

## Prevalence and determinants of Pre hypertension and Hypertension among urban high school adolescents of Hyderabad

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### Abstract

**Introduction:** The Aetio-pathogenesis and risky behaviour determinants start early in adolescent period for the development of hypertension which poses a major public health problem with serious complications. These are amenable for prevention and therefore this study was taken up to determine prevalence and determinants of Pre hypertension and hypertension among high school adolescents.**Materials and methods:** A school based cross sectional study was carried out among adolescents studying in a schools attached to urban health training centre of Deccan college of Medical Sciences, Hyderabad. All the students from seventh class to tenth class consisting of 404 students were included. A semi structured questionnaire schedule was used based on Global school based student health survey questionnaire module; Anthropometry and blood pressure measurement was done by trained team using standardised procedures. Data was entered in Microsoft Excel 2007 and analysed. Frequency, mean, standard deviation and Chi square were done wherever required. Z scores were calculated using WHO Anthro-plus.**Results:** Out of total 404 students- boys accounted to 162(40.1%) and girls 242(59.9%). Prevalence of Pre Hypertension was 49(12%) and Hypertension was 52(13%) respectively. Mean age was 13.46±1.28 years; mean systolic blood pressure was 112.99±11.18 and mean diastolic blood pressure was 70.84±10.74 mm of Hg. Gender and junk food intake were the significant risk factors of Pre hypertension and Hypertension among adolescents. **Conclusion:** In this study behavioural determinants play a major role and these are amenable for prevention.

**Key-words:**Pre hypertension,Hypertension,Adolescents, Prevention, Hyderabad

### Introduction

Adolescents account to nearly one-fifth of the world's population. They are 236.5 millions constituting 21% of total population in India.<sup>1</sup> The altered dietary practices and risky behavioural factors begins early during this adolescent stage in life and these have a strong impact on development of Hypertension.<sup>2</sup>

Hypertension is a “Silent Killer” and a complex public health problem as it constitutes an important risk factor for coronary heart disease, stroke, eye and renal complications. There is a wide variation in the prevalence of essential hypertension in India. South Indian prevalence varies from 7.2% to 21.4%.<sup>3-4</sup> It is more prevalent in urban areas as compared to rural because of differing lifestyles in both populations.<sup>5</sup> Tracking of blood pressure helps to identify pre hypertension and hypertension

thereby reduces the morbidity and mortality in adulthood. With globalisation and lifestyle changes in today's world, adolescents are exposed to various risk factors. These are mainly intake of junk food, processed food, reduced physical activity, alcohol and tobacco consumption. Most of these factors are amenable for prevention and this group is appropriate to intervene. India is experiencing epidemiological and nutritional transition and within this, Hyderabad is the most influenced by this change. As there is dearth of data about the magnitude and its determinants in this area an attempt has been made to study.

### Aim and objectives:

To determine the prevalence and determinants of pre-hypertension and hypertension among high school adolescents.

## Material and Methods

A school based cross sectional study was conducted in two schools which were attached to the urban health training centre attached to Deccan College of medical sciences located at old city of Hyderabad. High school students attending classes from seventh to tenth of the academic year 2016-17 were included in the study. Total four hundred and twenty four students were studying; out of which-chronic absentees' were 20 in number. The reasons for absenteeism were mainly- going to home town, engaged in other works and loss of interest in studies. Those who were absent on the day of study were interviewed the next days. So all together a total of 404 high school students who were pursuing education were included and assessed.

A pre- designed and pre tested semi structured questionnaire schedule was used by the trained team. Data was collected on identification details, anthropometry, blood pressure measurement and detailed questions on various determinants based on WHO designed Global School based student Health Survey (GSHS) questionnaire consisting of dietary habits, frequency of consumption of fruits and vegetables per week, frequency of intake of junk and fried food like chips, burgers, pizzas, bakery items, samosas etc.; extra salt consumption in the form of chutneys, pickles, papads and table salt addition; behavioural factors such as watching television/ mobile phone/ electronic gadgets for four hours or more per day; Regular physical activity in the form of cycling, outdoor games or running daily for half an hour, at least 5 times a week ; personal habits such as consumption of alcohol and tobacco in the last 30 days.<sup>6</sup> A single Blood pressure measurement was done by using standardised procedures in sitting position on right arm using a digital sphygmomanometer(OMRON IAI) standardised everyday with diamond mercury sphygmomanometer. If found on higher side an average of three readings was taken with 10 minutes apart. This device has the advantage of ease of use and minimization of observer bias as it displays systolic, diastolic blood pressure and pulse rate using LCD digital monitor. Height was measured using stadiometer to the nearest 0.1cm and weight was measured with the student on bare foot and school uniform using electronic weighing machine to the nearest 0.1kg using standardised methods.

Normal blood pressure levels was defined as Systolic Blood Pressure (SBP) and Diastolic Blood Pressure(DBP) less than 90<sup>th</sup> percentile; Pre hypertension was defined as average SBP or DBP levels that are greater than or equal to 90th percentile but less than 95th percentile for gender age and height. Hypertension was defined as average SBP or DBP greater than or equal to 95th percentile for gender, age and height.<sup>7</sup>

Age adjusted Body Mass Index (BMI) was found out using WHO Anthro-plus software. Categorization of

nutritional status was based on Z score, the four categories were underweight (Z score < -2); normal (Z score from -2 to +2); over weight (Z score 2 to 3) and obese (Z score >3).<sup>8</sup>

Permission was obtained from the principals of concerned school and Institutional ethical committee. Informed and written consent was obtained from parents on a printed consent form distributed a day prior to the filling of the questionnaire. Subjects with high blood pressure were referred to the health centre along with their parents for further evaluation and were health educated about the importance of various determinants influencing higher blood pressure levels.

Data was entered in Microsoft excel 2010 and analysed using frequencies and mean  $\pm$  standard deviation wherever appropriate. Chi- square was calculated to depict the association between various determinants and prevalence of pre-hypertension and hypertension.

## Results

Characteristics of the study subjects: A total of 404 subjects were analysed. Out of which boys accounted to 162(40.1%) and girls 242(59.9%). The age range was found between 12 years to 17 years. Mean age was found to be 13.46 $\pm$ 1.28years .Distribution of subjects as per age and sex depicted in table 1

**Table 1: Age and sex distribution of high school Adolescents**

Age (years)	Gender		Total
	Male(%)	Female(%)	
12	32(20)	59(24)	91(22.5)
13	60(37)	64(26)	124(30.5)
14	36(22)	69(29)	105(26)
15	21(13)	41(17)	62(15)
16	10(6)	6(2.5)	16(4)
17	3(2)	3(1.5)	6(2)
Total	162(100)	242(100)	404(100)

**Table 2: Age wise distribution of systolic and diastolic blood pressure**

Age	Mean systolic blood pressure	Mean diastolic blood pressure
12	110.19 $\pm$ 10.85	72.52 $\pm$ 10.01
13	111.38 $\pm$ 10.83	71.19 $\pm$ 11.73
14	115.38 $\pm$ 10.83	71.19 $\pm$ 11.73
15	114.61 $\pm$ 11.98	68.86 $\pm$ 9.39
16	117.86 $\pm$ 8.32	72.57 $\pm$ 8.65
17	119.80 $\pm$ 14.09	67.60 $\pm$ 11.88
Total	112.99 $\pm$ 11.18	70.84 $\pm$ 10.74

**Table 3: Prevalence of Pre hypertension and Hypertension among High school adolescents**

Classification	Male (%)	Female (%)	Total (%)
Normal	132 (81.4)	171(70.6)	303 (75)
Pre hypertension	12(7.4)	37 (15.2)	49 (12)
Hypertension	18(11.2)	34 (14.2)	52 ( 13)
Total	162 (100)	242 (100)	404 (100)

**Table 4:Association between various determinants and Pre hypertension and Hypertension**

Determinants	Normal N=303	Pre -HT N=49	HT N=52	Chi-square, P-value df
Gender				
Males	132(43.5)	12(24.5)	18(34.6)	7.136, 0.028*, df=1
Females	171(56.5)	37(75.5)	34(65.4)	
Extra salt Intake				
Yes	286(94)	44(90)	50(96)	2.061, 0.357, df=1
No	17(6)	5(10)	2(4)	
Junk food Intake				
Not at all	112(40)	11(22)	7(13)	10.337, 0.035*, df=4
<4days/week	89(29)	18(37)	19(36)	
>4days/week	102(31)	20(41)	26(51)	
Soft drink intake				
Not at all	78(26)	13(27)	15(29)	3.289, 0.511, df=4
<4days/week	112(37)	16(32)	15(29)	
>4days/week	113(37)	20(41)	22(42)	
Watching TV				
>=4hrs/day	180(59)	27(55)	40(77)	6.859, 0.14,df=1
< 4hrs/day	123(41)	22(45)	12(23)	
Physical activity				
Not at all	48(16)	25(51)	20(38)	6.328, 0.176, df=4
Occasional	125(41)	15(31)	18(35)	
Regular	130(43)	9(28)	14(27)	

HT-Hypertension, \*-Significant

Mean height was 150.35±7.70cms;Mean weight was 39.77±9.65kgs; Mean systolic blood pressure was 112.99±11.18mm of hg and Mean diastolic blood pressure was 70.84±10.74mm of hg. Table 2 depicts the age wise distribution of mean systolic and diastolic blood pressure .

Prevalence of prehypertension among adolescents was found to be 49(12%) and hypertension was 52(13%). Gender wise distribution of prevalence illustrated in table 3

To determine the association between various determinants and prevalence of Pre- Hypertension and

Hypertension Chi-Square was calculated. Among these gender and junk food intake were found statistically significant. Other variables such as extra salt intake, frequent junk food intake, frequent soft drink intake, watching TV/any electronic gadgets and no physical activity were associated with increased blood pressure but were not statistically significant. Regular fruit and vegetable intake, alcohol & tobacco consumption and high body mass index were not associated with increased blood pressure levels in our study. Tobacco usage was found among 13(3.2%) and alcohol consumption among 11(2.7%). Based on Z score undernourished were 13(3%), normal 369(91.5%), overweight 10(2.5) and obese 12(3%).

## Discussion

Our study found the prevalence of Pre-Hypertension and Hypertension to be 12% and 13% respectively. In contrast to our study high prevalence of Pre-Hypertension 12.3% and Hypertension 21.2% was found among the high school students of Mthatha (South Africa) conducted by Benedicta et al.<sup>9</sup> A study conducted by Bertrand Fikahemet al among Brazzaville, Congo students also reported high prevalence of Pre-Hypertension 20.7% and 10 % hypertension.<sup>10</sup> Similar to our study Satyanarayana et al of Hyderabad found 11.5% Pre-Hypertension and 9.7% hypertension respectively among the same age group.<sup>11</sup> School students of Shimla were found to have 14.3% Pre-hypertension and 4.3% hypertension respectively by Avinashsharma et al.<sup>12</sup> These variations in prevalence rates may be due to different methodology , criteria for diagnosis and regional variations.

In our study gender was found to be statistically significant determinant of Pre hypertension and hypertension. Similarly Tanuanand et al who has conducted study among Delhi school adolescents also found more among females and was statistically significant.<sup>13</sup> In contrast to this Eltagi A M Abdal et al found 14% hypertension among Sudanese boys and 8.4% among girls;<sup>14</sup> Jasmine S Sundare et al found the higher prevalence(31.7%) among high school males of Chennai which was statistically significant.<sup>15</sup> This gender difference may be attributed to hormonal changes that occur during puberty which had been noted to occur more rapidly in females than in males and also the stress associated with menarche could be one of the reason.<sup>16</sup>

Significant association was found with the intake of junk food for the frequency of >=4 times a week in our study. Similarly Satyanarayana et al found significant association with junk food intake among Hyderabad adolescents.<sup>11</sup> Anuradha et al found no such significant association with the frequency of junk food intake among Erode adolescents.<sup>17</sup> The intake of junk food which is rich

in saturated fat and high carbohydrates may be the precipitating factor for the vascular damage

However our study found higher prevalence of pre-hypertension and hypertension among those who take extra salt intake, frequent soft drink intake, watching TV/electronic gadgets for more than 4 hours per day and no physical activity but was not statistically significant.

Our study depicted no association with body mass index, alcohol and tobacco intake but Fortune A Ujunwaetal found significant association with BMI, alcohol and tobacco consumption among Nigerian adolescents.<sup>18</sup> Jamal Qaddumietal conducted study among Palestinian adolescents where they found the prevalence to be higher among obese and those who smoke regularly.<sup>19</sup> A study conducted by Pragyakumaretal among adolescents of Patna found significant association between prevalence of pre hypertension/hypertension and BMI.<sup>20</sup>This may be due to the significant ill effect be noticed only after longer duration of intake of alcohol and tobacco(dose and duration related).

**Conclusions:**Our study depicted the prevalence of Pre hypertension and Hypertension to be 12% and 13% respectively. Various determinants were gender, dietary habits and physical activity associated with Pre hypertension and Hypertension. Among these the gender and regular intake of junk food were statistically significant.This study helps us to know about the associated determinants of Pre Hypertension and Hypertension during adolescence period which are amenable for prevention of complications in adulthood

**Recommendations :**Regular screening of blood pressure at schools, school health education about the complications associated with hypertension, encouraging healthy diet by avoiding junk food/extra salt intake and regular physical activity at school are the primordial and primary preventive strategies which are at utmost importance to be adopted.

**Limitations:** The main limitation of this study is that - these results cannot be generalized as the sample size is less and have not included the family history, mode of transport and stress determinants..

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