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A Study on Hypertension in School Children of Chitradurga District, Karnataka

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Material and Methods: A cross sectional study was conducted to study the prevalence of hypertension in 1,734 school children in Chitradurga district from June 2011 to August 2011. A detailed history was taken in a predesigned proforma. The data thus obtained was compiled and analyzed.

Results: The prevalence of hypertension in children in this study was 2.5% and more in females compared to males. The prevalence was higher after 10 years of age. Family history was one of the important risk factor for hypertension in children. The prevalence was also higher in children with higher BMI percentiles.

Conclusion: Hypertension is not only common in children but also a neglected entity in children. This calls for urgent attention for the policy makers to begin the preventive measures as early as possible in the life to prevent the co morbidities.

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I. INTRODUCTION

Being an interesting disease entity of its own, hypertension remains silent, generally asymptomatic during its natural course. Since most of hypertensives remain asymptomatic, the disease does immense harm to the body in the form of "Target Organ" damage; hence, the WHO has named it after 'Silent Killer'¹.

The belief that the essential hypertension is rare compared to secondary hypertension in children is obsolete now. Due to epidemiological transition, hypertension is also increasing in trend in pediatric population². Evidence of progression of childhood hypertension to adult hypertension is documented by

some studies in the western world³. It has been also shown that the familial aggregation of blood pressure starts from first week of life⁴. The childhood hypertension is amenable to pharmacological or non pharmacological intervention at earliest possible point of time. Such treatment can prevent the development of adult hypertension and its sequel.

By 2025, the number of people with hypertension will increase by about 60% to a total of 1.56 billion as the proportion of elderly people will increase significantly⁴. This prediction serves as the most important matter of concern for the early intervention in the childhood to tackle this fatal disease. Other reasons are the continuing population increase and changes in lifestyle, which includes a diet rich in sugar and high-fat processed foods and sedentary behavior, mediated by televisions, computers and cars.

There is a wide variation in the prevalence of hypertension in Children^{5, 6, 7}. The prevalence of Childhood hypertension varies from 1% to 16.2%. The diversity in prevalence of Childhood hypertension may be due to varying cut off blood pressure levels by various authors. Hypertension in children is influenced by various risk factors, both modifiable and non modifiable. i.e., Age, Ethnicity, Family history of hypertension and childhood obesity. Some studies have also shown that hypertension tends to increase with increase in age and with no sexual predilection.

The prevalence of hypertension in children amongst Indian studies varies between 6.6 %⁸ to less than 1 %⁹. The prevalence may be high in South India, because of increased genetic inheritance secondary to more number of consanguineous marriages in south India, and also due to altered dietary habits and life style^{10,11}.

The present study was undertaken with the aim to find out the prevalence of hypertension amongst apparently healthy, asymptomatic school children of 9 – 16 years age from few government and private schools of Chitradurga district.

II. MATERIALS AND METHODS

A cross sectional study was undertaken in the children of ten schools of Chitradurga district. A total of 1,734 students were included as samples in a period from June 2011 to August 2011. A detailed history with particulars of age, sex, history of illness suggestive of

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renal diseases, family history of hypertension i.e., hypertensive status of father, mother and grandparents if they are alive, was taken in a predesigned proforma.

Height and weight was recorded in all children by standard techniques as described by Indian Council of Medical Research and the percentile between weight and height was calculated.

Blood pressure was recorded using a standard mercury Sphygmomanometer (Diamond deluxe). In children above 7 years of age standard adult size cuff (12.5 cm) was used, except in a few children who requires 7.5 cm cuff. This was conducted according to the recommendations made by Moss that a cuff which covers approximately two-thirds of upper arm with enough space left over the cubital fossa to place the diaphragm of stethoscope to be employed in the measurement of blood pressure in children⁹.

Before recording the blood pressure, children in groups of 10 were taken to a separate room away from noise, and they were explained in detail, the procedure of pressure recording and were reassured that the procedure was not painful. All children were made to void urine before blood pressure recording, as a full bladder is a source of strong sensory stimuli, which may increase the blood pressure. All efforts were made to eliminate factors which might affect the blood pressure such as anxiety, fear, crying, laughing, recent activities in order to facilitate the blood pressure recording under simulated "basal" or "near basal" conditions. Blood pressure was recorded only when the child had become accustomed to the observer, instrument and surroundings.

Blood pressure recording were taken as recommended by 1987 Second Task Force on blood pressure control in children. Blood pressure was recorded in sitting position and right arm. After applying appropriate size cuff, it was inflated to about 30 mm Hg above the point at which the radial pulse disappears. The pressure within the cuff was then released at a rate of about 2 to 3 mm Hg per second, while the auscultation was done over brachial artery. The onset of sound was taken as the systolic pressure (Korotkoff Phase I) and the absence of all sounds (Korotkoff Phase V) was taken as diastolic blood pressure. Three readings were taken in succession with an interval of 1½ to 2 minutes and the cuff was completely deflated between the readings. In those cases where the difference between first reading and third reading was more than 10 mm Hg, the first reading was omitted and another recording was obtained. The average of the three readings was calculated and entered in the proforma. Those children in whom blood pressure could not be recorded satisfactorily were omitted from the study. Those children in whom blood pressure was found to be abnormal for his/her age, were re-examined on two different occasions at an interval of 1 to 2 weeks and blood pressure was recorded in lying posture also.

All blood pressure recordings were taken on the same time of the day, i.e. during afternoon hours and recorded by the same person. Blood pressure was recorded after completing all other procedures.

The children were labelled as hypertensive, if the blood pressure was above the 95th percentile for that age, sex and height. In the hypertensive children, the readings were confirmed by recording blood pressure in both upper limbs⁸.

The data thus collected was tabulated according to various epidemiological parameters like age, sex, anthropometry etc. Appropriate statistical tests were used to refute the statistical evidence by using Statistical Package for Social Services (vs 18).

III. RESULTS

Table 1 : Prevalence of hypertension according to age

Age in years	Non hypertensives n (%)	Hypertensives n (%)	Total n (%)
9	2 (100)	0	2 (0.1)
10	55 (94.8)	3 (5.2)	58 (11.8)
11	201 (98.5)	3 (1.5)	204 (11.8)
12	322 (97.3)	9 (2.7)	331 (19.1)
13	456 (98.5)	7 (1.5)	463 (26.7)
14	381 (98.2)	7 (1.8)	388 (22.4)
15	153 (95.0)	8 (5.0)	161 (9.3)
16	120 (94.5)	7 (5.5)	127 (7.3)
Total	1690 (97.5)	44 (2.5)	1734 (100)

Above table shows the age and sex-wise distribution of childhood hypertension. A total of 1734 children were surveyed for hypertension. Among the surveyed children 2.5% had hypertension. The prevalence of hypertension was high in 10 years, 15 and 16 years children.

Table 2 : Age and Sex wise prevalence of Childhood hypertension

Age in years	Female		Total n (%)	Male		Total n(%)
	Non Hypertensives n (%)	Hypertensives n (%)		Non Hypertensives n (%)	Hypertensives n (%)	
9	2 (100)	0	2 (0.3)	0	0	0
10	42 (93.3)	3 (6.7)	45 (9.7)	13 (100)	0	13 (1.3)
11	69 (95.8)	3 (4.2)	72 (18.4)	132 (100)	0	132 (13.3)
12	128 (93.4)	9 (6.6)	137 (27.1)	194 (100)	0	194 (19.6)
13	197 (97.5)	5 (2.5)	202 (27.1)	259 (99.2)	2 (0.8)	261 (26.4)
14	148 (98.0)	3 (2.0)	151 (20.3)	233 (98.3)	4 (1.7)	237 (24.0)
15	76 (93.8)	5 (6.2)	81 (10.9)	77 (96.3)	3 (3.8)	80 (8.1)
16	52 (94.5)	3 (5.5)	55 (7.4)	68 (94.4)	4 (5.6)	72 (7.3)
Total	349 (95.8)	31 (4.2)	745 (100)	976 (98.7)	13 (1.3)	989 (100)

Females were more hypertensives than males. About 4.2% of the females and 1.3% of the male children were hypertensives. Female children of 15 years and more had higher prevalence compared to children of less than 14 years.

Table 3 : Prevalence of hypertension by BMI percentile

BMI Percentile	Female		Male	
	Non Hypertensives n (%)	Hypertensives n (%)	Non Hypertensives n (%)	Hypertensives n (%)
< 5 th	79 (96.3)	3 (3.7)	92 (100)	0
5 th	73 (97.3)	2 (2.7)	93 (98.9)	1 (1.1)
10 th	151 (97.4)	4 (2.6)	207 (100)	0
25 th	188 (94.0)	12 (6.0)	232 (98.7)	2 (1.3)
50 th	115 (97.5)	3 (2.5)	93 (98.9)	3 (1.7)
75 th	39 (90.7)	4 (9.3)	83 (95.4)	4 (4.6)
90 th	41 (97.6)	1 (2.4)	68 (97.1)	2 (2.9)
> 95 th	28 (93.3)	2 (6.7)	27 (100)	0
Total	714 (95.8)	31 (4.2)	976 (98.7)	13 (1.3)

The prevalence of hypertension was high for female children who had 25th, 75th and more than 95th BMI percentiles. In male children the prevalence was high for those children with 75th and 90th BMI percentiles.

Table 4 : Prevalence of hypertension according to family history

Family history	Non Hypertensives n (%)	Hypertensives n (%)	Total n (%)
No family history	1405 (97.8)	31 (2.2)	1436 (82.8)
Hypertensive grand parents	4 (3.1)	4 (3.1)	128 (7.4)
Hypertensive parents	161 (94.7)	9 (5.3)	170 (9.8)

Family history of hypertension is one of the important risk factor for hypertension. Table no 5 shows the family history of hypertension. About 82.8% of the children had no family history of hypertension. About 7.4% of the children had history of hypertension in grandparents and in 9.8%, the parents had history of family history of hypertension.

Table 5 : Regression analysis of the risk factors of hypertension in children

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-.100	.038		-2.629	.009
Age	.004	.003	.037	1.526	.127
Sex	.027	.008	.085	3.541	.000
BMI	.002	.001	.043	1.771	.077
Family history	.014	.006	.054	2.275	.023

a. Dependent Variable: Hypertension

The regression analysis of some risk factors of hypertension had shown that, Sex and Family history of hypertension were significant at 0.05 levels.

IV. DISCUSSION

The determination of prevalence of hypertension helps not in study of variation of blood pressure from one community to other but also helps in delineation of population at risk. Early identification of hypertension helps in translation into early intervention and thus modification of the natural course of it to decrease the mortality and morbidity.¹²

The prevalence of hypertension in study population was 2.5%. The prevalence was high in children of 10, 15 and 16 years. Female children of 15 years and more had higher prevalence compared to their counterparts. The prevalence of hypertension in our study is in accordance with other studies ranging from 0.41 to 5.9 %^{7, 8, 11, 12, 13, 14}. The prevalence was much lesser than a large sample survey in Pakistan which was reported to be 12.2%. However different studies used different criteria for defining the hypertension. Few studies were available for the comparison as suggested by Joint National Committee criteria for evaluation of blood pressure in children. The regional differences in prevalence of hypertension cannot be ruled out as Krishna et al reported higher systolic blood pressure in North Indian girls.¹⁶

Girls were more hypertensives than boys. About 4.2% of the females had hypertension in comparison with 1.3% of the male children. Similar to these findings in a study in Shimla, Sharma et al also observed a more prevalence in girls than boys.¹²

The association of obesity with hypertension in children has been demonstrated by many studies across India and world.^{2, 5, 12, 17} In this study the prevalence of hypertension was high in female children of 25th, 75th and more than 95th BMI percentiles. In male children the prevalence was high for those children with 75th and 90th BMI percentiles. But the regression analysis in this study had shown no association with BMI. In a study by Sharma et al had found that the hypertension

was common in the children who had high BMI and Pre hypertension in the children with low BMI.¹²

Family history of hypertension is one of the important risk factor for hypertension. About 82.8% of the children had no family history of hypertension. About 7.4% of the children had history of hypertension in grandparents and in 9.8%, the parents had history of family history of hypertension. The regression analysis also had shown an association between the hypertension and Family history.

Hypertension in children is influenced by various risk factors, both modifiable and non modifiable. i.e., Age, Ethnicity, Family history of hypertension and childhood obesity. Some studies have also shown that hypertension tends to increase with increase in age and with no sexual predilection⁵. A study by Larioia has shown that there will be spurts in blood pressure levels in 11-13 year boys and 12-14 year girls⁶.

To conclude, this study has shown that the hypertension is not only the disease entity of adults but also children. This calls for urgent attention for the policy makers that the co morbidities of the hypertension can be prevented from childhood itself. But the hypertension can be essential or also secondary to a physical entity in the body. Hence all the hypertensive children should be followed thereon to prevent the progression. The limitations of this study are worth to mention. This study was not conducted systematically or adjusted for factors such as salt intake, physical activity and dietary habits. Findings of the present study suggest a need for larger population based studies to accurately estimate the prevalence hypertension among children in our country.

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