

## Research Article

# Prevalence of hypertension among healthy school going children and correlation with anthropometric indices

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### ABSTRACT

**Background:** Hypertension is a major long-term health condition and is the leading cause of premature deaths among adults throughout the world. As the symptoms of childhood hypertension are largely nonspecific, children with essential hypertension are likely to be asymptomatic. The present study was designed to determine the prevalence of hypertension and prehypertension among apparently healthy school going children

**Methods:** A total of 500 students in the age group of 10-15 years from schools were selected for the study. Height, weight and blood pressure measurements were taken. BMI was calculated using height and weight measurements. Blood pressure was classified as pre hypertension and hypertension based on systolic and diastolic blood pressure percentiles matched for age, gender and height.

**Results:** Overall prevalence of hypertension was 11.4% and prehypertension was 23.2% in present study population. Correlation between familial history of diabetes and Ischemic heart disease and hypertensive children was found to be statistically significant ( $p < 0.05$ ). Among 11% of children who were found to be obese, the prevalence of hypertension (38.5%) was found to be higher than that of non-obese children (7.4%) ( $p < 0.05$ ).

**Conclusions:** In conclusion, our study confirms that there is significant high prevalence of childhood hypertension. Obesity, family history of diabetes mellitus and IHD are risk factors for childhood hypertension.

**Keywords:** Hypertension, Obesity, Anthropometry

### INTRODUCTION

Hypertension is one of the risk factor for developing coronary heart disease and cerebrovascular disease. Evidence across the globe has documented prevalence of childhood hypertension as 1-2% in the developed countries and 5-10% in the developing countries. The prevalence of hypertension in various Indian studies ranges from 0.96% to 11.4%, respectively.<sup>1</sup> Majority of children with hypertension are asymptomatic and they are undetected, unless specifically looked for. It is also suggested that development of adult hypertension may start very early in life and has resulted in increased emphasis on screening healthy asymptomatic children.<sup>2</sup> Obesity is considered as an independent risk factor for various chronic diseases including pre hypertension and

hypertension.<sup>3</sup> The primary objective of this study was to determine the prevalence of overweight and obesity, pre hypertension and hypertension among healthy school going children aged 10-15 years from Trichy city. It also aimed at assessing the degree to which obesity or overweight is associated with pre hypertension or hypertension. This data and its analysis can be of significance in providing further scope for considering obesity as a potential factor of contribution to the increasing blood pressure issues.

### METHODS

This cross sectional school based study was conducted by Department of Pediatrics, Chennai Medical College Hospital and research centre, Trichy for a period of 3

months from December 2015 to March 2016. After obtaining informed consent from schools, blood pressure was recorded in asymptomatic healthy children between 10-15 years. Children with previously diagnosed hypertension and other systemic illness were excluded. Weight and height of the children were measured using electronic scale and stadiometer respectively and BMI was calculated using formula weight in kg/ (height in m).<sup>2</sup>

WHO growth charts for height and BMI for age and sex were used as reference standards. Before recording blood pressure, nature of the procedure was explained to students and child was made to sit quietly for 5 minutes. Blood pressure was measured in sitting position in right arm using standard mercury sphygmomanometer by auscultatory method. Appropriate size cuff was used for children.

Systolic blood pressure was determined by onset of tapping Korotkoff sounds and diastolic blood pressure was determined by disappearance of korotkoff sounds. Three measurements were taken at interval of 5 minutes each and mean of these readings is taken as systolic and diastolic blood pressure. The blood pressure was

compared to age, sex and height percentile standards given by fourth report on hypertension in children<sup>4</sup>. Normal BP is defined as SBP and DBP that is less than 90<sup>th</sup> percentile for sex, age and height.

Hypertension is defined as average SBP or DBP that is greater than or equal to the 95<sup>th</sup> percentile for sex, age and height. Pre hypertension is defined as average SBP or DBP that is greater than or equal to the 90<sup>th</sup> percentile but less than the 95<sup>th</sup> percentile. Those children who were found to have SBP/DBP greater than 95<sup>th</sup> percentile were evaluated by subsequent measurements of blood pressure after one week interval before confirming them as hypertension.

## RESULTS

A total of 500 children were screened out of which 328 (65.6%) were males and 172 (34.4%) were females. The prevalence of prehypertension in the study population was 23.2% among which 17.4% were males and 5.8% were females. The prevalence of hypertension was found to be 11.4% out of which 7.2% were males and 4.2% were females. Table 1 shows the age and sex wise distribution of the study population.

**Table 1: Age and sex wise distribution.**

Age	Normotensive		Pre-hypertensive		Hypertensive		Total	
	Male	Female	Male	Female	Male	Female	Male	Female
10	16	15	5	0	3	4	24	19
11	21	17	1	5	7	1	29	23
12	18	33	26	4	6	6	50	43
13	57	38	20	12	6	5	83	55
14	40	17	17	6	8	5	65	28
15	53	2	18	2	6	0	77	4
Total	327		116		57			

**Table 2: Distribution of SBP and DBP according to sex and anthropometric characteristics.**

Age in years	SBP Mean $\pm$ SD		DBP Mean $\pm$ SD		Weight Mean $\pm$ SD	Height Mean $\pm$ SD	BMI Mean $\pm$ SD
	Male	Female	Male	Female			
10	112.8 $\pm$ 13.17	111.8 $\pm$ 12.8	73.33 $\pm$ 8.5	73 $\pm$ 8.44	35.2 $\pm$ 6.88	136.38 $\pm$ 6.8	19.39 $\pm$ 3.27
11	114.3 $\pm$ 13.51	104.6 $\pm$ 9.32	75.5 $\pm$ 8.27	70 $\pm$ 7.72	34.8 $\pm$ 7.33	138.5 $\pm$ 8.06	18.1 $\pm$ 3.3
12	113.6 $\pm$ 12.83	111.8 $\pm$ 11.2	72.4 $\pm$ 7.44	73.3 $\pm$ 8.65	40.1 $\pm$ 10.9	145.6 $\pm$ 8.46	19.15 $\pm$ 4.48
13	108.5 $\pm$ 9.8	109.8 $\pm$ 9.34	71.5 $\pm$ 7.51	71.3 $\pm$ 6.96	40.1 $\pm$ 8.59	148.6 $\pm$ 7.55	18.4 $\pm$ 3.66
14	111.3 $\pm$ 10.75	113.9 $\pm$ 11.5	72.5 $\pm$ 8.22	74.6 $\pm$ 7.44	46 $\pm$ 9.8	153.1 $\pm$ 9.1	19.7 $\pm$ 3.52
15	112.9 $\pm$ 9.12	112.5 $\pm$ 5	73.5 $\pm$ 6.83	75 $\pm$ 5.77	49.8 $\pm$ 10.5	155.5 $\pm$ 10.1	20.32 $\pm$ 3.22

Table 2 shows the age wise distribution of BP among children from 10-15 years. Overall, mean SBP was higher among males as compared with females until age of 12 years. Similarly, this transition was found to be earlier at age of 11 years for mean DBP. In present study, we observed that family history of hypertension was positive

in 66 children out of which 12.12% were hypertensive (p=0.843). Familial history of diabetes was positive in 8.1% of hypertensive children and 67.44% of normotensive children (p=0.00003). Family history of ischemic heart disease was positive in 11.11% of hypertensive children and 66.69% of normotensive

children ( $p=0.010$ ) (Table 3). Among the 500 children, 90 (18%) children were overweight and 55 (11%) were obese based on BMI centiles for the corresponding age group. Among obese children (55), the prevalence of pre hypertension was 20% (11) and the prevalence of

hypertension was 40% (22). Among overweight children (90), the prevalence of pre hypertension was 22.2% (20) and the prevalence of hypertension was 20% (18) (Table 3).

**Table 3: Relationship between different variables and childhood hypertension.**

Variables	Status	Normotensive	Hypertensive	Total	p value
Obesity	Present	33	22	55	0.000001
	Absent	410	35	445	
Family H/o hypertension	Present	46 (69%)	8 (12.12%)	66	0.843
	Absent	385	49	434	
Family H/O diabetes	Present	58 (67.44%)	7 (8.1%)	86	0.00003
	Absent	378	36	414	
Family H/o Ischemic Heart Disease	Present	6 (66.69%)	1 (11.11%)	9	0.010
	Absent	435	56	491	

**Table 4: Correlation between BP and anthropometric indices.**

BMI	Normotensive	Pre hypertension	Hypertension	total
Normal	253 (71.2%)	85 (23.9%)	17 (4.7%)	355
Over weight	52 (57.7%)	20 (22.2%)	18 (20%)	90
Obesity	22 (40%)	11 (20%)	22 (40%)	55
Total	327	116	57	500

In present study, we found the prevalence of hypertension among obese children (38.5%) to be significantly higher than non-obese children (7.4%). The p value according to chi square test was calculated to be  $<0.05$ .

## DISCUSSION

It is important to determine the prevalence of hypertension and pre hypertension in children, not only because it varies from one community to the other, but also because it is essential to identify the population at risk. Early identification translates into early interventions and possibly prevention of later morbidity and mortality.

In this study among school children, 11.4% had hypertension and an additional 23.2% had pre hypertension. The rate of prevalence found in our study is higher than other similar studies done in school children. Sharma A et al done in urban and rural school children in Shimla showed the prevalence of hypertension to be 5.9% and pre hypertension to be 12.3%.<sup>5</sup> Patil et al showed the prevalence of hypertension among 6-15 years children in Gulbarga city to be 3.9%.<sup>6</sup> The higher prevalence in our study may be due to major part of the studied population belonging to higher age group.

In present study, we did not find any increasing trend in blood pressure according to the age group as found in

other similar studies. This is comparable to other studies like Buch et al and Soundarssannance et al which shows a linear trend of blood pressure with increasing age group.<sup>7,8</sup> It is observed in our study that 38.5% of the obese children are hypertensive and obesity has a significant correlation with hypertension ( $p<0.05$ ). This observation is similar to Buch et al who found that 30% of obese children are hypertensive and Baradol et al found the prevalence of hypertension in obese children to be 21%, so they concluded that obesity plays very important role in development of childhood hypertension.<sup>9</sup>

Family history of hypertension was a significant risk factor for hypertension as evident in many studies like Verma et al, Soundarssannance et al.<sup>10</sup> But in present study we couldn't find a significant correlation between the two variables. However, we observed a significant correlation between the family history of diabetes mellitus and ischemic heart disease with children having hypertension ( $p<0.05$ ). Thus, family history can provide an early opportunity for identification and intervention in childhood hypertension.<sup>11</sup>

## CONCLUSION

In conclusion, present study confirms that there is significant high prevalence of childhood hypertension. Obesity, family history of diabetes mellitus and IHD are risk factors for childhood hypertension. Findings of the

our study suggest a need for larger population based studies to accurately estimate the prevalence and risk factors for hypertension among children in our country.

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