Original Article ISSN (O):2395-2822; ISSN (P):2395-2814

Evaluation of Blood Pressure and Anthropometric Measurements in School Children.

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Received: May 2019
Accepted: June 2019

ABSTRACT

Background: The prevalence of hypertension in children and adolescents seems to be increasing. The present study aimed to investigate the best anthropometric determinants of high blood pressure in school children. **Methods:** The present study was conducted in the department of Community Medicine. It comprised of 1160 school children age ranged 12-16 years of both genders. In all children, height (cm), weight (kg), systolic and diastolic blood pressure, Body mass index (kg/m2), Waist circumference (cm) Triceps skinfold (mm) was recorded. **Results:** Maximum boys were in age 12 years and 16 years and girls in age 14 years, followed by 70 boys in 12 years, 80 in 15 years and 60 in 14 years. 48 girls in 15 years, 42 in 13 years, 38 in 12 years and 17 in 16 years. Boys had 22% and girls had 20% of prevalence of hypertension. The mean height in males was 155.2 cm and in girls was 146.2 cm, weight was 37.4 kg in boys and 32.1 kg in girls, SBP was 132.4 mm Hg in boys and 124.6 mm Hg in girls. DBP was 86.2 mm Hg in boys and 74.6 mm Hg in girls. **Conclusion:** There is a positive correlation of weight of subjects and systolic and diastolic blood pressure in subjects. Early screening for high blood pressure in school students and introducing effective lifestyle modifications at an early age to prevent the epidemic of non-communicable diseases in future is the need of hour.

Keywords: children, diastolic blood pressure, hypertension.

INTRODUCTION

Hypertension is one of the most common public health problems globally among adults, and recent data suggests that there is an increase in the incidence of childhood hypertension as well. Hypertension is a wellknown risk factor for cardiovascular diseases and hypertension in adults often begins in the childhood. Many environmental and genetic factors play a significant role in the causation of blood pressure such as the age, gender, body size, body mass index, physical activity, diet and stress levels.[1,2]

The prevalence of hypertension in children and adolescents seems to be increasing. This rise is partially because of the increasing prevalence of obesity among children and adolescents, as well as a growing awareness of this disease. There is evidence that hypertension in children and adolescents can lead to adult hypertension. Presence of hypertension in children and adolescents may contribute to the early development of coronary artery disease. Previous reports have shown that early development of atherosclerosis does exist in children and adolescents and may be associated with childhood hypertension.[1]

Hypertension is a well-known risk factor for cardiovascular diseases and hypertension in adults often begins in the childhood. Many environmental and genetic factors play a significant role in the causation of blood pressure such as the age, gender, body size, body mass index, physical activity, diet and stress levels.[2] However, during adolescence, the main influencing factor that leads to hypertension is obesity and metabolic syndrome and familial factors of hypertension. In spite of it being a risk factor for cardiovascular diseases, high blood pressure is often under diagnosed in children.[3] Currently, however, there is no consensus on the choice of anthropometric predictor of high blood pressure in this population. Anthropometric indicators such as BMI, waist circumference, triceps skinfold and, more recently, the waist-to-height ratio, have been investigated for validity in predicting the risk for high blood pressure in the pediatric population.[4]

Regardless of patient age, measurement of the blood pressure should be part of routine physical examination. Its value as a screening tool for hypertension in adults has long been documented. It is currently firmly established as an important

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component of the routine paediatric physical examination and should be done annually after 3 years of age, or earlier in children with a history of neonatal problems, renal disease or familial risk factors.[4]

The present study was aimed to investigate the best anthropometric determinants of high blood pressure in school children.

MATERIALS AND METHODS

This cross sectional study was carried out among 1160 school children between the age group 10-15 years in the school children of both genders.

The ethical approval was obtained from institutional ethical committee. All students were informed regarding the study.

General information such as name, age, gender etc. was recorded. The assessments were performed during the school period, by trained evaluators and using calibrated equipment. In all children, height (cm), weight (kg), systolic and diastolic blood pressure, Body mass index (kg/m2)

Waist circumference (cm) Triceps skinfold (mm) was recorded. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Age wise distribution of subjects

Age (Years)	Boys	Girls
12	140	76
13	170	84
14	120	110
15	160	96
16	170	34
Total	760	400

[Table 1] shows that maximum boys were in age 12 years and 16 years and girls in age 14 years, followed by 140 boys in 12 years, 160 in 15 years and 120 in 14 years. 96 girls in 15 years, 84 in 13 years, 76 in 12 years and 34 in 16 years.

Table 2: Prevalence of hypertension in subjects

Total	Prevalence	
	Boys	Girls
1160	168 (15%)	80 (7.0%)

Table 3: Anthropometric parameters in all subjects

Anthropometric parameters	Boys Mean ± SD	Girls Mean ± SD	p
Height (cm)	155.2±10.2	146.2±9.6	0.01(sig.)
Weight (Kg)	37.4±3.5	32.1±4.4	0.022(sig.)
SBP (mm Hg)	132.8±12.5	124.6±10.6	0.01(sig.)
DBP (mm Hg)	86.2±8.6	74.6±8.4	0.01 (sig.)
Body mass index (kg/m2)	18.8±3.4	19±3.6	0.22 (non sig.)
Waist circumference (cm)	68.6±8.6	68.6±8.2	0.024(sig.)
Triceps skinfold (mm)	12.6±6.8	17.6±6.2	0.01(sig.)

[Table 2] shows that boys had 15% and girls had 7.0% of prevalence of hypertension.

[Table 3] shows that mean height in males was 155.2±10.2 cm and in girls was 146.2±9.6 cm, weight was 37.4±3.5 kg in boys and 32.1±4.4 kg in girls, SBP was 132.8±12.5 mm Hg in boys and 124.6±10.6 mm Hg in girls. DBP was 86.2±8.6 mm Hg in boys and 74.6±8.4 mm Hg in girls. Body mass index (kg/m2) in boys 18.8±3.4 and girls was 19±3.6. Waist circumference (cm) in boys 68.6±8.6 and in girls was 68.6±8.2. Triceps skinfold (mm) 12.6±6.8 in boys and in girls was 17.6±6.2

Table 4: Pearson's Correlation Coefficient

Anthropometric parameters	SBP	DBP
Height	0.51	0.32
Weight	0.01	0.05

[Table 4] shows positive correlation of weight of subjects and systolic and diastolic blood pressure in subjects (P< 0.05).

DISCUSSION

The prevalence of systemic blood hypertension in the juvenile population has increased around the world, with the highest proportion of hypertension observed in obese schoolchildren. Many studies were conducted to identify the best anthropometric determinant of high blood pressure in children and adolescents, but the results were divergent. Hypertension is a major risk factor for cardiovascular and cerebrovascular diseases. The risk of morbidity and mortality due to these diseases among adults is on the rise and more so in developing countries such as India. Many cases of hypertension in adults begin during childhood both in males and females.[5]

The association between overweight and elevated BP in children would reflect on an increased burden of hypertension-related diseases as the obesity epidemic further goes up. Prevention of cardiovascular risk factors as early as in childhood – also called primordial prevention – may be an important strategy to prevent non-communicable diseases in a life course perspective, particularly in settings with scarce resources.[6] The present study aimed to better clarify this issue, by examining the relationship between blood pressure and various anthropometric indicators in school children.

We included 1160 school children age ranged 12-16 years. Maximum boys were in age 12 years and 16 years and girls in age 14 years, followed by 140 boys in 12 years, 160 in 15 years and 120 in 14 years. 96 girls in 15 years, 84 in 13 years, 76 in 12 years and 34 in 16 years.

Sachdev et al,[7] in their study Defining ≥ 95th percentile as hypertension, 153 (10.2%) females and 177 (8.3%) males were hypertensive. Totally there were 330 subjects (8.3%) hypertensive in the study group. There was no significant difference in the prevalence of hypertension between the

genders. A rise is observed in mean systolic and diastolic BP with increase in mean weight, height and BMI. There were 173 (4.8%) children who were overweight and 30 (0.8%) children who were obese. Among the overweight children, 62 subjects (35.83%) were hypertensive. Among the children who were obese, 19 (63.3%) were hypertensive. There was also a correlation between body mass index and hypertension.

In present study, mean height in males was 155.2 cm and in girls was 146.2 cm, weight was 37.4 kg in boys and 32.1 kg in girls, SBP was 132.4 mm Hg in boys and 124.6 mm Hg in girls. DBP was 86.2 mm Hg in boys and 74.6 mm Hg in girls. There was a positive correlation of weight of subjects and systolic and diastolic blood pressure in subjects (P< 0.05).

Agarwal et al,[8] found that weak correlations among all the anthropometric parameters and systolic and diastolic levels, with coefficients values ranging from 0.18 to 0.28 ($p < 0.001$). In multivariate analysis, only body mass index and triceps skin fold were found as predictors of high blood pressure, regardless of abdominal adiposity, sexual maturation and socioeconomic status. They concluded that total body adiposity seems to be a better predictor of high blood pressure risk than abdominal fat in this population.

Durrani et al,[9] in their study found that the overall prevalence of hypertension was found to be 11.77%. Blood pressure of both genders appears to have positive correlation with anthropometric characteristics. Authors concluded that with increase in anthropometric measurements like height, weight and BMI were found to be positively correlated with hypertension among school children.

Regarding the association between high blood pressure and triceps skinfold thickness observed in this study, the literature is sparse and divergent. In this study, the risk of high blood pressure was almost twice as high in children with triceps skinfold thickness above the 90th percentile than those with adequate subcutaneous adiposity. Other studies published in literature also revealed the association between these variables. However, triceps skinfold in the upper quartile was not associated with risk of high blood pressure in children and adolescents of Belo Horizonte.[10,11]

However, it is essential that new studies seek to investigate the use of waist-to-height ratio during the growth spurt, because increased waist circumference cannot keep up with the rapid height gain in pubertal stage, hindering the diagnosis of abdominal obesity when the measure of waist is corrected by height.[11]

The association between overweight and elevated BP in children would reflect on an increased burden of hypertension-related diseases as the obesity epidemic further goes up. Prevention of cardiovascular risk factors as early as in childhood – also called primordial prevention – may be an important strategy to prevent non-communicable diseases in a life course perspective, particularly in settings with scarce resources.[9-11] This study reemphasizes the pressing need to develop a comprehensive medical and nutrition plan together with preventive and corrective strategies in school programmes to reduce the prevalence of these identified disease states, by empowering parents, teachers and policy makers to realize the need for increased physical activity, healthy dietary habits together with lifestyle.

CONCLUSION

Authors found a positive correlation of weight of subjects and systolic and diastolic blood pressure in subjects. Authors suggested out the need for early screening for high blood pressure in school students and introducing effective lifestyle modifications at an early age to prevent the epidemic of non-communicable diseases in future.

REFERENCES

1. Sinaiko AR. Hypertension in children. N Engl J Med 1996; 335(26): 1968-197.
2. National High Blood Pressure Education Programme Working Group on high blood pressure in children and adolescents. Fourth report on the diagnosis, evaluation, and treatment, of high blood pressure in children and adolescents. Paediatrics 2004;114:555–75.
3. de Swiet M. The epidemiology of hypertension in children. Br Med Bull 1986; 42: 172-175.
4. Berenson GS, Srinivasan SR, Bao W, Newman WP 3rd, Tracy RE, Wattigney WA. Association between multiple cardiovascular risk factors and atherosclerosis in children and young adults. The Bogalusa Heart Study. N Engl J Med 1998:338:160-6.
5. McGill HC, McMahan CA, Zieske AW, Malcom GT, Tracy RE, Strong JP. Effects of non lipid risk factors on atherosclerosis in youth with a favourable lipoprotein profile. Circulation 2001:103:1546-50.
6. Gupta AK, Ahmad AT. Normal blood pressure and sustained blood pressure elevation in childhood. Indian Pediatr 1990:27:33-42.
7. Sachdev Y. Normal blood pressure and hypertension. Indian Pediatr 1984;21;41-9.
8. Agarwal VK, Sharan R, Srivastava AK, Kumar P, Pandey CM. Blood pressure profile in children of age 3-15 years. Indian Pediatr 1983:20:921-5.
9. Durrani AM, Fatima W. Determinants of blood pressure distribution in school children. Eur J Public Health 2012;22:369-73.
10. G.G. Bergmann, A. Gaya, R. Halpern, M.L. Bergmann, R.R. Rech, C.B. Constanzi, et al. Waist circumference as screening instrument for cardiovascular disease risk factors in school children. J Pediatr (Rio J)., 86 (2010), pp. 411-416
11. J. Rosenthal. Methodologic evaluation of the relation of blood pressure and skinfold thickness: an epidemiologic approach. Rev Saude Publica., 23 (1989), pp. 322-335.

How to cite this article: Negi A, Chauhan AK, Ranjan R, Gupta P. Evaluation of Blood Pressure and Anthropometric Measurements in School Children. Ann. Int. Med. Den. Res. 2019; 5(5):CM04-CM07.

Source of Support: Nil, **Conflict of Interest:** None declared