Original Article

Evaluation of Childhood Hypertension in School Going Children Attending Pediatrics OPD in Ghaziabad City

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Abstract

Introduction - The purpose of this research was to examine the incidence of hypertension and other forms of high blood pressure in school-aged children who visited the Pediatrics Outpatient Department of a tertiary hospital in a tier II city in Northern India.
Materials and methods - We used a cross-sectional observational study with school-aged children who visited the Paediatrics Outpatient Department at SMC to determine the prevalence of asthma in these patients. Information like as ages, sex, medical histories, and smoking habits of parents were recorded. A questionnaire and the 24-hour recall method were used to assess dietary patterns such junk food consumption, fruit consumption, and daily calorie intake. The stadiometer and electronic scale were used to measure height and weight, respectively, while the subjects were clad only in light clothing and without shoes.
Results- The findings showed that 9.4% and 6.8% of the respondents, respectively, had elevated blood pressure (BP 90th percentile for age, height, and sex) and hypertension (BP 95th percentile for age, height, and sex). Family history, stress, and insufficient daily physical activity all played key roles in the development of hypertension. A higher body mass index (BMI), greater height, and greater age were all linked to both illnesses.
Conclusions- Nine percent and six point eight percent of children ages 6 through 12 were reported to have high blood pressure and hypertension, respectively. These were linked to factors like personal history, life pressure, and sedentary lifestyle.
Keywords- Childhood hypertension, blood pressure, diet, physical activity, body mass index

Introduction

Systemic hypertension is a serious condition that affects children around the world. Its prevalence is estimated to be between 1% and 2% in low- and middle-income nations[1-3]. Though formerly thought to only affect adults, rising numbers of youngsters are now being diagnosed with systemic hypertension[4]. It is of major significance in developed countries because of the correlation between hypertension in children and adults. The idea that hypertension begins in childhood is supported by the fact that children may be classified according to percentile distribution starting at the preschool age and continuing along a predictable course throughout their lifespan. Uneven blood pressure is a hallmark of secondary hypertension in children, but it is not seen in kids with primary or essential hypertension[5].

Obese children have an increased risk of developing primary hypertension, a condition formerly thought to be unusual in paediatric patients. Adolescent hypertension has been linked to changes in lifestyle factors like decreased physical activity, increased calorie intake, high-sodium and low-potassium diets, caffeine and alcohol consumption, obesity, emotional discomfort, and insufficient sleep. When compared to adults, hypertension in kids is more likely to have a secondary cause like renal parenchymal pathology or renovascular illness[6]. Clinical studies in the United States show a rising secular trend in systolic and diastolic blood pressure among kids and teens due to rising rates of obesity, shifting food patterns, decreased physical activity, and increased stress. Essential hypertension is uncommon in children and adolescents, with only 2-5% prevalence[7] found in one study of school-aged children in India.

Based on older criteria and techniques, the documented incidence of diagnosed paediatric hypertension is between 2% and 4%[8-10]. The revised guidelines' impact on incidence, however, has not been thoroughly investigated. As a

result, we decided to conduct this study to see how commonplace hypertension is among the school-aged children that come to our hospital's Pediatrics OPD for checkups.

Aim:
In light of the foregoing, the purpose of this investigation was to identify the frequency of increased BP and hypertension in children and to record any associations between these conditions and potential risk factors.

Materials and Method:

The study's materials and methods included obtaining written informed consent for clinical examination and laboratory examinations from all of the school-aged children who visited the Pediatrics Outpatient Department at Santosh Medical College, a tertiary hospital. The study lasted for a full year and had 500 participants. This is how we decided who to include and who to leave out of the study:

Inclusion criteria:

a) All youngsters between the ages of 6 and 12 who are currently patients at the Pediatrics Outpatient Clinic.

Exclusion Criteria :

a) Those in need of an admission to the intensive care unit
b) Refusing to give their permission for a study, either as a child or as an adult
c) Patients whose hypertension has a definite medical explanation, such as
d) Disease of the kidneys that persists throughout time
e) Nephritic syndrome or nephritis
f) Pheochromocytoma
g) Conditions affecting the heart, also called cardiomyopathy or cardiac failure
h) Disorders of the Blood Vessels-Systemic Lupus Erythemat
i) Various Disorders of the Vascular Collagen
j) As a result of excess production of corticosteroid hormones, Cu
k) Hypothyroidism
l) Persons with genetic disorders such as Bardet-Biedl, Carpenter, Prader-Willi, etc., are excluded from participation.

Method of data collection

a) All patients who came to the OPD were given a thorough history and examination.
b) Parental or other legally permissible caregiver written informed permission was acquired.
c) Age, gender, race/ethnicity, marital status, and smoking habits of both parents were recorded in a proforma to better understand the population's socioeconomic makeup.
d) Using meal frequency questionnaires and the 24-hour recall method, researchers analysed dietary behaviours such junk food and fruit consumption as well as daily calorie intake.
e) The candidate's height was measured using a stadiometer while they stood barefoot on the floor.
f) Subjects were asked to remove all except the lightest of clothing before being weighed on an electronic scale, and the results were rounded up to the next unit.
g) Body mass index (BMI) was determined by dividing a person's weight in kilogrammes by their height in metres and using the result as a percentage (m2).
h) A sphygmomanometer was used to listen to the patient's pulse and take their blood pressure using a cuff sized appropriately for a youngster.
i) After the youngster had rested for five minutes, their blood pressure was taken while they sat upright.
j) Only after three separate trips to the outpatient department did doctors start diagnosing children with hypertension.

Blood pressure was taken while the patient was seated using a calibrated sphygmomanometer (Diamond Deluxe BP Apparatus) and an appropriately sized cuff. Anxious kids were reassured and procedures were explained to them. The right arm was used to take the reading. Each person's blood pressure was taken three times, with a cuff sized appropriately based on their upper arm circumference. Each measurement was taken after a 30-minute resting period, and the average blood pressure was calculated. Diastolic blood pressure was recognised by the cessation of

the Korotkoff-1 sound, while systolic BP was indicated by its appearance (Korotkoff-5). Pre-hypertension is defined as having a mean SBP or DBP grade of at least the 90th centile but less than the 95th centile for gender, age range, and height on at least three separate visits (elevated blood pressure). If your blood pressure readings on at least three separate occasions averaged out to be at or above the 95th percentile for your gender, age group, and height, then you have hypertension.

For statistical analysis, the compiled information was entered into a computerised spreadsheet (MS Excel, Microsoft Systems®) and tallied with the help of a statistician. Statistical analysis was performed based on each group's mean and standard deviation (SPSS 22.00 for MS Windows; SPSS Inc., Chicago, USA). One-way ANOVA was used for statistical analysis across all measurement scales. Chi-square test was used to compare the two groups, and p less than 0.05 was considered significant.

Results

The findings showed that out of 500 participants, 204 were male (40.8%) and 296 were female (59.2%). Subjects aged 6–10 made up 73.6% of the sample, while those aged 10–12 made up 26.4%. The participants' blood pressures are listed in Table 1. Eighty-three percent of the participants had normal blood pressure readings. 9.4% of the individuals had high blood pressure, and 6.8% had hypertension. Table 2 clearly shows that the prevalence of hypertension rises with age. The Anova test showed that there were statistically significant differences across the age groups (p less than 0.05).

Blood pressure levels of the study participants are summarised in Table 1.

Blood Pressure	**N**	**%**	**Age**	**SD**
Normal	419	83.8	9.74	2.035
Elevated	47	9.4	9.21	1.922
Hypertension	34	6.8	8.72	1.991
Anova Test				5.06
p value				0.007*

*: statistically significant

Hypertension was reported by 3.18 percent of the population with no family history of the disease, 23.4 percent of those with a positive father history, 20.5 percent of those with a positive mother history, and 36.4 percent of those with a positive father and mother history. Using a chi-square test, we can see that there is a statistically significant split between the groups (p less than 0.05). Among those who reported feeling stressed, 26.2% were diagnosed with hypertension. Less than an hour of daily physical activity was connected with hypertension and raised blood pressure, while more than an hour of daily physical activity was associated with the opposite. Using a chi-square test, we observed that there was a statistically significant relationship between the different categories of blood pressure and factors such family history, stress levels, and levels of daily physical activity (table 2).
Family history, stress, and physical activity all played a role in classifying research participants' blood pressure into the four groups shown in Table 2.

Family History		**BP**			Total
		Elevated	**Hypertension**	**Normal**	
None	N	21	12	345	378
	%	5.56%	3.18%	91.27%	100.0%
Father	N	14	11	22	47
	%	29.87%	23.40%	46.81%	100.0%
Mother	N	11	7	16	34
	%	32.35%	20.59%	47.06%	100.0%
Both	N	1	4	6	11
	%	9.1%	36.4%	54.5%	100.0%
Chi Square		23.07			
p value		<0.01*			
Stressors					
No	N	25	7	365	397

	%	6.3%	1.8%	91.9%	100.0%
Yes	N	22	27	54	103
	%	21.4%	26.2%	52.4%	100.0%
Chi Square		106.87			
p value		<0.01*			
Physical Activity					
>1hr Per Day	N	15	2	245	262
	%	5.7%	0.8%	93.5%	100.0%
<1hr Per Day	N	32	32	174	238
	%	13.4%	13.4%	73.1%	100.0%
Chi Square		43.59			
p value		<0.01*			

*: statistically significant

The chi-square test showed a statistically significant difference (p less than 0.05) between those who consumed junk food more than twice a week and those who consumed it less than twice a week in terms of the prevalence of hypertension and increased blood pressure. Hypertension was reported by 2.4% of respondents after 1 hour of TV viewing, 4.2% after 2 hours, 22.2% after 3 hours, and 36.4% after 4 hours or more of TV viewing (p less than 0.05; chi-square test). 10 percent of those who got less than six hours of sleep per night (10 percent) and 10 percent of those who got more than six hours of sleep per night (10 percent) and 8 percent of those who got more than six hours of sleep each night (table 3).

Table 3: Classification of study participants by their blood pressure, based on how often they eat junk food and how much sleep they get.

Frequent Junk Food		**BP**			**Total**
		Elevated	**Hypertension**	**Normal**	
≤2times/Week	N	6	7	265	278
	%	2.2%	2.5%	95.3%	100.0%
>2times/Week	N	41	27	154	222
	%	18.5%	12.2%	69.4%	100.0%
Chi Square		61.74			
p value		<0.01*			
Hours of Sleep					
≤ 6	N	23	24	126	173
	%	10.3%	10.3%	79.3%	100.0%
>6	N	24	10	293	327
	%	8.3%	1.5%	90.2%	100.0%
Chi Square		63.15			
p value		<0.01*			

*: statistically significant

Higher body mass indexes, larger statures, and more overall weight were associated with higher blood pressure and hypertension in our study subjects. It was discovered in this study that there was a statistically significant difference in blood pressure groups while controlling for height, weight, and body mass index (BMI) using the Anova test, with a p value of 0.05. (table 5).

Table 4: Classification of participants' blood pressure according to their average height, weight, and body mass index

BP		**Height (cm)**	**Weight (Kg)**	**BMI**
Normal	Mean	128.19	25.73	15.34
	Std. Deviation	11.16	6.72	1.56
Elevated	Mean	136.29	31.95	17.14

	Std. Deviation	9.12	5.83	1.52
Hypertension	Mean	145.08	38.31	18.13
	Std. Deviation	5.68	5.65	1.72
Total	Mean	130.11	27.17	15.69
	Std. Deviation	11.66	7.44	1.76
Anova Test		47.79	71.32	72.69
p value		<0.01*	<0.01*	<0.01*

*: statistically significant

Discussion

Several studies have linked high blood pressure in kids to adverse health outcomes such thicker-than-normal carotid intima, atherosclerosis, left ventricular hypertrophy, and kidney failure. The potential for interventions to affect long-term impacts and cardiovascular complications[11-12] follows from this early discovery.

83.8 percent of the participants were determined to have normal blood pressure. Nine percent of participants had hypertension, and 6.8 percent had elevated blood pressure. The prevalence of hypertension in children varies widely between studies, with some reporting rates as high as 22.0% and others reporting rates as low as 6.0%. According to a study by Nirav Buch et al.[13], the prevalence of hypertension was 8.24% among private school students and 5.4% among public school students. According to research by Nihaz K. Naha et al.[14], hypertension affects 4.5% of children and pre-hypertension affects 5.8% of children. Three percent of Hakim IS[15] students (311 out of 2011) were confirmed to have hypertension. Most of the students in their study came from low-income families because they were only recruited from Delhi's public schools. Chadha et al.[16] found that 11.7% of Delhi's school-aged youngsters have hypertension. They looked at students in metropolitan locations, where poor eating habits, lack of exercise, and peer pressure may all contribute to greater rates of this illness. In our study, 73.6% of participants were in the 6-10 year old range, while 26.4% were in the 10-12 year old range or older. When compared to people with normal blood pressure, those with hypertension had a significantly higher mean age (9.742.04 years; p0.05). Hence, the likelihood of developing hypertension increases with age. These age-related increases in mean BP and prevalence might be attributable to general population fattening. Both the Turkish[17] and Zambia[18] studies on school-aged children showed an increase in BP with age. In addition, Soundarssanane MB et al[19] of India found a similar pattern of rising age-related hypertension prevalence.

Among the participants in our study, having a negative family history hypertension was stated by 3.18 percent, 23.40 percent, 20.59 percent, and 36.4 percent, a positive father history, a positive mother history, and both (positive father and mother history) correspondingly. Therefore, a favourable family history was linked to childhood hypertension. Multiple studies have found that a family history of hypertension is a substantial risk factor for the disease. One study[18] conducted in Zambia found that having a parent with hypertension prior to the age of 60 increases the risk of that parent's children developing hypertension in childhood. Similar findings have been found in Indian research conducted by groups like Soundarssanance et al.[19] and Gupta[20]. Twenty-six percent of the participants in the current study reported hypertension, and this was a statistically significant difference (p less than 0.05). As with diet, regular physical exercise has been shown to significantly lower blood pressure. Subjects who reported less than an hour of daily physical exercise were more likely to have hypertension or high blood pressure than those who reported an hour or more of daily physical activity (p less than 0.05). It was also found in a study by Nihaz K. Naha et al[14] that over 60% of people with hypertension and prehypertension played less than an hour of physically intensive sports per week. The previous two decades have seen a huge shift in the range of activities available to children, with a greater focus placed on sedentary pursuits such as computer-gaming, video-gaming, internet browsing, TV/film watching, and academic achievement. There are hardly any places to play active sports in modern cities, and fewer yet to use walking as a primary mode of transportation.

In addition, a statistically significant difference (p less than 0.05) was observed between those who consumed junk food more than twice a week and those who consumed it less than twice a week when it came to hypertension and high blood pressure. Similarly, Nihaz K. Naha et al[14] found that people with high blood pressure and those at risk of developing hypertension had a higher consumption of fried meals. Our results show that subjects' height, weight, and BMI all have a role in the increased likelihood of high blood pressure and hypertension. In this study, a p value of less than 0.05 indicated statistical significance when comparing blood pressure groups based on height, weight, and BMI. Other research, such as those in Norway[21] and Taiwan[22], also found the aforementioned correlation.

Obesity was always known to be linked to hypertension even before the groundbreaking Framingham study. About 41% of children with hypertension were overweight or obese, leading Andriska et al[23] to conclude that obesity plays a significant impact in juvenile hypertension. About 30% of overweight children had hypertension, according to research by Nirav Buch et al[13], indicating a strong correlation between the two conditions. First, it's possible that our sample doesn't accurately reflect the demographics of the entire Indian population. Children older than 12 years old were not included in the analysis. Hypertension rates might have been higher if such kids had been included. Data more reflective of the situation might have been obtained by the use of Ambulatory blood pressure monitoring on appropriate participants. Due to the rarity of hypertension in children, more data from a broader study population would be useful. Our reliance on participants' own accounts of their stress levels is another caveat of our research. Due to the strong correlation between stress and adult hypertension, it is important to better understand the potential for underreporting of stress.

According to the results, 9.4 percent of school-aged children in North Indian's tier II cities with a paediatrics outpatient department had hypertension. Hypertension was prevalent among the same population. The prevalence for both diseases was higher in male individuals. High blood pressure in children was found to be substantially related to age, obesity, junk food consumption, physical activity, family history of hypertension & tv viewing. The prevalence numbers obtained in this study are not trivial, and our research emphasises the need for routine blood pressure measurement in the paediatric OPD. Our findings further highlight the importance of reducing risk factors that have been linked to both high blood pressure and childhood hypertension.

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