

Variation in Blood Pressure Among School Children of Amritsar (Punjab)

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ABSTRACT The patterns of blood pressure among 1000 school children (540 boys and 460 girls) in the age group 6 to 14 years of Amritsar district of Punjab were studied cross-sectionally. Three readings of blood pressure were recorded for each subject. The mean values of systolic blood pressure and diastolic blood pressure increase with age in both sexes. There was no significant difference in blood pressure of the two sexes at all age groups except for systolic blood pressure at age group 7+. The study has also revealed that hypertension is prevalent in 7.5% healthy children of Amritsar. It is, therefore recommended that the children must be screened regularly for blood pressure to detect the prevalence of blood pressure.

INTRODUCTION

Hypertension is a major health problem in developed and developing countries affecting approximately one billion individuals worldwide (JNC-VII Report 2003). Although the prevalence is far lower in children and adolescent, but the evidence indicates that hypertension begins to develop during the first two decades of life (Zinner et al., 1985 ; Chadha et al., 1999). Several studies (Higgins et al., 1980; Kuller et al., 1980; Lauer and Clarke, 1984; Shears et al., 1986; Pruitt, 1996) have reported the tracking effect of blood pressure from childhood to adulthood. Therefore, the trends in blood pressure overtime in children may be important predictors of subsequent trends in adult hypertension. Luepker et al. (1999) also observed that although blood pressure normally increases with growth and development, the children with higher levels of blood pressure intend to maintain that position relative to their peer group as they mature or track into higher levels of blood pressure in adulthood. This tracking phenomenon appears strongest for systolic blood pressure but is also noted in diastolic blood pressure. High blood pressure is a potential risk factor for cardiovascular disease. Thus, one key to cardiovascular disease prevention may be

detection of blood pressure pattern during childhood and adolescent. It is, therefore, necessary to study the normal range of blood pressure among children. A considerable work has been done in different parts of India to establish the normal blood pressure variation for different age groups (Aggarwal et al., 1982; Chahar et al., 1982; Aggarwal et al., 1983; Gupta and Ahmed 1990; Gupta, 1991; Verma et al., 1995; Anand and Tandon 1996; Chadha et al., 1999). However, very few studies are available with reference to blood pressure among children in Punjab. Therefore, in the present study, an attempt has been made to report the variation in blood pressure among school children of Amritsar city of Punjab.

MATERIAL AND METHODS

This study was approved by the Ethical Committee of Guru Nanak Dev University, Amritsar (Punjab). The consent for participation was obtained from the school staff and the parents of the children. The aims and the importance of the study were explained, and a rapport was established with school staff and children.

A total of 1,000 school children, constituting 540 boys and 460 girls, were sampled from convent and public schools during the year 2001-2002. The range of age of the children varies from 6 to 14 years. The age was determined to the nearest birth date from the school registration record. The measurements were taken during the school hours, mostly in the morning, in a quiet

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isolated setting and sometimes also at home through subsequent visits. All the subjects came from high middle class families.

Blood pressure measurements (BP) were taken with a mercury sphygmomanometer and stethoscope by one observer following the recommendations of American Heart Association (Kirkendall et al., 1967). After 5 minutes of rest, three consecutive readings of blood pressure were taken for both systolic blood pressure (SBP) and diastolic blood pressure (DBP) and their mean values were used in subsequent analysis. If the SBP and DBP were higher than 95th percentile (for age and sex), then two additional readings were taken at an interval of three weeks by the 4th author. The lowest of the three readings was recorded for analysis. The children, whose blood pressure levels exceeded 95th percentile (for age and sex) of the Report of the Second Task Force (1987), were considered as hypertensive.

The data were arranged in nine age groups, each of one-year duration starting from, for example, the age group 6+ includes all subjects from 6.00-6.99 years, the age group 7+ from 7.00-7.99 years, and so on. The data were statistically treated to calculate the mean, standard deviation (SD) and annual increase. Student's t-test and χ^2 (Chi-square) were used to assess the difference between the two sexes.

RESULTS

Table 1 presents the mean, standard deviation and annual rate of increment of SBP and DBP in boys and girls. It is evident from the present sample that SBP increases from age group 6+ to 14+, showing a total increase of 18.5 mm Hg among boys and 19.2 mm Hg among girls. DBP also increases with age, but the total increase is quite less, i.e., 10.9 mm Hg and 11.1 mm Hg among boys and girls, respectively. The annual increment in mean SBP varies from 1-3 mm Hg in both sexes, except 12+ age group where a spurt of about 6.1 mm Hg and 4.6 mm Hg is observed in boys and girls, respectively, but in DBP, there is no such spurt in both sexes. SBP and DBP are more in boys than girls at all age groups, but the total increase in SBP and DBP from age group 6+ to 14+ is more among girls than boys.

Table 2 shows the age and sex wise prevalence of hypertension among school children. The prevalence of hypertension is

8.33% and 6.52% among boys and girls, respectively.

Table 1: Mean, standard deviation (SD) and increments in systolic blood pressure (SBP) and diastolic blood pressure (DBP) among boys and girls in different age groups.

Age group	No. of sub-jects	Systolic blood pressure			Diastolic blood pressure		
		Mean	SD	Incre-ment	Mean	SD	Incre-ment
Boys							
6+	63	96.5	2.0	—	65.0	1.3	—
7+	64	98.6*	2.1	2.1	66.8	1.1	1.8
8+	60	99.9	2.5	1.3	69.0	2.6	2.2
9+	65	101.3	2.1	1.4	70.2	2.5	1.2
10+	50	102.9	1.7	1.6	71.5	1.9	1.3
11+	58	105.1	2.8	2.2	72.0	2.0	0.5
12+	61	111.2	1.9	6.1	73.6	1.6	1.6
13+	60	113.0	2.6	1.8	74.2	2.0	0.6
14+	59	115.0	2.2	2.0	75.9	1.3	1.3
Girls							
6+	54	94.5	1.5	—	64.0	1.0	—
7+	49	96.0	2.0	1.5	65.1	1.2	1.1
8+	57	99.1	1.8	2.9	67.9	1.6	2.8
9+	59	100.2	2.2	1.1	68.8	0.9	1.1
10+	48	101.4	1.7	1.2	70.1	1.5	1.3
11+	46	103.0	1.9	2.4	71.8	1.9	1.7
12+	56	109.6	1.8	4.6	73.0	2.0	1.2
13+	44	111.9	2.1	2.3	74.0	1.8	1.0
14+	47	113.7	1.9	1.8	75.1	1.2	1.1

*Statistically significant at $p > 0.02$

Table 2: Age and sex wise prevalence of hypertension in school children

Age group	Boys			Girls		
	No. of sub-jects	No. of hyper-tensive subjects	% prevalence	No. of sub-jects	No. of hyper-tensive subjects	% prevalence
6+	63	2	3.17	54	1	1.85
7+	64	6	9.37	49	2	4.08
8+	60	5	8.33	57	5	8.77
9+	65	7	10.77	59	4	6.78
10+	50	6	12.00	48	3	6.25
11+	58	3	5.17	46	5	10.87
12+	61	7	11.47	56	3	5.35
13+	60	5	8.33	44	4	9.09
14+	59	4	6.77	47	3	6.38
Total	540	45	8.33	460	30	6.52

DISCUSSION

A trend of increase in mean values of SBP and DBP with age in the present sample has been observed in both sexes (Table 1). In most of the cross-sectional studies of blood pressure in various populations of the world, an increase of SBP and DBP with age has been reported.

(Kannel and Dawber 1972; Voor et al., 1976; George et al., 1981; Kotchen et al. 1982; Labarthe, 1983; Sinaiko et al., 1989; Rosner et al., 1993; Sinaiko 1996). In Indian school children, an increase in SBP and DBP has also been reported by various authors (Chahar et al., 1982; Verma et al., 1995; Anand and Tandon, 1996; Badaruddoza and Afzal., 1999; Chadha et al., 1999).

At age 12+, a spurt of about 6.1 mm Hg and 4.9 mm Hg in SBP has been observed in boys and girls, respectively, but in DBP, there is no such spurt. Londe (1968); Laroia et al. (1989) and Gupta and Ahmed (1990) also observed a spurt in SBP between 13-15 years, but the Task Force Committee Report (1987) found spurt in SBP between 5-6 years in both sexes.

In the present study, the value of SBP and DBP is slightly lower among girls than boys, but the differences were not found statistically significant in most of the age groups except for the difference between the SBP at age 7+. This is consistent with the findings of Voor et al. (1976); George et al. (1981); Anand and Tandon (1996) and Chadha et al. (1999).

The prevalence of hypertension in school children of Amritsar is 7.5% in boys and 6.52% in girls. According to Chadha et al. (1999) the prevalence of hypertension in Delhi school children of age 5+ to 14+ years is 11.7%. But Chahar et al. (1982); Aggarwal et al. (1983); Gupta and Ahmed (1990) and Anand and Tandon (1996) reported very low prevalence of hypertension, i.e. 0.41%-3.5%, among school children. The reason for low hypertension in these populations, according to Chadha et al. (1999) is mainly the use of an arbitrary criterion of hypertension assessment and not the recognized criterion of 95th percentile of blood pressure values.

In the present sample the sex differences in the prevalence of hypertension were not statistically significant ($P < 0.05$). The finding that there are no appreciable sex differences in prevalence of hypertension among school children has also been observed by Chadha et al. (1999); Anand and Tandon (1996); George et al. (1981) and Voors et al. (1976).

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