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Original Articles

Prevalence and Risk Factors of Hypertension Among School Going Children of Dhaka City

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Abstract

Despite general belief that hypertension is a disease of adulthood, children and adolescents can also suffer from the condition and may remain unnoticed because of lack of routine measurement of blood pressure. Hypertension in children in Bangladesh has not been well studied. Hence a study was conducted among 6-16 year-old school children of Dhaka city to find out the pattern of blood pressure (BP), prevalence of hypertension and its risk factors in this age group.

In this cross sectional study, 1995 apparently healthy children of specified age group were systematically sampled from 6 purposively selected schools in Dhaka city. Their BP were measured methodically under ideal situation. On the same day, their anthropometry were also done by taking height and weight. All of them were given a questionnaire to take home for filling up the family history of hypertension, education, occupation and monthly income of their parents. Those who had BP above 95th centile on three occasions with an interval of two weeks, were diagnosed as hypertensive.

Among the 1995 children, male female ratio was 1:1. There were 127-238 children in each single-year age category. Most of their fathers were service holders with 10-14 years of education. Mean systolic BP (SBP) ranged from 88.6 to 113.5 mm Hg, and mean diastolic BP (DBP) from 55.3 to 74.2 mm Hg. Girls had both SBP and DBP more than boys of same age category.

Both SBP and DPB have linear relationship with age. There was significant increment in both the systolic and diastolic BP among the female children from 9 to 10 years of age. Similar sudden increment of only systolic blood pressure was seen from 13 to 14 year old male children.

This study showed that prevalence of hypertension in school going children of Dhaka city was 0.55% and there was a significant relationship of hypertension with the obesity and family history of hypertension. Among the 11 hypertensive children, 9 (81.8%) had either of the two risk factors, odds ratio (95% CI) being 15.37 (3.31 - 71.37).

Key words: *Hypertension, school going children.*

Introduction

Blood pressure (BP) measurement is a part of routine examination in adult population. It is generally believed that hypertension is a disease of adulthood and children are exempted. Moreover, BP measurement in infants and children is difficult and time consuming. So, in pediatric practice BP is not measured routinely and is assumed to be normal. Contrary to this belief it is estimated that 1-3% children are hypertensive[1].

Diagnosis of hypertension in adult is made when BP exceeds a defined level i.e. systolic BP (SBP) 140 mmHg and diastolic BP (DBP) 90 mmHg[2]. Absence of such single cut off value in children makes diagnosis of hypertension more difficult, and the use of such age -sex-independent absolute value is inappropriate. In children, hypertension is diagnosed when resting BP consistently exceeds 95th centile in relation to age and sex[3]. In infancy and early childhood, hypertension is mainly secondary to some diseased

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conditions. In late childhood and adolescence, it is mainly primary or essential in type, not associated with any disease; but there appears to be a strong family history of hypertension. However, it is recognized that many factors such as heredity, salt intake, stress and obesity may play a role in the development of hypertension[4].

Etiology of hypertension may be understood by the level of blood pressure. In secondary hypertension blood pressure is usually very high and symptomatic, but in essential hypertension, which is found in late childhood and adolescence, it may remain borderline or slightly higher than the 95th centile for the age and sex and the child is usually asymptomatic[4].

The role of pediatricians includes not only the treatment of patients with established high blood pressure but also the identification of children at risk and the institution of preventive measures when indicated[5].

This study was carried out to see the prevalence of hypertension and its relationship with predisposing factors like obesity and family history of hypertension in apparently healthy school going children in Dhaka city.

Materials and Methods

This cross-sectional study was carried out in six schools of Dhaka city from January 1999 to December 2000. Schools were selected purposively. The target age for the study was 6-16 years. Total sample size was determined to be 1995.

Date, time and place of study were fixed in consultation with and prior consent of school authority. In each school, with the help of school records, both boys and girls of 6 - 16 years were listed and then around 350 children were selected from all classes for the study by systematic random sampling. Children suffering from chronic systemic disorder or psychological abnormality were excluded from the study.

At a time 10 students were taken to a room and were allowed to sit for 10 minutes. Meanwhile, in order to make them relaxed the purpose and procedure of the study was explained to them. Then their heights were measured by height scale and weights by bathroom scale[6,7]. After that BP was recorded one by one.

BP was measured by mercury sphygmomanometer using the same machine throughout the study and it was checked periodically for any loss of mercury or any leak in tubing or in control valves. Age appropriate cuff covering 2/3rd of the length of the arm and encircling its whole circumference was used[6,7]. Measurements were taken by the same post graduate medical doctor.

While measuring BP the child was asked to sit comfortably. The cuff was wrapped around the right arm keeping the arm at the level of heart. The bladder of the cuff was inflated to about 200 mm Hg level, then it was deflated slowly at a rate of 1 mm per second. SBP was measured at the level of first appearance of sound (Korotkoff phase 1) and DBP was measured at the level of muffling of sound (Korotkoff phase IV)[4]. Readings were taken for three times at an interval of three minutes. All these three readings were recorded and their average was considered as the BP of that child at that time. After that children were given a questionnaire to be filled up by their parents about the family history of hypertension and their complications, education, occupation and monthly income of their parents.

Children whose BP were found above 95th centile for age and sex were measured for the second time after two weeks; Children whose BP was again found above 95th centile were measured for the third time after two weeks. Those children having BP above 95th centile on three occasions were identified to have hypertension[1,4].

Data were entered into computer and analyzed using SPSS program.

Results

In this study 1995 apparently healthy school going children were checked for blood pressure. Fifty percent of the children were male and 50% were female.

Number of students ranged from 127 - 238 in each age group. Educational level of most of the parents was between Secondary School Certificate to Graduation (62.5 - 70%). Most of the fathers were service holders and most of the mothers were housewives. (Table I).

Distribution of SBP of both sexes of different age groups in table-II shows that there was gradual increase in BP with increase of age except at 8, 9

and 12 years in boys and at 9 years in girls. At these age groups BP was found less than the previous age groups. This table and Fig-1 also show that there was significant increase of systolic BP from 9 years to 10 years age group in girls & from 13 years to 14 years age group in boys.

Similarly, in table III, distribution of DBP of both sexes at different age groups shows that at age groups 8 and 13 years in boys and 9 years in girls, DBP was less than the previous age groups. This table and Fig-1 also show that there was significant increase of DBP from 9 years to 10 years age group in girls.

On the first measurement of BP 54 children (20 male and 34 female) were found to be hypertensive; on second measurement this number reduced to 20 (9 male and 11 female) and on the third and final measurement 11 children (5 male and 6 female) were found to be hypertensive.

Out of 1995 apparently healthy school going children 11 were hypertensive. Hence, prevalence of hypertension among the study population was 0.55%. Out of those 11 hypertensive cases 04 had systolic hypertension, 06 had diastolic hypertefnsion, and only 01 had both systolic and diastolic hypertension.

This study checked the relationship of hypertension with obesity and/or family history of hypertension. Presence of any one of these was taken as positive predisposing factor. Table-IV shows that out of 11 hypertensive cases 09 had either obesity or family history of hypertension.

Table-V shows the distribution of respondents according to their hypertensive status and the presence of predisposing factors. In this study, 465 (23.3%) children had predisposing factors, either family history of hypertension or obesity. Of those 465 children 09, (1.93%) were found to be hypertensive. In 1530 (76.7%) children predisposing factors were absent, among them only 02 (0.13%) were found to be hypertensive. Chi-square test was done (Table V) and the association between the children with hypertension and the presence of predisposing factors were found to be highly significant. (X^2 =18.02; p <0.001) .

Table I
Socio-demographic characteristics

	Characterstics	N	%
Sex	Male	1003	50
	Female	992	50
	6	133	6.7
	7	139	7.0
	8	183	9.2
	9	141	7.1
Age	10	162	8.1
Groups (in year)	11	212	10.6
	12	238	11.9
	13	223	11.2
	14	208	10.4
	15	229	11.5
	16	127	6.4
Fathers'	< 10	92	7
Education in years*	10 - 14	822	62.5
	> 14	404	30.7
Mothers'	< 10	206	16.1
education in years*	10 - 14	894	69.8
	14	181	14.1
Fathers'	Service	853	63
Occupation*	Business	425	31.5
	Others	75	5.5
Mothers'	Service	166	13.3
Occupation*	Business	22	1.8
	Housewife	1036	83.3
	Others	20	1.6
Parents' income	< 5000	862	43.2
(Taka per month)	5000 -<20,000	818	41.0
	20,000 and above	315	15.8

* Information could not be obtained from all parents

Table II

Distribution of systolic BP of boys and girls at different age groups (n=1995)

Age groups	Male N	Male Mean SBP (mm Hg)	Male SD	Female N	Female Mean SBP (mm Hg)	Female SD
6	68	88.6	9.5	65	93.3	10.3
7	66	91.2	12.7	73	94.3	9.8
8	97	88.9	10.2	86	95.5	10.9
9	81	89.7	9.0	60	93,6	8.3
10	96	92.4	11.3	66	102.8	11.9
11	118	94	10.8	94	103.5	11.5
12	123	93.9	10.4	115	105.5	11.6
13	103	96.6	12.3	120	108.6	11.6
14	100	103.4	12.1	108	111.2	11.0
15	85	104.1	12.2	144	111.6	10.9
16	66	107.1	12.2	61	113.5	12.9
Total	1003			992		

Table III

Distribution of diastolic BP of boys and girls at different age groups (n=1956)

Age groups	Male N	Female Mean DBP (mm Hg)	SD	N	Mean DBP (mm Hg)	SD
6	67	55.3	8.1	64	58.6	7.3
7	62	57.9	10.9	68	61.3	8.5
8	96	56.0	7.9	85	61.6	8.6
9	81	57.2	8.6	59	61.1	7.0
10	96	58.9	8.5	66	66.2	7.8
11	115	59.3	9.2	94	66.3	8.5
12	118	59.3	7.8	114	68.4	8.5
13	98	59.1	9.1	120	701	8.6
14	97	62.4	9.0	106	71.1	7.5
15	82	65.2	8.6	144	72.2	8.8
16	64	68.9	10.1	60	74.2	9.7
Total	976			980		

Note: In case of 39 children DBP could not be measured because of absence of muffling.

Table IV

Characteristics of hypertensive children (n =11)

Case no	Age (yrs)	Sex	Wt (kg)	Ht (cm)	BMI	F/H of HTN	Syst. BP	Diast. BP	Predisposing factors*
1	6	male	31	123	20.52	-ve	131.7	86.7	absent
2	7	male	31	129	18.67	+ve	123.9	76.1	present
3	8	male	40	134	22.34	+ve	130	80	present
4	10	female	56.5	152	24.45	-ve	130	85	absent
5	11	male	80	160	31.12	-ve	131.7	98.3	present
6	13	female	58.5	164	21.82	+ve	130	91.7	present
7	13	male	78	179	30.6	+ve	145	81.7	present
8	14	female	78	157	29.6	+ve	120	90.7	present
9	15	female	39	146	18.30	+ve	130	100	present
10	15	female	84	158	33.73	-ve	136.7	90	present
11	16	female	61	156.5	25	-ve	140	103.3	present

*Obesity or family history of hypertension or both

Table V

Relationship of hypertension with selected predisposing factors

		Hypertensive		Total
		Yes	No	
Predisposing	+ve	09	456	465
Factors	-ve	02	1528	1530
Total		11	1984	1995

Yates corrected Chi-square =18.02, p value = 0.000022
Odds ratio [95% CI] = 15.08 [3.25, 70.04]

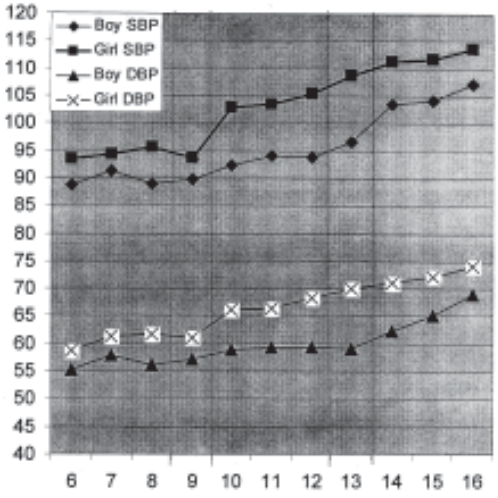

Fig.-1 : *Pattern of SBP and DBP by age among boys and girls*

Discussion

This study showed that with increase of age there is gradual increase of SBP excepting in 8 and 12 years old boys & 9 years old girls, there is also gradual increase of DBP excepting in 8 and 13 years old boys & 9 years old girls. This study also showed that there is a spurt of SBP from 13 years to 14 years old boys and in girls there is a spurt of both systolic and diastolic BP from age 9 years to 10 years. These results resemble the findings of Laroia et al[8] who found a direct corelation of SBP and DBP with age of the children. They also detected a spurt of SBP at 11, 12 and 13 years old boys and 12, 13 and 14 years old girls. For DBP they found a steady rise from 5 to 14 years in both sexes except 11 years in case of girls[8].

A similar study conducted by Anand et al[6] 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[6].

Two other cross sectional studies were conducted previously among the school going children of Dhaka city. Both the studies observed a positive correlation of blood pressure with the age of the children[9,10].

Prevalence of hypertension in this study population was 0.55%. The prevalence is comparable with the

findings of Anand et al[6]. In their study they found that prevalence of hypertension in apparently healthy school going children was 0.46%. Agarwal et al[11] showed a higher prevalence (1.8%).

This study also showed that hypertension in apparently healthy school going children had a significant relationship with obesity and family history of hypertension. Anand et al[6] found that compared to their normal counterparts, prevalence of hypertension was 15 times more in obese children and 40 times more in children having family history of hypertension. In a similar study, Gupta AK[12] showed that children of parents with hypertension or other morbid cardiovascular events are more likely to have persistently elevated blood pressure than children from families without such a history.

Conclusion & Recommendation

Prevalence of hypertension in apparently healthy school going children of Dhaka city was 0.55% and this had a strong relationship with obesity and family history of hypertension. These asymptomatic children with essential hypertension may become adult symptomatic patients. So, BP should be measured routinely for all children during physical examination. Further evaluation and follow up is required to find out the cause and to prevent complications of hypertension.

Further study involving larger number of children should be undertaken to find out the real prevalence in the country.

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