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Original Research Article

Adolescent Hypertension and Its Association with Body Mass Index (BMI), Personal Habits, Diet and Study Pattern

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Abstract

Background: Hypertension is an emerging public health problem worldwide. It can be initiated in childhood but usually go undetected. To identify its presence in earlier in life may contributes its easily management. And by identifying the factors associated with this hypertension it can be diagnosed earlier by targeting at risk groups.

Objectives: To find out prevalence of hypertension among school going children in the age group 10-19 years. And to find out its association with their body mass index (BMI) personal habits and study pattern.

Material and Methods: A cross –sectional study was done among 1008 school adolescents in Jaipur city. Information regarding socio-demographic data and diet & study pattern was collected through pre- designed semi structured questionnaire. Anthropometric measurements was done to calculate BMI. Blood pressure was taken by standard technique. Chi-square test was used find out association with qualitative variable and Unpaired 't' test for quantitative variables.

Results: Mean age of study participants was 14.26 ± 2.22 years with M:F 1.24. Prevalence of hypertension was found 15.87%. Hypertension was found maximum among obese students (64.62%) and least among underweight students (8.32%). It was found almost equal in vegetarian and non-vegetarian students but more hypertensive in students having habit of taking extra salt in their diet than who do not (16% v/s 15.81%). Hypertension was found more in students who had no physical activity (17.10% v/s 14.97%). Occurrence of hypertension was higher in students of science subject (25.00%). Occurrence of hypertension was high in those students taking coaching 2-3 years (100%) and it was found more in students taking personal coaching. Prevalence of hypertension was higher in those students studied 2-4 hours at home (18.47%) than their counterparts. On further analysis hypertension found associated with weight and years of coaching of students ($p<0.05$).

Conclusion: The overall prevalence of hypertension among adolescent was found to be 15.87%. It was found to be associated with weight and years of coaching of students. So screening for adolescent hypertension should be more targeted towards these risk groups.

Keywords: Adolescent Hypertension, BMI, Personal Habits, Diet, Study Pattern.

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Introduction

Adolescence is a most important period of life because it is a time of intense physical, psychosocial, and cognitive development. The adolescents are the future of the nation, forming a major demographic and economic force.

The World Health Organisation defines "Adolescent" as those people who lying between the age group of 10 to 19 years. [1] Adolescents currently account for 1.2 billion of the world's population and Eighty-eight percent (88%) of them live in developing countries. [2] India has 243 million adolescent people constituting about 21.4% of the country's total population. [3] Hypertension is an emerging public health problem worldwide. [4] It is most prevalent cardiovascular disease risk factor. It is one of the leading cause of death and disability worldwide.

Although it is a problem of adult, but the etiologic process and risk behaviour start early in life. [5] It can be initiated in childhood but can go undetected unless specifically looked for this period. [6] Childhood hypertension is an established predictor of adult hypertension and organ damage and it is underestimated problem in developing countries. High blood pressure is a major risk factor for stroke, CHD, heart or kidney failure. [7]

Hypertension is the most common comorbidity among overweight adolescents, which attributes risk of adulthood morbidity. [8] Role of diet in adolescent hypertension is mostly restricted to sodium intake. Excessive intake of sodium is strongly associated with elevated blood pressure. Use of tobacco (smoked and smokeless), consumption of alcohol, low consumption of fruits and vegetables and minimal or no physical activity which leads to the intermediate risk factors such as obesity, raised blood pressure, blood glucose and cholesterol levels, and ultimately contributes to cardiovascular diseases, cancer, diabetes and hypertension. [9]

Study of blood pressure in adolescents and early detection of high blood pressure may improve its management and thus, help to lower morbidity and mortality because earlier the prevention starts; more likely it is to be effective. Early diagnosis, treatment along with lifestyle modification is essential for the management of hypertension. Hypertension in children is treated with lifestyle changes, including weight loss for those who are overweight or obese; a healthy, low-sodium diet; regular physical activity; and avoidance of tobacco and alcohol.

There are only few studies regarding the distribution of blood pressure of adolescents in Rajasthan, the present study was conducted to find out the prevalence of adolescent hypertension and its associating factors among variables of personal habits, dietary and study pattern among school going adolescents (10-19 years) of Jaipur city, Rajasthan.

Methodology

This present study is a quantitative, cross-sectional, descriptive type of observational study conducted from 1st July 2019 to 10 December 2019 among school going adolescents of 10 to 19 years age which were selected from 6th to 12th class of schools of Jaipur city.

The study was done by categorizing all schools from Jaipur city into government and private schools in each zone of the city (East, West, North and South). Thus total eight schools were selected for the present study. The total number of selected students in the eight schools within this age group was 1008.

A Predesigned semi structured questionnaire was used for data collection. The proforma included School information schedule included information about school and written informed consent of principal. And Adolescent child information schedule included information regarding adolescent childlike socio-demographic information, personal habit information and study pattern information's. After taking written informed consent of principal of the selected school desired information were gathered as per proforma.

To take blood pressure procedure was explained to the children, BP was measured in the right arm by the auscultatory method using a standard automatic electronic digital manometer, and measurements were recorded as per the recommendations of the American Heart Association. [10] Children with SBP and/or DBP equal to or greater than the 130/90 were considered to be hypertensive. [11]

Results

Characteristics of study population: In present study, mean age was 14.26 with standard deviation 2.22 years and M:F ratio 1.24. Majority of students were in age group of 14 to 16 years followed by 10-13 years and 14-16 years. Most of the students were underweight (64.38%) followed by normal weight (25.69%). Mean BMI was 17.77 with standard deviation was 3.80. Most of the study participants were vegetarian (61.31%) and about 2/3rd of students (67.76%) were not using extra salt in their diet. Majority of the students were doing exercise (57.64%). Only 7.24% were having habit of taking tobacco. Majority of participants were using mobile (57.04%). Most of the students belonged to arts subject (62.50%), followed by science (25.00%) and least were in commerce (12.50%). Majority of the students were not taking any type of coaching (83.83%). Among who were taking coaching, majority were taking personal type of coaching (58.90%) and 41.10% students taking classroom coaching. Most of the students were studied 1-2 hours at home (33.13%) followed by 2-3 hours (25.89%). Mean study hours were 2.96 with standard deviation 1.5 hours. Majority

(45.93%) were studding less than 2 hours per day. Out of total 1008 students, 160 (15.87%) were found with hypertension. (Table 1)

Table 1: Characteristics of study population (N=1008)

S. No.	Variables		Number	Percentage
1	**Age Group**	Early adolescent (10-13 years)	401	39.78
		Middle adolescent (14 -16 years)	420	41.67
		Late adolescent (17-19 years)	187	18.55
2	**Sex**	Female	451	44.74
		Male	557	55.26
3	**Weight**	Normal	259	25.69
		Underweight	649	64.38
		Overweight	35	3.47
		Obese	65	6.45
4	**Type of Diet**	Non-vegetarian	390	38.69
		Vegetarian	618	61.31
5	**Added Salt**	No	683	67.76
		Yes	325	32.24
6	**Exercise**	No	427	42.36
		Yes	581	57.64
7	**Tobacco**	No	935	92.76
		Yes	73	7.24
8	**Mobile use**	No	428	42.46
		Yes	575	57.04
9	***Subject**	Arts	180	17.86
		Commerce	36	3.57
		Science	72	7.14
10	**Coaching**	No	845	83.83
		Yes	163	16.17
11	**Type of Coaching**	Classroom	67	6.65
		Personal	96	9.52
12	**Study Hours**	<2 Hours/Day	463	45.93
		2-4 Hours/Day	406	40.28
		>4 Hours/Day	139	13.79

***720 students are below 9th standard so discipline not applicable**

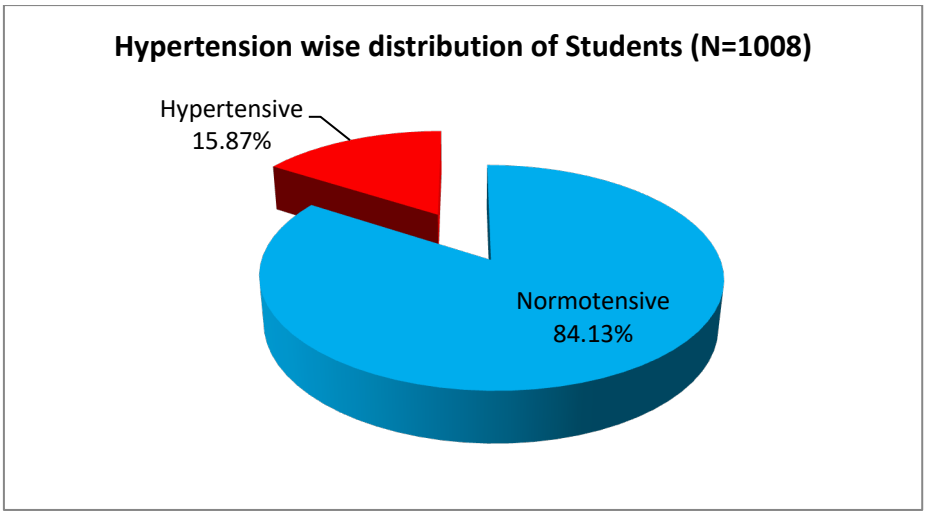

Figure 1: Hypertension wise distribution of Students (N=1008)

Association with Hypertension: Hypertension was found maximum among obese students (64.62%) followed by among overweight students (37.14%) and least among underweight students (8.32%). This distribution of hypertension as per BMI was found with significant variation (P-value < 0.001). Hypertension is not associated with hypertension. (Table 2) Prevalence of hypertension was almost equal in vegetarian and non-vegetarian children. So type of diet was not found to be

associated with (P-value> 0.05). Likewise there was 16% hypertensive among students using extra salt in their diet whereas 15.81% were among students not using extra salt in their diet. This difference in proportion was also not with significant difference (P-value >0.05). (Table 2) Although hypertension was more in children who had no physical activity than among who were doing exercise (17.10% v/s 14.97%) but this difference was not found significant (P-value> 0.05). (Table 2) Likewise, hypertension was more in children who had h/o tobacco chewing than among who did not (16.44% v/s 15.83%) but this difference was not found significant (P-value> 0.05). (Table 2) Prevalence of hypertension was almost equal among children who were using mobile or not using so it was without significant difference (P-value >0.05). (Table 2)

Although occurrence of hypertension was highest in students of science subject (25.00%) and least in students of commerce subject (8.33%) but this distribution of hypertension as per discipline of the study was not found significant (P-value> 0.05). (Table 2) Occurrence of hypertension was high in those students taking coaching 2-3 years (100%) followed by in students taking coaching for 0-1 years, nil coaching etc. This distribution of hypertension as per years of coaching status was found significant (P-value = 0.039).

Although prevalence of hypertension was high in those students taking personal type of coaching (18.75% v/s 16.42%) but this difference in distribution of hypertension as per type of coaching was not found significant (P-value >0.05). (Table 2) Prevalence of hypertension was highest in those students who used to study 2-4 hours at home per day followed by among who studied less than 2 hours and more than 4 hours per day.

But this difference was not found significant (P-value> 0.05). (Table 2)

Table 2: Association of Hypertension with various variables

S. No.	Variables			Hypertension Status			
			Total (N=1008)	Yes (N=160)		No (N=848)	
				Number	%	Number	%
1	**Weight**	Normal	259	51	19.69	208	80.31
		Underweight	649	54	8.32	595	91.68
		Overweight	35	13	37.14	22	62.86
		Obese	65	42	64.62	23	35.38
		Chi-square = 158.054 with 3 degrees of freedom; P <0.001 (Significant)					
2	**Type of Diet**	Non-vegetarian	390	62	15.90	328	84.10
		Vegetarian	618	98	15.86	520	84.14
		Chi-square = 0.005 with 1 degrees of freedom; P = 0.943 (Not Significant)					
3	**Habit of Adding Salt**	No	683	108	15.81	575	84.19
		Yes	325	52	16.00	273	84.00
		Chi-square< 0.001 with 1 degree of freedom; P = 0.987 (Not Significant)					
4	**Exercise status**	No	427	73	17.10	354	82.90
		Yes	581	87	14.97	494	85.03
		Chi-square = 0.679 with 1 degrees of freedom; P = 0.410 (Not Significant)					
5	**Tobacco Use**	No	935	148	15.83	787	84.17
		Yes	73	12	16.44	61	83.56
		Chi-square = 0.001 with 1 degrees of freedom; P = 0.977 (Not Significant)					
6	**Mobile Use**	No	428	67	15.65	361	84.35
		Yes	575	93	16.17	487	84.70
		Chi-square = 0.006 with 1 degrees of freedom; P = 0.939 (Not Significant)					
7	**Discipline of study**	Arts	180	31	17.22	149	82.78
		Commerce	36	3	8.33	33	91.67
		Science	72	18	25.00	54	75.00
		Chi-square = 4.731 with 2 degrees of freedom; P = 0.094 (Not Significant)					
8	**Coaching**	No	845	131	15.50	714	84.50
		0-1 Year	124	25	20.16	99	79.84
		1-2 Years	38	3	7.89	35	92.11
		2-3 Years	1	1	100.00	0	0.00
		Chi-square = 8.906 with 3 degrees of freedom; P = 0.039 (Significant)					
9	**Type of Coaching**	Classroom	67	11	16.42	56	83.58
		Personal	96	18	18.75	78	81.25
		Chi-square = 0.031 with 1 degrees of freedom; P = 0.861 (Not Significant)					
10	**Study**	Upto 2 Hours/Day	463	65	14.04	398	85.96

	Hours	2-4 Hours/Day	406	75	18.47	331	81.53
		>4 Hours/Day	139	20	14.39	119	85.61
		Chi-square = 3.451 with 2 degrees of freedom; P = 0.178 (Not Significant)					

Discussion

In present study, the prevalence of hypertension was 15.87% in school going adolescent children. Almost similar observation were made by earlier study conducted by Nisha Singh et al [12] who conducted study in Bhopal and reported prevalence of hypertension among adolescents 15.3 %. Another study conducted by Tulika GM etal [13] on school going children in Assam reported hypertension 12%. In present study, 64.62% hypertensive children had BMI more than 25 and weight of students was found to associate with hypertension.

Tulika GM et al [13] also found significantly ($p<0.001$) more hypertension in obese and overweight students. Another study conducted by Kaushik Nag et al [14] in Agartala, Tripura, India, also reported significantly more hypertension (29.1%) among the overweight study subjects than normal weight (1.1%) students. Singh S. K. et al [15] also reported obesity as risk factor for adolescent hypertension.

Prevalence of hypertension was almost equal in children in consuming either type of diet. Association of Hypertension with type of diet were not found. A study conducted by Kaushik Nag et al [14] in reported prevalence of hypertension 4.1% in non-vegetarian students where as it was 9.7% among vegetarian students. When present study population was analysed for the consumption of extra salt, 16% hypertensive children were consumed extra salt in their diet and 15.8% in whom who were not having habit of adding salt. Association of Hypertension with added extra salt was also not found. However Tulika GM et al [13] found significantly more ($p=0.037$) hypertension in salt consumers but almost similar observations were made by Kaushik Nag et al [14] who reported prevalence of hypertension 5.9% in students who used to take extra salt where as it was 5.4% among students who did not take extra salt regularly. The association between extra salt intake and hypertension was not found in their study also.

In present study, hypertension was observed in 17.10% among children had no physical activity and 14.97% in children had physical activity. Other studies [12,14] were in resonance to the present study. Nisha Singh et al [12] reported that 40.4% of children who exercised <30 min/day were pre hypertensive/ hypertensive. A study conducted by Kaushik Nag et al [14] in also reported higher prevalence of hypertension among students who did not take part in any physical activity than who took part in physical activity regularly (7.8% v/s 5.4%).

In present study, hypertension was found in 16.44% among children eating tobacco and 15.83% in non-tobacco users. There was no significant association found between occurrence of hypertension and tobacco use. Nisha Singh et al [12] reported that 12.5% of study subjects who smoked were found to be pre hypertensive/ hypertensive but this was found to be with significantly ($P<0.05$) more than in non-users. Another studies [13,14] also found association between tobacco chewing and hypertension in their study.

In present study, although mobile phone users were having higher prevalence of hypertension than non-users (16.67% v/s 15.83%) but this difference was not found significant. Yunfei Zou et al [16] also reported higher prevalence of hypertension in smart phone users but they found this difference significant. Deepu P et al [17] also conducted a study on adult hypertension, they found that the risk of hypertension was six times higher among those who had been using a mobile phone for more than 8 years.

In present study, although higher prevalence of hypertension (18.47%) was reported in students who were doing coaching from 2-3 years followed by doing coaching from 0-1 years and least in whom who were doing coaching from 1-2 years. This difference was not found significant but association of hypertension with type of coaching was also not found.

There was no association found between occurrence of hypertension and hours of study. A study conducted by Jasmine S Sundar et al [18] found that the prevalence of hypertension was increasing with the class of study, it was the lowest among students of VIII standard and highest among X, XI and XII students. It was also statistically very significant ($p=0.001$).

Conclusion

Hypertension was found in 15.87% of study population i.e. school going adolescent. Hypertension was found to be associated with weight and years of coaching of student. Hypertension was found more with more weight and more years of coaching.

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