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Research article

HYPERTENSION AS AN EMERGING HEALTH PROBLEM AMONGST SCHOOL CHILDREN AND ADOLESCENTS

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ABSTRACT

Introduction: Hypertension is a common non communicable disease in developed countries. But nowadays even in developing countries like India its prevalence is increasing in adults as well as in childhood population. **Objective:** To find out the prevalence of Pre hypertension and Hypertension amongst school children and adolescents. **Study Design:** Randomised, Cross-sectional, observational multicentric School based study. **Methodology:** In this study 3 schools were selected by simple random sampling method from Urban and rural region of Bijapur district which is a part of North Karnataka. Total 2800 children were screened in the age group from 10-16 years. General data and Blood pressure were recorded for each child. Blood pressure values are compared with reference charts given by National High Blood Pressure Education Programme working group of American heart association 2004 and grouped as prehypertensive (PHTN) and Hypertension (HTN). **Results**: In Rural school children, Prevalence of systolic PHTN was 2.2% and prevalence of systolic HTN was 1.8%. Among urban school children prevalence of systolic PHTN was 3.92% and prevalence of systolic HTN was 3.79%. Prevalence Diastolic PHTN in rural school children was 2% and that of Diastolic HTN was 1.5%. In case of urban school children, the prevalence of Diastolic PHTN was 4.28% and that of Diastolic HTN was 3.86%. In our study the prevalence of hypertension in males was more than female in both rural & urban school children. Also the prevalence of HT was more in urban than in rural population. **Conclusions:** Prevalence of hypertension in school children is increasing even in developing countries. In feature to prevent morbidities, early intervention strategies for promoting healthy eating, physical activities and health education should be undertaken from school age group. This primordial prevention should be considered as an important public health issue in our developing country.

Keywords: Prehypertension, Hypertension, North Karnataka, Primordial prevention.

INTRODUCTION

Hypertension is of importance mainly as a risk factor for cardiovascular and cerebrovascular disease. High blood pressure in the adult population has been shown to relate to the risk of stroke, renal disease and occlusive atherosclerotic vascular disease.[1] Efforts have

been made to reduce the blood pressure level than to prevent their development.

Although it is obviously better to prevent than to cure a disease, it is only recent years that interest has been focused on primary prevention of high blood pressure. Efforts should be made to prevent the development of hypertension during childhood only. This primordial prevention is of utmost important thing that should be considered in developed as well as in developing countries. Systemic hypertension is an important condition in childhood, with estimated population prevalence of 1-2% in the developed countries.[2] Data is lacking from India; small surveys in school children suggest a prevalence ranging from 5-10 %.[3, 4]

In the recent years numbers of studies of blood pressure have appeared for the most part these studies have attempted to establish value of blood pressure measurement for the purpose clinical diagnosis. Comparatively few studies have considered blood pressure and its relation to the increasing age or adolescent period and etiology and incidence of hypertension in this age group.[5-7]

So we carried out the study to find out the prevalence of hypertension amongst school children and adolescents in north Karnataka. The findings of this study will be useful for initiation of primordial prevention in this developing part of India.

MATERIALS & METHODOLOGY

It was a Randomised, Cross-sectional, multicentric study done in school children of the age group of 10 to 16 years during 9 months of study duration. 1400 Children were selected from rural areas and 1400 children of same age groups from the urban areas in and around Bijapur City which is part of North Karnataka. Out of 10 affluent schools in Bijapur City and rural areas, 3 schools were selected based on simple random sampling method. The total sample size was 2800. **Exclusion criteria:** Children with Renal diseases, acute illness, systemic diseases, students who are unwilling, children who are known hypertensives and who are on antihypertensive medication and children taking medications which can modify blood pressure measurement were excluded from the study.

Before initiation of the study, the study protocol containing proforma was approved by Institutional Ethics Committee. Data was collected in a pretested proforma meeting the objective of the study. Informed consent was taken from the parents of all children, Head of the Institution before examining school children. The importance of the study was explained to the school management, staff and teachers. The age of the school children was obtained from the school records. The name and other particulars were entered in a pretested proforma.

Blood pressure was measured in all 10 to 16 years school children between 8AM to 11AM in sitting position after 10 minutes of rest as per American Heart Association Guidelines.[8] 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-ordinating Committee[9]. Children were classified into three groups as follows:[9]

- BP < 90th percentile - Normal (N) Blood pressure (compared to age, sex and height percentile in each age group)
- BP = 90 - 95th percentile - Prehypertension (PHTN)
- BP > 95th percentile - Hypertension (HTN)

In those children whose systolic and or diastolic BP value was found to be more than 95th percentile for age, sex and height, two sets of BP reading were taken at an interval of 4 weeks. If systolic and or diastolic BP was found to be

persistently more than 95th percentile for age, sex, and height then child was classified as having sustained hypertension. Those children who had sustained hypertension were subjected to further investigations with informed parental consent. Investigations were done after taking consent from the parents in a format, after explaining the parents about the need for investigations and treatment aspects. Following investigations were done: Lipid profile, Blood Urea/serum creatinine, Urine albumin, urine sugar, urine microscopy, USG of abdomen.

Statistical analysis: Data were analyzed for prevalence rate & Frequency distribution. All the statistical operations were done through SPSS (Statistical Presentation System Software) for Windows, version 10.0 (SPSS, 1999. SPSS Inc: New York). A value of $P < 0.05$ was considered as statistically significant.

RESULTS

In the present study total 2800 students were screened. Out of these 1400 were Rural & 1400 were urban school children. Out of 2800, 1514 were male children and 1286 were female children. In male children, 731 students were from rural school and 783 students were from urban school. Also, in case of female students 669 students were from rural school, while 617 students were from urban school.

Table 1: Prevalence of Systolic Hypertension in Rural & Urban Children according to age*.

Age (years)	Rural school children				Urban school children			
	Normal	PHTN	HTN	Total	Normal	PHT	HT	Total
10	407	2	1	410	338	2	2	342
11	219	1	1	221	292	4	4	300
12	128	4	2	134	222	4	7	233
13	124	6	5	135	111	9	13	133
14	198	8	8	214	89	11	9	109
15	182	4	4	190	156	9	7	172
16	85	6	5	96	84	16	11	111
Total	1343	31	26	1400	1292	55	53	1400

(*All values are in absolute numbers) PTHN: Prehypertension, HTN: Hypertension

Table 2: Prevalence of Systolic Hypertension in Rural & Urban Children according to sex (*)

Sex	Rural school children				Urban school children			
	Normal	PHTN	HTN	Total	Normal	PHTN	HTN	Total
Male	697	19	15	731	717	33	33	783
Female	646	12	11	669	575	22	20	617
Total	1343	31	26	1400	1292	55	53	1400

(*All values are in absolute numbers) PTHN: Prehypertension, HTN: Hypertension

Table 3: Prevalence of diastolic hypertension in Rural & Urban Children according to age (*)

Age (years)	Rural school children				Urban school children			
	Normal	PHTN	HTN	Total	Normal	PHT	HT	Total
10	408	1	1	410	335	4	3	342
11	215	4	2	221	295	3	2	300
12	131	2	1	134	222	5	6	233
13	126	4	5	135	103	8	12	133
14	208	5	3	214	87	12	10	109
15	178	6	6	190	154	10	8	172
16	88	5	3	96	80	18	13	111
Total	1353	27	20	1400	1286	60	54	1400

(*All values are in absolute numbers) PTHN: Prehypertension, HTN: Hypertension

Table 4: Prevalence of diastolic hypertension in Rural & Urban Children according to sex (*)

Sex	Rural school children				Urban school children			
	Normal	PHTN	HTN	Total	Normal	PHTN	HTN	Total
Male	703	17	11	731	716	36	31	783
Female	650	10	9	669	570	24	23	617
Total	1353	27	20	1400	1286	60	54	1400

(*All values are in absolute numbers)

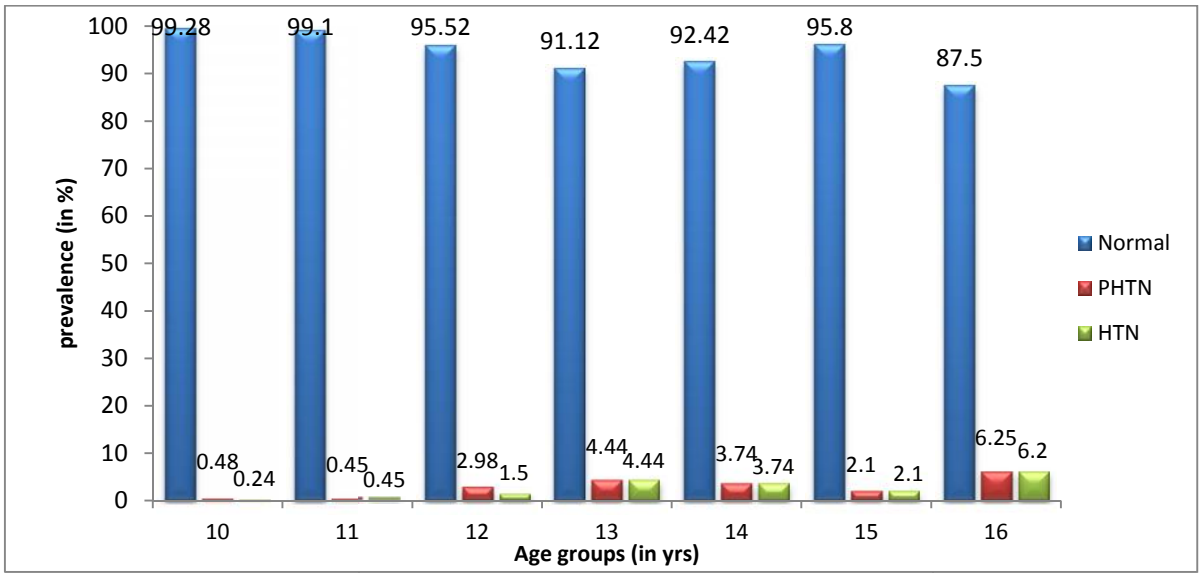

Fig1: Prevalence of Systolic Hypertension in Rural School Children according to age.

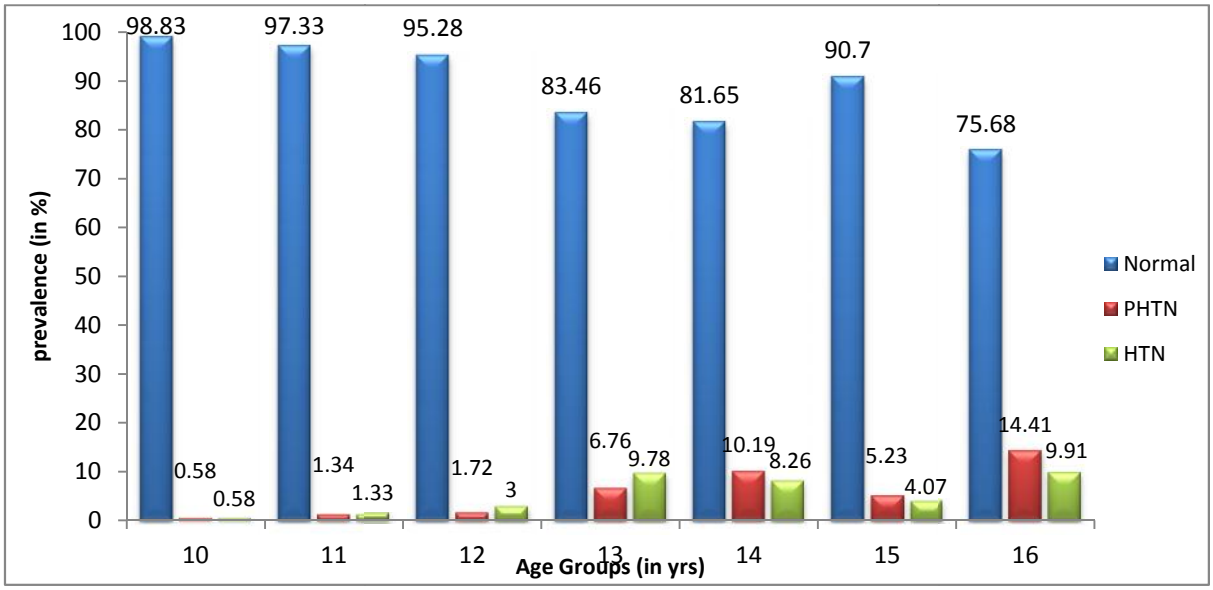

Fig 2: Prevalence of systolic hypertension in urban school children according to age.

As shown in Table no. 1, Prevalence of systolic prehypertension (PHTN) was 2.2% and prevalence of systolic hypertension (HTN) was 1.8% in rural school children. It was also observed that, systolic BP increases with age in both male & female. Also, maximum number of hypertensive and prehypertensive were seen in above 13 years of age. Figure no.1 describes the % prevalence of systolic hypertension in each group.

Among rural school children, it was found that Prevalence of systolic prehypertension in males was 2.6% compared to 1.79% in females. The prevalence of hypertension in males was 2.05%, while in females it was 1.64%.

Among urban school children, prevalence of systolic PHTN was 3.92% and prevalence of systolic HTN was 3.79%. As compared to rural, the prevalence of prehypertension and hypertension was more in urban population in all age groups. The maximum numbers of hypertensive were found in 16 years of age group. (As shown in table no. 1 & figure no.2)

It was observed in our study that, the prevalence of Systolic hypertension was predominantly seen in males (4.21%) compared to females (3.24%) in Urban school children. Also, the prevalence of systolic prehypertension was more in males (4.21%) as compared to females (3.56%).

In case of diastolic BP measurement, Prevalence of Diastolic PHTN in rural school children was 2 % and that of Diastolic HTN was 1.5%. It was also observed that, diastolic BP increases with age in both male & female. Also, maximum number of diastolic hypertensive and prehypertensive were seen in above 13 years of age.

When the difference between the prevalence rates of different sex was examined, it was found that the male prevalence of diastolic hypertension was 1.5% as compared to 1.34% in female.

In case of urban school children, the prevalence of Diastolic PHTN was 4.28 % and that of Diastolic HTN was 3.86 %. The maximum numbers of prehypertensive and hypertensive were found in 16 years of age group.

In the urban school children, the prevalence of diastolic PHTN in male was 4.6% while the prevalence of HTN was 3.96%. In female, the prevalence of PHTN was 3.89% and the prevalence of HTN was 3.72%.

DISCUSSION

Hypertension is a common non communicable disease. It is also risk factor for various disorders including cardiovascular disorders like myocardial infarction, angina and cerebrovascular disorders like stroke, haemorrhage etc. It is very important to diagnose and to treat the hypertension at early stage only, so as to decrease the morbidity and mortality following these disorders. Therefore detection of childhood hypertension carries utmost importance. Population changes in health-related behaviours, including the childhood obesity epidemic, indicate that the rates of hypertension in the young are increasing.[1] Although the prevalence of HT is less common in children than in adults,[10, 11] there are studies which had proven that the origin of essential HT start childhood.[11-15] But studies indicative of current status of hypertension in north Karnataka are not available in literature. Therefore, we decided to undertake the present study to highlight the rising problem, hypertension in both rural and urban area of north Karnataka.

Considerable advances have been made in detection, evaluation, and management of high blood pressure (BP), or hypertension, in children and adolescents.[8] The level of 'normal' BP varies in different studies due to number of variables such as the size of the rubber bladder within the cotton cuff, type of sphygmomanometer, arm position, whether the fourth or the fifth phase of Korotkoff's sound is used to obtain the DBP, and place and time of BP measurement.[12-13] In the present study, BP was recorded by mercury sphygmomanometer using standardized method.[8, 9]

In the present study, both SBP & DBP showed increase in the value as with increase in age. Similar findings were reported by Sharma *et al*[15] The age-related increase in BP may be attributable in part to increase in body mass.[16] A trend of increase in SBP and DBP with age in the present study was observed in both sexes. An increase in SBP and DBP with age has also been

reported in Indian children by other authors.[17-20] Gupta *et al*[21], observed a spurt in SBP between 13–15 years in both sexes. The spurt in SBP between 13–15 years is mainly related to certain biological and psychosocial factors, and puberty timing.[22-23] In our study, we observed that there was increase in both SBP & DBP value above 13 years of age with maximum BP at the age of 16 years. Also, there was no significant difference in BP measurement between male & female of same age group. The differences in BP between males and females of same age groups are probably related to certain biological and psychosocial factors.[16] The appearance of secondary sex characters together with the menarche is associated with a high level of anxiety resulting in higher SBP values in girls. However, there are no appreciable differences in the level of the BP of children, aged 5–14 years, between the two sexes.[24-27]

We found that, the prevalence of systolic prehypertension (PHTN) & hypertension (HTN) in rural school children were 2.2% and 1.8%, respectively, while in urban area, they were 3.92% & 3.79%, respectively. The prevalence of HT in children has been reported to vary between 0.41% to 11.7%.[17, 21] The prevalence of HT in urban population was found to be more than rural population. The contributing factors could be dietary habits like junk foods, lack of physical activity, and peer pressures[16]. Similar findings were noted about diastolic HT.

But in our study has some limitations. All BP measurements were taken by single observer. This can be a bias source. Also we did not include factors such as physical activity, diets and salt intake. These factors significantly affect the BP readings. In our study, we did not studied that among the hypertensive children, how many of children require antihypertensive medications, do they develop any cardiovascular disease or other morbidity. We referred these children to hospital with all their recorded data. Further research can be done in this aspect.

The study of childhood HT is important for several reasons: i) sequelae of long-term HT are irreversible and associated with significant morbidity and mortality, ii) childhood BP is the best predictor of adult BP. iii) helps in planning primordial preventive strategies.[16, 28-31] Therefore, this study can help to plan various health care strategies to prevent hypertension related comorbidities in developing countries like India.

CONCLUSION

The findings of this study suggest that there is increasing prevalence of hypertension both in rural as well as in urban part. The prevalence of HT in urban children is more than rural children. Maximum number of hypertensive and prehypertensives are present in more than 13 years of age. So there is need of further research in large scale to raise the issue of early childhood hypertension to start the primordial prevention as early as possible.

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