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ORIGINAL ARTICLE

A Study Of The Risk Factors And The Prevalence Of Hypertension In The Adolescent School Boys Of Ahmedabad City

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ABSTRACT

Background: Hypertension is one of the diseases which is less commonly diagnosed and treated, but its actual prevalence is high. The association between the presence of risk factors and the development of disease has been well documented. The present study was conducted to find out the risk factors and to evaluate the prevalence of hypertension among the adolescent school boys of Ahmedabad city.

Aims: 1.To study the distribution of blood pressure among the adolescent boys who were aged 12-19 years.

2. To find out the association between the prevalence of hypertension and it's risk factors.

Settings and Design: A cross sectional study was conducted from Feb. 2007 to August 2008 in secondary and higher secondary schools in 5 zones of the Ahmedabad Municipal Corporation.

Methods and Material: A predesigned and pretested proforma was filled by the students after the purpose of the study was explained to them. Anthropometric measurements and blood pressure were recorded as per the standard WHO guidelines.1093 proformas were analyzed after excluding the incomplete proformas. Hypertension was diagnosed when the BP exceeded two standard deviations (i.e.95th percentile) above the mean pressure for the population. BMI was used as a measure of obesity and it was derived by using the standard formula for it.

Statistical Analysis: The collected information was analyzed by using the Microsoft Excel and the Epi info 3.4 software. Chi-square test was used for analysis.

Results and Conclusions:

Out of 1093 adolescent boys, 107 (9.78 %) were found to be hypertensive. The highest prevalence was found at 19 years of age (21.7 %). Of the 107 hypertensive boys, 42 (39.2 %) had both systolic and diastolic hypertension. The mean SBP among the participants was 109.6 mm Hg and the mean DBP was 69.3 mmHg. The family history of HT and the presence of overweight and obesity in boys were found to be associated significantly. No association was found between hypertension and other risk factors like added salt, junk food and the socioeconomic class. Among the hypertensive adolescents, the risk factors which were found to have the highest prevalence were the intake of junk food (90.6%), followed by higher

socio-economic class (48.5%), extra salt in the diet (29.9%) and overweight and obesity (20.3%).

Key Words: Adolescent, Hypertension, Obesity, BMI

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Introduction

Most of the non-communicable diseases are undiagnosed in the community because of their asymptomatic nature in the earlier phases of the disease. Patients report to the health facility in the advanced stage with complications. Hypertension is one of the diseases which is diagnosed and treated in 25% of the cases according to Rule of Half.[1] Studies have documented that hypertension may begin in adolescence, perhaps even in childhood.[2]-[4] The prevalence of hypertension is reported as being 1-30% among adults in different age groups.[5] and the prevalence of hypertension in children is reported to range from less than 1% to 16.2%. [6]-[7] The relationship between adolescent and adult BP is demonstrated by the "tracking" phenomenon [8] (Those children and adolescents who's BP were at the upper percentiles, would have their BP staying at the same range after their growth and development). Risk factor identification is an established strategy to apply primordial prevention to reduce the incidence of hypertension in the community. The association between the presence of risk factors and the development of the disease has been well documented. The present study was conducted to find out the risk factors and to evaluate the prevalence of hypertension among the adolescent school boys of Ahmedabad city.

Aims and Objectives

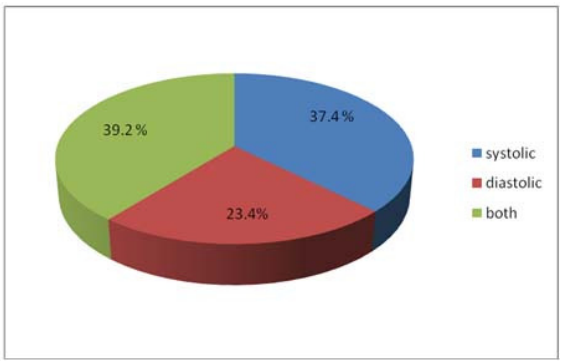
1. To study the distribution of blood pressure among the adolescent boys aged 12-19 years.
2. To find out the risk factors playing a role in hypertension in adolescent boys.
3. To find out the association between the prevalence of hypertension and factors like obesity, diet and the family history of NCDs, etc.
4. To provide health education to school children and their teachers on adolescent hypertension.

Material and Methods

A cross sectional study was conducted from Feb. 2007 to August 2008 in secondary and higher secondary schools in 5 zones of the Ahmedabad Municipal Corporation. From a total of 249 schools, 40 schools were selected by the simple random sampling method (8 schools from each zone). Prior permission for the study was taken from the school authorities. From each school, 30 boys from class 8^{th} to 12^{th} were selected randomly. A predesigned and pretested proforma was filled by the students after the purpose of the study was explained to them. Anthropometric measurements and the blood pressure were recorded by the investigators as

per the standard WHO guidelines. A total of 1200 apparently healthy adolescent school boys aged 12-19 years were taken as the study subjects. 1093 proformas were analyzed after excluding the incomplete proformas. The measurements included height (cm) and weight (kg). The students were made to rest and relax before measuring their BP for 10 minutes. Their BP was taken in the sitting position, by using a mercury sphygmomanometer. The cuff was applied evenly and snugly on the bare right arm with the lower edge at 2.5 cm above the antecubital fossa (as per WHO guidelines).The cuff was inflated rapidly and deflated slowly. The point of the onset of the first tapping sound was taken to indicate systolic blood pressure (SBP) and the diastolic BP (DBP) reading was taken when the fifth Korotkoff (K5) sound disappeared. For each subject, two recordings were taken at an interval of 30 minutes and the average of two readings was taken and it was considered to be the final reading.

The 5th to 99th percentiles for systolic and diastolic blood pressure were calculated separately for the respective age groups from 13 to 19 years. The children were considered to be hypertensive if their systolic or diastolic blood pressure or both were equal to or more than the 95th percentile for age and sex [9] and their distribution is clearly shown in [Table/Fig 1] and [Table/Fig 3].



[Table/Fig 1]: Distribution of Type of Hypertension in Adolescent boys

BMI was used as a measure of obesity and it was derived by using the standard formula for it. [9] BMI percentiles were calculated for each respective age group. The BMI percentile between the 5th percentile to less than the 85th percentile was taken as normal, the 85th to less than the 95th percentile was taken as overweight and that which was equal to or above the 95th percentile was taken as obese. Socioeconomic status was determined by Modified Prasad's classification scale.

Age (yrs)	No. of students	No. of Hypertensive cases	Prevalence (%)
13	49	7	14.3
14	154	15	9.7
15	298	28	9.4
16	216	21	9.7
17	282	24	8.5
18	69	7	10.1
19	23	5	21.7
Total	**1093**	**107**	**9.78**

[Table/Fig 2]: Prevalence of Hypertension according to Age

The collected information was analyzed by using the Microsoft Excel and the Epi info 3.4 software. Chi-square test was used to find out any significant association between the risk factors which were studied and hypertension.

Observation and Results

Among 1093 boys, the highest no. of students were from class 10th (35.95%), followed by those from class 12th (30.55%). The students were in the age group of 12 to 19 years. Their mean age was 15.75 years (SD: 1.38). The highest no. of students belonged to the 15 years age group (27.3%), followed by the 17 years age group (25.8%). The maximum numbers of students were from the socio-economic class II (35.4%), followed by those from the socio-economic class III (28.1%) and class IV (17.2%).

In boys, the 5th and the 95th percentile of BMI in the age group of 13 years were 14.06 and 26.03 respectively, while in the age group of 19 years, it was 15.66 and 24.35 respectively. The 5th and 95th percentiles of BMI in the middle order age groups (15, 16 and 17 years) were almost the same. Out of the 1093 students who were examined, 114 (10.44 %) were found to be overweight and 63 (5.77 %) were obese according to the BMI percentile criteria. The remaining 865 (79.14 %) had healthy weight and 49 (4.48 %) were underweight.

A nomogram was constructed for the study population (12-19 years). The 5th to 99th percentiles for systolic and diastolic blood pressure were calculated for the respective age groups of 13 to 19 years [Table/Fig 3].

	Age (in yrs)	BP Percentiles							
		5th	10th	25th	50th	75th	90th	95th	99th
Systolic BP(mmHg)	13	90	90	100	100	101	124	140	140
	14	90	90	100	110	111	122	130	136
	15	90	100	100	110	110	120	130	130
	16	90	100	100	110	120	130	140	148.5
	17	100	100	100	110	120	130	130	140
	18	94	100	110	110	120	130	140	140
	19	100.5	110	110	111	120	130	130	137.9
Diastolic BP(mmHg)	13	60	60	60	60	70	70	76	80
	14	60	60	60	70	70	80	80	90
	15	60	60	70	70	70	80	80	80
	16	60	60	70	70	0	80	81.25	90
	17	60	60	69.25	7	70	80	80	85.95
	18	60	60	70	0	80	80	90	90
	19	60	62	70	80	80	80	80	87.8

[Table/Fig 3]: Distribution of BP Percentiles according to age in adolescent boys

***Only two subjects in 12 years of age, so they were excluded**

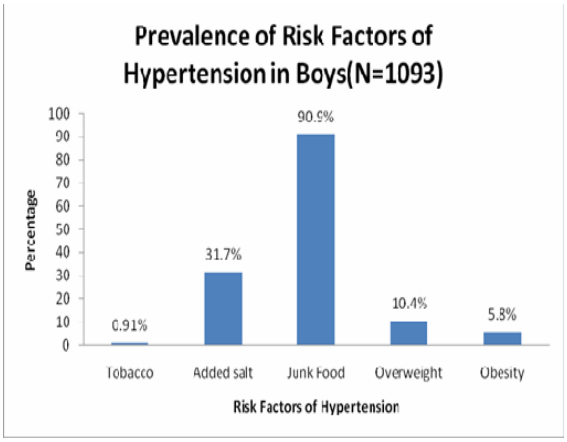
The mean SBP among the participants was 109.6 mm Hg and the mean DBP was 69.3 mmHg [Table/Fig 4].

[Table/Fig 4]: Age wise Distribution of Mean BP and S.D.

Age (yrs)	Mean SBP (SD)	Mean DBP (SD)
12*	102 (0.0)	60 (0.0)
13	104.2 (14.5)	64.3 (6.1)
14	107.0 (11.7)	68.5 (7.5)
15	107.7 (10.2)	68.6 (6.7)
16	111.3 (13.3)	69.7 (7.5)
17	111.3 (11.6)	70.0 (7.5)
18	113.6 (12.7)	72.2 (8.9)
19	116.7 (11.0)	74.3 (7.9)
Overall	**109.6 (12.1)**	**69.3 (7.5)**

***Only two students in this age**

Out of 1093 adolescent boys, 107 (9.78 %) were found to be hypertensive. The highest prevalence was found in the 19 years age group (21.7 %), followed by the 13 years age group (14.3 %) [Table/Fig 2]. Of the 107 hypertensive boys, 39.2 %(42) had both systolic and diastolic hypertension[Table/Fig1].Among the adolescent boys, the most common risk factor was the intake of junk food (90.9%). [Table/Fig 5]



[Table/Fig 5]: Prevalence of Risk Factors of Hypertension in Adolescents boys

The family history of HT and the presence of overweight and obesity in the boys both were found to be associated significantly [Table/Fig 6] and [Table/Fig 7]. No association was found between hypertension and other risk factors like added salt, junk food and the socioeconomic class [Table/Fig 7]. Among the hypertensive adolescents, the risk factor which had the highest prevalence was found to be the intake of junk food (90.6%), followed by higher socio-economic class (48.5%), extra salt in the diet (29.9%) and overweight and obesity (20.3%).

Family Eistory of Risk Factors		Number of families	Hypertension in adolescent boys		Chi square value	P value
			Yes	No		
HT	Yes	176	35(19.9%)	141(80.1%)	24.22	<0.001(significant)
	No	917	72(7.8%)	845(92.2%)		
DM	Yes	161	17(10.6%)	144(89.4%)	0.13	>0.05(insignificant)
	No	932	90(9.7%)	842(90.3%)		
CHD	Yes	103	15(14.6%)	88(85.4%)	2.93	>0.05(insignificant)
	No	990	92(9.3%)	898(90.7%)		

[Table/Fig 6]: Association between Family History of Non-Communicable Disease and Hypertension in Adolescent boys

Risk factors		Number of boys (N=1093)	Hypertension in adolescent boys		Chi- square value	P value
			Yes	No		
Overweight / Obesity	Yes	177	26(14.7%)	151(85.3%)	5.74	<0.01 (significant)
	No	916	81(8.8%)	835(91.2%)		
Added salt	Yes	347	32(9.2%)	315(90.8%)	0.19	>0.05 (insignificant)
	No	746	75(10.9%)	671(89.9%)		
Junk food	Yes	994	97(9.8%)	897(90.2%)	0.01	>0.05 (insignificant)
	No	99	10(11.1%)	890(98.9%)		
Socioeconomic class	class I,II	550	52(9.5%)	498(90.5%)	0.14	>0.05 (insignificant)
	Class III,IV,V	543	55(10.1%)	488(89.9%)		

[Table/Fig 7]: Prevalence of Risk Factors among Hypertensive Adolescent boys

Discussion

Hypertension is a major risk factor for cardiovascular and cerebrovascular diseases. Most of the studies of BP which were carried out in different populations have shown a rise of BP with age. [10] The insidious and the steady course of hypertension in adults indicates that it may have had its roots in childhood and the adolescent age group ("Tracking phenomenon"), but had probably gone undetected. [11] In some studies, the prevalence of hypertension in children was reported to range from less than 1.0 to 16.2%.[12] In the present study, the prevalence of sustained hypertension in urban school going boys between the ages of 12 to 19 years was found to be 9.78%, which was quite high as compared to 0.5-2% in other studies. [11],[12] It also reflects the changing lifestyle and environmental interaction as the major

causative factors for the prevalence of hypertension in school going children.

In present study, 37.4% of the hypertensives were Isolated Systolic Hypertension cases [Table/Fig 1]. Isolated Systolic Hypertension deserves attention as it is an important risk factor of coronary heart disease and stroke, independent of the diastolic status of the individual [13], [14].

The tendency of the blood pressure to rise with age is supported by the findings from a Turkish study among the age group of 13-18 years [15] and a study on Zambian school children (7-16 years) [16]. In the present study, both mean SBP and mean DBP rose with age [Table/Fig 4].

By the BMI criteria, 10.44% boys were found to be overweight and 5.77% were obese. By using similar criteria, Shah et al had reported the prevalence of overweight and obesity to be 9.25% and 5.55% respectively in an urban area of Bhavnagar city, Gujarat. [17] Obesity in children is associated with an increased incidence of hypertension, diabetes, coronary artery disease, osteoarthritis and an overall increase in morbidity and mortality during adult life. [18] The relationship between hypertension and obesity in childhood has been noted, though it has been less extensively evaluated. Hypertension in obese children may occur due to increased cardiac output, excessive sodium intake, increased steroid production and alteration in the reception for various pressure substances. [19]

It is evident from this school based epidemiological study, that increase in BMI predisposes the adolescent individual to higher blood pressure and subsequently, hypertension. A statistical significance was found between overweight/obesity and hypertension in the present study. A similar finding was also reported elsewhere in India [20]. Such an association in early childhood with SBP alone was reported by Sinaiko et.al [21] and Hardy et.al [22]. Lifestyle modification between the upper and lower socio-economic classes could have had an indirect bearing on the blood pressure levels. However, in the present study, no significant association was found between the upper and lower socio-economic classes and hypertension (X^2=0.14, P>0.05).

In the present study, the subjects in whom a positive family history of hypertension was elicited had higher blood pressure. The prevalence of hypertension was also higher in them (19.9%) [Table/Fig 6]. This suggests that there is a genetic role to play in the development of hypertension. A familial tendency for developing high blood pressure is well known. A positive parental history of high blood pressure was associated with higher SBP and DBP and this could provide a clue to the target population for blood pressure screening. No significant association was found between a family history of diabetes mellitus, coronary heart disease and the occurrence of hypertension.

Since comparative height adjusted values of blood pressure were not available for the Indian population, we have used the non-height adjusted values and also follow up was not done. This is a limitation in the study.

Both the teachers and parents were advised about the appropriate treatment of those students who were diagnosed as hypertensive according to the diagnostic criteria which were used in this study.

In the present study, 31.7% of the boys were found to be consuming added salt or extra salt in their diets. However, no significant association was found between the use of extra salt intake and hypertension (X^2=0.19, P>0.05) among the hypertensive boys.

Finally, a changing trend towards the higher prevalence of hypertension in school going children reflects the changing scenario of cardiovascular diseases in the current era due to the changing lifestyles and dietary patterns and decreased physical activity and increase in obesity. It also highlights the importance of screening adolescents for the detection of hypertension.

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