



ORIGINAL ARTICLE

Prevalence and risk factors of systemic hypertension among children.

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ABSTRACT... Objective: To find out the prevalence and risk factors of systemic hypertension. **Study Design:** Cross Sectional study. **Setting:** Department of Pediatrics, Sughra Shafi Medical Complex, Sahara Medical College, Narowal. **Period:** July 2020 to June 2021. **Material & Methods:** A total of 298 children of both gender aged 4-12 years, visiting pediatric outpatient department of the study institution were enrolled. A child was labeled as normotensive if blood pressure (BP) measurement was below 90th percentile, pre-hypertensive if BP between 90th to 95th percentile and hypertensive if BP more than 95th percentile. The data was analyzed using SPSS version 26.0. **Results:** In a total of 298 children, 171 (57.4%) were male. Overall, mean age was found to be 7.6+2.1 years while 159 (53.4%) were below 7 years of age. Majority of the children, 166 (55.7%) belonged to rural areas of residence. Family history of hypertension was noted in 150 (50.3%) children. Hypertension was found in 56 (18.8%) children, pre-hypertension in 9 (3.0%) while remaining 233 (78.2%) children were normotensive. Age less than 7 years ($p=0.0023$), overweight/obesity ($p=0.0026$) or family history of hypertension ($p=0.0118$) were found to have significant association with hypertension. **Conclusion:** High prevalence of systemic hypertension was noted in children. Younger age, high body mass index and family history of hypertension were found to be significantly associated with hypertension.

Key words: Blood Pressure, Hypertension, Pre-Hypertension.

INTRODUCTION

Systemic hypertension in pediatric age groups has become a global health issue and remains undiagnosed as there are different ranges varying with age, height and gender of the child.¹ The "National Heart, Lung, and Blood Institute (NHLBI) describes hypertension among children if the blood pressure (BP) reading at 3 different occasions is > 95th percentile of the normal curve.² The percentiles are calculated for each child depending upon the gender, age and height as these parameters impact BP among children based upon the gender, age and height.³

In children, prevalence of hypertension is estimated to be 26.3% in Pakistan⁴ while other Asian countries like India reports prevalence of hypertension among children as 7 to 22%^{5,6} while it is 25% in Malaysia.⁷ As multiple factors like socio-economic condition, medical history,

inheritance, ethnicity, etc, are linked with BP, variation in prevalence of hypertension among different parts of the world is justified. For these reasons, it is very important to conduct studies aiming evaluation of patterns in the prevalence of hypertension among pediatric age groups.^{8,9} Obesity, high sodium intake, family history of hypertension, high uric acid levels, male gender and ethnicity are some of the most commonly identified risk factors linked with hypertension in children.¹⁰

Lack of data exists in Pakistan regarding different aspects of pediatric hypertension so the present study was planned to find out prevalence and risk factors of hypertension in children visiting outpatient department of a tertiary care hospital. The findings of this study are thought to help clinicians estimating the current state of prevalence and various risk factors linked with

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systemic hypertension among children.

MATERIAL & METHODS

This cross-sectional study was conducted at The Department of Pediatrics, Sughra Shafi Medical Complex, Sahara Medical College, Narowal, Pakistan from July 2020 to June 2021. Approval was acquired from Institution's ethics committee. Written consent was taken from parents/guardians of study participants.

A sample size of 298 was estimated using the formula: $n = z^2 * p * (1 - p) / e^2$

Where $z=1.96$, $p=26.3\%^4$ (prevalence of hypertension in children) and $e=5\%$ (margin of error)

A total of 298 children of both gender aged 4-12 years visiting pediatric outpatient department of the study institution were enrolled. Children having congenital heart disease, chronic liver disease, chronic kidney disease or hematological disorders were excluded. The Blood Pressure measurements were taken from all children manually. Children's parents/guardians were asked for the evaluation and history of various risk factors linked with pediatric hypertension. All data regarding this study was noted on a specifically designed proforma and all children and their parents/guardians were ensured about the confidentiality of this study's data. A child was labeled as normotensive if BP measurement was below 90th percentile, pre-hypertensive if BP between 90th to 95th percentile and hypertensive if BP more than 95th percentile.

The data was analyzed using SPSS version 26.0.

Qualitative variables were expressed as frequency and percentage while mean and standard deviation (SD) were calculated for quantitative variables. Post-stratification, chi square test was

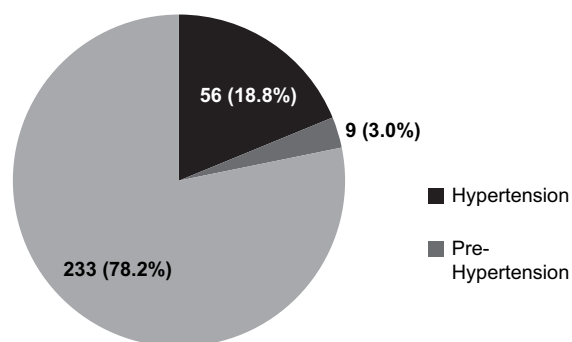


Figure-1. Prevalence of hypertension and pre-hypertension. (n=298)

applied considering p value < 0.05 as significant.

RESULTS

In a total of 298 children, 171 (57.4%) were male. Overall, mean age was found to be 7.6 ± 2.1 years while 159 (53.4%) were below 7 years of age. Majority of the children, 166 (55.7%) belonged to rural areas of residence. Family history of hypertension was noted in 150 (50.3%) children. Hypertension was found in 56 (18.8%) children, pre-hypertension in 9 (3.0%) while remaining 233 (78.2%) children were normotensive (Figure-1). Table-I is showing characteristics of children with respect to hypertension, pre-hypertension and normal BP readings. Age less than 7 years ($p=0.0023$), overweight/obesity ($p=0.0026$) or family history of hypertension ($p=0.0118$) were found to be significantly associated with hypertension.

Characteristics		Hypertension (n=56)	Pre-Hypertension (n=9)	Normotensive (n=233)	P-Value
Gender	Male	38	5	128	0.2128
	Female	18	4	105	
Age (years)	<7	41	6	112	0.0023
	>7	15	3	121	
Area of Residence	Urban	25	3	104	0.7977
	Rural	31	6	129	
BMI (kg/m ²)	Overweight or Obese	23	4	48	0.0026
	Healthy Body Weight	33	5	185	
Family History of Hypertension		36	7	107	0.0118

Table-I. Characteristics of children with respect to presence of hypertension, pre-hypertension and normal blood pressure. (n=298)

DISCUSSION

Hypertension in children has emerged as an interesting topic for research in the recent decades globally. We found prevalence of hypertension to be 18.8% while pre-hypertension was observed in 3.0% children. A recent study from Karachi, Pakistan revealed 20% children to have systemic hypertension while pre-hypertension was noted in 2% children.¹⁰ Data from developing countries like USA reported much lower prevalence of hypertension among children ranging between 2.7 to 3.7%.¹¹ Researchers from Europe revealed prevalence of hypertension in children aged 2-9 years to be 20.0%¹² which is close to which we found in the present research. Data from Canada found prevalence of hypertension among children aged 3 to 8 years to be 14.8%.¹³ A recent study from India involving children between 5 to 15 years of age recorded prevalence of hypertension to be 6.8%¹⁴ which is lower than what was noted in the present study. Another study done by Chadha et al from India involving 10215 school children revealed 12% boys and 11% girls to have hypertension.¹⁵ Difference noted in terms of prevalence among various researchers in different geographies could be attributed to adoption of different cut off values for labeling hypertension among children as well as methods adopted to measure BP and reasons of visits to pediatric clinics or differences in place of study (like schools). Some studies have also shown that repeat measurements of BP can lead to reduction in the proportion of hypertensive cases which was not the case in the present study as we had only taken one measurement of BP in the present study.^{16,17}

In this study, younger age, high BMI and family history of hypertension were found to be significantly associated with hypertension in children. Linkage between genetic predisposition for development of hypertension or increase in BMI after initial decline in body weight of the children has been proposed by some researchers in the past while this is termed as "adiposity rebound".^{18,19}

The present study had some limitations as well. We were only able to measure BP once while we

could not repeat BP measurement which might have contributed to overestimation regarding prevalence of hypertension in the present study. This research involved children visiting pediatric outpatient department of a tertiary care hospital for various clinical reasons, our findings do not represent local population perspective about the prevalence of hypertension in children.

CONCLUSION






High prevalence of systemic hypertension was noted in children. Younger age, high body mass index and family history of hypertension were found to be significantly associated with hypertension. Further large population based studies are required to estimate the exact prevalence of hypertension in the local population.
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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Fazal ur Rehman	Introduction, Proof reading.	
2	Khurram Shah Nawaz	Data collection, Final approval.	
3	Farhan Zahoor	Literature Review, Methodology.	
4	Bushra Madni	Data analysis, Discussion.	Bushra Madni 
5	Muhammad Imran	Drafting, References.	
6	Muhammad Naveed	Literature Review, Data collection.	