

PREVALENCE OF HYPERTENSION IN ADOLESCENTS OF PRIVATE SCHOOLS, HAYATABAD, PESHAWAR

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ABSTRACT

BACKGROUND: Hypertension is a chronic diseased condition in which blood pressure levels remain high as compared to the standard values for a certain age, for a certain period of time. It may compromise the functions of the heart, brain, kidneys, and blood vessels. At any age, in either sex, elevated blood pressure (systolic or diastolic) is a contributor for all forms of cardiovascular disease. Increased prevalence of hypertension among adolescents is associated with inadequate nutrition, physical inactivity and overweight. This study was conducted to determine the prevalence of hypertension among adolescents and association of Body Mass Index with hypertension.

METHODS: This cross-sectional study was conducted from April 2017 to May 2018, selecting two private schools of Hayatabad Peshawar (Frontier Children's Academy for boys and Frontier Youth Academy for girls). Students aged 13 to 18 years present on the day of collection of data were included. Those who were unwilling to participate were excluded. Interviewer filled questionnaire included weight, height, blood pressure, family history, physical activity amongst other questions. Convenience sampling technique was used. Height was measured with measuring tape, weight with a portable weighing machine and blood pressure was measured by the auscultatory method.

Results: The study included 372 participants, having 53.8% males. Majority of the students were normotensive (BP < 90th percentile). Pre-hypertension seen in 4.57% and hypertension in 36.83% of children. Total prevalence of hypertension was 41.4%, overweight 10.43% and obesity was observed in 3.48%.

CONCLUSION: Results confirms that there is significant high prevalence of hypertension in adolescent population in Peshawar. Total prevalence among the study subjects was 41.4%. We identified factors like family history, life style, socioeconomic and nutritional status but they turned out to be not-significant except the BMI which was quite significant. Future investigations need to standardize techniques and references, besides analyzing important factors for this population such as age, nutritional status, adolescence and stages of sexual maturity, to mitigate the high heterogeneity.

KEY WORDS: Hypertension, Prehypertension, Adolescence, BMI, Family history, Nutrition, Physical activity.

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INTRODUCTION

Hypertension is a chronic diseased condition in which blood pressure levels remain high as compared to the standard values for a certain age, for a certain period of time. It may compromise the functions of the heart, brain, kidneys, and blood vessels¹. Hypertension is the leading cause of premature death among adults throughout the world. Environmental, genetic, and behavioral factors play an important role in the emergence of essential hypertension. Because of its hereditary component, hyperten-

sion is considered to have its origin in the early ages of life. Changes in health-related behaviors in a population, indicate an increase in the rates of hypertension in the young. It is now established that increased blood pressure is detectable in children and adolescents and is not uncommon².

At any age, in either sex, elevated blood pressure (systolic or diastolic) is a contributor for all forms of cardiovascular disease³. Increased prevalence of hypertension among adolescents is associated with inadequate nutrition, physical inactivity and overweight. Early diagnosis is difficult

because of its asymptomatic nature. However, its detection, treatment and control can help to prevent and reduce the cardiovascular events¹.

As hypertension is influenced by racial, geographic, cultural and dietary patterns, therefore its prevalence is different in different parts of the world³. In the European countries and the United States definite hypertension is prevalent in 15-18% of the adult population. Hypertension has also got high prevalence in Asian countries. According to community surveys hypertension is a major health problem in Pakistan⁴, with

the prevalence of 18% in adults⁶. In Peshawar, hypertension has been reported as the commonest cardiovascular problem in a hospital population⁴. Changes in teenage life-style, such as physical inactivity, consumption of fast food and culture of videogames and computer games as a leisure time activity are considered to be the cause of increased trend in BMI⁵. This study was conducted to observe the prevalence and risk factors for hypertension in healthy school adolescents of Peshawar and its association with BMI. A research in Aga Khan University Karachi (2013) determined the prevalence of high BP in healthy school children and its association with high BMI, asymptomatic proteinuria and hematuria. They studied 661 public school children and measured their BP, height, body weight and urine dipstick was performed on single occasion. Hypertension (BP > 95th centile) and prehypertension (BP > 90th centile) were defined based on the US normative BP table. Overweight and obesity were based on WHO classification of BMI. Mean age was 14+3 years. The mean BMI was 18.5+4.3 kg/m². Majority of children were normotensive (BP < 90th centile). Prehypertension was observed in 15% and hypertension in 3% of the children, overweight observed in 7.7% and obesity in 1% of children. Hypertension in children is strongly correlated with obesity, asymptomatic proteinuria⁵.

A study of 2694 adolescents in a secondary school in South East Nigeria comprised of 1293 males and 1401 females, aged 08 to 18 years was done. The mean systolic BP for males was 106.66+11.08 mmHg and diastolic BP was 70.25+7.34 mmHg. The mean SBP and DBP for females were 109.83+11.66 and 72.23+8.26 mmHg. BP was found to increase with age. Prevalence of hypertension and prehypertension was 5.4% and 17.3% respectively with higher rate in females (6.9%) than males (3.8%). Prehypertension prevalence was 14.3% and 20% respectively. Modifiable risk factors exist among adolescents. Early lifestyle modification is recommended⁷.

A study in government high schools at Patna, India of adolescents studying in 8th, 9th and 10th grade included 2913 participants, with 1745 females (59.9%). Total prevalence of hypertension was 4.6%, the prevalence of prehypertension was 10.9%. Prevalence of hypertension in males was 5% and females 4.3%. The prevalence increased with age, obesity and rise in BMI⁸. In Texas a study has been carried out at Children Memorial Hermann hospital to determine the proportions and correlates of essential hypertension among children in a tertiary hypertension Clinic. 423 consecutive children were evaluated. They identified 65% hypertensive children (BP > 95th percentile) from 423 children that were referred to clinic for elevated BP. The remainder had normal blood pressure (11%) white coat hypertension (11%), prehypertension (10%) and pending diagnosis (3%). Among 275 hypertensive children 43% had essential hypertension and 57% had secondary hypertension. The phenotype of essential hypertension can present as early as 3 years and its predominant form of hypertension at 6 years of age⁹. A study conducted in Swat, Pakistan on 1249 children aged 6 to 18 years, males (58.2%) showed that total prevalence of hypertension was 6.48%. Out of total 1249, 37% were from private schools (prevalence 8.24%) and 63% from government schools in which the prevalence of HT was 5.4%. Prevalence of obesity was 1.6%. It was 3.03% in private school children and 0.7% in government school children. Prevalence of hypertension was 6.74% in males and 6.13% in females. The prevalence of hypertension increased with age and 1/3rd of obese in this study were hypertensive³.

In Shimla, India (2015) a research to determine the prevalence of hypertension among the urban school adolescents and to find the association between hypertension and BMI was done. Sample comprised of 3385 students with 49.2% females. Overall mean SBP and DBP increased significantly with age in both genders. Mean SBP (111.60 mmHg + 11.43) and DBP (72.8 mmHg + 7.41) were higher in males as compared to females in whom mean SBP was

(109.91+12.04 mmHg) and mean DBP was (71.84+7.37 mmHg). There was significant association of hypertension and BMI in both genders¹⁰

National school-based studies done in Brazil on adolescents aged 12-17. Complete data on the anthropometry & blood pressure of 73,399 students, from a total of 102,327 eligible, were obtained from schools' registration systems. Prevalence of hypertension was 9.6% while obesity was 8.4%. The fraction of hypertension attributable to obesity was 17.8%¹¹. In a study, 1011 adolescents with a mean age of 13.1(+2.3) years were assessed. Prevalence of overweight/obesity was 27.7% & abdominal obesity was 19.3%. Systolic and diastolic blood pressure was higher in girls and boys who had overweight/obesity or abdominal obesity compared to eutrophic adolescents. Although, both waist circumference & BMI were associated with hypertension, but WC was more strongly correlated with BP¹². A retrospective cohort study included 101,725 subjects aged 3-17 years from three health systems across the United States. Among children adolescents who become obese or maintained obesity had largest increase in BP percentile. Among the subjects 0.4% developed hypertension over median 3.1 years. Obese children aged 3 to 11 had 3.5 folds higher risk of developing hypertension compared to normal weight. Children and adolescents who remained obese had 5.4 and 4.8-fold increased risk of developing hypertension, respectively, compared with those who used to maintain a normal weight¹³.

Study done on consumption of sugar-sweetened beverage (SSB) and its relation with obesity and hypertension in a national sample of children and adolescents in China. Data was acquired from national intervention program against obesity in children & adolescents aged 6-17 years. The measured parameters were height, weight, waist circumference, blood pressure. Information about SSB consumption, socioeconomic status, dietary intake, screen time and physical activity were self-reported. Total of 66.6% of the 53,151 participants reported consuming SSB. Increased

consumption of SSB occurred by boys, older children, and adolescents with long screen time or high physical activity or low parental education level. Consumption of SSB was independently associated to a high risk of abdominal obesity. Results showed that SSB reduction strategies may be useful in preventing obesity among Chinese children & adolescents¹⁴. This study was conducted to determine the prevalence of hypertension among adolescents and association of Body Mass Index (BMI) with hypertension.

MATERIAL & METHODS

This cross-sectional study was conducted from April 2017 to May 2018, selecting two private schools of Hayatabad Peshawar (Frontier Children’s Academy for boys and Frontier Youth Academy for girls).

Students aged 13 to 18 years present on the day of collection of data were included. Those who were unwilling to participate were excluded. Using WHO sample size calculator, 372 eligible study participants were selected through convenient Sampling.

A semi-structured questionnaire was filled by the authors after asking and explaining the questions to the students. Trained investigators recorded the anthropometric measurements. Using measuring rod (fixed on the wall) and digital balance, height and weight were measured, with sensitivity of 0.1 cm and 0.1 kg, respectively. The student stood straight with heels, buttocks and back touching the wall and stretching upwards to the fullest extent with arms hanging on the side. Height and weight were measured without any footwear.

Children made comfortable and explained about procedure to alleviate anxiety. BP was recorded by aneroid sphygmomanometer using standardized method. The systolic blood pressure was determined by the onset of the “tapping” Korotkoff-1 sound and the diastolic at its disappearance (Korotkoff-5). 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, age

and gender³. Students found to have high systolic and diastolic values, were made further comfortable and relaxed and their blood pressure was measured 3 times after every 5 minutes. After that they were considered as hypertensive. Blood pressure measurements were made by a single observer.

The data was analyzed using SPSS version 20.0. Descriptive statistics were calculated as the mean and standard deviation for continuous variables and proportions for categorical variables. Chi square tests were performed to determine the factors independently associated with hypertension. Statistical significance was accepted at P <0.05.

RESULTS

Study included 372 children with 200 males (53.8%). Mean age was 14.80 ± 1.367 years, mean BMI 20.83 ± 4.10 kg/m². The mean systolic BP was 122.26 ± 15.43 mmHg. The mean diastolic BP was 73.68 ± 10.94 mmHg (Table 1). The majority (58.60%) of the

children were found to be normotensive (BP <90th percentile). Pre-hypertension was seen in 4.57% and hypertension in 36.83% of the children. Total prevalence of hypertension was 41.4% (Figure1). Over-weight was observed in 10.43% of the children and obesity in 3.48%. Prevalence of hypertension in males was 25.53% and in females was 11.29% (Figure 1). We observed significant high prevalence of hypertension in obese children or in other words half of obese in our study were hypertensive Table 1. There was strong association between hypertension and BMI (P= 0.001). The association of diastolic and systolic blood pressure of adolescents with exercise, having some other cardiac problem, family history of hypertension and eating junk food was not found to be significant. The association of diastolic and systolic blood pressure of adolescents with male gender was found to be highly significant at p values (0.009 and 0.001) respectively (Table 1, Table 2).

FIG 1: TOTAL PREVALENCE OF HYPERTENSION

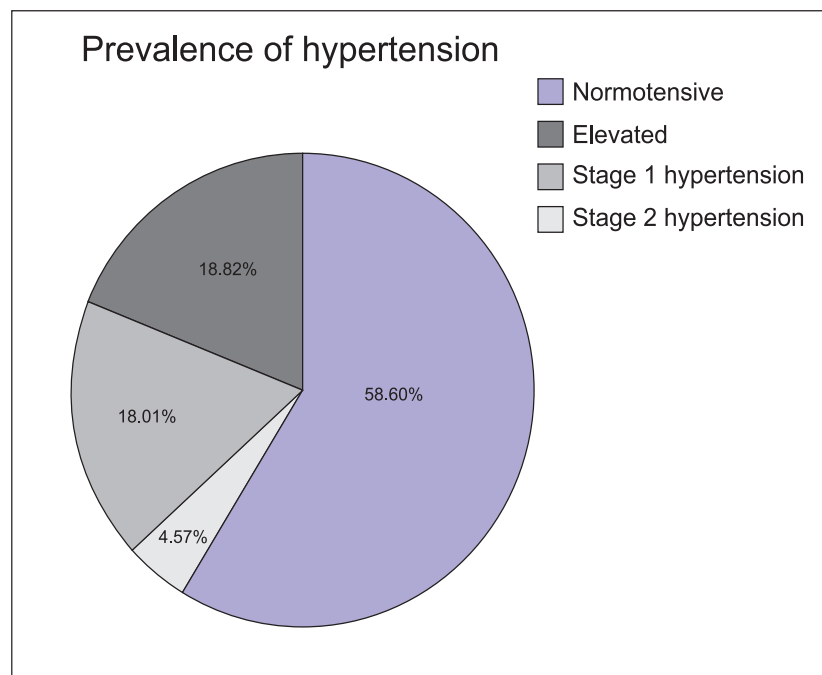


FIG 2: GENDER-WISE PREVALENCE OF HYPERTENSION

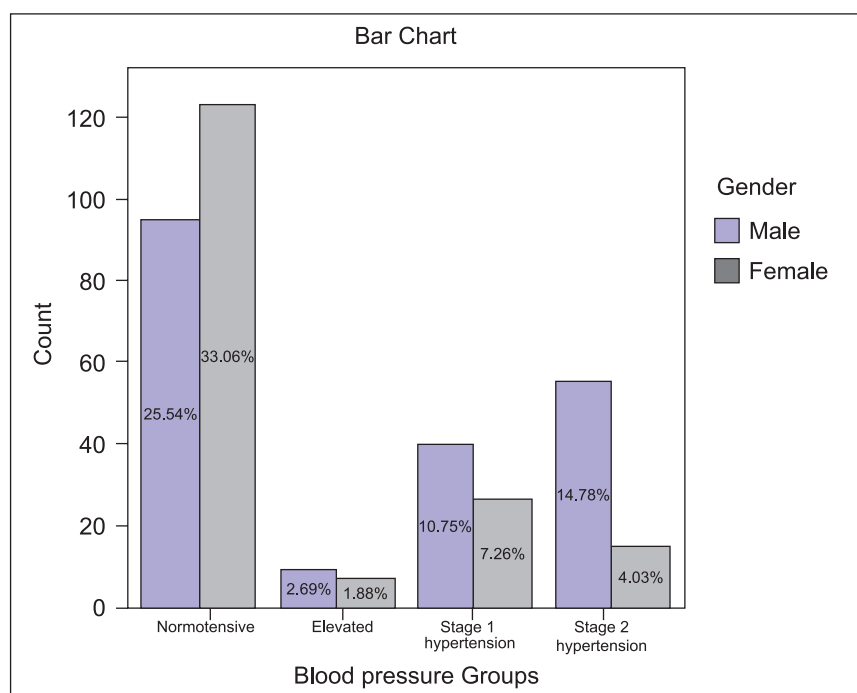


TABLE 1: DESCRIPTION OF AGE, BMI, SBP AND DBP

	Mean	Std. Deviation
Age	14.79	1.367
BMI	20.8268	4.09893
Systolic BP	122.26	15.433
Diastolic BP	73.68	10.941

TABLE 2: ASSOCIATION OF HYPERTENSION WITH BMI

		Normotensive	Elevated	Stage 1 hypertension	Stage 2 hypertension	Total	P value
BMI	Underweight	91	5	14	5	115	P < 0.001
	Normal	110	10	41	45	206	
groups	Overweight	12	2	11	14	39	
	Obese	5	0	1	6	12	
Total		218	17	67	70	372	

TABLE 3: ASSOCIATION OF HYPERTENSION (SYSTOLIC) WITH GENDER

			Systolic group		Total	P value
			Normotensive	Hypertensive		
Gender	Male	frequency	95	104	199	P < 0.001
		% within gender	47.7%	52.3%	100.0%	
	Female	frequency	123	50	172	
		% within gender	71.1%	28.9%	100.0%	
		frequency	218	153	371	
Total		% within gender	58.8%	41.2%	100.0%	

TABLE 4: ASSOCIATION OF HYPERTENSION (DIASTOLIC) WITH GENDER

			Diastolic group		Total	P value
			Normotensive	Hypertensive		
Gender	Male	frequency	167	33	200	P < 0.009
		% within gender	83.5%	16.5%	100.0%	
	Female	frequency	159	13	172	
		% within gender	92.4%	7.6%	100.0%	
		frequency	326	46	372	
Total	% within gender	87.6%	12.4%	100.0%		

DISCUSSION

The increase in Blood pressure over the past decade is partially attributable to an increased prevalence of overweight¹⁵. In this study obese adolescents among the hypertensive were 5.1% against normotensive 2.2 % which is similar to what others have reported¹¹. This association between the prevalence of obesity and hypertension can be attributed to the increased ingestion of fast food and sedentary life style highly prevalent among the adolescents. Results show a strong association between BMI and hypertension. Similar correlation has been demonstrated in a study conducted in Northern India. The study reported a gradual increase in the blood-pressure with increasing age. Highest prevalence was observed in the age group 12-15. The different percentages of prevalence of hypertension observed in the results of these studies can be assigned to the different measurement protocols employed by the conductors. They encouraged the subjects to void urine before the recording of blood pressure. In addition it was made sure that the sample contained proportionate number of students from each socio-economic class¹⁰.

At any age, in either sex, elevated blood pressure (systolic or diastolic) is a contributor for all forms of cardiovascular disease³. Increased prevalence of hypertension among adolescents is associated with inadequate nutrition, physical inactivity and overweight. Early diagnosis is difficult in adolescents because of its asymptomatic nature. However, its detection, treatment and control

can help to prevent and reduce the cardiovascular events¹. The prevalence of adolescent hypertension worldwide is not known, due to regional differences in the definition of high BP, the distribution of reference BP data, and the BP measurement methodology². As hypertension is influenced by racial, geographic, cultural and dietary patterns, therefore its prevalence is different in different parts of the world³. In the European countries and the United States definite hypertension is prevalent in 15-18% of the adult population. In Africa hypertension is reported as the most common cardiovascular disorder. Hypertension has also got high prevalence in Asian countries. According to community surveys hypertension is a major health problem in Pakistan⁴, with the prevalence of 18% in adults⁶. In Peshawar, hypertension has been reported as the commonest cardiovascular problem in a hospital population⁴.

Our results report total prevalence of hypertension among the adolescents to be 41.4%, which is similar to what others have found^{10,11}, which refutes the null hypothesis. While pre-hypertension and hypertension is reported as 4.57% and 36.83% prevalent respectively which is in contrast to what others have found⁵. Such variation in observations might be attributed to the smaller sample size we calculated, difference in the socioeconomic statuses of the subjects in the respective studies and also, to some extent, to the difference in the skill set of the recording personnel. Also, the recording protocol differed in that they recorded 3 measurements of blood pressure for each student

and used their average for analysis.

Within the National Childhood Blood Pressure database, a segment of adolescents underwent BP measurement at intervals of 2 and 4 years. Analysis found that, among adolescents with pre-hypertension, 14% had developed hypertension 2 years later, which yielded an approximate incidence rate of 7% per year².

Despite the meticulous precision in the BP tables, which adjust for gender, age, and height, the percentile method for the evaluation of BP in children is cumbersome and difficult to use in clinical practice. It would be extremely useful clinical practice advancement if a few numerical levels could be reliably used for the evaluation of children's BP².

The study was limited by the shortage of time as the BP values were measured only once for each participant except for those whose systolic BP was recorded higher than normal. Also, the study could not cover all socio-economic sectors and most of the participants were from middle class working families.

CONCLUSION

Results show significant high prevalence of hypertension in adolescent population in Peshawar. BMI and male gender showed significant association with hypertension. Future investigations need to standardize techniques and references, besides analyzing important factors for this population such as age, nutritional status, adolescence and stages of sexual maturity, to mitigate the high heterogeneity.

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CONFLICT OF INTEREST

None declared.

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NIL

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.