TPM Vol. 32, No. S1, 2025
ISSN: 1972-6325
https://www.tpmap.org/

Open Access

EVALUATING THE BLOOD PRESSURE-TO-HEIGHT RATIO AS A PRACTICAL SCREENING METHOD FOR PEDIATRIC HYPERTENSION IN INDIA

DR. SHREENIVAS R[1], DR. SHALINI PRIYA N[1], DR. KARTHIK VVN[1], DR. ELILARASI S[1], DR. MATHANGI[2]
[1]DEPARTMENT OF PAEDIATRICS, SAVEETHA INSTITUTE OF TECHNICAL AND MEDICAL SCIENCES, THANDALAM, CHENNAI
[2]SENIOR LECTURER, DEPARTMENT OF BIOCHEMISTRY, SREE BALAJI DENTAL COLLEGE & HOSPITAL, CHENNAI, INDIA
CORRESPONDING AUTHOR: DR. SHREENIVAS R

Abstract

Introduction:

Hypertension in childhood is an under-recognized condition that can lead to long-term cardiovascular complications. Conventional diagnosis relies on age-, sex-, and height-specific BP percentile charts, which can be cumbersome in clinical practice. Blood pressure-to-height (BP/Ht) ratios have been proposed as a simpler alternative, but evidence from the Indian pediatric population is limited.

Aim:

To evaluate the diagnostic accuracy of systolic BP-to-height (SBP/Ht) and diastolic BP-to-height (DBP/Ht) ratios as screening tools for hypertension in South Indian children aged 5–15 years.

Materials and Methods:

A retrospective observational study was conducted at Saveetha Medical College and Hospital, Chennai, using anonymized pediatric outpatient records from April to December 2023. Children aged 5–15 years with complete anthropometric and BP data were included. BP classification was based on the 2017 AAP guidelines. SBP/Ht and DBP/Ht ratios were calculated for each child. Receiver operating characteristic (ROC) curve analyses determined optimal cut-off values, sensitivity, specificity, and area under the curve (AUC) for detecting elevated BP (≥90th percentile) and hypertension (≥95th percentile). Pearson's correlation assessed associations between BP/Ht ratios and BP percentiles. Statistical analysis was performed using SPSS v29.0.2.0.

Results:

The study included 150 children (65 males, 85 females; mean age 9.75 ± 2.74 years). According to AAP criteria, 46.7% were normotensive, 22.0% prehypertensive, and 31.3% hypertensive. Males had higher mean SBP/Ht and DBP/Ht ratios than females, though differences were not statistically significant. Hypertensive children were significantly younger than normotensive and prehypertensive peers ($p = 0.010$). Both SBP/Ht and DBP/Ht ratios were significantly higher in hypertensive children ($p< 0.001$). SBP/Ht ratio showed a strong positive correlation with SBP percentile ($r = 0.691$, $p< 0.001$). ROC analysis identified optimal cut-offs of 0.878 for SBP/Ht (AUC 0.876, 95% CI: 0.813–0.928; sensitivity 78.7%, specificity 83.5%) and 0.520 for DBP/Ht (AUC 0.669, 95% CI: 0.573–0.766; sensitivity 72.3%, specificity 64.1%).

Conclusion:

SBP/Ht and DBP/Ht ratios are simple, cost-effective, and reliable screening tools for pediatric hypertension. The SBP/Ht ratio demonstrated superior diagnostic accuracy and could be integrated into school health programs and primary care screening to enable earlier detection and intervention in resource-limited settings.

Key words: Hypertension, Adolescents, Blood Pressure, Height

INTRODUCTION

Blood pressure (BP) measurement is a fundamental part of pediatric clinical assessment, as early detection of elevated BP can help prevent long-term cardiovascular consequences. "Normal blood pressure" is defined as SBP and DBP values <90th percentile (on the basis of age, sex, and height percentiles). For the preadolescent, "prehypertension" was defined as SBP and/or DBP ≥90th percentile and <95th percentile (on the basis of age, sex, and height). For adolescents, "prehypertension" was defined as BP ≥120/80 mm Hg to <95th percentile, or ≥90th and <95th percentile, whichever was lower. HTN was defined as average clinic measured SBP and/or DBP ≥95th percentile (on the basis of age, sex, and height percentiles) and was further classified as stage 1 or stage 2 HTN [1].

Hypertension is a major public health challenge not only in adults but also in children, given its potential to cause irreversible cardiovascular damage over time. In adults, primary hypertension is more common and significantly increases the risk of adverse cardiovascular events.Adults often have primary hypertension, which makes them more likely to have a heart attack, stroke, or kidney failure. The risk of stroke is increased by 35% and coronary artery disease by 20% for every 5 mm Hg increase in diastolic blood pressure. The prevalence of hypertension rises with age, impacting 15% of young adults and 60% of those over 65. Along with diabetes, people with hypertension are at high risk for developing end-stage renal disease [2].

Between 1990 and 2019, the frequency of hypertension doubled worldwide; nevertheless, only half of those with the disease receive a diagnosis, and only 25% have their condition appropriately managed [3].In children, the burden of hypertension, although less frequently recognized, is steadily increasing due to rising rates of obesity, sedentary lifestyles, and dietary changes. The overall prevalence of hypertension in childhood is 2% to 5% [4], while in India, the prevalence ranges from 10% for prehypertension and 7% for hypertension [5]. This is of particular concern in developing countries, where routine BP screening in pediatric practice is often inconsistent, leading to delayed diagnosis and intervention.Although often asymptomatic, hypertensive children can show signs of target organ damage. Childhood primary hypertension frequently persists into adulthood, with children having hypertension having 1.72 times higher odds of hypertension during adulthood [6].

Unlike older people, who have higher vascular resistance, young people with high blood pressure have enhanced cardiac output [7]. Young people's higher cardiac output is caused by things like elevated sympathetic tone, fluid and sodium retention, and notably in those who are overweight or obese. In both children and adults, there is also evidence of neurohormonal and renal cardiovascular dysregulation, which includes changes in baroreflex sensitivity and salt-sensitive blood pressure. Aside from insulin resistance, other pathways that lead to poor cardiovascular outcomes include inflammation and dysregulation of the renin-angiotensin-aldosterone system. Through cardiac injury, microvascular narrowing, arterial stiffening, and altered baroreceptor activity in response to vascular stiffening, hypertension-induced target organ injury (TOI) maintains prolonged hypertension [8].

Genetics, low birth weight, and even exposure to the environment are some of the non-modifiable factors that may lead to high blood pressure in children. Modifiable risk factors include overweight, obesity, excessive intake of processed food, low physical activity and poor sleep. Given these diverse risk factors and the silent nature of the disease, there is a pressing need for simple, cost-effective, and accurate screening tools that can be implemented in school and community settings.

The feasibility and accuracy of the systolic blood pressure-to-height ratio (SBP/height ratio) and the diastolic blood pressure-to-height ratio (DBP/height ratio) were assessed for the first time in 2010 by Lu et al. They suggested the ideal thresholds for both SBP/height ratio and DBP/height ratio in order to identify hypertension in Chinese adolescents. They came to the conclusion that the BP/height ratios are reliable, affordable, and easy indices for spotting hypertension in teenagers. Since then, several studies in different populations have supported the utility of BP-to-height ratios as a screening tool, but evidence in the Indian pediatric population remains limited.The purpose of this study was to determine whether or not basic BP/height ratios can be a reliable clinical tool for identifying kids and teens who are at risk for hypertension[9]. Accordingly, the present study aims to evaluate the diagnostic accuracy of BP-to-height ratios in detecting hypertension among South Indian children, with the goal of simplifying screening protocols and enabling early intervention.

MATERIALS AND METHODS

Study Design and Setting

This was a retrospective observational study conducted at Saveetha Medical College and Hospital, Chennai, India. The analysis was carried out on anonymized hospital-based pediatric health records collected between April 2023 and December 2023 as part of routine outpatient pediatric care. No direct contact with participants was made for research purposes, and no personally identifiable information was recorded. Therefore, this secondary data analysis did not require additional informed consent or prior Institutional Ethics Committee approval, in accordance with local regulations on the use of de-identified clinical data.

Study Population and Sample Size

Children aged 5 to 15 years who had undergone routine health assessment during outpatient visits within the specified period were eligible for inclusion. Only records with complete measurements for height, weight, waist circumference, systolic blood pressure (SBP), diastolic blood pressure (DBP), and gender were analysed. Records with missing data, implausible anthropometric values, or documented acute illnesses affecting BP were excluded.

Sample size justification:

The required sample size was estimated using Buderer's formula[10] for diagnostic test evaluation, assuming:

- Expected sensitivity of BP-to-height ratio to detect elevated BP: 85% (based on Lu et al.)[11]
- Expected specificity: 85%
- Desired precision: ±7%
- Prevalence of elevated BP in the target population: 10% (based on prior Indian studies) This yielded a minimum required sample of 138 subjects. Accordingly, 150 anonymized records meeting the inclusion criteria were included in the final analysis to account for potential data variability.

Data Collection and Measurements

Data were extracted from the hospital's pediatric outpatient records.

- **Anthropometric measurements:** Height was measured without shoes using a stadiometer to the nearest 0.1 cm, and weight was recorded using a calibrated digital weighing scale to the nearest 0.1 kg. Waist circumference was measured at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest using a non-elastic tape.
- **Blood pressure measurement:** SBP and DBP were recorded using a mercury sphygmomanometer or validated automated device, with an appropriately sized cuff according to the American Academy of Pediatrics (AAP) 2017 guidelines (1). Children were seated quietly for at least 5 minutes prior to measurement, and two readings were taken at 2-minute intervals; the mean value was used for analysis.
- **BP classification:** Age-, sex-, and height-specific BP percentiles were determined based on the AAP 2017 update, and children were classified as having normal BP, elevated BP (≥90th percentile but <95th percentile), or hypertension (≥95th percentile).

Blood Pressure-to-Height Ratio Calculation

The following ratios were computed for each child:

- **SBP-to-height ratio:** SBP (mmHg) ÷ height (cm)
- **DBP-to-height ratio:** DBP (mmHg) ÷ height (cm)

Statistical Analysis

Ethical Approval: Ethics approval was waived due to the retrospective nature of the study and use of anonymized hospital records. This complies with institutional and national guidelines.

RESULTS

A total of 150 children aged between 5 and 15 years were included in the study, comprising 65 males (43.3%) and 85 females (56.7%).Across the entire study population, the mean age was 9.75 ± 2.74 years, mean height 138.66 ± 16.90 cm, mean weight 37.93 ± 12.23 kg, and mean BMI 19.07 ± 2.54 kg/m². The average SBP was 115.63 ± 9.98 mmHg, DBP was 72.03 ± 9.25 mmHg, SBP-to-height ratio was 0.84 ± 0.11, and DBP-to-height ratio was 0.53 ± 0.09.The mean age was 9.02 ± 2.41 years for males and 10.31 ± 2.86 years for females, with this difference being statistically significant (p = 0.004). Females had higher mean weight (39.51 ± 12.83 kg) and height (141.31 ± 18.10 cm) compared to males (35.85 ± 11.16 kg and 135.19 ± 14.61 cm, respectively), with the difference in height reaching statistical significance (p = 0.028). The SBP-to-height and DBP-to-height ratios were higher in males than in females, although these differences were not statistically significant. (Table 1)

According to the AAP 2017 criteria, 70 children (46.7%) were normotensive, 33 (22.0%) had prehypertension, and 47 (31.3%) were hypertensive. Among males, 44.7% were normotensive, 22.4% prehypertensive, and 32.9% hypertensive, while among females, 49.2% were normotensive, 21.5% prehypertensive, and 29.2% hypertensive. (Table 2)

When stratified by BP category, one-way ANOVA showed significant differences for several variables. Hypertensive children had a significantly lower mean age (8.91 ± 2.42 years) compared to normal (10.43 ± 2.86 years) and prehypertensive (9.52 ± 2.62 years) groups (p = 0.010). Mean SBP increased progressively from 109.13 ± 7.05 mmHg in the normal group to 114.85 ± 7.27 mmHg in prehypertensive children and 125.86 ±

6.30 mmHg in hypertensive children ($p < 0.001$). Mean DBP showed a similar trend, increasing from 68.46 ± 6.40 mmHg in the normal group to 74.34 ± 10.46 mmHg in prehypertensive children and 76.33 ± 10.05 mmHg in hypertensive children ($p < 0.001$). Both SBP-to-height and DBP-to-height ratios were significantly higher in the hypertensive group compared to the other groups ($p < 0.001$ for both). The mean systolic BP percentile increased markedly across categories, from 68.73 ± 15.72 in the normal group to 83.52 ± 12.21 in prehypertensive children and 98.55 ± 1.45 in hypertensive children ($p < 0.001$). BMI values were similar across the three groups ($p = 0.700$).

Pearson's correlation analysis revealed a strong positive correlation between SBP percentile and SBP-to-height ratio (r = 0.691, $p < 0.001$), indicating that higher SBP percentiles were associated with higher SBP/Ht ratios (Figure 1).

ROC curve analysis was performed to assess the diagnostic performance of BP-to-height ratios for identifying hypertension (BP ≥95th percentile for age and height) (Figure 2). The SBP-to-height ratio yielded a cut-off of 0.878 with an AUC of 0.876 (95% CI: 0.813–0.928, $p < 0.001$), sensitivity of 78.7%, and specificity of 83.5%. The DBP-to-height ratio yielded a cut-off of 0.520 with an AUC of 0.669 (95% CI: 0.573–0.766, $p = 0.001$), sensitivity of 72.3%, and specificity of 64.1% (Table 3).

DISCUSSION

This study aimed to evaluate the sensitivity and specificity of the systolic blood pressure (SBP) and diastolic blood pressure (DBP) to height ratios as diagnostic markers for elevated blood pressure in children. Our study included 150 children aged 5 to 15 years, with a gender distribution of 65 males and 85 females. The results highlighted several significant findings that contribute to the understanding of pediatric hypertension and its early diagnosis.

The study observed that females had generally higher weights and heights compared to males. However, males exhibited higher SBP/height and DBP/height ratios. These findings align with existing literature, suggesting that although females may be larger in body size, males tend to have higher blood pressure levels relative to their height[1,12]. This trend has been reported in both Indian and international pediatric populations, where boys demonstrate greater cardiovascular reactivity and slightly higher systolic values, potentially linked to early androgenic effects, differences in vascular compliance, and patterns of physical activity.The observed differences in blood pressure ratios may be attributable to gender-specific physiological and hormonal factors that influence blood pressure regulation.

Out of the 150 children, 70 were classified as normal, 33 as prehypertensive, and 47 as hypertensive. Notably, the mean age of hypertensive children was significantly lower (8.91 years) compared to those who were normal (10.43 years) or prehypertensive (9.52 years). This finding suggests that younger children in the studied age group are more likely to exhibit higher blood pressure levels, which could be due to early onset hypertension or other underlying risk factors [13].This age-related pattern is clinically relevant, as it emphasizes the possibility that early endothelial dysfunction, obesity-related hemodynamic changes, or genetic predispositions may manifest before adolescence. Early-onset hypertension in childhood has been linked to accelerated arterial stiffening and left ventricular hypertrophy, reinforcing the need for earlier screening in at-risk groups.

A strong positive correlation was found between SBP percentiles and the SBP/height ratio (r (148) = .691, p < .001). This indicates that as the SBP percentiles increase, the SBP/height ratio also increases, reinforcing the potential of this ratio as a reliable indicator of elevated blood pressure in children. Previous studies have highlighted the importance of height-adjusted blood pressure measurements in paediatric populations, as they account for body size variations and provide a more accurate assessment of hypertensive status [14].The advantage of BP-to-height ratios lies in their independence from complex percentile charts, making them easier for primary care providers, school health workers, and community screening programs to implement, particularly in resource-limited settings.

The ROC analysis demonstrated a steep progression in sensitivity and specificity above certain cut-off values for the SBP/height and DBP/height ratios. The cut-off values identified for diagnosing hypertension (BP > 95th percentile) were 0.878 for the SBP/height ratio and 0.52 for the DBP/height ratio. These thresholds provide a practical tool for clinicians to identify children at risk for hypertension, facilitating early intervention and management. The use of ROC curves in establishing diagnostic cut-offs is a widely accepted method, providing robust validation for these ratios as screening tools [15].Our cut-offs are comparable to those reported by Lu et al. in Chinese adolescents, though slightly higher for SBP/Ht, which may reflect ethnic differences in height distribution, dietary sodium intake, and body composition. This suggests that population-specific validation of these ratios is essential before widespread implementation.

The findings from this study underscore the importance of routine blood pressure screening in paediatric populations, particularly using height-adjusted measurements. Early detection of elevated blood pressure through simple ratios like SBP/height and DBP/height can lead to timely lifestyle modifications and medical interventions, potentially preventing long-term cardiovascular complications [16]. Given that pediatric hypertension often remains undiagnosed until late adolescence or adulthood, integrating such simple indices into school health programs could improve detection rates. Furthermore, as obesity and sedentary lifestyles become more prevalent in Indian children, the application of these ratios could be extended to annual school health check-ups, sports fitness evaluations, and rural outreach programs.

In summary, our findings support the use of BP-to-height ratios as an accessible, low-cost, and accurate screening method in clinical and community settings. While the SBP/height ratio demonstrated superior diagnostic performance compared to DBP/height, both ratios correlated well with BP percentiles. The practical implications include reduced reliance on cumbersome percentile charts, enabling faster decision-making in outpatient and screening environments.

Future research directions should include multi-centre studies across diverse Indian states to develop age- and sex-specific reference values, prospective longitudinal studies to determine predictive validity for adult hypertension, and integration of BP-to-height ratio cut-offs into electronic medical record systems for automated flagging during routine pediatric visits.

Limitations: This was a single-center, retrospective study, which may limit generalizability. Blood pressure was measured at a single visit, which could overestimate hypertension prevalence. Confounding factors such as diet, physical activity, and family history were not assessed. Future multi-center, longitudinal studies are recommended to validate these findings.

In conclusion, this study highlights the efficacy of SBP/height and DBP/height ratios as diagnostic markers for hypertension in children. The strong correlation between these ratios and blood pressure percentiles, along with their high sensitivity and specificity, supports their use in clinical practice. Our results demonstrate that the SBP-to-height ratio, in particular, outperforms the DBP-to-height ratio in diagnostic accuracy, making it a practical and reliable screening tool in both clinical and community settings.

The simplicity of calculating these ratios without the need for complex percentile charts allows for their integration into school health programs, primary care clinics, and rural health outreach initiatives. In resource-limited settings, this can facilitate earlier identification of at-risk children, enabling timely lifestyle interventions, dietary counselling, and medical management where needed.

Given the observed trend of younger children presenting with hypertension, implementing such tools could help address the problem at an earlier stage, potentially reducing the burden of cardiovascular disease later in life.

Future research should aim to validate these findings in larger, more diverse populations, develop population-specific cut-offs for different age and sex groups, and explore the long-term predictive value of BP-to-height ratios for adult hypertension and cardiovascular outcomes. Integration with electronic health record systems and mobile health applications could further streamline the use of these ratios, ensuring that no opportunity for early detection is missed.

REFERENCES

1. Khoury M, Madsen N. Screening and Management of High Blood Pressure in Children and Adolescents. JAMA Pediatr. 2018 Nov 1;172(11):1087.
2. Kliegman RM. Nelson textbook of pediatrics. 21st edition. Philadelphia, MO: Elsevier; 2019.
3. Zhou B, Perel P, Mensah GA, Ezzati M. Global epidemiology, health burden and effective interventions for elevated blood pressure and hypertension. Nat Rev Cardiol. 2021 Nov;18(11):785–802.
4. Falkner B, Gidding SS, Baker-Smith CM, Brady TM, Flynn JT, Malle LM, et al. Pediatric Primary Hypertension: An Underrecognized Condition: A Scientific Statement From the American Heart Association. Hypertension [Internet]. 2023 Jun [cited 2024 Jul 15];80(6). Available from: https://www.ahajournals.org/doi/10.1161/HYP.0000000000000228
5. Meena J, Singh M, Agarwal A, Chauhan A, Jaiswal N. Prevalence of Hypertension among Children and Adolescents in India: A Systematic Review and Meta-Analysis. Indian J Pediatr. 2021 Nov;88(11):1107–14.
6. Meng Y, Mynard JP, Smith KJ, Juonala M, Urbina EM, Niiranen T, et al. Pediatric Blood Pressure and Cardiovascular Health in Adulthood. Curr Hypertens Rep [Internet]. 2024 Jun 15 [cited 2024 Jul 15]; Available from: https://link.springer.com/10.1007/s11906-024-01312-5
7. Kotsis V, Stabouli S, Papakatsika S, Rizos Z, Parati G. Mechanisms of obesity-induced hypertension. Hypertens Res. 2010 May;33(5):386–93.
8. Li Y, Haseler E, Chowienczyk P, Sinha MD. Haemodynamics of Hypertension in Children. Curr Hypertens Rep. 2020 Aug;22(8):60.
9. Lu Q, Ma CM, Yin FZ, Liu BW, Lou DH, Liu XL. How to simplify the diagnostic criteria of hypertension in adolescents. Journal of Human Hypertension. 2011 Mar 1;25(3):159–64.

10. Buderer NMF. Statistical Methodology: I. Incorporating the Prevalence of Disease into the Sample Size Calculation for Sensitivity and Specificity. Academic Emergency Medicine. 1996 Sep;3(9):895–900.
11. Ambarita K, Ramayani OR, Lubis M, Fujiati II, Ramayati R, Rusdidjas R. Blood pressure-to-height ratio for diagnosing hypertension in adolescents. PI. 2017 Apr 28;57(2):84.
12. Rosner B, Cook NR, Daniels S, Falkner B. Childhood Blood Pressure Trends and Risk Factors for High Blood Pressure: The NHANES Experience 1988–2008. Hypertension. 2013 Aug;62(2):247–54.
13. Hansen ML, Gunn PW, Kaelber DC. Underdiagnosis of Hypertension in Children and Adolescents.
14. Falkner B. Recent Clinical and Translational Advances in Pediatric Hypertension. Hypertension. 2015 May;65(5):926–31.
15. Obuchowski NA. Receiver Operating Characteristic Curves and Their Use in Radiology. Radiology. 2003 Oct;229(1):3–8.
16. The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents.

		Mean	**SD**	**p-value**
Age (yrs)	Males	9.02	2.41	0.004
	Females	10.31	2.86	
Weight (Kg)	Males	35.85	11.16	0.069
	Females	39.51	12.83	
Height (cm)	Males	135.19	14.61	0.028
	Females	141.31	18.1	
Systolic Blood Pressure (mmHg)	Males	115.32	10.3	0.741
	Females	115.87	9.78	
Diastolic Blood Pressure (mmHg)	Males	71.46	8.91	0.513
	Females	72.46	9.53	
SBP / Height	Males	0.859	0.1	0.143
	Females	0.832	0.12	
DBP / Height	Males	0.534	0.088	0.379
	Females	0.521	0.086	
Systolic BP Percentile	Males	82.35	15.64	0.538
	Females	80.54	19.32	
BMI	Males	19.02	2.53	0.842
	Females	19.11	2.56	

Table 1: Anthropometric and Blood Pressure Parameters by Sex in the Study Population

Variables		**SS**	**df**	**MS**	**F**	**Significance**
Age (yrs)	Normal	67.72	2	33.861	4.729	0.01
	Prehypertension	1052.448	147	7.16		
	Hypertension	1120.168	149			
Weight (Kg)	Normal	542.823	2	271.411	1.834	0.163
	Prehypertension	21756.341	147	148.002		
	Hypertension	22299.164	149			
Height (cm)	Normal	1654.584	2	827.292	2.972	0.054
	Prehypertension	40923.922	147	278.394		
	Hypertension	42578.506	149			
Systolic blood pressure (mmHg)	Normal	7897.112	2	3948.558	83.605	< .001
	Prehypertension	6942.585	147	47.228		

	Hypertension	14839.697	149			
Diastolic blood pressure (mmHg)	Normal	1767.316	2	883.658	11.834	<.001
	Prehypertension	10976.228	147	74.668		
	Hypertension	12743.544	149			
SBP / Height	Normal	0.812	2	0.406	56.079	< .001
	Prehypertension	1.064	147	0.007		
	Hypertension	1.876	149			
DBP / Height	Normal	0.193	2	0.096	15.392	< .001
	Prehypertension	0.92	147	0.006		
	Hypertension	1.113	149			
Systolic BP Percentile	Normal	25215.291	2	12607.65	84.566	< .001
	Prehypertension	21915.702	147	149.086		
	Hypertension	47130.993	149			
BMI	Normal	4.643	2	2.322	0.357	0.7
	Prehypertension	955.3	147	6.499		
	Hypertension	959.943	149			

Table 2: Anthropometric and Blood Pressure Parameters Compared Across Blood Pressure Categories (Normal, Prehypertension, Hypertension)

Variable	Cut-off	AUC	p-value	95% CI upper limit	95% CI lower limit	Sensitivity	Specificity
SBP/Ht	0.878	0.876	< .001	0.821	0.931	78.70%	83.50%
DBP/Ht	0.52	0.669	0.001	0.573	0.766	72.30%	64.10%

Table 3: Receiver Operating Characteristic (ROC) Curve Analysis for SBP/Ht and DBP/Ht Ratios in Detecting Hypertension

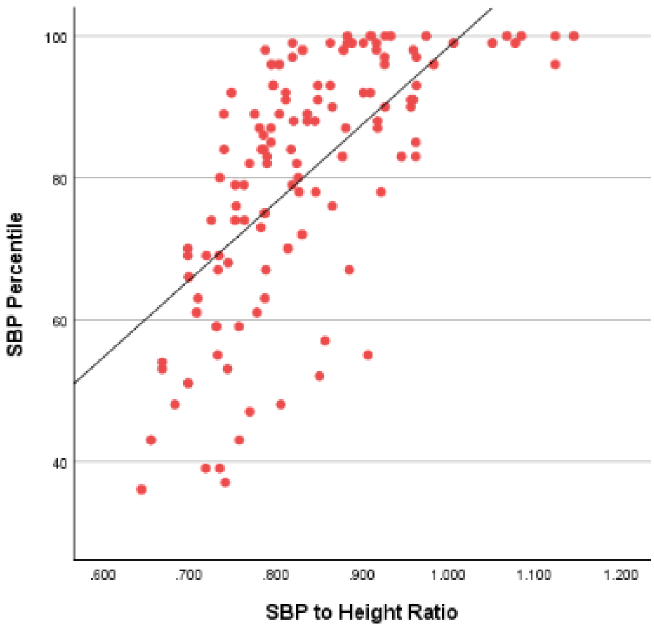

Figure 1: Scatter Plot Showing the Correlation Between Systolic BP Percentile and SBP-to-Height Ratio

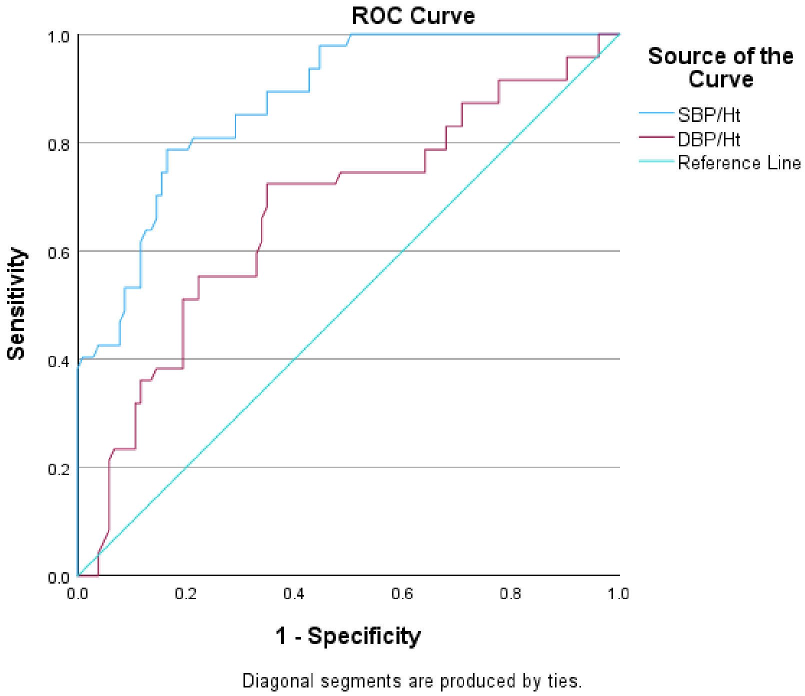

Figure 2: ROC Curves for SBP-to-Height and DBP-to-Height Ratios in Detecting Hypertension