Prevalence of hypertension in high school students of a rural area- a pilot study

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ABSTRACT

Background: Essential hypertension is a global ailment and is associated with increased risk of myocardial infarction, stroke and cardiovascular mortality in adults. Studies reflect increasing prevalence in adolescents.

Objectives: To find the prevalence and distribution of hypertension and to evaluate the risk factors of hypertension among the high school students.

Methods: Anthropometric and blood pressure measurements have been carried out among 1000 high school students in the age group of 10-17 yr of the rural area of Khanpur Kalan, Sonepat.

Results: Prevalence of hypertension and prehypertension was found to be 6.2% (n = 62) and 9.3% (n = 93), respectively. Prevalence of hypertension among males was 7.34% (n = 37) against 5.04% (n = 25) in females. However, the prevalence of pre-hypertension was observed 10.31% (n = 52) among males when compared to 8.26% (n = 41) in females.

Conclusion: The origin of essential hypertension and its risk factors are present in childhood. Early detection and control of the hypertension in this age group is essential to address the future epidemic of hypertension.

Key words: hypertension, high school students, rural area

INTRODUCTION

Essential hypertension (primary hypertension) is a common disease worldwide and is associated with increased risk of myocardial infarction, stroke and cardiovascular mortality in adults.[1] it is detectable in the young and may track into adulthood.[2] There are evidences that even asymptomatic adolescents with mild blood pressure elevation can have target organ damage. However, it goes undetected unless specifically looked for. Therefore, according to the recommendation of the fourth report from the National high B.P education program (NHBPEP) working group - all children above 3 years of age, seen in medical care should have their blood pressure (B.P) measured routinely.[3] Globally, non-communicable diseases (NCDs) are increasingly recognized as a major cause of morbidity and mortality. Many of the cardiovascular risk factors have their origin in childhood. By this age atherosclerotic and hypertensive disease process start and life style habits are formed (e.g. .smoking, eating, physical exercise).[4,5] Factors that seem to contribute to primary hypertension in children include high blood cholesterol level, overweight, physical inactivity, smoking and excessive consumption of salt. In some studies, it has been found that the prevalence of hypertension is increasing in adolescents.[6,7] Thus preventive efforts should be directed towards discouraging the children from adopting harmful life styles in an attempt to reverse the situation and to reduce the resulting risk of atherosclerosis in adulthood. With this background this study was taken up to estimate the prevalence and distribution of hypertension as well as to evaluate the risk factors in this age group.

MATERIALS AND METHODS

A cross sectional study was conducted in selected schools of Villages of Sonepat district of Haryana. Those schools permitting to

conduct the study were included for this project. It comprises of five government run schools and five private schools. A total of 1413 students were interviewed and finally 1000 (five hundred students from each government run and private schools) were selected for this study. The study population consisted of students ranging from standard 6th to tenth of age between 10 – 17 years. Students having history of chronic medical diseases like congenital heart disease (C.H.D.), hepatic failure, and chronic renal failure were excluded from the study.

100 students were taken from each of the government schools and in each school, 20 students were selected from each standard; from 6th to 10th standards. The students were chosen randomly with the help of attendance registers. The same technique was followed in private schools as well. The procedure used for the purpose of the study was a predesigned and pretested structured questionnaire, which was administered using the interview method by visiting each and every school.

A questionnaire was used for obtaining information from students by self reporting on age, gender, smoking, and whether they or their families have had any diseases, such as urinary tract infection and diabetes. Age was verified from school records and rounded off to completed years. Detailed anthropometry including body mass index and waist and hip circumference were done in each student as per standard norms.

Weight measurement

A bathroom scale calibrated from zero to 120Kg was used to measure the weight of the subjects. The scale was checked and corrected for zero error before every measurement. Each subject was allowed to wear only the school uniform for measurement; shoes and sweaters were removed. The weight was read to the nearest 0.5 Kg.

Height measurement

A suitable and level place was chosen for the wall to be calibrated, so as to avoid variations in the readings. The wall was calibrated using a meter mile, from a point from the ground. The subject was asked to remove shoes and stand upright by the wall and reading was taken to the nearest 0.5cm. The measurements of the weight and the height were used to calculate the BMI, which was used to assess the nutritional status, overweight and obesity.

Waist and hip circumference measurement

A measuring tape was used to take the waist circumference and the hip circumference. The subject was asked to remove all heavy clothing around the waist (belts and other thick clothing) before the measurement was taken to ensure accuracy. The waist measurement was taken at the midpoint between the lower border of the rib cage and the iliac crest. The subject was asked to stand and the measuring tape wrapped round his waist from the zero mark and the reading was taken. The hip circumference was taken at the maximum level of the gluteal region. Moving the measuring tape to and fro until a highest value was read. This was done to ensure accuracy.

Blood Pressure measurement

Measurement of arterial blood pressure was performed in a quiet room after five minutes of resting in a sitting position. Right arm was kept

at the same level of heart during the measurement. The appropriate sized cuff was selected with the bladder width about 40% of the arm circumference at a point midway between olecranon and acromion and the bladder length covering at least 80% to 100% of the circumference of the arm. If cuff is too small, the next larger cuff was used. The cuff was inflated until the radial pulse was no longer audible from the antecubital area, and then the cuff was deflated 2-3 mm Hg per second while auscultating the pulse. While decreasing the cuff pressure, the onset of the sound was systolic blood pressure of the student and the disappearance of the sound was accepted as diastolic blood pressure. The measurements were performed three times repeatedly at an interval of five minutes by the same specialist medical doctor during 9 am to 12 noon. First measurements were excluded, and the average of the last two measurements was taken into account.

If BP was persistently high even in the second screening, BP was rechecked twice at one week interval. If at the end of the fourth screening, BP was persistently elevated to between > 90th percentile to 95th percentile or > 120/80mm Hg (even if < 90th percentile), student was considered as having pre-hypertension. If BP at the end of fourth screening was > 95th percentile, student was considered as having hypertension. If the student had the hypertension, then other family members would be investigated for hypertension.

Data analysis

Data obtained was analyzed using the SPSS software (version 20). Pearson correlation and Student's t-test were used in evaluating the data. Results were expressed as mean ± standard deviation.

RESULTS

Sex distribution was almost equal among the participants. Mean SBP level was 114.15±12.66 mmHg and 112.55±10.30 mmHg in males and females respectively. Mean DBP level was 74.26±10.62 mmHg and 71.51±9.92 mmHg in males and females respectively.

Initial visit demonstrate that 9.5% (n = 95) were hypertensive and 10.9% (n = 109) were prehypertensives. The same subjects were visited second time and the prevalence of hypertension and prehypertension was 7.2% (n = 72) and 9.9% (n = 99) respectively.

Finally on third visit, the prevalence of hypertension and prehypertension was found to be 6.2% (n = 62) and 9.3% (n = 93), respectively. Prevalence of hypertension among males was 7.34% (n = 37) against 5.04% (n = 25) in females. However, the prevalence of prehypertension was observed 10.31% (n = 52) among males when compared to 8.26% (n = 41) in females.

The Mean SBP and DBP level were found to be increased from 10 years to 16 years in both the sexes with the exception at age 15. The mean SBP and DBP were higher among males compared with females. Overall mean weight and mean height were more in males as compared to females in different age groups. But weight was higher in females at the age of 14 and 15 year. However, BMI was more until the age group of 13 years in males as compared to females; after which females had higher in BMI. Waist circumference was more in males as compared to females in different age groups.

Prevalence of hypertension and

prehypertension among the boys is 7.34% (n = 37) and 10.31% (n = 52) whereas in girls it is 5.04% (n = 25) and 8.26% (n = 41) respectively. In hypertensives boys, 27 have both systolic and diastolic hypertension; 6 have isolated systolic hypertension and 4 have isolated diastolic hypertension (Table 1). In hypertensives girls, 16 have both systolic and diastolic hypertension, 5 have isolated systolic hypertension and 4 have isolated diastolic hypertension (Table 2).

Table.1. Prevalence of hypertension and prehypertension among boys

Age	No. Students	Prevalence of Hypertension	Percentage (%)	Prevalence of Systolic+Diastolic Hypertension	Prevalence of Isolated Systolic Hypertension	Prevalence of Isolated Diastolic Hypertension	Prevalence of Prehypertension (n) (%)
10	57	2	3.5	2	0	0	2 (3.5)
11	85	4	4.7	3	1	0	5 (5.88)
12	86	7	8.13	5	1	1	9 (10.46)
13	91	8	8.79	5	2	1	10 (10.98)
14	83	8	9.63	6	1	1	9 (10.84)
15	73	5	6.84	4	1	0	11 (15.05)
16	29	3	10.34	2	0	1	6 (20.68)
Total	504	37	7.34	27	6	4	52 (10.31)

Table .2. Prevalence of hypertension and prehypertension among girls

Age	Number of Students	Prevalence of Hypertension	Percentage (%)	Prevalence of Systolic+Diastolic Hypertension	Prevalence of Isolated Systolic Hypertension	Prevalence of Isolated Diastolic Hypertension	Prevalence of Prehypertension (n) (%)
10	58	0	0	0	0	0	2 (3.44)
11	83	1	1.2	1	0	0	1 (1.20)
12	82	6	7.31	4	1	1	9 (10.97)
13	92	6	6.52	4	1	1	8 (8.69)
14	83	6	7.22	3	1	2	9 (10.84)
15	71	4	5.63	3	1	0	8 (11.27)
16	27	2	7.4	1	1	0	4 (14.81)
Total	496	25	5.04	16	5	4	41 (8.26)

The correlation of systolic and diastolic blood pressures with waist circumference, height, weight, and BMI is displayed in table 3. Systolic and diastolic blood pressures did not significantly ($p>0.05$) correlate with the height in both boys and girls. Statistically significant ($p<0.05$) positive correlation was observed with waist circumference, weight, and BMI among the boys but not in the girls.

Table.3. Correlation between BP and anthropometric parameters

Anthropometric Parameters	Sex	SBP		DBP	
		r-value	p-value	r-value	p-value
Waist	Male	.554**	0.0	.434**	0.0
	Female	-0.084	0.061	-0.084	.060
Weight	Male	0.461**	0.0	0.37**	0.0
	Female	0.057	0.204	-0.055	0.224
Height	Male	-0.016	0.713	-0.014	0.748
	Female	0.037	0.414	0.023	0.604
BMI	Male	0.467**	0.0	0.373**	0.00
	Female	-0.084	0.063	-0.071	0.115

** Correlation is significant at the 0.01 level (2-tailed).

The involvement of some risk factors/variables in the prevalence of hypertension is shown in Table 4. In our study, obesity was the most common risk factor, found to be associated with followed by physical inactivity.

Table.4. Distribution of risk factors among hypertensive

Number of Students	Smoking	Alcohol	Physical inactivity	Stress	Obesity	Family History
13	-	-	+	-	+	-
17	-	-	-	-	+	-
8	-	-	-	-	-	+
6	+	-	-	-	-	-
4	-	-	-	+	-	-
14	-	-	-	-	-	-

DISCUSSION

Early identification of hypertension and prehypertension lead to early institution of interventions and possibly prevention of later morbidity and mortality from non communicable diseases.[5] This study demonstrate the prevalence to be 6.2%. It is almost similar to other Indian studies from rural area. Sudeepa et al[8] in his study among children from rural area reported the prevalence of 5.9%. Similarly Mishra et al[9] states that 8.3% of adolescents had high blood pressure at the end of fourth screening. In the present study, the

prevalence of hypertension among males is found to be 7.34% and females 5.04%. A trend of increase in mean values of SBP and DBP with age in the present sample has been observed in both sexes as shown in table 1 and 2. In most of the cross-sectional studies in various populations of the world, an increase of SBP and DBP with age has been reported.[10,11] The age related increase in BP may be attributed to the increase in body mass.

Present study shows positive correlation of SBP and DBP with waist circumference, weight and BMI among the males, which is consistent with the previously reported studies on BP in children.[12] The study of childhood hypertension is paramount importance as BP in childhood is the best predictor of hypertension in later life supported by phenomenon of "tracking."[13] Studies have documented target organ damage among asymptomatic hypertensive hence healthy behavioural changes among prehypertensives and early diagnosis and treatment can reduce long term morbidity and eventual mortality in later life.

The mean SBP and DBP levels are found increased from 10 years to 16 years in both the sexes. Tobacco use, alcohol, unhealthy diets, physical inactivity, stress, obesity, high cholesterol and glucose levels and family history of hypertension are the major risk factors for hypertension. In our study physical inactivity and obesity are the commonest risk factors and are found in 48.32% (n=30) of the students with hypertension. There is an increasing prevalence of physical inactivity among the students because of less time spent in outdoor games.

CONCLUSION

The setting up of essential hypertension and its risk factors took place in childhood. There is a need for early detection and intervention in this age group to address the future epidemic of hypertension. Routine screening in adolescent age group is also recommended.

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