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AN EPIDEMIOLOGICAL STUDY ON HYPERTENSION AMONG SCHOOL GOING ADOLESCENT IN URBAN AREA OF PATNA, BIHAR

Community Medicine

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ABSTRACT

INTRODUCTION: Hypertension or high blood pressure is one of the major non-communicable health problems of 21st century associated high morbidity and mortality, global burden of which increasing day by day. Hypertension is a key risk factor for cardiovascular diseases which affects people silently all over the world. It is suggested that hypertension has its origin in childhood but goes undetected unless specifically looked for during this period. Thus early detection of hypertension and its precipitating or aggravating factors are important if one is to evolve measures so that complications of hypertension can be averted. **Objectives:** To estimate prevalence of Hypertension among Adolescent school students, to study distribution of blood pressure of adolescent school students according to age, sex and height and to identify the socio demographic and behavioral factors associated with Hypertension among school students. **Methods:** This was School based, epidemiological, observational Study was conducted in two Government co-education secondary and higher secondary (H.S) schools in urban area of Patna Bihar. **Result:** In Female Group, 15(8.2%) students had SBP <90 mm Hg, 127(69.4%) school students had 91-119 mm Hg systolic blood pressure, 37(20.2%) school students had 120-129 mm Hg systolic blood pressure. In Male Group, 36(17.6%) students had SBP of <90 mm Hg, 93(45.6%) students had 91-119 mm Hg systolic blood pressure, 35.8%school students had SBP between 120-129mm Hg and SBP 2 male students was 130 mm Hg or more. In Female Group, DBP of 156(85.2%) students were between 51-79 mm Hg, and 27(14.8%) students had DBP of ≥80 mm Hg. In Male Group, 10(4.9%) students had DBP of ≤50mm Hg, 178(87.3%) students had 51-79mm Hg of Diastolic blood pressure and 16(7.8%) school students had ≥80mm Hg DBP. **Conclusion:** Findings of the study is expected to be of much help to the public health programme planner and manages to fine tune strategic intervention for reducing non-communicable disease burden in the country.

KEYWORDS

Hypertension, blood pressure and SBP.

INTRODUCTION:

Hypertension or high blood pressure is one of the major non-communicable health problems of 21st century associated high morbidity and mortality, global burden of which increasing day by day. Hypertension is a key risk factor for cardiovascular diseases which affects people silently all over the world. It is suggested that hypertension has its origin in childhood but goes undetected unless specifically looked for during this period. Thus early detection of hypertension and its precipitating or aggravating factors are important if one is to evolve measures so that complications of hypertension can be averted.

Hypertension is a major health problem in developed and developing countries associated with high mortality and morbidity affecting approximately one billion individuals worldwide [1]. Since sign and symptoms generally do not appear during childhood and adolescence so it goes undetected during this period.

The blood pressure varies with age, sex, weight, height, Body Mass Index (BMI), social economic status, extra salt intake, smoking, family history of Hypertension and dietary habits. Reliable BP recording is very difficult in children who are below six years by conventional methods; hence the ideal age would be 6–16 years, i.e., school children. National Institute of Health (NIH) of USA has also recommended that BP measurement should be recorded along with other anthropometric measurements, to be done in children at least once a year. But, even today in many parts of world including India, this practice has not been implemented [2].

Hypertension is one of the diseases which is diagnosed and treated in 25% of the cases so it is said to be a largely under-diagnosed problem.[3] There is plenty of evidence to suggest that hypertension begins in childhood and adolescence. The asymptomatic nature of hypertension in early phases of its onset during adolescence increases the chances of developing complications during adulthood. Therefore, detection of hypertension during childhood is of potential value in identifying those, who are at increased risk of primary hypertension as adults, and who might benefit from earlier intervention and follow-up.

Systemic hypertension is an important condition in childhood, with estimated population prevalence of 1-2% in the developed countries. Nutritional surveys, in the USA show a significant secular increase in systolic and diastolic blood pressures.[4] The causes for increase in blood pressure are attributed to obesity, change in dietary habits, lacking physical activity and increasing stress. Similar data is lacking from India; small surveys in school children suggest a prevalence ranging from 2-5 %.

AIMS AND OBJECTIVES

OBJECTIVES

- To estimate prevalence of Hypertension among Adolescent school students.
- To study distribution of blood pressure of adolescent school students according to age, sex and height.
- To identify the socio demographic and behavioral factors associated with Hypertension among school students.

MATERIALS AND METHODS

Study type: This was School based, epidemiological, observational Study
Study design: Cross sectional study
Study settings: The study was conducted in urban Patna, Bihar
Duration of study: October 2021 to March 2022
Study Population: Adolescent school students (both boys and girls) of Govt. School Secondary and H.S. Co-education schools from class V to Class XII of the study area.
Inclusion criteria:
Students of class V, VI, VII, VIII, IX, X, XI and XII
Exclusion criteria:

- Students unwilling to participate,
- Absent on the day of data collection.
- Co morbidity, if any chronic illness.,

Statistical Analysis:
For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS 24.0. and GraphPad Prism version 5. A chi-squared test ($\chi 2$ test) was any statistical hypothesis

test wherein the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as short for Pearson's chi-squared test. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate p-value ≤ 0.05 was considered for statistically significant.

RESULT AND DISCUSSION

Adolescent Hypertension is an emerging epidemic in India and the complications of hypertension like stroke, retinopathy, and Coronary Artery Disease (CAD) are on the rise. Important risk factors of adolescent hypertension are physical inactivity, unhealthy food habit, obesity, family history of hypertension etc. The study was aimed to find out the prevalence of hypertension among adolescent school students and to study association of the risk factors with hypertension.

Prevalence of adolescent hypertension

The prevalence of Adolescent hypertension was 12% which indicates it is major public health problem and immediate intervention is needed. It has been varying widely in different Indian studies - from 0.46% to 11.9% In a study conducted in 2007 among school students of Adolescent age group in Mysore, the prevalence was 6.1% 227. In another study done in Shimla, the prevalence was 20% (study period 2005 to 2006) 228. The prevalence of isolated Systolic HTN in this study was 16.3%. This fact also has to be taken seriously as previous studies have shown that increase in Systolic hypertension alone itself interacts with other major risk factors such as high cholesterol and diabetes, which also increase with age, to amplify the age-related risk of cardiovascular events 229,230.

Hypertension was seen in 35.3% of students who used to take extra salt where as it was 1.5% among students who did not take extra salt regularly. The association between extra salt intake and hypertension was found to be statistically significant.

Baradol RV et al [5](2014) found that 3.6% rural school children were overweight (OW) in age group of 13 years, 1.4% children were obese (OB) in age group of 15 years. In urban school children, 3.3% OB in age group of 12 years and 11.1% OW in age group of 10 years. In Rural school children, prevalence of systolic HTN was 21% in OW children and 25% in OB children. Among urban school children prevalence of systolic PHTN was 5.1% among OW and in OB group it was 16.6%.

It was observed that in Boys group, 42(20.6%) school students were in class V, 7(3.4%) school students were in class VI, 31(15.2%) school students were in class VII, 21(10.3%) school students were in class VIII, 30(14.7%) school students were in class IX, 7(3.7%) school students were in class X, 21(10.3%) school students were in class XI and 45(22.0%) school students were in class XII. In girls group, 42(22.3%) school students were in class V, 14(7.7%) school students were in class VI, 21(11.5%) school students were in class VII, 7(3.8%) school students were in class VIII, 30(16.4%) school students were in class IX, 28(15.3%) school students were in class XI and 41(22.4%) school students were in class XII.

Anand T et al [6](2014) found that out of the total 315 students, 208 (66%) were boys and 107 (34%) were girls and the mean age was 14.31 ± 0.96 years. Overall prevalence of malnutrition was 24% and boys were found to be more obese as compared to girls. There were 5 students (1.6%) who were found to have systolic hypertension while 17 (5.4%) were found to have diastolic hypertension while 4.1% (n = 13) of the participants were systolic pre-hypertensive and 26% (n = 82) were in stage of diastolic pre-hypertension. Body mass index and gender were found to be independent predictor for systolic hypertension.

Ujunwa FA et al [7](2013) found that the results showed that the mean systolic blood pressure and diastolic blood pressure for males were 106.66+ 11.80 mmHg and 70.25 + 7.34 mmHg respectively. The mean SBP and DBP for females were 109.83+ 11.66 mmHg and 72.23 + 8.26 mmHg respectively ($p < 0.01$). Blood pressure was found to increase with age. Prevalence of hypertension and prehypertension was 5.4% and 17.3% respectively with a higher rate in females (6.9%) than males (3.8%). Prevalence of prehypertension among males and females were 14.3% and 20.1% respectively. The prevalence of obesity was 1.9%.

We found that difference of mean Systolic with both Hypertension was statistically significant ($p<0.0001$). In HTN group, the mean Diastolic (mean± s.d.) of school students was 80.1522± .8424. In Non-HTN group, the mean Diastolic (mean± s.d.) of school students was 69.4956± 7.4212. Difference of mean Diastolic with both Hypertension was statistically significant ($p<0.0001$). In HTN group, the mean BMI (mean± s.d.) of school students was 22.5001± 3.7306. In Non-HTN group, the mean BMI(mean± s.d.) of school students was 18.4450± 2.4426. Difference of mean BMI with both Hypertension was statistically significant ($p<0.0001$).

It was found that in Female Group, 15(8.2%) school students were <90 systolic blood pressure, 127(69.4%) school students were 91-119 systolic blood pressure, 37(20.2%) school students were 120-129systolic blood pressure and 4(2.2%) school students were 130 and above systolic blood pressure. In Male Group, 36(17.6%) school students were <90 systolic blood pressure, 93(45.6%) school students were 91-119 systolic blood pressure, 73(35.8%) school students were 120-129systolic blood pressure and 2(1.0%) school students were 130 and above systolic blood pressure. Association of SBP vs. Sex was statistically significant ($p<0.0001$).

We also found that in Female Group, 156(85.2%) school students were 51-79 Diastolic blood pressure and 27(14.8%) school students were >80 Diastolic blood pressure. In Male Group, 10(4.9%) school students were <50 Diastolic blood pressure, 178(87.3%) school students were 51-79 Diastolic blood pressure and 16(7.8%) school students were >80 Diastolic blood pressure. Association of DBP vs. Sex was statistically significant ($p=0.0014$).

Mahajan A et al [8](2015) found that Overall mean SBP and DBP increased significantly with age in both the genders. Mean SBP (111.60 mmHg ± 11.43) and DBP (72.88mmHg ± 7.41) were higher in males in comparison to females in whom mean SBP and DBP were 109.91 ± 12.04mmHg and 71.84 ± 7.37mmHg, respectively. The prevalence of hypertension in females was more i. e., 13.1% in comparison to males 9.5%. However, the prevalence of pre-hypertension was nearly equal (11.0% in females and 11.3% in males).

Sucharitha ST et al [9](2014) showed that the prevalence of hypertension (>95 percentile distribution per age and gender) among male adolescents in this study is 1.9% and 1.72% among female adolescents. The prevalence of isolated systolic hypertension (>95 percentile distribution per age and gender) among males is 0.71% when compared with 0.28% in females. Prevalence of hypertension is found to be less but life style factors, which can have negative effect on blood pressure, are highly prevalent. Preventive efforts should target school attending adolescents to promote healthy life styles habits.

Abdul-Jalil IN et al [10](2018) found that the prevalence of obesity was 2.6% (95% CI 1.3%, 4.5%) and the prevalence of overweight was 10.5%. All the obese participants were female. The prevalence of hypertension among the respondents was 12.8% (95% CI 9.8%, 16.4%) and the prevalence of pre-hypertension was 7.5%. BMI correlated positively with SBP and DBP. BMI was significantly associated with high SBP (OR 3.39, 95% CI: 1.27–9.06, $p < 0.05$).

Our study showed that in HTN, the mean Ht (mean± s.d.) of school students was 1.4411± .0553. In Non-HTN, the mean Ht (mean± s.d.) of school students was 1.3659± .0662. Difference of mean Ht with both Hypertension was statistically significant ($p<0.0001$). In HTN, the mean Age (mean± s.d.) of school students was 15.2391± 2.3588. In Non-HTN, the mean Age (mean± s.d.) of school students was 13.3402± 2.5876. Difference of mean Age with both Hypertension was statistically significant ($p<0.0001$).

Our study showed that in Boys group, 1(0.5%) school students had 1-2 Times/Week, 22(11.0%) school students had 3-4 Times/Week and 121(59.0%) school students had 5 or More Times/Week. In girls group, 4(2.2%) school students had 1-2 Times/Week, 12(6.6%) school students had 3-4 Times/Week and 27(15%) school students had 5 or More Times/Week. In Boys group, 10(5%) school students had 1-2 Times/Week, 45(22.0%) school students had 3-4 Times/Week and 99(48.0%) school students had 5 or More Times/Week. In girls group, 5(3.0%) school students had 1-2 Times/Week, 22(12.0%) school students had 3-4 Times/Week and 36(19%) school students had 5 or More Times/Week. In Boys group, 93(45.6%) school students had Low Physical Exercise and 111(54.4%) school students had Moderate Physical Exercise. In girls group, 49(26.8%) school students had Low Physical Exercise and 134(73.2%) school students had Moderate Physical Exercise.

It was found that in Boys group, 10(4.9%) school students were under weight,170(83.3%) school students were Normal and24(11.8) school students were Overweight. In girls group, 156(85.2%) school students were Normal and27(14.8%) school students were Overweight. In Boys group, 154(75.4%) school students had Normotensive,32 (15.6%) school students had Pre hypertensiveand18 (9.0) school students had Hypertensive. In girls group, 113(61.7%) school students had Normotensive, 42(23.0%) school students had Pre hypertensiveand28(15.3%) school students had Hypertensive.

In our study 59(15.2%) school students had Hypertension,42(2.9%) school students had Diabetes,10(2.6%) school students had Strokeand10(2.6%) school students had Cancer. In Hypertension n (%), 34(16.8%) school students had >14 Years (N=202) and 12(6.5%) school students had 14 Years or Less (N=185). Association of Age vs Hypertension was statistically significant (p=0.0002).Odds of more than 14 years age individual developing hypertension was 2.918 (1.461, 5.826) compared to 14 years or less individuals at the time of the study.

We also found that in Female (N=183), 28(15.3%) school students had Hypertension (%). In Male (N=204), 1843(8.8%) school students had Hypertension (%). Association of sex vs Hypertension was statistically significant (p=0.049).In Hypertension, 12(6.5%) school students were Class V- VIII (N=185) and 34(16.8%) school students were Class IX-XII (N=202). Association of Class vs Hypertension was statistically significant (p=0.0002). In Hypertension, 15(4.5%) school students were Normal or BMI < +1SD (N=336) and 31(60.8%) school students were Overweight or BMI> +1SD (N=51). Association of Nutritional status vs Hypertension was statistically significant (p<0.0001). In Hypertension, 10(8.5%) school students were Other (SC, ST, OBC) (N=117) and 36(13.3%) school students were General (N=270). Association of Caste vs Hypertension was not statistically significant (p=0.181).

Sharma A et al [11](2010) conducted a study to find the prevalence of sustained hypertension and prehypertension among school children aged 11–17 years. Students with blood pressures above the 90th centile were re-examined after four weeks. The mean BMI of the students was 17.5±2.7 kg/m2, 5 (0.4%) were obese, and 39 (3.5%) overweight. After two evaluations, hypertension was identified in 62 (5.9%) children and prehypertension in 130 (12.3%). Urban and rural children had comparable rates of elevated BP (hypertension and prehypertension). Rates of elevated BP were significantly higher (46.5% vs 17%, P<0.001) among those with high BMI (overweight and obese) compared to those with normal BMI. In conclusion, nearly 20% of the school children had elevated blood pressures.

Harrabi I et al [12](2006) found that the prevalence of arterial hypertension was 9.6%, with no significant difference between boys (9.2%) and girls (9.9%). The prevalence of systolic and diastolic hypertension was 6.4% and 4.5%, respectively. In both boys and girls, systolic pressure had a highly significant positive correlation with height (boys: r=0.33, P<0.001; girls: r=0.08, P=0.02), weight (boys: r=0.47, P≤0.001; girls: r=0.35, P<0.001) and triglyceride concentrations (boys: r=0.13, P<0.001; girls: r=0.10, P=0.006). Among boys, a positive correlation was found between systolic blood pressure and age (r=0.12, P=0.001) and, among girls, a negative correlation was found (r=–0.12, P=0.001).

Guo X et al [13](2011) found that Blood pressure (BP) was measured at the research center and classified using the population-based percentiles. Sleep duration and related information were determined through questionnaires. The prevalence of hypertension and prehypertension were 20.3% and 15%, respectively. The median sleep duration was 8.77 ± 1.07 hours (mean ± standard deviation).

It was found that in Hypertension, 17(26.6%) school students were Thrice a Week or Less (N=64) and 29(9.0%) school students were More than Thrice a Week (N=323). Association of GL veg vs Hypertension was statistically significant (p<0.001). In Hypertension, 6(10.2%) school students were Thrice a Week or Less (N=59) and 40(12.2%) school students were More than Thrice a Week (N=328). Association of Other veg vs Hypertension was not statistically significant (p=0.658). In Hypertension, 12(5.6%) school students were Thrice a Week or Less (N=216) and 34(29.0%) school students were More than Thrice a Week (N=117). Association of Fast food vs Hypertension was statistically significant (p<0.001)

We found that in Hypertension, 42(35.3%) school students had Excess salt. Association of Excess salt vs Hypertension was statistically significant (p<0.001). In Hypertension, 43(30.3%) school students were Low (N=142) and 3(1.2%) school students were Moderate (N=245).Association of Physical activity vs Hypertension was statistically significant (p<0.001)

It was found that in case, mean difference of Height (increase in height) with 95% confidence interval [1.153-1.493, P <0.0001].It was found that in case, mean difference of Age (>14 years) with 95% confidence interval [.048–1.059, P =0.0590].It was found that in case, mean difference of Overweight with 95% confidence interval [8.003–206.501, P < 0.001].It was found that in case, mean difference of Fruit (Thrice a week or less) with 95% confidence interval [1.554–26.021, P= 0.0100].It was found that in case, mean difference of GL Veg (Thrice a week or less) with 95% confidence interval [.970–12.785, P= 0.0560].It was found that in case, mean difference of Fast Food (>Thrice a week) with 95% confidence interval [.113–1.633, P= 0.2150].It was found that in case, mean difference of Extra Salt (Yes) with 95% confidence interval [2.316–64.019, P= 0.0030].It was found that in case, mean difference of Physical Activity (Low) with 95% confidence interval [.771–39.288, P =0.0890].It was found that in case, mean difference of sex (Female) with 95% confidence interval [.655–7.481, P =0.2010].

CONCLUSION

NCDs diseases are on the rise in India. Hypertension is a known risk factors of different types of NCDs. It is well recognised that in the majority hypertension starts during childhood and adolescents. It has also been well documented that programmes into towards reduction of modifiable risk factor of hypertension can reduce the burden of NCDs to a large extent.

With this concept the study was conducted to assess the prevalence of hypertension among school students and associated behavioral risk factor related to hypertension in two co-education schools situated in Patna.

The study has revealed students are very much susceptible to the common type of NCDs including hypertension and this is a grade need of health education programme to influence and modify the behavioral risk factor of hypertension and among the students.

Findings of the study is expected to be of much help to the public health programme planner and manages to fine tune strategic intervention for reducing non-communicable disease burden in the country.

Table. Distribution of Study Population according to status of blood pressure (n=387)

Category	Boys (n=204) No. (%)	Girls (n=183) No. (%)	Total No. (%)
Normo-tensive	154(75.5)	113(61.7)	267(69.0)
Pre hypertensive	32(15.7)	42(23.0)	74(19.0)
Hypertensive	18(8.8)	28(15.3)	46(12.0)

Table: Sex wise distribution of mean systolic blood pressure of students [n = 387]

		No.	Mean SBP (mm of Hg)	SD (mm of Hg)	Minimum	Maximum	Median	p-value
SBP	Female	183	108.82	11.75	88.00	131.00	110.00	0.4187
	Male	204	109.88	13.84	80.00	132.00	117.00	
DBP	Total	387	109.37	12.88	80	132	112	
	Female	183	70.53	7.96	56.00	82.00	74.00	0.5787
	Male	204	70.97	7.63	50.00	82.00	71.00	
	Total	387	70.76	7.77	50	82	72	

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