ARTICLE

"PREVALENCE OF HYPERTENSION AND ITS ASSOCIATION WITH OBESITY AMONG CHILDREN AGED BETWEEN 12YEARS AND 16YEARS - A CROSS-SECTIONAL OBSERVATIONAL STUDY"

Dr. Shridhar Neminath Aski[1], Dr. K. B. Mahendrappa[2], Dr. Nandhakumar V[3], Dr Meghana S K[4], Dr Sri Raksha S[5], Dr. R. Keerthi[6]

[1]Junior Resident, 3rd Year, Department of Paediatrics, Adichunchanagiri Institute of Medical Sciences, Adichunchanagiri University, B.G. Nagara, Mandya District, Karnataka – 571448, India

[2]Professor and Head, Department of Paediatrics, Adichunchanagiri Institute of Medical Sciences, Adichunchanagiri University, B.G. Nagara, Mandya District, Karnataka – 571448, India

[3]Associate Professor, Department of Paediatrics, Adichunchanagiri Institute of Medical Sciences, Adichunchanagiri University, B.G. Nagara, Mandya District, Karnataka – 571448, India

[4]Assistant Professor, Department of Paediatrics, Adichunchanagiri Institute of Medical Sciences, Adichunchanagiri University, B.G. Nagara, Mandya District, Karnataka – 571448

[5]India, Assistant Professor, Department of Paediatrics, Adichunchanagiri Institute of Medical Sciences, Adichunchanagiri University, B.G. Nagara, Mandya District, Karnataka – 571448

[6]India, Assistant Professor, Department of Community Medicine, Adichunchanagiri Institute of Medical Sciences, Adichunchanagiri University, B.G. Nagara, Mandya District, Karnataka – 571448, India

Corresponding author: Dr. K. B. Mahendrappa, drmahendrappakb@bgsaims.edu.in

ABSTRACT

Background: Childhood obesity and hypertension are emerging public health concerns worldwide, particularly in developing countries undergoing rapid urbanization and lifestyle transitions. Hypertension in childhood often remains undiagnosed because it is usually asymptomatic, yet it has significant long-term cardiovascular implications. Early identification of elevated blood pressure and associated risk factors such as obesity is therefore essential. Limited region-specific data are available regarding the burden of paediatric hypertension and its association with obesity in school-aged children in India, necessitating local studies to guide preventive strategies. Objective: To determine the prevalence of hypertension among school children aged 12–16 years and to assess the association between hypertension and obesity in the study population. Methods: This study was a cross-sectional observational study conducted among 466 children aged 12 years–16 years. Participants were selected according to predefined inclusion and exclusion criteria after obtaining informed consent and institutional approval. Anthropometric measurements including height, weight, and body mass index (BMI) were recorded using standardized techniques. Blood pressure was measured using appropriate cuff size and standard protocols, and 3 blood pressure readings were taken. Children were categorized into BMI groups (underweight, normal, overweight, and obese) based on standard growth references. Blood pressure classification was performed according to paediatric guidelines. Demographic details, family history of hypertension, and socioeconomic variables were collected using a structured proforma. Data were entered and analysed using statistical methods to determine prevalence and associations, with significance assessed using appropriate tests. Results: The study included 466 participants, with a mean age of approximately 13.95 ± 1.39 years. Females constituted 54.9% of the sample, while males accounted for 45.1%. More than half of the children (51.9%) had normal BMI, while 26.2% were overweight, 13.3% were obese, and 8.6% were underweight. The prevalence of hypertension was 4.3%, while the majority (95.7%) had normal blood pressure. Prevalence of hypertension in obese children's is 9.7% and prevalence of hypertension in non-obese children's is 3.5%. A statistically significant association was observed between BMI category and blood pressure classification, with overweight and obese children showing higher rates of hypertension. Family. History of hypertension also demonstrated a significant relationship with elevated blood pressure. However, variables such as age, sex, socioeconomic status, and residence did not show statistically significant associations in this study. Conclusion: This study demonstrates the prevalence hypertension is present in 4.3% of school children and is significantly associated with BMI. These findings highlight the growing burden of lifestyle-related disorders in the paediatric population. Early screening of school children for hypertension and obesity may help to identify the high-risk group to prevent further complications. Health education, promotion of physical activity, and nutritional interventions in schools are essential to prevent long-term cardiovascular morbidity. Collaborative efforts involving parents, schools, healthcare providers, and policy makers are crucial to address childhood obesity and hypertension effectively.

Keywords: Childhood hypertension, Obesity, Body mass index, Blood pressure, Prevalence, School children, Preventive health

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INTRODUCTION

Obesity is a complex, multifactorial chronic condition characterized by excessive accumulation of body fat resulting from an imbalance between caloric intake and energy expenditure. It arises from a combination of genetic, behavioural, environmental, and socioeconomic factors that disrupt normal metabolic regulation. Over recent decades, the global prevalence of obesity has escalated dramatically, affecting both developed and developing nations. Once predominantly seen in adults, obesity is now increasingly common among children and adolescents, posing serious health and social concerns.

In recent years, the prevalence of hypertension among children and adolescents has risen concurrently with increasing rates of overweight, obesity, and unhealthy dietary patterns[1-4]. According to the World Health Organization (WHO), approximately 42 million children under five years of age were overweight or obese globally in 2013 [5,6,7.] National data from Turkey indicate that the prevalence of obesity increased markedly from 0.6% between 1990 and 1995 to 7.3% during 2011–2015 [8] The prevalence of hypertension ranges between 4% and 14% among overweight children and between 11% and 23% among obese children[5,6]

Hypertension in children is classified as either primary (essential) or secondary. Primary hypertension—often linked to family history—is more common in overweight individuals and increases proportionally with body mass index (BMI) [9,10] The American Academy of Paediatrics (AAP) updated its diagnostic criteria in 2017, defining elevated blood pressure in children aged 1–13 years as values between the 90th and 95th percentiles or systolic 120–129 mm Hg with diastolic <80 mm Hg, and hypertension as readings ≥95th percentile or ≥130/80 mm Hg, whichever is lower [11] For adolescents aged 13 years and above, the American Heart Association (AHA) and American College of Cardiology (ACC) classify stage 1 hypertension as 130/80–139/89 mm Hg and stage 2 as ≥140/90 mm Hg[11,12]

Obesity and hypertension share a complex, bidirectional relationship, with central (abdominal) obesity exerting significant effects on both endocrine and immune regulatory pathways. The accumulation of visceral adipose tissue contributes to metabolic disturbances that heighten the risk of insulin resistance, type 2 diabetes mellitus, hypertension, and cardiovascular disease[13] Obesity is now established as a major independent risk factor for hypertension across all age groups, and this association is consistent across racial, ethnic, and gender differences[14]. Longitudinal studies have shown a strong positive relationship between increasing BMI and the incidence of hypertension [15,16]. Individuals who gain 5–10 kg or more than 25 kg have approximately 1.7-fold and 5.2-fold higher risks of developing hypertension, respectively, with nearly 40% of new cases attributed directly to excess body weight [1]. Furthermore, increased adiposity accounts for about one-quarter of hypertension cases in both sexes, with prevalence rising progressively across BMI categories—reaching up to 87% in those with class III obesity[16,17]

Obesity-induced hypertension results from multiple interacting mechanisms, including hemodynamic alterations, endothelial dysfunction, oxidative stress, renal impairment, insulin resistance, sleep apnea, and activation of the leptin–melanocortin pathway. Central obesity leads to higher systemic vascular resistance and lower cardiac output than peripheral obesity. Excess adipose tissue promotes vascular dysfunction through pro-inflammatory adipokines such as angiotensin II, aldosterone, and resistin, alongside increased renin activity and impaired vasodilation due to glycocalyx damage. Elevated free fatty acids enhance reactive oxygen species production via NADPH oxidase, accelerating atherosclerosis and vascular injury. Visceral fat compresses the kidneys, activates the renin–angiotensin–aldosterone system (RAAS) and sympathetic nervous system (SNS), and increases sodium retention, resulting in nephron loss and hypertension. Insulin resistance further stimulates sympathetic activity and renal sodium reabsorption through NHE3, ENaC, and WNK kinases. Sleep apnea aggravates hypertension via hypoxia-induced endothelial dysfunction, while leptin-mediated sympathetic activation raises blood pressure through RAAS stimulation and sodium retention [18].

Recent evidence indicates that the pooled prevalence of hypertension among Indian children under 18 years is approximately 7%, while prehypertension affects around 10%. The burden is markedly higher among obese children (29%) compared to overweight (21%) and normal-weight peers (7%). This trend mirrors the global rise in childhood obesity and highlights the urgent need for early prevention and public health interventions. Meta-analyses estimate the global prevalence of sustained paediatric hypertension at 3.89% and occasional hypertension at 11.85%, with both significantly higher among overweight and obese children 19In India, cross-sectional and systematic studies report hypertension prevalence between 5% and 15%, with obesity identified as the strongest modifiable risk factor [20,21,22]. International studies similarly show that overweight and obese children have up to six- to sevenfold higher odds of developing hypertension compared with normal-weight peers [23,24,25]

Moreover, obesity contributes not only to elevated blood pressure but also to structural and functional cardiovascular alterations, including left ventricular hypertrophy, endothelial dysfunction, and renal impairment[26,27] Additional factors such as poor dietary habits, sedentary lifestyles, psychosocial stress, and increased screen time further exacerbate pediatric obesity and hypertension[28,29]

Despite substantial global and regional evidence linking obesity with paediatric hypertension, population-specific data—particularly from developing countries like India—remain limited. Rapid urbanization, changing dietary patterns, and sedentary behaviours are reshaping children's health, yet systematic, region-specific studies quantifying the burden of obesity-related hypertension are scarce. Variations in diagnostic standards, methodologies, and sociodemographic contexts contribute to inconsistent prevalence estimates. Furthermore, paediatric hypertension often goes undiagnosed due to its asymptomatic nature and lack of routine screening in schools and primary healthcare settings. Given the increasing prevalence of both obesity and hypertension in children, there is a pressing need for regionally [3] .Relevant studies to determine their true magnitude, identify modifiable risk factors, and develop effective preventive and management strategies aimed at reducing long-term cardiovascular morbidity and mortality.

MATERIALS AND METHODS

- **Study Design**: This study was designed as a cross-sectional observational study.
- **Study Setting**: The study was conducted at government school in Nagamangala taluk, mandya district, Karnataka.
- **Study Population**: The study population includes Government school children aged 12 to 16 years residing in Nagamangala Taluk, Mandya District.

● **Study Duration**: The study was carried out over a period of 18 months, from May 2024 to December 2025.

Inclusion Criteria

1. Children aged between 12 and 16 years studying in two Government schools and whose parents or guardians provided written informed consent.

Exclusion Criteria

1. CHILDREN WITH CONGENITAL ANOMALIES.

2. Children with metabolic disorders (e.g., diabetes mellitus, hypothyroidism).

3. CHILDREN ON ANY CHRONIC MEDICATIONS.

Sample Size Determination

The sample size was calculated using the formula: □=4□□□2

Where:

● p = prevalence of hypertension (from reference study)

● q = 100 − p

● d = allowable error (5% of p)

Using prevalence from the study conducted by Oschega Y. Hughes et al., □=4×60×7036=466

n=466 [32]

Sampling Method: Participants were selected using simple random sampling to ensure adequate representation of the target population. 2 Schools were randomly selected from Nagamangala Taluk, and eligible students within the selected schools were invited to participate in the study.

Ethical Considerations

Prior to initiation, the study received ethical clearance from the Institutional Ethics Committee of Adichunchanagiri Institute of Medical Sciences. Written and informed consent was obtained from the parents or guardians of all participants. Consent was also obtained from children aged above 12 years after explaining the study objectives in simple terms.

Method of Data Collection

The study was conducted after obtaining ethical clearance from the Institutional Ethics Committee of Adichunchanagiri Institute of Medical Sciences (AIMS), B.G. Nagara, Mandya District. Written and informed consent was obtained from the parents or guardians of all participants, and assent was taken from children above 12 years of age after explaining the purpose and procedures of the study in simple language.

Data were collected from school children aged 12 to 16 years studying in government school in Nagamangala taluk over an 18-month period. A structured proforma was used to record demographic details, anthropometric measurements, and blood pressure readings. Height was measured to the nearest 0.1 cm using a stadiometer, and weight was measured to the nearest 0.1 kg using a calibrated digital weighing scale. BMI was calculated using the formula: □□□=□□□□*h*□ (□□)/□□□□*h*□ (□)²

and classification into underweight, normal weight, overweight, or obese categories was done according to WHO age- and sex-specific growth chart percentiles.

Blood pressure was measured using a standard mercury sphygmomanometer with an appropriately sized cuff that covered two-thirds of the upper arm. Three readings were taken at 5-minute intervals in a seated position after adequate rest, and the average of the three readings was recorded. The classification of blood pressure followed the 2017 American Academy of Paediatrics (AAP) guidelines for children and adolescents, which defined elevated BP and hypertension based on age, sex, and height percentiles. All collected data were entered into Microsoft Excel for coding and cleaning, and later analysed using SPSS version 25.0 for statistical evaluation.

Statistical Analysis

All collected data were entered into Microsoft Excel and analysed using SPSS software version 25.0. Continuous variables were expressed as mean ± standard deviation (SD), while categorical [33] variables were represented as frequencies and percentages. The Chi-square test (χ^2) was applied to determine the association between categorical variables such as obesity and hypertension. A p-value < 0.05 was considered statistically significant. Additional tests such as Pearson's correlation coefficient were used to evaluate the relationship between BMI and systolic/diastolic blood pressure where applicable.

RESULTS

Table1: Age Distribution (n = 466)

Age (years)	Frequency	Percentage (%)
12	102	21.9
13	82	17.6
14	92	19.7
15	116	24.9
16	74	15.9
Total	466	100
Mean + SD	13.95 + 1.39	

The study population comprised 466 school children, with the most represented age being 15 years, accounting for 24.9% (n=116) of the total sample. This was followed by those aged 12 years (21.9%), 14 years (19.7%), 13 years (17.6%), and 16 years (15.9%). The mean age of the participants was 13.95 years with a standard deviation of 1.39, indicating a fairly even spread of participants across the 12–16-year age group.

Table 2: Sex Distribution

Sex	Frequency	Percentage (%)
Female	256	54.9
Male	210	45.1
Total	466	100

Out of the total 233 participants, 256 were female, making up 54.9% of the sample, while males constituted 45.1% (n=210). This reflects a slightly higher representation of females in the study population.

Table 3: Socioeconomic Status

Socioeconomic Status	Frequency	Percentage (%)
High	112	24
Low	118	25.3
Middle	236	50.6
Total	466	100

The majority of the students, accounting for 50.6% (n=236), belonged to the middle socioeconomic status group. Low socioeconomic status was reported in 25.3% (n=118), while the high socioeconomic group represented 24% (n=112) of the sample. This distribution suggests a predominance of middle-income backgrounds among the schoolchildren surveyed.

Table 4: Residence

Residence	Frequency	Percentage (%)
Rural	194	41.6
Urban	272	58.4
Total	466	100

A greater proportion of participants resided in urban areas, comprising 58.4% (n=272) of the total sample, while the remaining 41.6% (n=194) were from rural areas. This indicates a slightly urban-skewed sample distribution.

Table 5: Family History of Hypertension

Family History of HTN	Frequency	Percentage (%)
Yes	136	29.2
No	330	70.8
Total	466	100

Nearly one-third of the participants (29.2%, n=136) reported a family history of hypertension, whereas 70.8% (n=330) had no such history. This reveals a significant segment of the cohort with a hereditary predisposition to high blood pressure.

Table 6: Anthropometric Measurements

Parameter	Mean	Standard Deviation
Height (cm)	160.47	5.79
Weight (kg)	56.85	11.92
BMI (kg/m²)	22.01	4.13

The mean height of the study participants was 160.47 cm with a standard deviation of 5.79 cm, while the mean weight was 56.85 kg with a standard deviation of 11.92 kg. The calculated mean BMI was 22.01 kg/m² with a standard deviation of 4.13, reflecting variability in body composition across the population.

Table 7: BMI Category

BMI Category	Frequency	Percentage (%)
Normal	242	51.9
Obese	62	13.3
Overweight	122	26.2
Underweight	40	8.6
Total	466	100

More than half of the children (51.9%, n=242) fell within the normal BMI category. Overweight children constituted 26.2% (n=122), while 13.3% (n=62) were classified as obese. Additionally, 8.6% (n=40) were underweight. These results indicate a concerning prevalence of both overweight and obesity among the schoolchildren, affecting nearly 40% of the cohort.

Table 8: Systolic Blood Pressure Readings

Parameter	Mean	Standard Deviation
SBP 1 (mmHg)	109.83	6.56
SBP 2 (mmHg)	110.1	6.61
SBP 3 (mmHg)	109.79	6.55

Three consecutive systolic blood pressure readings showed very close mean values: 109.83 mmHg, 110.1 mmHg, and 109.79 mmHg respectively, with standard deviations hovering around 6.5 mmHg. This consistency across readings enhances the reliability of the measurements.

Table 9: Diastolic Blood Pressure Readings

Parameter	Mean	Standard Deviation
DBP 1 (mmHg)	68.24	5.41
DBP 2 (mmHg)	68.38	5.5
DBP 3 (mmHg)	68.33	5.33

The diastolic readings were similarly consistent, with means of 68.24 mmHg, 68.38 mmHg, and 68.33 mmHg for the three readings, and standard deviations around 5.4 mmHg. These stable values suggest dependable BP monitoring across trials.

Table 10: Blood Pressure Classification

BP Classification	Frequency	Percentage (%)
Normal	446	95.7
Hypertension	20	4.3
Total	466	100.0

Most of the participants (95.7%, n=446) had normal blood pressure levels. However, 4.3% (n=20) were classified as hypertensive. This highlights the presence of high blood pressure, suggesting a public health concern at the school level.

Table 11: Association between BMI Category and Blood Pressure Classification

BMI Category	Blood Pressure	p-value	
	Normal	Hypertension	
Underweight (n=40)	40 (100.0%)	0 (0.0%)	<0.001*
Normal (n=242)	232 (95.9%)	10 (4.1%)	
Obese (n=62)	56 (90.3%)	6 (9.7%)	
Overweight (n=122)	118 (96.7%)	4 (3.3%)	

A significant association was observed between BMI and blood pressure classification ($p < 0.001$). Notably, none of the underweight children were hypertensive, while 9.7% of obese children had hypertension. The normal-weight and overweight groups showed relatively lower hypertension rates at 4.1% and 3.3%, respectively. These findings highlight a clear trend of increased hypertension prevalence with higher BMI, even when elevated BP is considered part of the normal range.

Table 12: Association between Age and BP Classification (n = 466)

Age (years)	Blood Pressure	p-value	
	Normal	Hypertension	
12 (n=102)	96 (94.1%)	6 (5.9%)	0.798
13 (n=82)	80 (97.6%)	2 (2.4%)	
14 (n=92)	90 (97.8%)	2 (2.2%)	
15 (n=116)	112 (96.6%)	4 (3.4%)	
16 (n=74)	68 (91.9%)	6 (8.1%)	

No statistically significant association was found between age and blood pressure classification ($p = 0.798$). However, the 16-year-old group had the highest proportion of hypertensive participants (8.1%), followed by the 12-year-olds (5.9%). Other age groups showed relatively lower hypertension rates, with 14-year-olds having the lowest at 2.2%. While not statistically conclusive, these patterns may suggest a nonlinear relationship between age and BP in adolescents.

Table 13: Association between Sex and BP Classification (n = 466)

Sex	Blood Pressure	p-value	
	Normal	Hypertension	
Female (n=256)	248 (96.9%)	8 (3.1%)	0.078
Male (n=210)	198 (94.3%)	12 (5.7%)	

Although the difference was not statistically significant ($p = 0.078$), a trend was evident: male participants had a higher prevalence of hypertension (5.7%) compared to females (3.1%). This suggests a possible sex-based predisposition, with boys showing a slightly greater vulnerability to elevated blood pressure outcomes.

Table 14: Association between Socioeconomic Status and BP Classification (n = 466)

SES	Blood Pressure	p-value	
	Normal	Hypertension	
Low (n=118)	110 (93.2%)	8 (6.8%)	0.254
Middle (n=236)	228 (96.6%)	8 (3.4%)	
High (n=112)	108 (96.4%)	4 (3.6%)	

No significant association was found between socioeconomic status (SES) and blood pressure classification ($p = 0.254$). However, the low SES group had the highest hypertension prevalence (6.8%), while the middle and high SES groups showed lower rates (3.4% and 3.6%, respectively). Though not statistically robust, this may imply a modest socioeconomic gradient in hypertension risk.

Table 15: Association between Residence and BP Classification (n = 466)

Residence	Blood Pressure	p-value	
	Normal	Hypertension	
Rural (n=194)	186 (95.9%)	8 (4.1%)	0.303
Urban (n=272)	260 (95.6%)	12 (4.4%)	

There was no statistically significant relationship between place of residence and hypertension (p = 0.303). However, urban participants showed a slightly higher hypertension rate (4.4%) compared to rural counterparts (4.1%). This minimal difference suggests that urban lifestyle factors may play a minor role, but further research is needed to confirm this.

Table 16: Association between Family History of Hypertension and BP Classification (n = 466)

Family History	Blood Pressure	p-value	
	Normal	Hypertension	
Yes (n=136)	120 (88.2%)	16 (11.8%)	0.001*
No (n=330)	326 (98.8%)	4 (1.2%)	

A statistically significant association was found between family history of hypertension and actual blood pressure status among participants (p = 0.001). Children with a positive family history were almost 10 times more likely to be hypertensive (11.8%) compared to those with no such history (1.2%). This strongly indicates a hereditary or genetic predisposition, emphasizing the importance of family health history in early screening.

DISCUSSION

Childhood obesity and hypertension have emerged as significant public health concerns worldwide, particularly in low- and middle-income countries undergoing rapid nutritional and epidemiological transitions. The present study evaluated the prevalence of hypertension and its association with obesity among school-going children aged 12–16 years in Nagamangala Taluk, Karnataka. The findings demonstrated a hypertension prevalence of 4.3%, with a significant association between increased body mass index (BMI) and elevated blood pressure. These observations reinforce existing evidence that excess adiposity during childhood contributes substantially to the development of hypertension and future cardiovascular risk.[1,5,6]

The mean age of participants in the present study was 13.95 ± 1.39 years, with a slight female predominance (54.9%). More than half of the participants belonged to the middle socioeconomic class, and approximately one-third reported a positive family history of hypertension. Similar demographic distributions have been reported in Indian school-based studies evaluating obesity and hypertension among adolescents.[20-22] The relatively balanced age and sex distribution in our study enhances the generalizability of the findings to school-aged children in similar settings.

The prevalence of overweight and obesity observed in the present study was 26.2% and 13.3%, respectively. Thus, nearly 40% of the study population exhibited excess body weight. These findings are concerning and reflect the increasing burden of childhood obesity in India. Gupta et al. and Raj and Kumar highlighted the growing prevalence of childhood obesity in developing countries due to urbanization, sedentary lifestyles, reduced physical activity, and increased consumption of calorie-dense foods[23,24] Similar trends have been documented globally, where childhood obesity has reached epidemic proportions and is recognized as a major contributor to cardiovascular and metabolic diseases later in life.[2,14]

The overall prevalence of hypertension in the present study was 4.3%. This finding is comparable to global estimates reported by Song et al., who observed a pooled prevalence of approximately 4% among children and adolescents worldwide.[19] Patel et al. also reported hypertension prevalence ranging between 5% and 10% among Indian school children, emphasizing that elevated blood pressure during childhood is no longer an uncommon phenomenon.[20] The prevalence identified in our study indicates that a substantial proportion of apparently healthy school children may already have elevated cardiovascular risk.

A major finding of the present study was the significant association between BMI and blood pressure status. Hypertension was identified in 9.7% of obese children compared with 4.1% of normal-weight children, while no cases of hypertension were observed among underweight children. The association between obesity and hypertension was highly significant (p < 0.001). These findings are consistent with previous studies demonstrating a strong positive relationship between increasing BMI and elevated blood pressure among children and adolescents.[6,7,12]

Schwiebbe et al. reported that overweight and obese children had substantially higher rates of hypertension than their normal-weight counterparts, with obese children showing the greatest cardiovascular risk.[25] Similarly, Patil et al. found a significant association between obesity and hypertension among Indian adolescents and emphasized that excess body weight was one of the strongest predictors of elevated blood pressure.[21] Ali et al. also demonstrated that overweight and obese adolescents had significantly higher odds of developing hypertension compared with normal-weight peers.[22] The consistency of these findings across diverse populations strengthens the evidence that obesity is a major modifiable determinant of pediatric hypertension.

Several pathophysiological mechanisms explain the relationship between obesity and hypertension. Excess adipose tissue contributes to activation of the sympathetic nervous system and the renin–angiotensin–aldosterone system, leading to sodium retention, vascular remodeling, and increased peripheral vascular resistance.[13] Obesity is also associated with insulin resistance, chronic inflammation, endothelial dysfunction, and oxidative stress, all of which contribute to elevated blood pressure.[7,13] These mechanisms collectively explain why obese children are at substantially increased risk of developing hypertension even at an early age.

The present study did not demonstrate a statistically significant association between age and hypertension. Although older adolescents showed slightly higher prevalence rates, the difference was not significant. Similar observations have been reported in several school-based studies where BMI was found to be a stronger predictor of hypertension than age alone.[20-22] This suggests that obesity may exert a greater influence on blood pressure than chronological age during adolescence.

Likewise, no significant association was observed between sex and hypertension, although males demonstrated a slightly higher prevalence than females. Previous studies have reported inconsistent findings regarding gender differences in childhood hypertension. Some investigators have found a male predominance, whereas others have reported similar prevalence rates between sexes.[19–21] The lack of a significant association in

our study suggests that obesity and family history may be more important determinants of blood pressure than gender.

Socioeconomic status and place of residence also did not show significant associations with hypertension. Nevertheless, children from lower socioeconomic backgrounds exhibited slightly higher rates of elevated blood pressure. This trend may be related to disparities in dietary habits, access to healthcare, physical activity patterns, and health awareness. Although these factors were not statistically significant in our study, larger multicentric studies may help clarify their contribution to childhood hypertension.[20,23]

An important finding was the significant association between family history of hypertension and elevated blood pressure. Children with a positive family history were nearly ten times more likely to be hypertensive than those without such a history. This observation is consistent with previous evidence indicating that genetic predisposition plays a major role in blood pressure regulation[5,18] Family history may reflect both inherited susceptibility and shared environmental influences, including dietary practices, physical activity patterns, and lifestyle behaviors.

The findings of this study have important public health implications. Given the increasing prevalence of obesity and hypertension among adolescents, routine school-based screening programs should be encouraged for early identification of high-risk children. Interventions promoting healthy dietary practices, regular physical activity, reduced sedentary behavior, and increased awareness among parents and teachers are essential for preventing long-term cardiovascular complications.[1,4,12] Early recognition and management of obesity may substantially reduce the future burden of hypertension and cardiovascular disease.

The strengths of this study include adequate sample size, standardized anthropometric measurements, and the use of current pediatric blood pressure classification guidelines. However, certain limitations should be acknowledged. The cross-sectional design limits causal inference, and the study was conducted in a specific geographic region, which may restrict generalizability. Additionally, dietary patterns, physical activity levels, and biochemical risk factors were not evaluated. Future multicentric longitudinal studies incorporating these variables would provide a more comprehensive understanding of the determinants of pediatric hypertension.

Overall, the present study confirms that childhood obesity is significantly associated with hypertension and highlights the urgent need for preventive strategies targeting modifiable lifestyle risk factors. Early intervention during childhood and adolescence offers a valuable opportunity to reduce future cardiovascular morbidity and mortality.

CONCLUSION

Children with hypertension made up a quantifiable fraction of the research group. The results show a strong correlation between a higher BMI and hypertension, suggesting that being overweight or obese is a major modifiable risk factor. There was an increased risk of hypertension in children with a higher body mass index (BMI) compared to those with a normal BMI. These findings add to the mounting evidence that risk factors linked to lifestyle have a significant impact on cardiovascular risk development even in adolescents.

High blood pressure was also associated with a family history of the disease, which further supports the idea that both hereditary and environmental factors play a role. In this research, however, we found no statistically significant relationships between demographic characteristics including gender, age, or socioeconomic position.

Early identification, regular school-based blood pressure monitoring, and the introduction of preventative measures including increased physical activity, healthier eating habits, and parental and educator awareness are all highlighted by the research. In order to lessen the future impact of cardiovascular illnesses, school-based health activities are crucial.

Finally, hypertension and childhood obesity are becoming more serious problems in public health. Preventing adult hypertension and its long-term cardiovascular consequences requires early detection and behavioural changes. Community and school-based preventative health education and screening initiatives should be greatly enhanced. Additional research using a multicentric approach is necessary.

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