ORIGINAL ARTICLE

PREVALENCE AND RISK FACTORS ASSOCIATED WITH HYPERTENSION IN CHILDREN AND ADOLESCENTS

Kumar Amritanshu, Atul Kumar, Apeksha Pathak, Neha Garg, Deba Prasad Banerjee*

Abstract

Objectives: To determine prevalence of childhood and adolescent hypertension and its risk factors.

Materials and methods: Children and adolescents aged 5 to19 years of life were included. High blood pressure was categorized as pre-hypertension and hypertension. Pre-hypertension was considered as blood pressure (BP) equal or greater than the age and gender specific 90th percentile after adjusting for weight and height or BP equal or more than 120/80 mm of Hg. When BP was equal or over the age and gender specific 95th percentile value, it was considered as hypertension. Data was collected using pre-tested questionnaire completed by parents.

Results: Prevalence of hypertension was found to be 4.7%. It was significantly associated with family history of hypertension ($p<0.001$), type of diet ($p<0.001$) and additional salt intake ($p=0.008$). In our study BP showed a gradual increase over age. It also shows that there is spurt of systolic and diastolic blood pressure from 13 to 14 years in boys while in girls there is spurt of systolic BP from 9 to 11 years of age and diastolic BP from 11 to 12 years of age.

Conclusion: Children with family history of hypertension should be targeted for primary prevention in vigorous manner along with dietary and lifestyle modification.

Introduction

Hypertension has been increasing among children and adolescents since1990s. During 1997-2006, hospitalization rate for children and adolescents with a diagnosis of hypertension doubled, from approximately 18 cases per 100,000 pediatric hospital discharges in 1997 to approximately 35 cases per 100,000 in 2006. Among children and adolescents with hypertension, as many as one in three has target organ damage, especially left ventricular hypertrophy. (1)

The circumstances of diagnosing hypertension in children and adolescents are varied. Those with essential hypertension are usually asymptomatic; the hypertension is usually mild and detected during routine examination. Similarly, unless the blood pressure has been sustained for a long time or is particularly high or rising rapidly in children with secondary hypertension, it is also asymptomatic, and any clinical manifestation will be those of underlying disease, such as growth failure and chronic kidney disease (CKD). (2)

Various factors might have attributed to this rising trend like changing life style, diet and urbanization. Leupker et al reported that blood pressure normally changes with growth and development. (3) So, it becomes increasingly important to detect and interrupt development of childhood and adolescent hypertension to reduce long term ill effect of the disease. Thus, this study aims to find out prevalence of childhood and adolescent hypertension and its risk factors.

Methods & Materials

This observational study was carried out at outpatient department (OPD) of Pediatrics, Katihar Medical College in Bihar, India from October 2014 to December 2014. All children and adolescents aged 5 to 18 years of life along with their parents were included in the study. Blood pressure (BP) was measured to the nearest 2mm of Hg in the seated position using a mercury sphygmomanometer by the resident doctor with at least 10 minutes rest period before the measurement. The first and fifth korotkoff were used to represent the systolic (SBP) and diastolic blood pressure (DBP) respectively. The measurement were taken from all participants at 2 minute interval, and the average of the last two measurement were recorded. High blood pressure (HBP) was categorized as pre- HTN (Hypertension) and HTN. Pre-hypertension was considered as BP equal or greater than the age and gender specific 90th percentile after adjusting for weight and height or BP equal or more than 120/80 mm of Hg according to the fourth report of working group on blood pressure control in children, commissioned by the National Heart, lung and blood institute of the National institutes of health of America. When BP was equal or over the age and gender specific 95th percentile value, it was considered as HTN. (4) For parents, HTN was defined as systolic >140mm of Hg and or diastolic >90 mm of Hg (5) or they were on antihypertensive medication. Data was collected using pre-tested questionnaire (5-7) completed by parents. According to dietary history subjects were categorized vegetarians if they never consumed non-vegetarian food at any time in their life and non-vegetarians if they consumed non-vegetarian food items in their diet. Junk food was defined as food that is high in calories and low in nutritional content. It includes food items like potato chips, samosa, cold drinks, chowmein etc. Frequency of intake of junk foods was defined as daily when more than or equal to once a day, weekly when upto three times a week, monthly when less than three times a month, and none when there was no intake of junk food. (7)

Results

In this study 2604 children participated. Male to female ratio was 1.07:1.The age range of pupils was 5-19 years of age. In our study BP showed a gradual increase over age. There is also gradual increase DBP except in 8 - 13 years old boys and 9 year old girls. There is also a spurt of systolic and diastolic blood pressure from 13 to 14 years of old boys and in girls there is spurt of systolic BP from 9 to 11 years of age and diastolic BP from 11 to 12 years of age. (Table 1 and 2) Out of 2604 children 755 (28.9%) and 123 (4.7%) were pre- HTN and hypertensive respectively. Risk factors associated with hypertension are depicted in Table 3.

TABLE no 1:- Distribution of systolic BP for boys and girls at different age group

AGE GROUP (Years)	Males (n)	MALE Mean SBP (mmHg)	SD	Females (n)	FEMALE Mean SBP (mmHg)	SD
6	78	88.4	9.4	74	93.2	10.4
7	80	91.4	12.6	79	93.6	9.6
8	108	88.8	10.5	103	95.7	10.8
9	89	88.7	8.9	86	93.7	8.4
10	101	94.6	11.2	94	102.6	11.7
11	103	94.2	10.6	97	103.4	11.6
12	106	93.6	10.5	92	105.7	11.4
13	112	96.8	12.4	104	108.8	11.3
14	99	103.6	11.9	92	111.3	11.2
15	91	104.2	12.1	87	111.5	11
16	97	104	12.3	89	113.4	10.8
17	98	107.2	12.6	93	113.6	10.7
18	99	107.8	12.7	79	114.2	12.3
19	91	107.6	12.9	83	114.3	12.8

SD= Standard deviation

TABLE no 2:- Distribution of Diastolic BP for boys and girls at different age group

AGE GROUP (Years)	Males (n)	MALE Mean DBP (mmHg)	SD	Females (n)	FEMALE Mean DBP (mmHg)	SD
6	77	55.2	7.9	73	58.7	7.2
7	78	57.6	10.8	77	61.4	8.3
8	107	56.2	7.7	97	61.7	8.5
9	88	57.1	8.8	85	59.8	8.9
10	101	58.8	8.4	93	66.2	7.7
11	103	59.2	8.9	97	66.3	8.6
12	105	59.1	7.7	91	68.3	8.7
13	110	59.1	9.2	103	70.1	8.8
14	97	62.3	9.1	89	70.8	7.7
15	89	65.2	8.3	86	71.1	8.9
16	96	66.8	8.5	87	72.3	9.1
17	97	68.7	8.7	91	72.4	9.2
18	95	69.9	9.2	77	74.4	9.2
19	89	69.9	9.3	81	74.6	9.3

Table no 3:-Relationship between hypertension and risk factors.

RISK FACTORS	Hypertensives	Non-hypertensives	Total	p value
Family history of hypertension (both maternal and paternal)				P<0.001
Present	48 (7.7%)	576 (92.3%)	624	
Absent	75 (3.8%)	1905 (96.2%)	1980	
Maternal history of hypertension				P=0.001
Present	36 (7.7%)	432 (92.3%)	468	
Absent	87 (4.1%)	2049 (95.9%)	2136	
Paternal history of hypertension				P<0.001
Present	35 (8.7%)	368 (91.3%)	403	
Absent	88 (4%)	2113 (96%)	2201	
Type of diet				P<0.001
Vegetarian	16 (2.3%)	687 (97.7%)	703	
Non-vegetarian	107 (5.6%)	1794 (94.4%)	1901	
Additional salt intake				P<0.001
yes	99 (11.5%)	765 (88.5%)	864	
no	24 (1.4%)	1716 (98.6%)	1740	
Intake of junk food				P=0.959
Daily/Weekly	59 (4.7%)	1196 (95.3%)	1255	
Monthly/None	64 (4.7%)	1285 (95.3%)/td>	1349	

Discussion

In our study BP showed gradual increase over age with spurt of systolic blood pressure and diastolic blood pressure from 13 to 14 years old boys and in girls there is a spurt of both systolic BP from 9 to 11 years of age and diastolic BP from 11 to 12 years of age. Similarly Anand et al (8) showed that BP increases with advancement of age with a spurt of systolic BP at 12 years of age in both sexes .These spurts of BP may be due to the effect of sex hormones liberated at the time of puberty. Patel et al (9) in their studies observed a positive correlation of systolic blood pressure with ages of children but no correlation with diastolic blood pressure.

The prevalence of hypertension (4.72%) in our study is consistent with other studies in which the reported prevalence of hypertension in children ranges from 2% to 5%. (10,11) The study also showed that hypertension has significant relation with family history (p<0.001). Mijinyawa et al (12) reported that adolescent hypertensives in Kano, Nigeria were twice more likely to have family history of hypertension than their normotensive counterparts. Dayananda et al (13), showed that young normotensives with a positive family history of hypertension had significantly higher blood pressure (p<0.005) and also increased resting heart rate (p<0.05) than young normotensives with a negative family history of hypertension. Contrary, to finding in this study, a study conducted on children by Genovesia et al (14) didn't show a significant association between family history of hypertension and childhood hypertension. The fact that their study was on sample of 377 children identified by primary care referral and sent for further investigation for cardiovascular risk in children for either elevated blood pressure values and /or family history of cardiovascular disease and not a random study of the general population may account for the different findings in the two studies. Furthermore impairment in baroreceptor reflex sensitivity in hypertension is in part genetically determined and may be an important hereditary component in pathogenesis of essential hypertension. (15)

A significant higher percentage of hypertensives were non-vegetarians. Similar results were also reported by Agrawal et al. (16) In this study significant association was found between hypertension and additional salt intake. Similar results has been reported by Sadhu Khan et al (17) and Vimala et al. (18) It may be due to the fact that normally sodium excretion

increases when there is an acute increase in blood pressure. In persons with hypertension, however the blood pressure required to excrete a given sodium load is higher than that in persons without hypertension. (19) Junk food intake was high among children and adolescents who were hypertensive. However, no significant association was observed with frequency of intake of junk food.

Conclusion

Children with family history of hypertension should therefore, be targeted for primary prevention in vigorous manner along with dietary and lifestyle modification. Knowledge about prevalence, early and appropriate diagnosis is important since even a small decrease in blood pressure can have substantial effect on hypertension related morbidity and mortality, greater attention on blood pressure in early life ultimately lead to considerable improvements in cardiovascular health.

Funding: None
Conflict of Interest : None

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From: Department of Paediatrics, *Department of Medicine, Katihar Medical College, Katihar, Bihar, India.

Address for Correspondence: Dr Kumar Amritanshu, Associate Professor, Department of Paediatrics, Katihar Medical College, Katihar-854105, Bihar, India.

Email: dramritanshupediatric@gmail.com.

DOI: 10.7199/ped.oncall.2015.34