

A STUDY OF BLOOD PRESSURE PROFILE IN SCHOOL GOING ADOLESCENTS OF DISTRICT JAIPUR (RAJASTHAN)

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ABSTRACT

Background & Objectives: The studies on Blood Pressure in school age population are deficient in this part of the country (Rajasthan). The present study was conducted to evaluate the Blood Pressure profile of school going adolescents in the age group of 11-19 years of Jaipur (Rajasthan) and to compare rural and urban adolescents.

Methods: The study was carried out among 4237 students of class 6th-12th of Dist. Jaipur (Raj.) in the age group of 11 to 19 years. Height and Weight were measured using standardized equipment and procedure. The blood pressure was measured using mercury sphygmomanometer.

Results: The overall mean Systolic Blood Pressure (SBP) and mean Diastolic Blood Pressure (DBP) were 109.2 mm Hg (range 72 to 161) and 72.4 mm Hg (range 39 to 110) respectively. Mean SBP and DBP among the male students were 108.8 mm Hg and 72.6 mm Hg. The females had mean SBP and mean DBP of 109.7 mm Hg and 72.0 mm Hg, respectively. Both mean SBP and DBP were high in rural population than that of urban, among all age groups in both genders (P=0.01).

Conclusion: Mean blood pressure was found higher among females than that of males and in rural students than that of urban.

Keywords: Systolic Blood Pressure, Diastolic Blood Pressure, School going adolescents, Urban, Rural.

INTRODUCTION

Presently we are passing through an epidemic transition because of changing life style and growing economy and we are witnessing obesity and high blood pressure not only in adults but also in children. Luepker et al¹ observed that although blood pressure normally increases with growth and development, the children with higher level of blood pressure tend to maintain that position as they mature to adulthood. According to Cunningham², hypertension starts in childhood or even during intra-uterine life and children who persistently experience increased blood pressure levels have an increased risk of becoming hypertensive adults.³

Blood pressure is influenced by various nonmodifiable factors such as Age, Gender, Height, Weight, Genetic factors, and modifiable factors⁴. One elevated blood pressure reading

doesn't necessarily mean that there is high blood pressure, but it does warrant repeated measurements. Recommendations suggest that, before a child is diagnosed with hypertension, the measurement must be repeated in a total of three consecutive occasions.⁵ As a result, incidence levels are frequently lower than they actually are.⁶ Many studies have been done in different parts of India to establish the normal blood pressure variation in different age group children. There are only few studies examining the distribution and the differences in blood pressure (BP) of adolescents in Rajasthan.

Therefore this study was done with following objectives: 1. To evaluate the Blood Pressure of school going adolescents in the age group of 11-19 years of Jaipur (Rajasthan) and to create Percentile distribution. 2. To compare the Blood Pressure of rural and urban adolescents.

MATERIAL AND METHODS

This cross-sectional observational study was conducted in Secondary and Sr. Sec. schools of Jaipur district during school hours except holidays from Aug.2008 to May 2009. Ethical clearance was taken from Institutional Ethical Committee before starting of study. District Jaipur have a population of 5251071 (2659004 in rural area and 2592067 in urban area), with 897 females/1000 males and literacy rate of 69.9%. There were 1375 Secondary and Sr. Sec. schools in Jaipur district with 351641 students {220552 (62.7%) males and 131089 (37.3%) females}.⁷ There were 1128 schools in urban area and 247 in rural area.

Assuming 10%^{5,8} adolescents have Blood Pressure >95th percentile and expecting 1% allowable error. The sample size was taken 3457 using WHO criteria for sample size calculation (one sample situation) $Z = Z^2_{1-\alpha/2} P(1-P)/d^2$; $d = 1\%$.

A complete list of secondary and Sr. secondary schools run by the Govt. and Private organizations of district Jaipur were collected from office of District Education Officer, Jaipur (Raj.). A complete sampling frame of urban, rural, Govt. and private schools was made, equal samples were drawn from each unit by applying simple random sampling technique and all students present at the time of school visit were included in the study. Some selected schools refused to be included in the study. These were replaced by other randomly selected schools from the same area. Total 4467 students in the age group of 11 to 19 years from class VI to XII were present at the time of visit, 230 students out of 4467 were excluded from the study because of acute or chronic diseases at the time of study.

Verbal consent was taken for examination of students from the school authorities and motto of study was explained. Information pertaining to socio-demographic profile recorded and other parameters like height, weight, and blood pressure measured by the investigator on a pre designed proforma at the time of examination. All students were made to sit in a room and the procedure for the measurement of blood pressure was explained to allay their anxiety and fear. After 5 minutes of rest⁹ three consecutive readings of Blood pressure were taken by same investigator at interval of 2 minutes and their mean values were used for analysis^{5, 6}. Blood pressure was measured in

sitting position in right arm with appropriate sized cuff¹⁰. Through out the study same mercury sphygmomanometer was used. Systolic blood pressure (SBP) was indicated by onset of Korotkoff sounds and Diastolic blood pressure (DBP) is indicated by disappearance of sounds. The values were recorded in multiples of 2 mm Hg.¹¹

Age was recorded from the school records and rounded of in completed years. **Weight** of the subject was measured without shoes with their regular uniform to nearest 1.0 kg. **Height** of each child was measured by standard steel measuring tape fixed on wall. Height was measured after the subject was made to stand upright against a plane vertical surface without shoes.¹⁴

Statistical analysis

The qualitative and quantitative data was recorded on Excel sheet. Based on objectives of our study descriptive and inferential statistics was drawn. Age specific percentiles were calculated using Hazen percentile calculator.

OBSERVATIONS AND DISCUSSION

Childhood has been considered as the most significant time when future health is determined as blood pressure level determine the presence of cardiovascular diseases in children.⁶

The present study group consisted of 2701 males (63.75%) and 1536 females (36.25%) which is representing the same distribution as in all schools of Jaipur district.⁷ About 53% students were from government schools and about 2/3rd (64%) students were from urban areas. Maximum (45%) proportion of the study population was in the age group of 14-16 years; followed by 11-13 years (28%) while least (27%) in the age group of 17-19 years. Majority (97%) of the study population belonged to Hindu community. About 2/5th (43%) of the study population belonged to general category followed by Other Backward Class (35%), Schedule Tribes (13%) and Schedule Castes (9%). Most (63.7%) adolescents had Body Mass Index¹³ of <18.5, 29.3% of study population had BMI ranging from 18.5 - 24.99, while only 7% subjects had BMI of >25. Maximum (28.4%) proportion of the study population belonged to Rs. 456 to 916/- per capita monthly income of family followed by Rs. 1528-3055/- (26.2%) and Rs. 916 to 1527/- (21.2%). Both extremes of per capita

monthly income of family (< Rs. 458/- and > Rs. 3056/-) were less in study population.¹⁴

Table 1- Percentile distribution of Blood Pressure in Males and Females

Gender	Blood Pressure	Age (years)	Percentile Blood Pressure (mm of Hg)								
			5	10	25	50	75	90	95	99	
Male (n=2701)	Systolic	11-13	83.3	86.7	93.3	99.3	107.3	116	120	128.7	
		14-16	90	93.3	100.7	108.7	116.7	126	131.3	143.5	
		17-19	95.3	100	107.3	114.7	124.7	131.3	135.3	152	
	Diastolic	11-13	49.3	53.3	60.7	66.7	73.3	80.3	84	88.7	
		14-16	55.3	60	66.7	72.7	80	85.3	88	95.1	
		17-19	62.7	66.7	72	78	84	90	92	98.7	
	Female (n=1536)	Systolic	11-13	86.7	90	96	103.3	112	119.3	126.7	140
			14-16	92	96.7	102.7	110.7	117.3	126	129.5	142
			17-19	96	98	104.7	114.7	121.3	130	135.2	142.7
Diastolic		11-13	48.7	53.3	60.7	68	75.7	79.9	82.7	90.7	
		14-16	54	60	66.7	73.3	80	86	88.7	92	
		17-19	60.8	64.7	69.3	76	83.3	88	90.5	98.2	

The overall mean Systolic Blood Pressure (SBP) and mean Diastolic Blood Pressure (DBP) were 109.2 mm Hg (range 72 to 161) and 72.4 mm Hg (range 39 to 110) respectively. Mean SBP among the male students was 108.8 mm Hg (range 79 to 161) and the mean DBP was 72.6 mm Hg (range 39 to 104). The females had mean SBP and mean DBP of 109.7 mm Hg (range 72 to 159) and 72.0 mm Hg (range 39 to 110) respectively. Comparative observations were seen by M. B. Soudarssanane⁸ (mean SBP and mean DBP 113.6 and 74.3 mm Hg) in 15-19 years age group. Higher values {123.4±11 mm Hg (range 100-160) and 81.5±8 mm Hg (range 60-100) } were found by Gupta et al¹⁵ among urban adolescents (13-17 years) and P. Chabra et al.¹⁶ (119/79 mmHg) in 17-19 years old college students.

Table 2 - Gender and Age group-wise analysis of Mean blood pressure

Blood Pressure	Age (years)	Male Mean (SD)	Female Mean (SD)	P-value* (t-test)
Systolic	11-13	100.8(10.8)	104.3 (12.2)	P < 0.01
	14-16	109.5(12.6)	110.6(11.8)	P > 0.05
	17-19	115.8(12.4)	114.2(12.2)	P < 0.05
Diastolic	11-13	67.2 (10.3)	67.6 (10.5)	P > 0.05
	14-16	72.7 (9.9)	72.6 (10.2)	P > 0.05
	17-19	77.9 (9.2)	76.0 (9.6)	P < 0.01

*Separate t-test was done among males and females of different age groups for SBP & DBP

The difference of mean Systolic blood pressure among the males and females was found

statistically significant (P < 0.05). This is not in concurrence with the findings of some other studies reported by M.B. Soudarssanane et al⁸, Chadha et al¹¹ and V.K. Agarwal et al¹⁷.

They did not find any significant difference in the mean Systolic blood pressure of males and females. But the difference of mean Diastolic blood pressure (DBP) among the males and females was not found to be statistically significant (P>0.05) akin to some other studies^{8, 11, 17}

Systolic Blood Pressure (109.7 mm Hg) was higher among females than males (108.8 mm of Hg) while Diastolic Blood Pressure was lower (72.0 mm Hg) among females than in males (72.6 mm Hg). This is consistent with the findings of Rajesh Dholpuria et al¹⁸ with mean SBP/DBP 122.4/80.1 mm Hg in females and 121.1/81.2 mm Hg in males among 12-18 yrs. age group of Bikaner (Raj.). Nicholas H NG' Andu¹⁹ found, the girls had either the same or slightly higher mean blood pressure level at all ages than boys. Hashem Y. Jaddou²⁰ found SBP values for males were higher than females in the extremes of age (6 - 9, and 15 -17 years), and lower in ages 10 to 14. Females had higher DBP mean values than males all through ages 7 to 13 years, while males recorded higher DBP mean values from age 14 years onwards. There was significant difference found between SBP of males and females of 11-13 years (p<0.01). Similar findings were seen by Mahmood D. Subhi²¹ in Iraqi primary school children of 10-12 years, girls manifested higher SBP (p<0.01) and DBP (p<0.05) than boys.

Table 3: Comparative analysis of Mean blood pressure of study population

Gender	Blood Pressure	Age (years.)	Rural		Urban		P value
			No.	Mean (SD)	No.	Mean (SD)	
Male	Systolic	11-13	192	105.1 (11.3)*	548	99.2 (10.2)	<0.01
		14-16	426	113.7 (12.7)	792	107.3(11.9)	<0.01
		17-19	479	118.0 (12.3)	264	111.7(11.7)	<0.01
	Diastolic	11-13	192	71.4 (9.6)	548	65.8 (10.2)	<0.01
		14-16	426	76.3 (9.5)	792	70.9 (9.7)	<0.01
		17-19	479	79.0 (8.8)	264	75.9 (9.6)	<0.01
Female	Systolic	11-13	102	113.1 (13.2)	354	101.8(10.6)	<0.01
		14-16	140	117.2 (10.6)	546	109.0(11.5)	<0.01
		17-19	184	119.6 (10.6)	210	109.6(11.7)	<0.01
	Diastolic	11-13	102	71.8 (7.4)	354	66.4 (10.9)	<0.01
		14-16	140	78.1 (9.5)	546	71.3 (9.9)	<0.01
		17-19	184	78.7 (9.6)	210	73.6 (8.9)	<0.01

Systolic and Diastolic blood pressure increased with increase in height in both males and females, shown by correlation coefficient in males 0.49/0.41 and in females 0.32/0.31 for SBP and DBP respectively. Both mean SBP and DBP values were high in rural population than urban, among all age groups in both genders (P=0.01). This may be because of Rural adolescents may be less familiar with health check up procedures than urban adolescents. So that there may be some sort of anxiety during blood pressure recording even when all efforts done to reduce anxiety.

Blood pressure values in the present study are not comparable with others because age group criterion was different from others.

CONCLUSIONS

Mean blood pressure was found higher among females than that of males and in rural students than that of urban.

SUGGESTIONS

Routine blood pressure monitoring is needed in children and teenagers as an early marker of risk for future cardiovascular events. There is need to focus on routine blood pressure check up in rural adolescents along with urban.

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