



ISSN 2278 – 0211 (Online)

Prevalence of Hypertension among School Children in Puducherry

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Abstract:

Hypertension in childhood is now recognized to be a common and serious problem with a prevalence of 2% to 5%. Early identification of children at risk for hypertension, proper evaluation and appropriate management are important to prevent the serious, long – term complications associated with the condition. The present study was undertaken in this direction, to estimate the prevalence of hypertension and identify the risk factors in among school children (11 – 17 years) in Puducherry. After critically analyzing the results of the present study and comparing the results with other studies, it can be concluded that:

- *Blood pressure, both systolic and diastolic gradually increases with age, the increase being more pronounced in systolic blood pressure than in diastolic blood pressure.*
- *The increase in the blood pressure with increase in the age is not uniform with a wide range of fluctuations, between different age groups.*

Key words: *Blood pressure, school children, gradually increasing with age*

1. Introduction

Hypertension is a major killer disease in the world. Hypertension in childhood is now recognized to be a common and serious problem with a prevalence of 2% to 5%¹. The prevalence of hypertension, Hypertension is an important clinical problem in children's, and the approach to its management differs from that in adults in several major respects. As the symptoms of childhood hypertension are largely non-specific, most children with essential hypertension are likely to be asymptomatic.

Early identification of children at risk for hypertension, proper evaluation and appropriate management are important to prevent the serious, long – term complications associated with the condition. Hypertension in children has been shown to correlate with family history of hypertension, low birth weight and excess weight, with the increasing prevalence of childhood weight problems, increased attention to weight related health conditions including hypertension is warranted. ICMR have been established normal standards for anthropometric measurements for Indian children. The present study was undertaken in this direction, to estimate the prevalence of hypertension and identify the risk factors in among school children (11 – 17 years) in Puducherry.

2. Clinical Manifestation

Usually the symptoms and findings are the results of the hypertension. Headache, dizziness, nausea, vomiting, disturbed vision, irritability, hyperactivity, facial nerve palsy, convulsions, changes in the state of consciousness, personality change, anxiety, tachycardia, episodes of sweating, dyspnea, polyuria, polydipsia, weakness and weight loss are the various modalities of presentation. The clinical features may point towards a disorder of nervous system because of such symptoms as lethargy, coma, seizures, delirium and facial palsy. Some of symptoms may be due to long term effects of hypertension on target organs.

3. Laboratory Investigation: Routine Investigations

Complete blood count, urine analysis, urine culture, BUN, serum creatinine, uric acid, serum electrolytes, fasting lipids and glucose, chest X-ray, ECG and a rapid sequence intravenous pyelogram.

This battery of tests is adequate for the detection of renal disease and a rapid sequence IVP serves as a screening procedure for renovascular hypertension.

4. Special Investigations

- Renal arteriography
- Aortography
- Measurement of urinary catecholamines and/or their metabolites
- Measurement of urinary 17-ketosteroids
- Peripheral plasma renin activity (PRA)
- Radionuclide renal scanning
- Digital subtraction angiography (DSA).

5. Diet therapy

It is probable that initial weight loss and improved blood pressure in the dieting obese patients are due to restriction of salt and not calories.⁴⁰ Carney and associates have reported that patients receiving a moderate salt restriction were observed to show improvement in hypertension similar to that produced by a thiazide diuretic.

6. Materials and Methods

- Study design: Descriptive Cross sectional study
- Study area: Schools of urban area and rural area of Puducherry
- Study period : December 2010 – September 2011
- Study population: School children of Puducherry.

The study population was recruited based on the following criteria:

6.1. Inclusion criteria

- 11 – 17 years age will be included in the study.
- Both male and female school children.

6.2. Exclusion Criteria

School children who are suffering from following diseases were excluded from the study

- Congenital anomaly
- Cardiac diseases
- Renal diseases
- Under chronic drug intake.

6.3. Sample Size Calculation

Since prevalence of hypertension in school children was not known and not documented in Puducherry, we incorporated the prevalence figure of 2.2% from a previously conducted study among school children⁵. Applying the formula $n = [t^2 \times p(1-p)] / m^2$, where n is required sample size, t is the confidence level (standard value of 1.96), p is estimated prevalence and m is the margin of error (standard value 0.05), and adjusting for the design effect of 1.5, keeping the number of estimate (gender estimate) to be 2 and 10% being the non-response rate, the sample size required will be 1100.

6.4. Sampling Procedure

Stratified random sampling procedure will be used in this study. Puducherry town comprises of 110 higher secondary schools which includes both government and private schools. First random of 16 schools will be selected among 110 schools keeping equal representation from both private and government schools. Secondly from the school register, the students from each school will be included in the study randomly considering equal representation in classes between 6 and 12th standard. Thus 1100 school students will be interviewed in the study.

In the present study, sixteen schools, situated in Puducherry Union Territory were selected on the basis of the simple random sampling method. The schools were as follows:

7. Statistical Analysis

The data collected were tabulated according to various epidemiological parameters like age, sex, etc. The mean values and standard deviation of all Anthropometric parameters were calculated. T-test, unpaired, was used to find the difference between the mean values among boys and girls concerned with systolic blood pressure, diastolic blood pressure, height with systolic blood

pressure and diastolic blood pressure and weight with systolic blood pressure and diastolic blood pressure.

The Pearson's or product moment correlation coefficients (r) were calculated to assess the correlation between weight and systolic blood pressure, weight and diastolic blood pressure, height and systolic blood pressure, height and diastolic blood pressure both for boys and girls. The strength of the correlation coefficient was determined by using t-test $p > 0.05$ (5% level of significance) was considered as not significant (NS) and $p < 0.01$ was considered as significant (S) for the corresponding degrees of freedom (df).

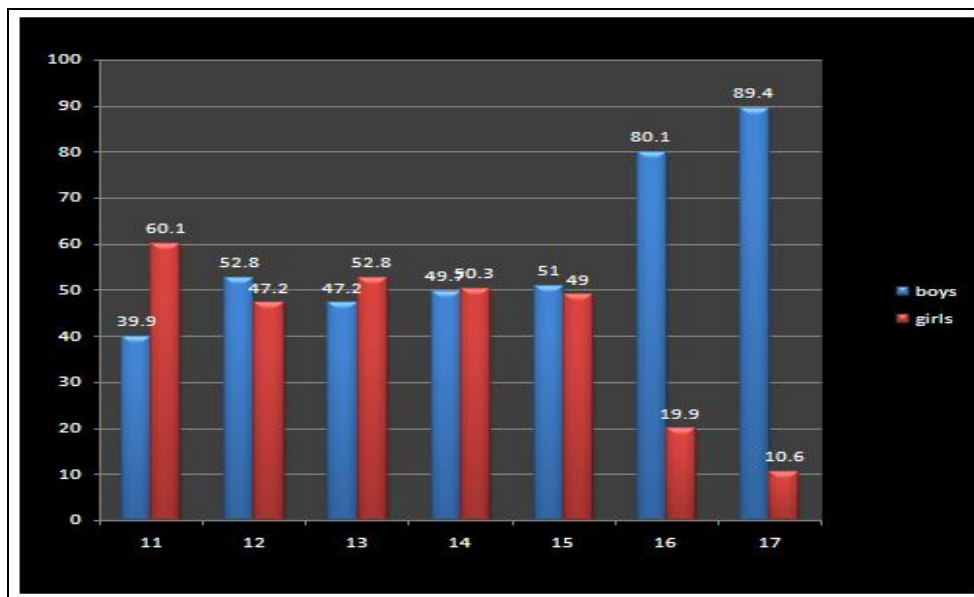


Figure 1: Blood Pressure Readings in Different Age Groups

7.1. Systolic Blood Pressure in boys in different age group

The mean Systolic blood pressure of the study population was found to be 107.51 ± 11.5

The mean SBP in girls was found to be similar between the aged 13 and 15 years. However,

Compared to the boys in almost all age groups 95th percentile cutoff points was found to be higher than compared to the boys

7.2. Diastolic Blood Pressure in boys in different age group

Age in Years	No. of Children	Mean \pm SD (mmHg)	Percentile(mmHg)							Range Min–Max (mmHg)
			5 th	10 th	25 th	50 th	75 th	90 th	95 th	
11	61	64.4 \pm 8.4	50.4	54.4	56	64	71	76	78	32
12	38	60.0 \pm 7.7	46	49.5	54	61	66	70	74	28
13	85	67.18 \pm 8.2	56.6	58	60	66	72	78	86	32
14	77	66.55 \pm 9.4	50	52	60	68	70	82	82.4	36
15	106	67.98 \pm 7.9	54	60	60	69	74	78	84	32
16	145	70.39 \pm 7.2	60	60	66	70	76	80	82	40
17	135	68.9 \pm 7.8	56	60	64	70	74	78	84	36

Table 1

The data on DBP among boys shows that when age increases the DBP also increased. Also the 95th percentile was higher in higher age groups, which peaked 86mmHg among 13 year old boys.

7.3. Diastolic Blood Pressure in girls in different age group

Age in Years	No. Of children	Mean \pm SD (mmHg)	Percentile(mmHg)							Range Min–Max(mmHg)
			5 th	10 th	25 th	50 th	75 th	90 th	95 th	
11	92	67.46 \pm 7.3	54	56	62.5	68	70	79.4	81.4	34
12	34	67.6 \pm 7.2	50	58	64	66	74	78	80	30
13	95	68.3 \pm 6.9	56	58	64	68	72	78.2	80	26

14	78	69.18±8.4	56	60	62	70	76	80	84	14
15	102	69.15±9.1	54	58	64	70	76	80	84	40
16	36	69.78±6.8	56	57.4	65	70	75.5	78	78	22
17	16	64.2±9.3	48	48	54	68	70	76	0	28

Table 2

The DBP among girls was higher between age groups 14 and 16 years and peaked 84mmHg in age groups 14 and 16

From the previous observations, it has been observed that the mean systolic and Diastolic BP among both sexes were similar though it reported little higher among girls.

7.4. Mean SBP and DBP in both sexes

Sexes	SBP (mmHg) Mean ± STD	DBP (mmHg) Mean ± STD
Boys	106.39±12.1	67.65±8.4
Girls	109.2±10.4	68.48±7.9
	t = -3.90 df = 10.98	p<0.000

Table 3

The mean SBP and DBP among boys were 106.39 and 68.48mmHg respectively. This difference is found to be statistically significant. The mean SBP and DBP among different age groups shows that age influence the blood pressure positively and this relationship is non linear, however, this difference of blood pressure among age groups was found to be statistically significant

7.5. Correlation of Systolic and Diastolic Blood Pressure with Weight and Height

Correlation of Blood pressure with Weight and Height in Boys (n = 647)

Correlation coefficient (r) of Weight with		Correlation coefficient (r) of Height with	
SBP	DBP	SBP	DBP
0.414	0.428	0.179	0.062
p < 0.000	p < 0.000	p < 0.000	p < 0.000

Table 4

In boys, positive correlation was found between the weight and blood pressure though low but found to be significant, whereas correlation between height and blood pressure was found to be very low

8. Discussion

8.1. Relation of blood pressure with age

In all the studies in India and abroad it has been shown that blood pressure, both systolic and diastolic, gradually increases with age, although such an increase is not a steady one. The findings of the present study are in agreement with the above statement.

The systolic spurt observed in the present study between 13-14 years in both sexes has been supported by Agarwal Rajiv Sharma, AK Shrivastava, Premkumar and CM Pandey who observed similar spurts in systolic blood pressure in both sexes between 12 and 13 years of age⁴⁵. Rakesh Agarwal, SL Mandowara, B Bhandari and Garg OP also observed a spurt in blood pressure between 12 and 13 years. The steep rise in systolic blood pressure was also observed by Londe between 14 to 15 years in both sexes.

The systolic spurt observed in the present study can be accounted by the onset of puberty in both sexes, which results in increase of body weight and height, as a result of increase in muscular tissue in boys and deposition of adipose tissue in girls, which begins around 11 to 12 years and reaches peak levels by 14-15 years of age.

All the above studies, including present study show, there is an alteration of diastolic blood pressure different age group. There is a spurt of diastolic blood pressure in 13-14 years of age group in females in the present study. Such spurt has not been reported by any other workers.

The blood pressure levels in the present study were considerably higher, both systolic and diastolic pressures, in either sex than the findings in other Indian studies. Even in the Western studies similar differences have been observed, the difference between NIH Task Force readings and Bogalusa heart study being 10-15 mm Hg, with considerably higher level reported in the NIH report.

8.2. Relation between blood pressure and sex

8.2.1. Age group

It can be seen from the results of the present study, that there were is a differences in the mean systolic blood pressure and mean

diastolic blood pressure in all age groups in between girls and boys. The mean systolic blood pressure was slightly higher in boys lower than in girls and the mean diastolic blood pressure is slightly higher in girls than in boys. However, sex has influence the difference of systolic blood pressure but it was found to be similar range in diastolic blood pressure

8.2.2. Height and Weight group

It can be observed from the results of present study that girls were having slightly lower mean systolic and diastolic pressure levels in majority of the comparable height and weight groups in boys. (Tables 11) When the mean height and mean weight in different age groups were compared, it was found that boys were having slightly more height and weight than girls. These findings are strongly in favour of the argument that body weight and height are the strongest determinants of blood pressure.

9. Conclusion

After critically analyzing the results of the present study and comparing the results with other studies, it can be concluded that:

- Blood pressure, both systolic and diastolic gradually increases with age, the increase being more pronounced in systolic blood pressure than in diastolic blood pressure.
- The increase in the blood pressure with increase in the age is not uniform with a wide range of fluctuations, between different age groups.
- There is significant difference in blood pressures of the two sexes.
- There is a positive correlation between blood pressure and weight and blood pressure and height in boys. Correlations of weight, height with blood pressure were found to be low among girls compared to boys.
- The family history of hypertension has influenced diastolic blood pressure among the study population which is found to be statistically significant.

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