

A Study of Blood Pressure Profile in Rural School Children of Kolar Taluka

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Abstract

Background: Hypertension (HTN) is the common and potent universal contributor to cardiovascular mortality. There are not many studies done about the prevalence of HTN in rural school children.

Objectives: The present study was done in school children to know the occurrence/prevalence of HTN and to study the relation of HTN with age, sex, BMI & family history.

Study design: It is a cross sectional study done in randomly selected rural school children in the age group of 10-16 yrs. The study sample includes apparently healthy 1120 children. For each child, BMI was calculated & 3 BP recordings were taken. If BP was found to be > 95th percentile again two sets of BP readings done at 4 weeks interval

Results: In the present study, prevalence of systolic HTN was 2.6% in males & 1.5% in females with overall 1.9%. HTN is predominant in the age group of 13 yrs (12.2%). Prevalence of obesity was 3.3%. 11.8% obese and 13.4% overweight children are hypertensive. Out of 22 hypertensive children only 5(22.7%) had family history of HTN present.

Conclusion: HTN is a major risk factor for cardiovascular & cerebrovascular disease. In the present study prevalence of HTN was 1.9% with male preponderance (2.6:1.5). Obesity is an important risk factor for cardiovascular complications. In the present study prevalence of HTN was 11.8% in obese and 13.4% in overweight school children.

Keywords: Obesity, HTN, School children

INTRODUCTION

Hypertension is one of the major diseases, which is killing majority of population in the entire world. Majority of them is of essential type. In childhood systemic hypertension is a major condition, with estimated population prevalence of 1-2% in the developed countries.¹ Although no such statistics are available for Indian scenario, but there is every reason to believe that the state of affairs is in no way better than any other Western countries.

In the past decade, many workers have confirmed that familial aggregation of blood pressure occurs among adults, and such an aggregation, has been traced to childhood, as early as one year of age and there is some evidence

to believe that such an aggregation begins somewhere between the first week and first month of life.² Blood pressure in children is a reliable predictor of adult blood pressure level, therefore it is important to diagnose children and adolescents who are at increased risk of developing essential hypertension as adults.³

Ideally hypertension or tendency for hypertension should be detected as early in life as possible. According to Nelson, to increase early detection of hypertension, accurate blood pressure measurements should be part of the routine annual physical examination of all children, three years or older.⁴ However it is not possible to record reliable blood pressures by conventional methods in children below 6-7 years of age.⁵ Hence the ideal age, would be between

6-15 years, i.e. school children. NIH Task force of USA has even recommended that blood pressure measurements along with weight and height should be recorded in children, at least once a year.⁶

Many studies have been done in Western countries on this subject and normal standards for blood pressure have been established for the children of different ages, in both sex, black and white race, in their countries. At the same time Western standards cannot be applied to Indian children, because of differences in factors such as ethnic, socio-economic, dietetic, environmental and emotional factors between Indian and Western countries. Hence there is strong need to establish the normal blood pressure standards for Indian children and find out the prevalence of hypertension among them.

Many studies in India have been done to know the blood pressure profile in children in varying age groups (varies from 3 to 17 years) and urban affluent children and not in rural areas. Therefore, the present study was undertaken to determine the blood pressure levels in apparently healthy, asymptomatic school children in the age range of 10 to 16 years in rural Kolar taluka and to determine the influence of contributory factors like, age, sex, body mass index (BMI) and parental blood pressure status. So that this can be a reference and guidance for the management of hypertension.

MATERIALS & METHODS

Source of Data

It is a cross sectional study done between time period from October 2009 and January 2010 in the age group of 10 to 16 years. Children were selected from Rural schools in Kolar taluka. Three schools Vemagal government high school, Higher primary school and Kembodi Janata High School were selected based on simple random sampling method. Study was approved and ethical clearance was obtained from ethical committee of Sri Devaraj Urs Medical College.

Method of Collection of Data

Sample size

1120 children in the age group of 10-16 years.

Inclusion Criteria

- Apparently healthy rural School children aged between 10 to 16 years of rural Kolar taluka

Exclusion Criteria

- Children below 10 years and above 16 years.
- Children with known cardiovascular, renal and endocrine diseases.

Data was collected in a pre-tested Performa meeting the objective of the study. Informed consent was obtained

from the parents of all children before measuring blood pressure. Blood pressure was measured in all 10-16 years school children between 8 AM to 11 AM in sitting position after 10 minutes of rest. BP was measured after applying an appropriate sized cuff on the right arm encircling 2/3rd circumference of the arm with lower edge 2.5 cm above the cubital fossa, as per guidelines suggested by WHO guidelines. The age of the school children was obtained from the school records. The name and other particulars were entered in a pretested Performa. Height was measured by making the child to stand upright barefoot, on the ground with heels, buttocks and shoulder touching the wall and head in Frankfurt plane. The height was measured using a sliding stadiometer (Johnson and Johnson) with an accuracy of 0.1 mm.

Weight was recorded using a spring balance (bathroom scale) calibrated to 0.5 Kg accuracy. Blood pressure was also recorded.

Systolic blood pressure was determined as appearance of 1st Korotkoff sounds and diastolic blood pressure was taken at the point of muffling of heart sounds (4th Korotkoff sounds). Three measurements were taken at an interval of five minutes each and mean of these readings were taken as average systolic blood pressure and average diastolic blood pressure.

Blood pressure values were compared to the values given by the update of 1987 task force report of the National high blood pressure Education Programme Co- coordinating committee.⁷

Children were classified into 3 groups as per guidelines of the above committee

- If BP > 95th percentile - Hypertension (HTN)
- 90 – 95th percentile - Pre hypertension (PHTN)
- < 90th percentile - Normal (N)

Blood pressure was compared in relation to age, sex and height percentile in each age group. In those children whose systolic and diastolic Blood Pressure values was found to be more than 95th percentile for age, sex and height. Two sets of Blood Pressure reading were taken at an interval of 4 weeks.

After recording weight and height of the school children, Body mass index (BMI) was also calculated and based on these values children were classified as follows

- If BMI > 95th percentile Obese (OB)
- 85-95th percentile Over weight (OW)
- <85th percentile Normal (N)

Statistical Methods

Results on continuous measurements were presented on Mean \pm SD (Min-Max) and results on categorical measurements were presented in Number (%). Significance

is assessed at 5 % level of significance. Prevalence/ Occurrence of overweight/obesity, pre hypertension/ hypertension had been computed according to age and gender. Chi-square test was performed to obtained results. SPSS 15.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

1. Chi-Square Test: Where O_i is Observed frequency and E_i is Expected frequency
Follows chi-distribution $(r-1) \times (c-1)$ df
2. Significant figures
+ Suggestive significance (P value: $0.05 < P < 0.10$)
* Moderately significant (P value: $0.01 < P < 0.05$)
** Strongly significant (P value : $P < 0.01$)

RESULTS

Study group consists of 1120 rural school children from Kolar taluka between 10-16 years, 508 were males and 612 were females. In these children, prevalence of systolic hypertension in males is 2.6% compared to 1.5% in females with over all prevalence of 1.9%. Prevalence of systolic Pre-hypertension in males is 5.9% compared to 0.7% in females with overall prevalence of 3.1%. Prevalence of Diastolic hypertension in males is 0.9% compared 1.6% in females with overall 1.3%, where as prevalence of diastolic Pre-hypertension is more in males(4.9%) compared to females(2.8%) with overall 3.8%.

Systolic hypertension is predominantly seen in the age group of 13 and 14 years in both male and female. Systolic Pre hypertension is predominantly seen in the age group of 10 years in male and 16 years in female (Table 1).

Table 1: Distribution of Systolic hypertension (SBP) in male and female according to age

Age in years	Male			Female			Total		
	Total	HTN	Pre HTN	Total	HTN	Pre HTN	Total	HTN	Pre HTN
10	138	2	23	120	0	0	258	2	23
11	97	0	0	103	0	0	200	0	0
12	72	1	1	32	0	0	104	1	1
13	49	3	2	70	3	1	119	6	3
14	83	5	2	118	4	1	201	9	3
15	29	1	1	113	1	1	142	2	2
16	40	1	1	56	1	1	96	2	2
Total	508	13	30	612	9	4	1120	22	34

Diastolic hypertension is predominantly seen in the age group of 15 years in male and 12 years in female. Diastolic pre hypertension is predominantly seen in the age group of 12 years in both male and female (Table 2).

Table 2: Distribution of diastolic hypertension (DBP) in male and female according to age

Age in years	Male			Female			Total		
	Total	HTN	Pre HTN	Total	HTN	Pre HTN	Total	HTN	Pre HTN
10	138	2	3	120	3	4	258	5	7
11	97	0	2	103	2	2	200	2	4
12	72	1	7	32	1	3	104	2	10
13	49	1	4	70	1	3	119	2	7
14	83	0	6	118	0	2	201	0	8
15	29	1	1	113	2	1	142	3	2
16	40	0	2	56	1	2	96	1	4
Total	508	5	25	612	10	17	1120	15	42

Prevalence of obesity is 2.4% in male and 0.8 % in female with over all prevalence of 1.5%. Prevalence of over weight is 7.3% in male compared to 4.9 in female with overall prevalence of 6%.

Systolic hypertension seen in 13.4% of overweight and 11.8% of obese children. Systolic pre hypertension seen in 11.9% overweight and 11.8 % obese children. Only 2.3% are pre hypertensive and 1.1% is hypertensive with normal BMI.

Diastolic hypertension seen in 4.5% of overweight and 11.8% obese children. Diastolic pre hypertension seen in 13.4% overweight and 23.5 % obese children. Only 2.8% are pre hypertensive and 0.9% are hypertensive with normal BMI (Table 3).

Out of 22 children with systolic hypertension only 5 children gave definite family history of hypertension in one of the family members. Out of 15 children with diastolic hypertension only 4 gave definite history of hypertension in one of the family members (Table 4).

DISCUSSION

The present study is a cross sectional study done in three rural schools of Kolar taluka, Karnataka, consists of 1120 children in the age group of 10-16 years.

Prevalence of Systolic hypertension in the present study is 2.6% in males and 1.5% in females with overall prevalence of 1.9%.

A wide range of prevalence of hypertension has been recorded in different studies ranging from 1 to 16.2%. This diversity of prevalence of hypertension is mainly due to varying agegroups taken for study and different criteria adopted for defining hypertension, basic differences between racial sub groups related to geographic, dietary and cultural factors.⁷

Table 3: Prevalence of pre-hypertension and hypertension in school children studied according to BMI

BMI	Total number	Systolic pre-hypertension and hypertension (SBP)			Diastolic pre-hypertension and hypertension (DBP)		
		Normal	Pre HTN	HTN	Normal	Pre HTN	HTN
Normal BMI	1036	1001 (96.6%)	24 (2.3%)	11 (1.1%)	997 (96.2%)	29 (2.8%)	10 (0.9%)
Overweight	67	50 (74.6%)	8 (11.9%)	9 (13.4%)	55 (82.1%)	9 (13.4%)	3 (4.5%)
Obesity	17	13 (76.5%)	2 (11.8%)	2 (11.8%)	11 (64.7%)	4 (23.5%)	2 (11.8%)
Total	1120	1064 (95.0%)	34 (3.1%)	22 (1.9%)	1063 (94.9%)	42 (3.8%)	15 (1.3%)
Inference	BMI is significantly associated with pre hypertension and hypertension with $\chi^2=46.692$; $P<0.001^{**}$			BMI is significantly associated with pre hypertension and hypertension with $\chi^2=33.332$; $P<0.001^{**}$			

Table 4: Prevalence of hypertension according to family history and gender

Family history	Total	Male						Female					
		Hypertension (SBP)			Hypertension (DBP)			Hypertension (SBP)			Hypertension (DBP)		
		Normal	Pre HTN	HTN	Normal	Pre HTN	HTN	Normal	Pre HTN	HTN	Normal	Pre HTN	HTN
Absent	360	331 (91.9%)	19 (5.3%)	10 (2.8%)	340 (94.4%)	17 (4.7%)	3 (0.8%)	428 (97.9%)	2 (0.5%)	7 (1.4%)	406 (94.9%)	14 (3.3%)	8 (1.9%)
Present	148	134 (90.5%)	11 (7.4%)	3 (2.1%)	138 (93.2%)	8 (5.4%)	2 (1.4%)	186 (97.3%)	2 (1.1%)	2 (1.1%)	181 (97.3%)	3 (1.6%)	2 (1.1%)
Total	508	465 (91.5%)	30 (5.9%)	13 (2.6%)	478 (94.1%)	25 (4.9%)	5 (0.98%)	612 (97.9%)	4 (0.6%)	9 (1.5%)	585 (95.6%)	17 (2.8%)	10 (1.6%)

In our study prevalence of Systolic hypertension is correlating with the studies done by Kilcoyne et al., Londe and Laroia et al. in which prevalence of Diastolic hypertension is 1.3%.⁸

The hypertension in the present study is distributed over all adolescent age groups with Systolic hypertension is predominant in 13 year age group in both male and female which is similar to other study by Paul Mounter et al.⁹ The elevation of blood pressure in adolescents is also observed in various other studies, although exact reasons for the same are not clear.

Present study shows that prevalence of Systolic hypertension is higher in males (2.6%) compared to females (1.5%), which is similar to studies done by Prazny Kardar et al.¹⁰ and Laroia et al.⁸

Prevalence of Diastolic hypertension is 0.9% in male compared to 1.6% in female whereas diastolic Pre-hypertension is 4.9% in male compared to 2.8% in female which is also nearer to the study done by Laroia et al.⁸

Present study shows a Systolic HTN of 11.8% in obese school children which is similar to other studies by Jonathan M et al.¹¹ and J Chatwal et al.¹² Present study also shows Systolic HTN in 13.4% of overweight children whereas systolic Pre-Hypertension in 11.8% of obese and 11.9% of overweight children. It was evident that obesity in children is a risk factor for hypertension.

In the present study, there is no significant association between parental hypertension and blood pressure in their children. Out of 22 children with systolic hypertension only 5 children gave family history of HTN in one of the parents. Similar observation was made by Sachdev, who actually recorded blood pressure of both the parents and their children and compared them.¹³

However, it is an established fact that familial aggregation of blood pressure occurs among adults and it extends through childhood down to the age of one year and in some cases the resemblance seems to start as early as first month of life.^{2,14}

In the present study the reason for lack of significant association between parental blood pressure status and blood pressure of their children is not clear. The probabilities are that:

- No attempt was made to measure the blood pressure of parents whose children were labeled as hypertensive due to lack of time, resources and personnel, hence the true state of affairs might have been missed.
- Children were unaware of their parental blood pressure status.
- Parents themselves might not have undergone regular medical checkups which include routine blood pressure recordings.

In cases where any one of the parents was hypertensive but their children blood pressure was within normal limits, the possibilities are:

1. Parents are suffering from one of the secondary types of hypertension, which is unlikely to affect the offsprings.
2. If only any one of the parents is suffering from essential hypertension the chances of affecting the offsprings is only 28%, the particular child included in the study being unaffected.

Further detailed studies which include measurement of parental blood pressure are warranted.

CONCLUSION

HTN is a major risk factor for cardiovascular & cerebrovascular disease. In the present study prevalence of HTN was 1.9% with male preponderance (2.6:1.5). Obesity is an important risk factor for cardiovascular complications. In the present study prevalence of HTN was 11.8% in obese and 13.4% in over weight school children.

LIMITATIONS OF THE STUDY

No attempt was made to measure the blood pressure of the parents, whose children were labeled as hypertensive, due to lack of time, resources and personnel. Hence the true state of affairs regarding parental hypertension might have been missed

What is Already Known ?

Blood pressure in children is a reliable predictor of adult blood pressure level who are at increased risk of developing essential hypertension as adults.

What this Study Adds to Literature?

Hypertension is more prevalent in adolescent age group even in rural areas especially males with overweight and obesity being the significant risk factors with less significance to family history.

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