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PREVALENCE OF HYPERTENSION AND PRE-HYPERTENSION AMONG ADOLESCENTS ATTENDING SECONDARY AND HIGHER SECONDARY SCHOOLS IN URBAN AREA OF WESTERN – NEPAL



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**ABSTRACT**

Introduction: Hypertension is considered as an adulthood disease. The need of regular monitoring and screening of blood pressure among adolescents was not given much importance in the past, reason being hypertension was considered as an adult disease and study conducted to determine the prevalence of hypertension and pre-hypertension among adolescents attending secondary and higher secondary schools in urban area of western – Nepal.

Materials and Methods: A cross-sectional study was conducted on adolescents of aged 10-19 years in secondary schools in Siddharthanagar Bhairahawa, Nepal. The multi-stage sampling method was used to select the subjects. Data was collected with the help of questionnaire. Weight, height, and blood pressure were measured and recorded. Results: Total study population was 700 and out of which 326 (46.6%) were males and 374 (53.4%) were females. Among underweight group, 90.8% had normal blood pressure and 4.1% were hypertensive. Among obese, prehypertensive were 7.8% and 6.1% were hypertensive. 7.2% overweight were prehypertensive and 3.6% were hypertensive. Prevalence of prehypertension and hypertension was more in overweight and obese group in comparison with normal weight group. The total mean systolic blood pressure was 107.9 ± 8.7 and total mean diastolic blood pressure was 75.3 ± 8.1 . **Conclusion:** Periodic blood pressure monitoring as part of the school health programme is the need of the hour. Hypertension exists among secondary school adolescents in Urban schools of western region of Nepal, with a prevalence of 6.1% among the obese and 3.6% among overweight child.

Introduction

Hypertension in adults remains a major public health problem. Several studies support the theory that the roots of essential hypertension may extend back to childhood(1). With obesity reaching epidemic proportions and obesity in children and adolescents being one of the strongest predictors of young adulthood hypertension along with childhood blood pressure (BP) level and family history of hypertension, it is important to determine whether the prevalence of hypertension is increasing or decreasing in children and adolescents.(2) In the past the need for regular blood pressure screening in children was arguable and the main reason against it being that hypertension is an adult illness and there is no evidence that screening healthy children for hypertension was worthwhile(3). Presently it has been established as an important component of routine physical examination among the Paediatric population and should be carried out annually after three years or

earlier in children with a history of neonatal problems, renal disease or familial risk factors.(4)

In children, hypertension is defined as systolic or diastolic blood pressure that is above the 95th percentile for age, sex and height, while pre-hypertension is between 90th and 95th percentile.(5) High blood pressure and its complications are the leading cause of death in the world,(6) and about one billion adults around the world had hypertension in the year 2000, and this number is expected to rise to 1.56 billion by 2025.(7) The recognition that blood pressure elevation in childhood is a predictor of high blood pressure in adults, have led to renewed curiosity in investigating blood pressure and its correlates in childhood and adolescence.(8) In adolescents, hypertension is often undetected because they are generally healthy and seldom visit a physician unless there is an obvious illness.(9) For this reason, routine measurement of blood pressure among children and adolescents is recommended. In adolescents, hypertension is often undetected because they are generally healthy and seldom visit a physician unless there is an obvious illness. Detecting adolescents with prehypertension and hypertension would aid early treatment. Studies in recent times have demonstrated that the level and trend in blood pressure vary from population to population.(10,11) In fact, among children and adolescents, growth patterns, age and gender strongly influence blood pressure levels.(11) Equally, socio-demographic factors, overweight and obesity in children has been associated with high blood pressure.(12,13) It is important to continually assess blood pressure among children, as doing so, will provide information for the formulation of health-care policy and prevention strategies especially in developing countries where data are scarce. (6)

In South Asia, particularly in Siddharthanagar Bhairahawa province 5 of Nepal, there is a paucity of data on childhood hypertension. This study aims to determine the prevalence of hypertension and pre-hypertension among adolescents attending secondary and higher secondary schools in urban area of western – Nepal.

Materials and Methods

This was a cross-sectional study of adolescents aged 10-19 years in secondary schools in Siddharthanagar Bhairahawa, Nepal. With the absolute error/precision of 5 % (corresponding to a confidence interval of $50\% \pm 5\%$) at type 1 error of 5% the sample size was calculated from the prevalence of 6.3% from the previous studies,(14) and this size came out to be 368 but here we aimed to take around 700 subjects in the study. Children with any chronic illnesses will be excluded from the study. Also, children were asked about the dietary habit, daily fruits intake, junk food intake, screen time, and outdoor games. Subjects were selected using a multi-stage sampling method. All the secondary schools were grouped into public and private secondary schools. Based on student

population, a ratio of two public schools to one private school was selected. Within selected schools, students were stratified along age and gender (males and females) using the class registers. Subjects were selected from each stratum by simple random sampling (balloting). The selected students and their parents were asked for written and oral consent before being enrolled as subjects in the study. Before starting the study, ethical clearance was obtained from the institutional review committee of UCMSTH(IRC/22/19). The study was done from July 2019- April 2020. Written consent was taken from parents and school officials for the study. All the subjects had their urine examined for protein and those with significant proteinuria were excluded from the study.

Data was collected from all eligible subjects with the aid of a questionnaire administered to them. Weight, height and blood pressure were measured and recorded. Body mass index was calculated using the weight and the height as; Weight (kg)/Height (M²).⁽¹⁵⁾ Height was measured with the subject standing, the two legs together and fully extended, and the heels, buttocks, shoulder blades and occiput in firm contact with the measuring rule, and readings recorded to the nearest 0.5cm using a stadiometer (model RGZ-120). The weight was measured to the nearest 0.5 kg with minimal clothing (with their school uniforms on and shoes removed) using 'Health scale' weighing scale model RGZ-120. The blood pressure was measured after at least 5 minutes of rest in a seated position using Heine sphygmomanometer made in Germany. The measurement was taken in the morning hours between 8.30am and 12 noons before the break time. The measurement was done as recommended in the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7).⁽¹⁶⁾ with the subjects sitting quietly and the right arm on a table at the level of the heart. An appropriately sized cuff, covering about two-thirds of the upper arm with the lower border not less than 2.5 cm from the cubital fossa, was applied after restricting clothing is removed. The manometer was at the level of the cuff. The brachial artery was palpated and its position was noted. The cuff was then inflated to a pressure of 30 mmHg above the level at which the radial pulse was no longer palpable. The stethoscope was placed over the brachial artery in the cubital fossa and the pressure in the cuff was deflated at 2 mm Hg every second until the first Korotkoff sound was heard. This was recorded as the systolic blood pressure (SBP). The pressure in the cuff was further lowered until the sounds disappear completely. This was the fifth Korotkoff sound, and the corresponding pressure recorded as the diastolic blood pressure (DBP). The blood pressure was measured twice at an interval of 1-2 minutes and the mean recorded. Normal blood pressure (NBP) was defined as systolic and diastolic blood pressure that is <90th percentile for gender, age and height. Prehypertension was defined as systolic and diastolic blood pressure ≥ 90th percentile, but < 95th percentile for gender, age, and height. Hypertension was defined as systolic and diastolic blood pressure ≥ 95th percentile for gender, age and height.⁽⁵⁾

Normal weight was defined as BMI- for age between the 5th and 85th percentile, overweight was defined as BMI-for-age between 85th and 95th percentile while obesity was defined as BMI-for-age above 95th percentile. Children having 'elevated BP' based on the last two readings third set of three readings were measured another after 1 week later. After third record of elevated BP parents were enquired about chronic disease status of child through phone. Data were analyzed using SPSS (Statistical Package for Social Science) version 17. Frequency distributions were displayed using tables and charts. The comparison of categorical variables and tests for association was by means of chi-square test (χ^2). The continuous variables like age and BMI were compared using the students-tests. Statistical significance was set at P-value < 0.05.

Results

Out of 700 cases recruited in our study 326 (46.6%) were males, 42.2% adolescents were of 16-19 years age group, 34.4% were of 13-15 years and 23.4% were of 10-12 years. Majority of our study population belonged to middle class socio-economic status

(44.0%). 67.8% of study population had no family history of hypertension, 76.0 % had knowledge about hypertension, 78.0 % were non-vegetarian, 71.7% had habit of high physical activity on daily basis whereas only 5.3% never did any high physical activity. Most of the study population had fruit whenever they get it, 28.9% had fruit daily and 19.1% never had fruit, 56.4% spent more than 2 hours per day on screen (Mobile, Television, I pad) and 3.0 % spent time on screen only on holidays (Table 1 and 2).

Figure 1 was showing the distribution of study population on the basis of their BMI. 17.2% of male and 11.3% of female were underweight. Among the whole study population 57.7% were having normal BMI where as 11.9% were overweight and 16.4% were obese. 13.9% female were overweight whereas males were only 9.5%.

Among underweight group, 90.8% had normal blood pressure and 4.1% were hypertensive. Among obese, prehypertensive were 7.8% and 6.1% were hypertensive. 98% were having normal blood pressure and normal BMI. 7.2% overweight were prehypertensive and 3.6% were hypertensive. Prevalence of prehypertension and hypertension was more in overweight and obese group in comparison with normal weight group (Table 3). The total mean systolic blood pressure was 107.9±8.7 and total mean diastolic blood pressure was 75.3±8.1 (Table 4).

Table 1. Showing basic characteristics of the adolescents

Gender	Number (N)		Percentage (%)		Total	
Male	326		46.6		700	
Female	374		53.4			
Age (in years)	n	%	Male		Female	
			N	%	N	%
10-12	164	23.4	65	19.9	99	26.5
13-15	241	34.4	107	32.8	134	35.8
16-19	295	42.2	154	47.3	141	37.7
Total	700	100	326	100	374	100
Socio-Economic status	Male N (%)		Female N (%)		Total n (%)	
Low	98 (30.1)		63 (16.8)		161 (23.0)	
Middle	136 (41.7)		172 (46.0)		308 (44.0)	
High	92 (28.2)		139 (37.2)		231 (33.0)	

Table 2: Distribution of the Study Sample According to Study Variables

Variable		Frequency	Percentage
Family history of hypertension	Yes	167	23.9
	No	475	67.8
	Don't know	58	8.3
Knowledge about hypertension	Yes	532	76.0
	No	168	24.0
	Vegetarian	154	22.0
	Non-vegetarian	546	78.0
Fruit intake	Daily	202	28.9
	At least twice in a week	108	15.4
	Not routinely but take whenever I get	256	36.6
	Never	134	19.1
High physical activity	Daily	502	71.7
	At least twice in a week	161	23.0
	Never	37	5.3

Time spend on screen (Mobile, Television, I pad)	< 2hrs a day	209	29.9
	> 2hrs a day	395	56.4
	On holidays only	21	3.0
	Not at all or very less (< 2 hrs a week)	75	10.7

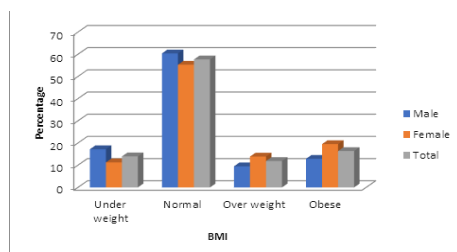


Figure 1: Distribution of BMI in the study population

Table 3: Prevalence (%) of hypertension according to BMI classification

BMI classification	Normal	Prehypertension	Hypertension
Under weight (n = 98)	90.8(89)	5.1(5)	4.1(4)
Normal (n = 404)	98.0(396)	1.5 (6)	0.5(2)
Overweight (n = 83)	89.2 (74)	7.2(6)	3.6(3)
Obese (n = 115)	86.1 (99)	7.8(9)	6.1(7)

Table 4: Mean blood pressure in the study population

Blood pressure	Male Mean±SD	Female Mean±SD	Total Mean±SD
Systolic BP	106.5±8.5	109.4±8.9	107.9±8.7
Diastolic BP	74.4±7.5	76.2±8.6	75.3±8.1

Discussion

A cross-sectional study was conducted on 700 adolescents of Bhairahawa, Nepal. Total study population in our study was 700, out of which 326 (46.6%) were males and 374 (53.4%) were females. 42.2% adolescents were of 16-19 years age group, 34.4% were of 13-15 years and 23.4% were of 10-12 years. Majority of our study population belonged to middle class socio-economic status (44.0%). In our study, 17.2% of male and 11.3% of female were underweight. Among the whole study population 57.7% were having normal BMI where as 11.9% were overweight and 16.4% were obese. 13.9% female were overweight whereas males were only 9.5%. Greater body mass index among girls in the early puberty may also explain the difference. Review of the literature revealed that obesity and overweight are established risk factors for hypertension (12). A study done by Ezeudu CE et al (14) also demonstrated that 5.6% and 2.5% of the subjects were overweight and obese respectively. Further analysis revealed that a significantly high proportion of the females were overweight or obese when compared to their male counterparts. Opara et al.(17) had earlier documented a similar finding among 983 schoolchildren in Southern Nigeria. Senbanjor and Oshinkoye (18) in Abeokuta South-Western Nigeria documented a significantly higher prevalence of obesity and hypertension among female adolescents when compared to their male counterparts. In our study, the total mean systolic blood pressure was 107.9±8.7 and total mean diastolic blood pressure was 75.3±8.1, similar results were found in a study done by Ezeudu CE et al.(14)

In a study done by Qaddumi J et al.(19) there were 65.9% study participants who were having family history of hypertension and 61.0% were having knowledge about hypertension. In our study, among underweight group, 90.8% had normal blood pressure and 4.1% were hypertensive. Among obese, prehypertensive were 7.8% and 6.1% were hypertensive. 98% were having normal blood pressure and normal BMI. 7.2% overweight were prehypertensive and 3.6% were hypertensive. Prevalence of prehypertension and

hypertension was more in overweight and obese group in comparison with normal weight group. The findings of our study was consistent with the results of studies conducted on adolescents in other countries that indicated that obesity was associated with an increased risk of elevated blood pressure in children and adolescents(20–22). The prevalence of high blood pressure among adolescent girls was higher in a study done by M. Rafraf(23) than in some other countries(24–26), 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%) (26)

Conclusion

There is increasing prevalence of high blood pressure in children of urban Nepal due to change in lifestyle, food habits and increasing obesity. Periodic blood pressure monitoring as part of the school health programme is the need of the hour. Obesity should be controlled at early age to reduce the chances of developing pre hypertension and hypertension among adolescents.

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