Australasian Medical Journal AMJ 2010, 3, 11, 695-698

Prevalence of hypertension in the paediatric population in Coastal South India

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RESEARCH

Please cite this paper as: Kamath V., Parthage P.M., Pattanshetty S, Kamath A, Balakrishnan A, Mishra T, Sinha N, A L. Prevalence of hypertension in the paediatric population in Coastal South India. AMJ 2010,3,11, 695-698. Doi 10.4066/AMJ.2010.372

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Abstract

Background
Hypertension in children and adolescents has become increasingly common. We sought to study the prevalence of hypertension among apparently healthy school children in Udupi Taluk, a rapidly developing coastal region in Karnataka in South India and correlate high blood pressures with age, gender and BMI.

Method
A total of 2067 students (1055 boys and 1012 girls) between the ages of 5 – 16 years from rural schools in Udupi taluk were studied as part of school health services. Height (in cm) and weight (in kg) were recorded along with Blood Pressure measurements using the auscultatory method. Blood pressure was measured twice among children who were found to have a high reading (more than the 95th percentile) the first time. Using WHO charts for BMI for boys and girls, prevalence of overweight and obese children was determined. The evaluation of hypertension was based on the Update on the 1987 Task Force Report on High Blood Pressure in Children and Adolescents.

Results
Overall prevalence of hypertension in children was 2.2%. Prevalence of hypertension in female children was 2.4% and in males it was 2.1%. The proportion of hypertensives was found to the maximum in the 14-16 year age group. The prevalence of obesity among girls and boys was found to be 1.5% and 1.1% respectively. The prevalence of systolic hypertension was found to be significantly higher (P=0.041) in obese children (12.5%) as compared to that in underweight children (1.4%).

Conclusion
We found that higher BMI was associated with higher blood pressures. The results suggest that the prevalence of hypertension is mainly in the adolescent age group; therefore targeted screening in this group would be beneficial.

Key Words Children, Adolescents, Hypertension, WHO, Blood Pressure

Background

Blood Pressure studies in children provide important epidemiological information which may help in controlling or modifying coronary risk factors. There is a need for early identification of these children so that they may be placed under surveillance. According to the recommendations of the 1996 task force report on blood pressure (BP) in children and adolescents, BP measurements should be incorporated into the routine paediatric examination of children three years of age and older[1]. Although the prevalence of hypertension during childhood is lower than that seen in adulthood, this condition is not rare in children, thus stressing the importance of evaluating BP for both primary and secondary hypertension. [2]

Previous studies have documented that hypertension may begin in adolescence, perhaps even in childhood.[3-6] Early diagnosis, treatment, follow-up of the hypertensive cases and preventive methods such as decreasing weight to the ideal(BMI for age and sex between 5th and 85th percentile), increasing physical activity and changing eating habits may decrease future hypertension morbidity and mortality.
The association between obesity and hypertension in children has been reported in numerous studies among a variety of ethnic and racial groups with virtually all studies finding higher blood pressures and/or higher prevalence of hypertension in obese compared with lean children[7,8].

The purpose of this study was to highlight the prevalence of hypertension among apparently healthy school children in Udupi Taluk, a rapidly developing region in Karnataka in South India and correlate high blood pressures with age, gender and BMI.

Method

This is a cross-sectional study wherein a total of 2067 students between the ages of 5 – 16 years from rural schools in Udupi taluk, Karnataka were studied as part of school health services.

The age of the child was obtained from the school registers. The height was recorded to the nearest centimetre using a stadiometer and weight was measured using a weighing machine.

Blood pressure (BP) was measured using mercury sphygmomanometer. To maintain uniformity throughout the study, measurement was done in the right arm of the subjects in sitting position. The appropriate sized cuff was used so as to cover approximately 75% of the upper arm. The onset of sound in phase I (K.1) corresponded to the systolic BP and K5 phase was taken as a measure of diastolic blood pressure respectively. Blood pressure was measured twice among children who were found to have a high reading (more than the 95th percentile) the first time. [1]

Using WHO charts [9], overweight was defined as BMI values more than 85th percentile of BMI for age and sex and obesity as more than the 95th percentile. Hypertension in children and adolescents was defined as systolic BP and or diastolic BP that is at or above the 95th percentile for age, sex, height and gender according to the "Task Force on Blood Pressure Control in Children". [1]

The collected data was analyzed using SPSS version 11.5. Chi square test was used to test the significance of the differences across the groups and $p<0.05$ was considered statistically significant.

Results

Of the 2067 students included in the study, 1055 (51%) were males and 1012 (49%) were females. The baseline characteristics of the study population are presented in Table 1. Majority of the subjects belonged to 8 to 13 years of age. Overall, the prevalence of hypertension in the study group was 2.2%. Prevalence of hypertension among female was 2.4% and in males it was 2.1%.

The prevalence of hypertension among the study group was seen to be the highest between the ages of 14 and 16 years, males being 4.6% and females being 5.6 %. We also found that the prevalence of hypertension was higher in girls in the 5-7 age groups. However, there was no significant difference between the prevalence of hypertension between males and females. Among the girls, 20 (2.0%) and 17 (1.6%) among the boys were found to have systolic hypertension. The diastolic hypertension was similar in both girls and boys with a prevalence of 0.8%. Systolic Hypertension was highest among the 14-16 age groups, with prevalence 4.9%. Diastolic Hypertension was most common among the age group of 5-7 years, with a prevalence of 1.5%.

The prevalence of obesity among girls and boys was found to be 1.5% and 1.1% respectively. Table 3 shows that prevalence of hypertension was seen to increase with increase in BMI ($p = 0.011$). This significant trend was also observed for systolic hypertension ($p=0.041$) but could not be seen for diastolic hypertension. Table 4 shows the distribution of systolic and diastolic hypertensions across the nutritional status of the subjects. Both systolic and diastolic hypertension prevalence increased with increase in BMI.

Discussion

Traditionally, hypertension has been considered an uncommon problem among children and adolescents. Blood pressure is considerably lower in children than adults but almost always increases throughout the first two decades of life. In normal children blood pressure varies not only with age, but also with sex, height and weight.

BP is slightly higher in boys than in girls during the first decade of life. This difference begins to widen at the onset of puberty and BP is significantly higher in young men by the end of adolescent age. [10]

Many studies have demonstrated a significant impact of obesity on children's BP. In the Bogalusa Heart Study, a mixed cross-sectional and longitudinal follow-up study of 9167 children from 5 to 17 years of age, in a stable community, there was a strong relation of obesity to higher BP. [11] Obesity as a risk factor for hypertension has also been elicited by Soudarssanane et al [12] in his study**.** In our study, we found that the prevalence of systolic hypertension among underweight was 1.4% and that among obese was 12.5%, thus our results show a similar pattern.

In a study by N.K. Anand et al[13], there was no significant difference between systolic and diastolic BP of the two sexes in most age groups. In our study, the difference in male and female blood pressures was also minimal, with females having a prevalence of 2.4% and males having a prevalence of 2.2%. In the same study, it was revealed that the rise in BP was directly proportional to the increase in age in both sexes, with a spurt of about 5 mmHg in SBP at the age of 12 years in both sexes. In our study, we observed a sharp rise in BP in the 14-16 age group, with a prevalence of 4.9%.

Once considered relatively rare, primary hypertension in children has become increasingly common in association with other cardiovascular risk factors that include overweight, insulin resistance, and dyslipidemia.[14-17] Therefore measuring the BP of the schoolchildren should be added to routine school health examinations. This study thus shows that hypertension is not a rare phenomenon in

the paediatric age group. Children may not present with the signs and symptoms of hypertension but detecting high blood pressure measurements at a young age and taking precautionary measures can go a long way in postponing the onset or even preventing the onset of hypertension at a later age.

Conclusion

We found that higher BMI was associated with higher blood pressures. The results show that the prevalence of hypertension was seen mainly in the adolescent age group; therefore screening towards this group would be beneficial.

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PEER REVIEW

Not commissioned. Externally peer reviewed.

CONFLICTS OF INTEREST

None

FUNDING

Nil

Figures and Tables

Table 1: Baseline characteristics of the study population (n=2067)

Age group of the subjects (years)	Males No. (%)	Females No. (%)	Total No. (%)
5-7	305(51.7)	285(48.3)	590(28.5)
8-10	391(49.9)	392(50.1)	783(37.9)
11-13	316(49.9)	317(50.1)	633(30.6)
14-16	43(70.5)	18(29.5)	61(03.0)
Total	1055(51.0)	1012(49.0)	2067(100)

Table 2: Prevalence of Hypertension according to Age and Sex (n=2067)

Age group (years)	**Males No. (%)**	**Hypertensive Males No. (%)**	**Females No. (%)**	**Hypertensive Females No. (%)**	**Total**	**Total hypertensive children (%)**
5-7	305	7(2.3)	285	13(4.6)	590	20 (3.4)
8-10	391	6(1.5)	392	5 (1.3)	783	11 (1.4)
11-13	316	7(2.2)	317	5 (1.6)	633	12 (1.9)
14-16	43	2(4.6)	18	1 (5.6)	61	3 (4.9)
TOTAL	**1055**	**22(2.1)**	**1012**	**24 (2.4)**	**2067**	**46 (2.2)**

Table 3: Classification of blood pressure with respect to BMI classification (n=2067)

Nutritional status	**Normal No. (%)**	**Hypertensive No. (%)**	**Total No. (%)**	
Underweight	996 (98.5)	15 (1.4)	1011 (48.9)	Fisher's exact test p=0.011
Normal	973 (97.3)	27 (2.7)	1000 (48.4)	
Overweight	28 (96.5)	1 (3.4)	29 (1.4)	
Obese	24 (88.8)	3 (11.1)	27 (1.3)	
Total	**2021**	**46**	**2067**	

Table 4: Classification of systolic and diastolic blood pressures with respect to BMI classification (n=2067)

Nutritional status	Systolic hypertension No. (%)		Diastolic hypertension No. (%)	Total No. (%)	
Underweight	16 (1.6)	Fisher's exact test; p=0.041	3 (0.29)	1011 (48.9)	Fisher's exact test; p=0.131
Normal	25 (2.5)		7 (0.7)	1000 (48.4)	
Overweight	3 (8.7)		1 (3.44)	29 (1.4)	
Obese	3 (12.0)		1 (3.71)	27 (1.3)	
Total	45 (2.17)		12 (0.58)	2067	