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Study on Prevalence of Hypertension among Adolescents

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Abstract: ***Introduction: In the past, Hypertension in childhood was not considered a problem but in the last few decades, it has gradually become a source of concern especially as children are known to maintain their blood pressures into adulthood. Therefore, hypertensive children are at risk of developing cardiovascular complications earlier in adulthood. In our own environment, the prevalence of hypertension in children is undocumented, hence the purpose of this study was to determine the prevalence of hypertension and risk factors among adolscents in Tumkur India. Methods: A sample of 320 was selected by stepwise random sampling from four schools of Tumkur. Blood pressure, weight, and height of the subjects were measured and BMI was calculated. Blood pressure measurements were categorized as normal, prehypertension, or hypertension using the 2004 Fourth Report blood pressure screening recommendations. Overweight and obesity were defined according to International BMI Cut Off Points for adolescents. Results: The prevalence rates of prehypertension and hypertension were 10.2% and 16%, respectively. Obesity and overweight were seen in 4.8% and 18.4% of subjects, respectively. The prevalence rates of hypertension and prehypertension increased with increasing BMI. Conclusions: The prevalence of hypertension and prehypertension in this study was found to 16% and 10.2% respectively. Hypertension/prehypertension was more likely to develop with increasing age, BMI and waist circumference. Obesity was associated with an increased risk of elevated blood pressure. Routine blood pressure measurements in adolescents of our community are suggested to prevent high blood pressure in adolescence and its complications in later life.***

Keywords: Hypertension, Adolescent

1. Introduction

Hypertension is fast becoming a source of growing concern in children in developing countries [1]. Children with elevated blood pressures (BP) tend to maintain those same levels of blood pressure into adulthood; therefore, early detection is essential to minimize complications later in life [2]. In children, hypertension is said to be present when the systolic and diastolic blood pressure is greater than the 95th percentile for the child's age, sex and height on three or more occasions. The causes for increase in blood pressure are attributed to obesity, change in dietary habits, decreased physical activity and increasing stress. Similar data is lacking from India; small surveys in school children suggest a prevalence ranging from 2-5 % [3].

Cardiovascular diseases are a major cause of morbidity and premature mortality in men and women in most of the industrialized world and in many developing countries [4]. Cardiovascular diseases are becoming more prevalent in developing countries, particularly in urban areas. The World Health Organization (WHO) conference on a "second wave" epidemic of cardiovascular disease connected with arterial sclerosis predicted that in 2020 cardiovascular diseases will most likely be the leading cause of death in the world [5]. Thus, cardiovascular diseases must be targeted at a primary health promotion level before some of the important underlying causes of cardiovascular disease seriously afflict a person or a population at large [6].

2. Methods

In this crosssectional study, a sample of 320 adolscents (11 to 19 years old) were selected from among high school students in Tumkur city in 2012 by a two-stage stratified random-sampling technique. Written informed consent was obtained from the students and their parents. Information on general characteristics was obtained by interview. Subjects with a history of disease, including diabetes, heart disease, kidney disease, gastrointestinal disease, or use of and medication, were excluded from the study.

The exact age of children was verified from school records. Children were explained about study in their local language (kannad). A semi-structured pre-tested questionnaire was administered to each student with the help of class representative and asked to get filled by parents at home.

Body weight was measured with the use of calibrated beam scales and was recorded to the nearest 0.5 kg. The subjects were measured barefoot wearing light clothing. Height was measured with the use of a mounted tape with the subjects, arms hanging freely at their sides and was recorded to the nearest 0.5 cm. Body mass index (BMI) was calculated as the weight in kilograms divided by the height in meters squared. Underweight, healthy weight, overweight, and obesity were defined according to the International BMI Cut Off Points for adolescents.

The children were considered hypertensive if the systolic or diastolic blood pressure or both were equal to or more than the 95th percentile for height for age and sex.[5] Students found to have hypertension on first visit were contacted to undergo a second set of blood pressure measurements at least four weeks later.

Statistical analysis was performed with SPSS for Windows, version 11.5. The results were considered statistically significant if $p < .05$.

3. Results

Table shows the characteristics of the study population. The prevalence rates of hypertension and prehypertension were 16 % and 10.2%, and the prevalence

rates of obesity and overweight were 4.8% and 18.4%, respectively.

Table 1: Characteristics of the subjects (n = 320)

Variable	Value
Age (yr):	15.67 ± 1.01
Height (cm):	159.36 ± 5.63
Weight (kg):	54.23 ± 9.81
BMI (kg/m2):	21.28 ± 3.50
Systolic blood pressure (mm Hg):	114.59 ± 14.04
Diastolic blood pressure (mm Hg):	70.15 ± 10.03
Blood pressure classification	
Normal:	236 (73.8)
Prehypertension:	33 (10.2)
Hypertension:	51 (16)
BMI classification	
Underweight:	20 (6.2)
Healthy weight:	240 (75)
Overweight:	44 (13.7)
Obese:	16 (5)

Values are mean ± SD or no. (%).

4. Discussion

The overall prevalence rates of hypertension and prehypertension were 16% and 10.2% respectively. Juarez-Rojas et al. reported prevalence rates of hypertension and prehypertension of 10.6% and 10%, respectively, in male and female Mexican adolescents 12 to 16 years of age. In another study by Chiolero et al. in Seychelles, a rapidly developing island state in the African region, the prevalence of elevated blood pressure was 7.8% in male and female children and adolescents 4 to 18 years of age [8].

The present study found significant rise of hypertension with obesity in both sex groups.. This association also demonstrated in many studies like Norwegian study[9] and Taiwan study.[10] The Framingham study[11] also showed increased prevalence of obesity in subjects with hypertension as well increase in BP in established obesity. Many studies from India[12,13] and also from Surat[14] had similar observations. Similar observations were also reported among adolescent population in Hungary[15] and France[16] and such association in early childhood with SBP alone was reported by British cohort.[17] and found 41% of their hypertensive children were obese, so they concluded that obesity plays very important role in development of childhood hypertension.

The prevalence of high blood pressure among adolescent was higher in our study than in some other countries [8, 18], despite a lower prevalence of obesity (2.8%) in our subjects than in adolescents of other countries, such as island states in the African region (8.7%) and Houston, Texas, USA (18.1%) [8].

The reason for this paradox is unclear, but it could be due to ethnic differences between populations.

Factors which were significantly associated with developing hypertension in this study were age, BMI and waist circumference. As age increased, there was a higher likelihood of a child becoming hypertensive and this is in keeping with findings from other studies [8]. This can be explained by the observed trend of increasing blood pressure with increase in body size, weight and sexual maturity which tends to occur with increasing age . BMI continues to demonstrate a significant positive correlation with hypertension as seen in this study. Several studies corroborate this finding: Oduwole et al. [19] in Lagos, Nigeria found that BMI in adolescents aged 14-17years was significantly associated with prehypertensive and hypertensive range systolic blood pressures in overweight and obese subjects.

5. Conclusion

In conclusion, the prevalence of hypertension and prehypertension in our study population appears to be significant. These results suggest the need for routine blood pressure measurements in adolescents to identify those whose blood pressure merits further evaluation by a physician and to rule out abnormal blood pressure in adolescents.Amongst the factors investigated in this study, only age, BMI and waist circumference were significantly associated with the development of hypertension and prehypertension. Development and implementation of national policies and interventions toward improving health-related variables among overweight or obese adolescents, such as dietary modification, weight reduction and prevention of obesity, and increasing physical activity, are suggested to prevent high blood pressure in adolescence and its complications in later life.

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