Nimisha and colleagues (2023)v [16] observed a moderate correlation between BMI and SBP ($r = 0.369$, $p < 0.05$), and an increasing risk of hypertension with higher BMI among medical students.

The association between BMI categories and elevated BP/hypertension prevalence was statistically significant (Chi-square $p < 0.01$) in our study—most pronounced in the overweight and obese groups. This is in agreement with a Punjab-based study, where around 71.8% of hypertensive young adults were overweight or obese. Further, Deepika's study [17] on arterial stiffness in young individuals found a strong association between higher BMI and prehypertension (early BP elevation), supporting our bin-based risk stratification.

Conclusion

The present study demonstrated a significant positive correlation between Body Mass Index and both systolic and diastolic blood pressure among young adults. A clear stepwise rise in blood pressure was observed across BMI categories, and the prevalence of elevated blood pressure and hypertension was considerably higher in overweight and obese individuals. These findings highlight that excess body weight exerts a measurable impact on cardiovascular risk even in early adulthood. Early screening of BMI and blood pressure in college populations, coupled with lifestyle modification programs focusing on diet, physical activity, and weight management, is essential to curb the rising burden of hypertension and its long-term complications.

Bibliography

1. Global Cardiovascular Risk Consortium. Global effect of modifiable risk factors on cardiovascular disease and mortality. N Engl J Med. 2023; 389(14):1273–85.
2. Liu K, Daviglus ML, Loria CM, Colangelo LA, Spring B, Moller AC, et al. Healthy lifestyle through young adulthood and the presence of low cardiovascular disease risk profile in middle age: the Coronary Artery Risk Development in (Young) Adults

(CARDIA) study. Circulation. 2012; 125(8):996–1004.
3. Allen NB, Khan SS. Blood pressure trajectories across the life course. Am J Hypertens. 2021; 34(3):234–41.
4. Misra A, Singhal N, Sivakumar B, Bhagat N, Jaiswal A, Khurana L. Nutrition transition in India: Secular trends in dietary intake and their relationship to diet-related non-communicable diseases. J Diabetes. 2011; 3(4):278–92.
5. Mohajan D, Mohajan HK. Body mass index (BMI) is a popular anthropometric tool to measure obesity among adults. J Innov Med Res. 2023; 2(4):25–33.
6. Ebron K, Andersen CJ, Aguilar D, Blesso CN, Barona J, Dugan CE, et al. A larger body mass index is associated with increased atherogenic dyslipidemia, insulin resistance, and low-grade inflammation in individuals with metabolic syndrome. Metab Syndr Relat Disord. 2015; 13(10):458–64.
7. Tesfaye F, Nawi N, Van Minh H, Byass P, Berhane Y, Bonita R, et al. Association between body mass index and blood pressure across three populations in Africa and Asia. J Hum Hypertens. 2007; 21(1):28–37.
8. Taylor BC, Wilt TJ, Welch HG. Impact of diastolic and systolic blood pressure on mortality: implications for the definition of "no rmal." J Gen Intern Med. 2011; 26(7):685–90.
9. Maximova E. The role of physical activity, obesity and perception of weight status in the prevention of elevated blood pressure in youth: biological and behavioral investigations. 2010;
10. 10. Vasudevan D, Stotts AL, Mandayam S, Omegie LA. Comparison of BMI and anthropometric measures among South Asian Indians using standard and modified criteria. Public Health Nutr. 2011; 14(5):809–16.
11. Patel B, Khiloshiya MJ, Vyas TH. Correlation between Body Mass Index and Blood Pressure in Young Adults. Eur J Cardiovasc Med. 2025; 15:41–3.
12. Yusni Y, Rahman S, Naufal I. Positive correlation between body weight and body mass index with blood pressure in young adults. Narra J. 2024; 4(1):e533.
13. Mishra S. OBESITY AND HYPERTENSION AMONG YOUNG ADULTS OF DELHI-NCR. J Hypertens. 2023; 41(Suppl 3):e156.
14. Brar MS, Gupta M, Gupta VK, Garg K. Prevalence of Hypertension in Young Adults in Punjab. J Assoc Physicians India. 2025; 73(8):45.
15. Khan ZA, Qureshi U, Khan T, Goel S. Change in the prevalence of prehypertension and hypertension among young Indians aged 15–24 years between 2015–16 and 2019–21: Insights from nationally representative surveys. Plos One. 2025; 20(4):e0319274.
16. Dr Nimisha V, Dr Santhosh Viswan, Dr Amrut Arvindrao Dambal. Correlation of Body Surface Area and Body Mass Index with Blood Pressure inYoung Adults in a South Indian Medical College. Journal of Chemical Health Risks. 2023; 13(5):26–31.
17. Deepika V, Vijayakumar R. Impact of body mass index on arterial stiffness in young prehypertensives: a cross sectional study. J Res Health Sci. 2017; 18(1):402.