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Research Article

Prevalence of hypertension in school going children in tea garden community in Dibrugarh town, Assam, India

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ABSTRACT

Background: The disease burden of hypertension among workers in tea gardens is large, despite the community not being obese. Consumption of high quantity of common salt (NaCl) is considered to be the main factor. Therefore it is expected that prevalence of hypertension and level of blood pressure would be higher among these group of children. Hence the present study was taken to determine the prevalence of hypertension in apparently healthy, asymptomatic school children of tea garden workers in the age group of 6-12 years.
Methods: Blood pressure was recorded in the right arm in the sitting position by using a standard Hg sphygmomanometer using appropriate cuff sizes. Three readings were taken at an interval of at least 5 minutes and the average of these three readings was considered as the blood pressure of the individual. Average SBP or DBP levels that are greater than or equal to the 95th percentile for sex, age, and height was taken as hypertension.
Results: The prevalence of systolic, diastolic and both systolic and diastolic hypertension are 3.86%, 1.71% and 4.29% and 2.62%, 0.37% and 5.24% in boys and girls respectively and the overall prevalence of hypertension was found to be 9.0% (systolic 3.2%, diastolic 1.0% and systolic and diastolic 4.8%).
Conclusions: The high risk children need to be considered for close follow ups for modification of risk factors by advising lifestyle changes like reduction in intake of salt.

Keywords: Hypertension, Children, Tea garden

INTRODUCTION

Blood pressure is the lateral pressure exerted by the flowing blood on the walls of the vessels and is one of the principal vital signs. The maximum arterial pressure during systole is called systolic blood pressure and minimum arterial pressure during diastole is called the diastolic blood pressure.

The word "hypertension", by itself, normally refers to systemic arterial hypertension.[1] When a person is said to have chronic hypertension (or high blood pressure) it is meant that his or her mean arterial pressure is greater than the upper range of accepted normal pressure.[2] It can be regarded as the silent killer when one considers its long term complication, mortality and morbidity. Essential hypertension in adults is known to have its roots in childhood by Ronald M et al in 1978.

It is suggested that hypertension has its origin in childhood but goes undetected unless specially looked for during this period. Children with upper percentile of blood pressure levels are more likely to become adult hypertensive.

If the trend towards adult hypertension can be recognized in childhood, it may be possible to alter lifestyle and prevent systemic hypertension as well as related complication.[3] Thus, early detection of hypertension and its precipitating or aggravating factor is important if one

is to evolve measures so that complication of hypertension can be prevented.[4]

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.[5] However it is not possible to record reliable blood pressures by conventional methods in children below 6-7 years of age.[6] Hence the ideal age would be 6-15 years i.e. school children.

This recognition has made the medical workers and authorities in Western countries to include routine blood pressure measurements in school health programs and in regular office practice. The incorporation of blood pressure measurement into routine pediatric examination has led to the discovery of significant number of children with asymptomatic hypertension.[7] 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.[8,9] But even today in many parts of the world including India, this practice has not been implemented due to unknown reasons.

The disease burden of hypertension among workers in tea gardens is large, despite the community not being obese.[10] In a study by Hazarika NC et al in tea garden workers of Assam, the prevalence of hypertension was found out to be 60.8% in ≥30 years of age in spite of the fact that obesity is not a factor amongst them, rather they are underweight.[10]

Consumption of high quantity of common salt (NaCl) is considered to be the main factor. This habit of consuming extra salt in food and beverages is present amongst the children in the tea garden community. Therefore it is expected that prevalence of hypertension and level of blood pressure would be higher among these group of children. Hence the present study was taken up to determine the prevalence of hypertension in apparently healthy, asymptomatic school children of tea garden workers in the age group of 6-12 year.

METHODS

The study was undertaken on apparently healthy school going children of tea garden workers in the age group 6-12 years in and around tea gardens of Dibrugarh town, Assam, India.

It was a community based cross sectional study for one year and sample size for the present study was 500. There are 14 numbers of Tea gardens in and around Dibrugarh town, Assam, India. The schools of these tea gardens were selected randomly one by one and the students of the selected schools, who fulfilled the criteria, were included in the study. The process was stopped once the required sample size of 500 children was fulfilled.

Parameters to be studied were:

Blood pressure

Before taking the blood pressure, the students were explained about the procedure and efforts were made to eliminate the factors with may affect the blood pressure such as anxiety, fear, stress, crying, laughing, recent activity etc. Blood pressure was recorded in the right arm in the sitting position by using a standard Hg sphygmomanometer using appropriate cuff sizes.

Three readings were taken at an interval of at least 5 minutes and the average of these three readings was considered as the blood pressure of the individual. The cuff was gradually inflated to about 20 mm Hg above the point at which the radial pulse disappeared; the pressure was then released slowly at a rate of 2-3 mm Hg per second while listening for the first sound (Korotkoff I) using a stethoscope, the diaphragm of which was placed on the brachial artery. Korotkoff's 1st and 5th sounds were considered as systolic and diastolic blood pressures respectively.

Statistical analysis of data was carried out using SPSS Version-16. Data were presented in the forms of percentages, mean± standard deviation and also in the forms of diagrams. Statistical significance was ascertained by using Chi square test and ANOVA wherever applicable.

Age (years)

Age was taken in complete years and was recorded from the school register.

Sex

Height (cm)

Height was measured using an anthropometer consisting of graduation (0-200) in cm. It was measured without shoes and subject standing against a wall on which a measuring scale was placed. The subject had to stand erect, feet parallel and heels, buttocks and shoulder and occiput touching the vertical rod of the anthropometer, head to be held erect, eyes aligned horizontally and ears vertically without any tilt. The horizontal bar which is at right angles to the vertical rod was placed touching the vertex. Height was measured to the nearest of 0.5 cm.

Definition of hypertension

The definition of hypertension in children and adolescents is based on the normative distribution of BP in healthy children. Normal BP is defined as SBP and DBP that is less than the 90th percentile for sex, age, and height.

Hypertension is defined as average SBP or DBP that is greater than or equal to the 95th percentile for sex, age, and height on at least three separate occasions. Average SBP or DBP levels that are greater than or equal to the 90th percentile, but less than the 95th percentile, had been designated as "high normal" and were considered to be an indication of heightened risk for developing hypertension.

This designation is consistent with the description of "prehypertension" in adults. The JNC 7 Committee now defines prehypertension as a BP level that is equal to or greater than 120/80 mmHg and recommends the application of preventive health-related behaviors, or therapeutic lifestyle changes, for individuals having SBP levels that exceed 120 mmHg. It is now recommended that, as with adults, children and adolescents with BP levels at 120/80 mmHg or above, but less than the 95th percentile, should be considered prehypertensive[11].

Instruments to be used were sphygmomanometer, stethoscope and anthropometer.

RESULTS

The study was carried out among 500 school going children of tea garden workers in the 6-12 years age group in and around tea gardens of Dibrugarh town, Assam, India. Relevant data as mentioned in the proforma were collected.

Table 1: Age and sex distribution of the children.

Age (years)	Boys	Boys in %	Girls	Girls in %	Total	Total in %
6	41	47.13	46	52.87	87	17.4
7	37	45.68	44	54.32	81	16.2
8	42	54.55	35	45.45	77	15.4
9	39	50.65	38	49.35	77	15.4
10	30	43.48	39	56.52	69	13.8
11	23	41.07	33	58.93	56	11.2
12	21	39.62	32	60.38	53	10.6
Total	233	46.6	267	53.4	500	100

Table 2: Systolic and diastolic blood pressure according to age and sex.

Age (years)	Sex	No. of cases	SBP (mm Hg)		DBP (mm Hg)	
			Mean±SD	Range	Mean ±SD	Range
6	M	41	96.91±5.08	86.67-111.33	60.98±4.75	50.67-73.33
	F	46	95.58±5.94	88.00-112.00	61.06±4.88	50.67-70.00
7	M	37	98.99±5.48	87.33-117.33	61.96±6.32	50.67-82.67
	F	44	98.88±7.13	90.67-117.33	62.91±8.36	54.67-89.33
8	M	42	101.94±7.05	90.67-123.33	63.95±7.47	54.67-89.33
	F	35	99.71±7.50	90.67-123.33	62.90±6.84	54.67-89.33
9	M	39	103.44±8.44	88.67-123.33	65.83±6.60	54.67-89.33
	F	38	101.58±8.22	90.67-121.33	63.89±6.17	54.67-81.33
10	M	30	104.93±7.19	93.33-125.33	66.11±8.18	57.33-91.33
	F	39	104.63±8.80	71.33-125.33	66.77±5.87	60.67-91.33
11	M	23	105.65±7.43	94.67-127.33	68.06±8.69	56.67-93.33
	F	33	105.60±7.44	96.67-127.33	66.22±6.63	57.33-81.33
12	M	21	106.92±8.98	96.67-131.33	68.83±6.05	60.67-81.33
	F	32	107.90±7.66	96.67-123.33	68.81±4.83	62.67-79.33

In the present study 233 children (46.6%) were boys and 267 (53.4%) were girls. Highest number of boys was found in 8 years age, while in case of girls highest number was found in the 6 years age (Table 1). There is progressive increase in both mean systolic and diastolic blood pressure with age in both the sexes. In boys, increase in mean SBP is more marked in 7-8 years and mean DBP in 10-11 years, whereas in girls mean SBP is marked in 6-7 years and mean DBP increase more in 9-10 years (Table 2).

When cases were distributed according to their height, it is found that both SBP and DBP increase as the height increases (Table 3). The prevalence of hypertension is

highest in the 12 years age group in case of both boys and girls (Table 4). Out of all boys 9.87% are hypertensive and out of all girls 8.23% are hypertensive and the difference is not statistically significant (Table 5). The prevalence of systolic, diastolic and both systolic and diastolic hypertension are 3.86%, 1.71% and 4.29% and 2.62%, 0.37% and 5.24% in boys and girls respectively.

Table 3: Height of the children according to age and sex.

Age	Sex	No. of cases	Height	
			Mean±SD	Range
6	M	41	110.05±6.14	97-124
	F	46	109.11±5.76	98-122
7	M	37	116.78±6.84	102-127
	F	44	116.59±6.60	102-128
8	M	42	119.48±6.12	102-128
	F	35	118.37±5.11	102-126
9	M	39	121.85±2.51	118-130
	F	38	120.84±2.19	116-126
10	M	30	123.87±2.61	121-132
	F	39	122.90±2.38	119-131
11	M	23	125.22±6.43	113-143
	F	33	123.88±6.04	112-139
12	M	21	129.71±6.47	119-142
	F	32	129.62±5.05	122-141

Table 4: Hypertensive cases according to age and sex.

Age (years)	Boys			Girls		
	No. of cases	No. Of hypertensives	% prevalence	No. of cases	No. Of hypertensives	% prevalence
6	41	3	7.31	46	2	4.34
7	37	1	2.70	44	4	9.09
8	42	4	9.52	35	2	5.71
9	39	5	12.82	38	4	10.52
10	30	2	6.66	39	3	7.69
11	23	4	17.39	33	3	9.09
12	21	4	19.04	32	4	12.5
Total	233	23	9.87	267	22	8.23

Table 5: Sex distribution of hypertensive cases.

Sex	No. of cases	Hypertensive	Percentage (%)	
Boys	233	23	9.87	P > 0.05
Girls	267	22	8.23	
Total	500	45	9	

Table 6: Prevalence of hypertension.

Hypertension	Boys		Girls		Total	
	No. of cases	% of 233	No. of cases	% of 267	No. of cases	% of 500
Systolic	9	3.86	7	2.62	16	3.2
Diastolic	4	1.71	1	0.37	5	1.0
Systolic and diastolic	10	4.29	14	5.24	24	4.8
Total	23	9.87	22	8.23	45	9

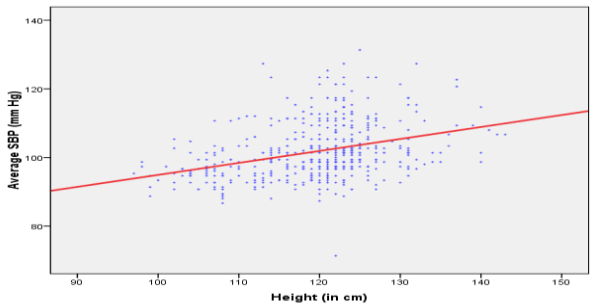

Figure 1: Scatter diagram showing the correlation of SBP with height.

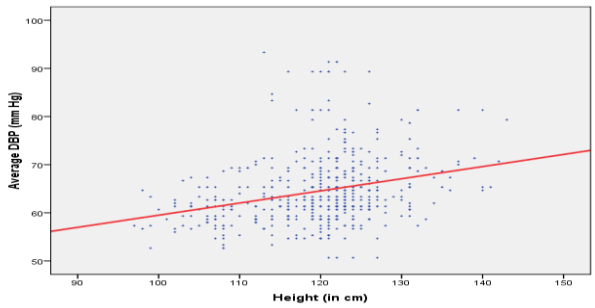

Figure 2: Scatter diagram showing the correlation of DBP with height.

Table 7: Systolic and diastolic hypertension according to sex.

BP	Boys		Girls		Total	
	No. of cases	%	No. of cases	%	No. of cases	%
Systolic	9	39.13	7	31.81	16	35.55
Diastolic	4	17.39	1	4.54	5	11.11
Systolic and diastolic	10	43.47	14	63.63	24	53.33
Total	23	100	22	100	45	100

The overall prevalence of hypertension is 9.0% (systolic 3.2%, diastolic 1.0% and systolic and diastolic 4.8%). (Table 6). In boys, out of all hypertensive cases systolic, diastolic and systolic and diastolic hypertension cases were 31.13%, 17.39% and 43.47% respectively. In girls, out of all hypertensive cases systolic, diastolic and systolic & diastolic hypertension cases were 31.81%, 4.54% and 63.63% respectively (Table 7).

Table 8: Correlation of age and height with SBP and DBP.

	SBP		DBP	
	Correlation coefficient(r)	P - value	Correlation coefficient(r)	P - value
Age	0.45	P<0.01	0.35	P<0.01
Height	0.34	P<0.01	0.28	P<0.01

SBP and DBP are positively correlated with age and height, which indicate that SBP and DBP increase with the increase in age and height (Table 8 and Figure 1 and 2).

DISCUSSION

Dube et al in their blood pressure studies in black children (4-17 years) noted that prevalence was 3.6%, where cut of BP was >2 SD above mean for age.[12] Rames et al reported prevalence of hypertension <1% among 5-18 years, where criteria for determination of hypertension was 95th percentile or >140/90 mmHg.[13] Agarwal R et al by using the criteria BP >95th percentile, found that 2.6% systolic hypertension and 2.4% diastolic in boys as compared to girls which is 2.5% and 2.2% respectively.[14]

Agarwal VK et al found that overall incidence of hypertension was 1.8%.[15] Of this, 0.52% had systolic hypertension and 0.52% had diastolic hypertension and 0.76% cases had both systolic and diastolic hypertension. Laroia D et al reported overall prevalence of hypertension was 2.93% with a slight male preponderance (62.6%).[16]

Gupta AK et al reported in their study of 3,861 school children (5 to 15 years of age), the incidence of essential hypertension was 0.41% by using the criteria >+2 SD of mean for age and sex.[17]

Verma et al conducted a study among 2560 school children in an industrial and prosperous city of Punjab, between the ages of 5-15 years.[18] The prevalence of

hypertension was 2.8% at first screening but decreased to 1.3% and 1.1% by 6 and 9 months respectively.

Anjana et al in their study of 1000 school children found that the prevalence of hypertension was 8.33% and 6.52% among boys and girls, respectively.[19] Amar Taksande et al in their study of 2643 school children found that the prevalence of hypertension was 5.75% (i.e., 3.25% for systolic hypertension and 2.49% for diastolic hypertension).[7]

Durrani AM et al in their study of 701 school children found the prevalence of hypertension at 9.36% in boys and 9.4% in girl's respectively.[20] The prevalence of hypertension in school going children in the present study was found out to be high compared with studies by other authors.

CONCLUSION

In this study, a humble endeavour has been made to find out the prevalence of hypertension in the 6-12 years age group in the schools of tea gardens in and around Dibrugarh town, Assam, India. More studies involving large number of children with parental blood pressure recordings are needed. Blood pressure recording and anthropometric measurements should be a part of school health programmes and also for children attending the health care system, to identify, to treat early and to prevent the late complications. The high risk children need to be considered for close follow ups for modification of risk factors by advising lifestyle changes.

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