Original Article

Obesity and Childhood Hypertension

Prevalence and Risk Factors for Hypertension Among School Children in Four Districts of Hazara division, Khyber Pukhtoonkhwa

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ABSTRACT

Objective: The current study was conducted with the aim to evaluate the prevalence and risk factors for hypertension among schoolchildren.

Study Design: Descriptive / cross-sectional study

Place and Duration of Study: This study was conducted at the Department of Paediatric, Saidu Medical College, Swat from March 2014 to December 2014.

Materials and Methods: A total of 3200 schoolchildren aged between 5 to 15 years selected from 16 schools of four districts of Hazara division were included in this study. A pretested questionnaire was used to collect information about children gender, age, and family history of hypertension, diabetes mellitus and cardiovascular diseases. Mercury sphygmomanometer with appropriate cuff size was used to measure blood pressure (BP). For each subject, BP was recorded three times on the same visit with at-least 30 minutes rest between the readings. Participants with the average systolic and/or diastolic BP>95th percentile were categorized as hypertensives. Data was analysed by using SPSS 17.

Results: The mean age of the study participants was 9.7±3.2 years with a male to female ratio of 1:1. A total of 153 (4.78%) children suffered from obesity, whereas the prevalence of hypertension was 6% (n=191). In univariate analysis, obesity (OR=1.932, p-value=0.024), family history of hypertension (OR=1.321, p-value=0.033) and studying in private schools (OR=1.712, p-value=0.024) had statistically significant positive association with childhood hypertension. However, in multivariate analysis, obesity emerged as the only risk factor for childhood hypertension (OR=2.316, p-value=0.021).

Conclusion: Prevalence of childhood hypertension in the current study was comparable to the range reported in literature. Behaviour therapy directed at increased physical activity and dietary modification in obese children may reduce the incidence of childhood hypertension.

Key Words: Family history of hypertension; private schools; obesity

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INTRODUCTION

Hypertension at any age in either sex is a major risk factor for cardiovascular morbidity and mortality.[1,2] Primary hypertension, once considered a rare condition in children, has become increasingly prevalent.[2] Currently, with the estimated prevalence of 2-5%, childhood hypertension is one of the ten most common chronic diseases in children, predisposing them to adult hypertension, and is associated with early markers of cardiovascular diseases.[3-5] Considering the long-term complications of untreated hypertension, the timely diagnosis and management of hypertension in children with safe and effective medications is of utmost importance.[6] According to hypertension management guidelines, children with age of >3 years who are seen in clinical or hospital settings should have their blood pressure (BP) measured at-least once during each visit.[6] However, as the majority of hypertensive children suffer from asymptomatic or mild to moderate symptomatic primary hypertension, and accurate diagnosis of hypertension in children requires the use of standardized growth charts specific for age, gender, and height, childhood hypertension in nearly 75% cases goes unrecognized.[7] The authors of a study conducted in United States reported that only 23% of 12138 children and adolescents with charted BP >95th percentile (at a minimum of three separate clinic visits), had associated International Classification of Diseases

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(ICD) codes for a hypertension-related diagnosis, and only 5.6% of those with diagnosed hypertension were on antihypertensive medications.[3]. The under-diagnosis of childhood hypertension may be even more common in developing countries, where medical care is limited to symptomatic diseases, and childhood hypertension is being overlooked in place of more urgent symptomatic disease. As there is scarcity of published information regarding the childhood hypertension in Pakistan, the present study was conducted with the aim to evaluate the prevalence and risk factors associated with childhood hypertension among the schoolchildren in four districts of Hazara Division of Khyber Pukhtoonkhwa, Pakistan.

MATERIALS AND METHODS

This was a descriptive / cross-sectional study conducted in 16 schools of four districts of Hazara Division (Abbottabad, Batagram, Haripur and Mansehra). From each district, four schools, two for boys and two for girls from government and private sector were randomly selected. Initial twenty students of each class from prep to 9th with age ranging from 5 to 15 years and who were willing to participate in the study were included(200 subjects from each school). The exact age of children was verified from the school record.

Data collection and measurements: A team of four house officers, one dispenser and one ward boy was prepared. They were given orientation lecture on different aspects of the study such as administering the questionnaire and measuring weight, height and BP. In order to keep the inter-observer error to minimum, each member of the team was given a specific task throughout the study. A pretested questionnaire was used to collect information about children gender, age, and family history of hypertension, diabetes mellitus and cardiovascular diseases. The questionnaire was administered to the enrolled children and they were asked to get it filled by their parents at home. Incomplete or unsatisfactory answer was confirmed by telephonic contact or repeating the questionnaire.

For each student, weight, height and BP were measured. A portable measuring board and meter ruler, and standard weight machine were used for measuring height and weight respectively. Blood pressure was recorded by mercury sphygmomanometer using standardized method and standard cuff for different ages. For each subject, the BP was recorded three times on the same day with at-least 30 minutes rest between the readings. All the measurements were carried out after removing all the extra clothing except shalwar kameez/pant shirt. Body mass index (BMI) was calculated by using the formula (weight in kilograms/height in m^2), and was categorized according to the Centres for Disease Control and Prevention (CDC) age- and sex-specific growth charts (8). The following categories were used: underweight <5th percentile; normal weight, 5th to 85th percentile; overweight, 85th to 95th percentile; obese, >95th percentile. Blood pressure was categorized by using BP tables and age, gender and height percentile from Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents.[6] Study subjects with the average systolic and/or diastolic BP <90th percentile were categorized as normotensives, those with the average systolic and/or diastolic BP ranging from 90th to 95th percentile as pre-hypertensives and those with the average systolic and/or diastolic BP >95th percentile as hypertensives.[6]

Statistical analysis: Data was analysed by using SPSS 17. Categorical variables were presented as frequencies and percentages, whereas mean $\pm$ standard deviation (SD) were calculated for continuous variables. Multivariate binary logistic regression analysis was used to obtain final model to identify the risk factors associated with the presence of hypertension. Variables which had a p-value of <0.25 in univariate analysis were included in multivariate analysis. The fit of the model was assessed by Hosmer Lemeshow and overall classification percentage. A p-value of<0.05 was considered statistically significant.

Ethical approval: This study was approved by the Research and Ethics Committee of Ayub Medical College Abbottabad, Pakistan.

RESULTS

Table No.1: Socio-demographic characteristics of the study participants

Variable	Mean $\pm$ SD	No. (%)
Age(years)	10.7$\pm$3.2	
5-10		1873 (58.5)
11-14		1327 (41.5)
Gender		
Female		1600 (50)
Male		1600 (50)
School sector		
Private		1600 (50)
Public		1600 (50)
Family history of hypertension		2792 (86.3)
No		408 (12.7)
Yes		
Family history of CVD		
No		3088 (96.5)
Yes		112 (3.5)
Family history of diabetes mellitus		2848 (89)
No		352 (11)
Yes		

CVD, cardiovascular disease; SD, standard deviation

A total of 3200 children were included in the study with a male to female ratio of 1:1. The mean age of the study participants was 9.7±3.2 years. Socio-demographic characteristics of the study participants are given in table 1.

A total of 153 study participants (4.78%) suffered from obesity, whereas the prevalence of hypertension in the current study was 6% (n=191).

In univariate analysis, obesity (OR= 1.932, p-value= 0.014), family history of hypertension (OR= 1.321, p-value= 0.033) and studying in private schools (OR= 1.712, p-value= 0.024) had statistically significant positive association with childhood hypertension. However, in multivariate binary logistic regression analysis, obesity emerged as the only risk factor for childhood hypertension (OR= 2.316, p-value= 0.021). This model fit was based on non-significant Hosmer Lemeshow test (p-value= 0.648) and overall percentage of 76% from classification table (Table 2)

Table No.2: Risk factors for hypertension

Variables	Hypertension	Univariate analysis OR(95%CI)	p-value	Multivariate analysis OR(95%CI)	p-value
Age					
5-10	91 (47.6)	Referent		-	
11-14	100 (52.4)	1.107 (0.561-2.811)	0.811		
Gender					
Female	87 (45.5)	Referent		-	
Male	104 (54.5)	1.287 (0.631-1.917)	0.730		
School sector					
Public	70 (36.6)	Referent		Referent	
Private	121 (63.4)	1.712(1.256-3.561)	0.024	1.421 (0.891-2.154)	0.074
Family history of hypertension					
No	80 (41.9)	Referent		Referent	
Yes	111 (58.1)	1.321 (1.111-2.342)	0.033	1.341 (0.723-2.116)	0.114
Family history of CVD					
No	93 (48.7)	Referent		-	
Yes	98 (51.3)	1.091(0.461-2.111)	0.899		
Family history of DM					
No	101 (52.8)	Referent		-	
Yes	90 (47.2)	0.891(0.689-1.987)	0.813		
Obesity					
No	65 (34.0)	Referent		Referent	
Yes	126 (66.0)	1.932(1.345-3.467)	0.014	2.316 (1.911-3.891)	**0.021**

CI, confidence interval; CVD, cardiovascular disease; DM, diabetes mellitus; OR, odds ratio

DISCUSSION

Being a multifactorial disease, hypertension is influenced by genetic factors, socio-demographic and cultural factors and dietary pattern, thus, its prevalence varies across regions, countries and communities. In the current study, the prevalence of hypertension among the study participants was 6%. This was comparable with the prevalence of childhood hypertension reported by studies conducted in Surat (6.48%), Bihar (4.7%) and Shimla (5.9%) cities of neighbouring India.[9-11] However, it was comparatively higher than the rate of childhood hypertension (3%) reported by a study conducted in Karachi, Pakistan.[12] The possible reason for comparatively high prevalence in our study could be the relatively high frequency of obesity (4.8%) in our cohort than that reported by the study conducted in Karachi (1%).[12] Moreover, as the two studies were conducted in two different parts of Pakistan i.e. Hazara Division and Karachi respectively, the difference in life style, genetic factors and nutrition of the study populations could be the other possible reasons for the different prevalence of hypertension in the two studies.

Early identification of the risk factors for childhood hypertension is essential for reducing its incidence and preventing its complications. In the current study, after adjusting for the family history of hypertension and studying in private schools, obesity emerged as the only risk factor for the presence of hypertension. Obese children were 2.3 times more likely to be hypertensive than their counterparts. As obesity causes disturbances in autonomic function, insulin resistance, hyperactivity of sympathetic nervous system, sodium retention, activation of the renin-angiotensin-aldosterone

system,and abnormalities in vascular structure and function,[2, 13-17] it has been widely reported as a risk factor for childhood hypertension. Similar to our finding, a strong correlation between obesity and paediatric hypertension has been reported by various Western studies [18-20] and studies conducted in Pakistan[12] and India.[9,11,21]

Although in the current study, in univariate analysis, family history of hypertension had a positive association with childhood hypertension, but it did not reachthe level of significance in multivariate analysis. This was contrary to the findings of those studies in which positive family history of hypertension emerged as a risk factor for paediatric hypertension.[21,22] In developing countries like Pakistan, people usually undergo medical check-up only when they suffer from symptomatic diseases. As primary hypertension largely remains asymptomatic, we hypothesize that the possible inadequate screening of parents of the current study participants could be a reason for non-significant association between the family history and childhood hypertension in our cohort. The comparatively lower percentage of children with positive family history for hypertension (12.7%) than the estimated national prevalence of hypertension (18%),[23]advocates the possible under-diagnosis of hypertension in the parents of study participants. Similar to our finding, no significant association between family history of hypertension and paediatric hypertension has been reported elsewhere.[9,12]

As measuring BP on separate visits is essential for the diagnosis of hypertension on clinical basis,[6] taking the average of the three BP readings on the single visit was the major limitation associated with the current study. This could have overestimated the prevalence of hypertension in the studied cohort. Lack of information about physical activity and dietary pattern, and using BMI as the sole measure of obesity were the other limitations associated with the current study.

CONCLUSION

Prevalence of childhood hypertension in the current study was comparable to the range reported in published literature. In order to prevent its complications in adulthood, we propose that children should be screened regularly for hypertension. As in our cohort, obese children were significantly more likely to be hypertensive, and losing weight in early years of life has been reported to be associated with clinically significant reductions in BP,[2] therefore, they should be targeted for primary prevention. Behaviour therapy directed at increased physical activity and dietary modification, and public health initiatives to increase community awareness about complications of paediatric obesity may lead to considerable improvement in cardiovascular health. Studies in future with large sample size, repeated BP measures on different visits and information about physical activity and dietary pattern are suggested to confirm the findings of the present study.

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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