

## Prevalence and determinants of hypertension among urban school children in the age group of 13- 17 years in, Chennai, Tamilnadu

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**Abstract:** *Introduction:* Hypertension is a common disease associated with high mortality and morbidity. Hypertension could have its origin in childhood and go undetected unless specially looked for during this period. With globalization bringing more lifestyle modifications, adolescents are exposed to multiple risk factors including obesity, diet, academic stress, lack of physical work apart from hereditary risk factors. Early diagnosis of hypertension is an important strategy in its control, effective treatment and prevention of complications.

**Objectives:** To estimate the prevalence of hypertension among school children in the age group of 13- 17 years and study the determinants.

**Methods:** A cross-sectional survey was done among 400 adolescent students including government and private schools in the age group of 13-17 years in Chennai. Sociodemographic details, food habits, physical activity, anthropometric measurements and family history of hypertension were obtained. Blood pressure was measured at 0, 5 & 30 minutes and average of three readings was taken as reading of the individual. Statistical analyses were done using SPSS.

**Results:** The prevalence of Adolescent hypertension was 21.5%. MANOVA showed there was significant ( $p < 0.05$ ) effect on gender, class of study, body mass index, waist hip ratio. Chi-square showed significant association for some variables including parent history of hypertension. The major determinants were found to be increased Body mass index and decreased physical activity (ODD's ratio  $> 3$ ).

**Conclusion and Recommendations:** Hypertension among the adolescent age group was alarmingly high; there was no difference in prevalence among government and private schools and among various types of curriculum. Awareness of hypertension was very low. There was no association with socio economic status. Periodic surveys should be done in schools to identify the "at risk" group of children and adolescents who can develop hypertension in future, so that preventive care can be provided.

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### I. Introduction

Hypertension is a common disease associated with high morbidity and mortality. The disease is a silent threat to the health of people 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 prevented.

Hypertensive children tend to have other medical problems, such as obesity, high blood lipids and/or diabetes mellitus. Coronary risk factors such as hypertension, smoking, physical inactivity, obesity and improper diet are fairly widespread. Cardiovascular diseases, particularly hypertension, account for high mortality in the form of cardiovascular strokes in countries like India, Taiwan and Japan<sup>1</sup>. In Indian adolescent school children, there is a high prevalence of obesity, hypertension, and hypercholesterolemia. Studies from Boston and Pennsylvania had commented that the role of hypertension as a risk factor is clear and familial aggregation of blood pressure and tracking phenomenon support the concept that children with hypertension are likely to be hypertensive as adults and will be at risk for early Coronary heart disease<sup>2</sup>.

Though the data on Adolescents hypertension is very scarce across the globe, the National High Blood Pressure Education Programme (NHBPEP) of United States has recognized the presence of primary hypertension in children and adolescents.<sup>3</sup>

With globalization bringing more lifestyle modifications, adolescents are exposed to multiple risk factors including obesity and also family history of hypertension.<sup>4</sup> Research in this area will help policy makers to see if there is a need for addressing this problem effectively in prevention and management of hypertension in

children and adolescents. Early diagnosis of Hypertension is an important strategy in its control, which will be useful in tracking and effective treatment, to prevent further complications. Hence study was conducted to estimate the prevalence of hypertension in Chennai city and determinants of hypertension such as obesity, family history of hypertension, physical inactivity and life style associated with adolescent hypertension.

## II. Materials and Methods

A cross sectional study was executed in Chennai-India including 400 samples with an equal distribution of 200 each from both private and public schools. Chennai has been divided into four educational zones namely North, South, Central and East zones. From each zone one school both from public and private sector using stratified random sampling method was selected. From each school fifty adolescent students (25 boys & 25 girls) between the age group of 13-17 who were eligible were selected by simple random sampling method and included for the study after obtaining their informed consent.

## III. Methodology

### Blood Pressure Measurement:

The Student was seated and relaxed. The cuff was placed on the right arm at the level of heart. On the day of measurement three readings were made at 0, 5 and 30 minutes. The average of three readings was taken as blood pressure of the individual.

### Socio economic status

Socioeconomic status of the family in which respondent belonged was recorded using a well structured questionnaire. The questionnaire included details such as

Personal details: Age, religion, Standard, Type of curriculum Academic performance

Family details: Type of family, Parent's education, occupation, income

Physical activities: Details of physical activity in school and indoor activities

Food details: details of junk food and aerated drinks and frequency of intake .

Health information: Awareness regarding hypertension such as Its definition, causes and symptoms were included. Details of the presence of symptoms of hypertension and history of parent's hypertension.

Anthropometric measurements such as height, weight, Waist-Hip ratio were recorded. Statistical analysis was done using SPSS version 10.

Hypertension: According to Joint National Committee VII (Indian scenario),2003 12 the following measurements of blood pressure are considered as normal, pre-hypertension and hypertension.

For - 13 years

Classification	Systolic BP mmHg	Diastolic BP mmHg
Normal	<120	<80
Pre Hypertension	120 – 139	80- 89
Stage I Hypertension	140 – 159	90 – 99
Stage II Hypertension	> 160	> 100

## IV. Results

Adolescent Hypertension (AHTN) among school students: In this study 86 of the 400 participants were found to have hypertension. The prevalence AHTN was 21.5% and normal children were 314 (78.5%).

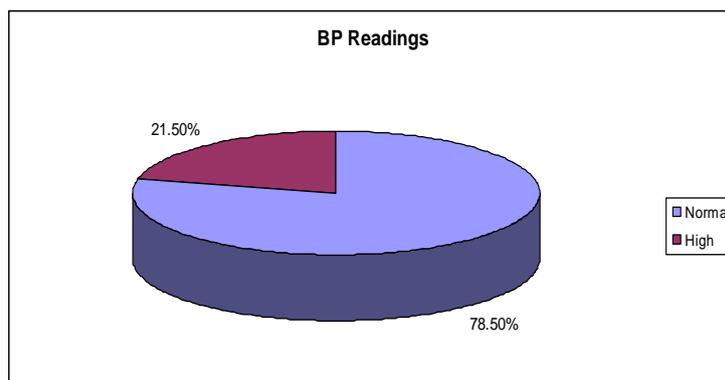


Fig-1 prevalence of Hypertension

*Prevalence and determinants of hypertension among urban school children in the age group of 13- 17*

Both the systolic and diastolic BP was observed in 21 of these 86 hypertensives (24.41%) whereas 65 students (75.59%) had isolated systolic HTN. No students had isolated diastolic HTN.

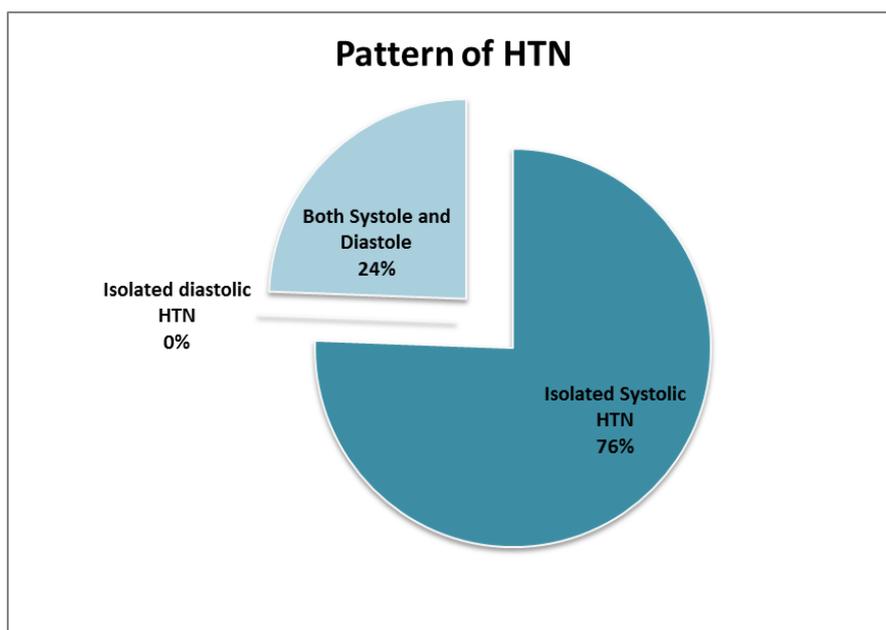
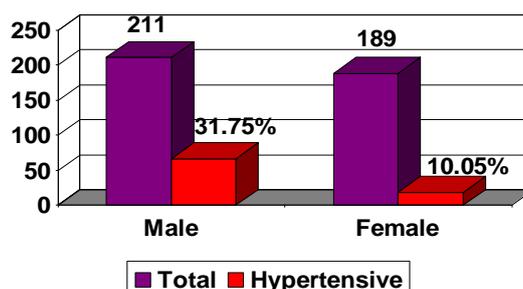


Fig: 2. Mean and standard deviation of systolic B.P was 110 mm/Hg and 12.65, Diastolic B.P was 65 mm/Hg and 8.62.

Fig:3 Gender wise prevalence

**Genderwise Prevalence of Hypertensive**

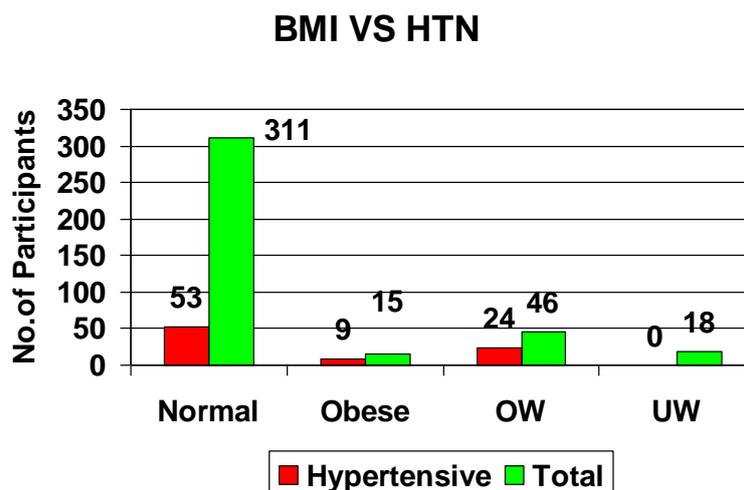


The prevalence among male was 67 (77.90%) and among females 19 (22.09%) , which was found to be highly significant among males than females (p = 0.000).

**BMI and HTN**

Of the 321 normal weight students between (15th and 85th percentile), there were 53 (16.51%) hypertensives. Eighteen were underweight below 15th percentile and there were no hypertensive's among them. Forty six were overweight with BMI between (85th and 95th percentile), 24 (52.17%) students were hypertensives, fifteen were obese with BMI above 95th percentile 9 (56.25%) were hypertensives.

Fig :4



**Highly significant risk factors for HTN:**

Table below shows the risk factor for development of HTN in this study, gender, standard, BMI, Obesity, Waist Hip ratio and family of hypertension which were found highly significant.

**Multivariate Analysis**

	Pearson Chi-Square	p value	F test	p value
Gender	27.818	0.000	29.747	0.000
Class	18.723	0.001	14.797	0.000
BMI	48.482	0.000	89.941	0.000
Obesity	7.567	0.006	50.071	0.000
Waist Hip Ratio	175.937	0.002	24.641	0.000
Family h/o HTN	9.243	0.026	7.153	0.008

**Other Medical Conditions:**

Out of 400 participants 386 were normal healthy individuals without taking any any medications, two (0.5%) students were known hypertensive and on treatment. Six students were asthmatic, one had undergone coronary bypass surgery, two girls reported irregular periods and five students complained of renal calculi and epilepsy who were on treatment.

**V. Discussion**

Adolescent Hypertension is an emerging epidemic in India and the complications of hypertension like stroke, retinopathy, and CAD. The risk factors like obesity, family history of hypertension, Physical inactivity, academic performance, food habits and life style were studied using qualitative methods.

**Prevalence of Adolescent Hypertension:**

The prevalence of Adolescent hypertension was 21.5% 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%<sup>23</sup>. In a study conducted in 2007 among school students of Adolescent age group in Mysore the prevalence was 6.1%<sup>23</sup>. In another study done in Shimla the prevalence was 20% (study period 2005 to 2006)<sup>28</sup>.

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<sup>24,9</sup>.

### **Gender**

The prevalence among boys (31.75% n=211) was found to be much higher than among girls (10.05%,n=189). The difference was highly significant ( $p=0.000$ ) and goes along with the study done in Kerala in 2007<sup>6</sup>. But some other previous studies revealed the gender variation to be much different. While the Mysore study<sup>23</sup> found no gender predilection at all, few other studies showed the prevalence high among girls<sup>27</sup>. Anyhow, the finding of the current study has to be taken as significant because the prevalence among boys is strikingly high.

### **Standard of study:**

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 ( $p=0.001$ ). Though there was no previous data available in this regard, this higher prevalence may be attributed to the high stress level among the students of X, XI and XII due to huge academic burden and responsibilities.

#### **Type of curriculum**

No significant relationship between the type of curriculum followed by the students and the prevalence of hypertension ( $p=0.340$ ) could be found. It may be taken as that irrespective of the difference in their curriculum, it seems all the students face the same level of stress.

### **Academic performance and hypertension**

There was no significant relationship between hypertension and academic performance noticed. This may be because hypertension in its earlier stage is a silent condition without any symptoms and does not affect the studies and day to day activities of the person.

### **Physical activity:**

Current study could not find the any significant association between physical activity and hypertension. Spending more time in physical activities plays an important role in preventing and delaying the onset of hypertension. The association between physical activity and Hypertension is an established fact. A study done by Gang Hu on relationship of physical activity and BMI to the risk of hypertension proved the protective effect of physical activity was observed in both sexes regardless of the level of obesity<sup>25</sup>. Anyhow the It may be perhaps due to the fact that only qualitative assessment was done. In depth analysis of the level of physical activity of the students could have revealed the association in a better way. .

### **Parent's education, employment and income:**

Details of parents' education, employment status and income were asked, to assess the socio economic status of the family. There is no influence of SES with hypertension in this study. This is a contradiction to the result of an analysis done by Tanya M.Spruill, which says prevalence of hypertension was high among people belonging to low socio-economic status due to poor living conditions and high stress<sup>21</sup>.

Food habits: The strong relationship between hypertension and diet habits has been well proved through various studies. Still the current study does not show a statistically significant relationship between food habits and HT. This may be because only qualitative assessment of food consumption was done. Anyhow non-significant relationship between diet and hypertension has also been arrived in another study conducted by M.R.Savitha et al in Mysore<sup>25</sup>.

### **Relationship between BMI and HTN:**

There is an overwhelming evidence in this study that the prevalence of HT is high among obese individuals ( $p=0.000$ ), which is highly significant. This also confirms results of done by Jonathan et al indicated obesity and overweight has major risk factors in hypertension<sup>31</sup>. John F Hall study also showed similar finding that chronic obesity also causes marked structural changes in the kidneys that eventually leads to a loss of nephron function, further increasing the arterial pressure. This study results also coincides with an Indian study done by Ruchika et al in Delhi among school children, published in 2010,<sup>18,11</sup>

### **Waist-Hip Ratio and HTN:**

There is strong evidence in this study that obesity and overweight among males with waist-hip ratio more than normal is highly significant for higher prevalence of adolescent hypertension. This results agrees with similar finding of Ruchika goel et al done in Delhi, increased in HTN with high W/H ratio and also Sinaiko et al<sup>11,27</sup>.

### **Familial history and HTN:**

The prevalence of hypertension was very high (41.86%) among children of hypertensive parents (either father or mother or both). This study strongly supports the fact that increase in prevalence of adolescent HT is highly significant among parents with hypertension. Similar relationship was found in Sharma et al a study done among Delhi school students<sup>26</sup>

This study result also agrees with another work done by KA Jamerson et al in U.S<sup>19</sup>

### **Awareness of HTN:**

Knowledge and awareness of hypertension are important factors in early diagnosis as well as achieving blood pressure control but the awareness of HTN was suboptimal as only 28.25% among the 400 students had some awareness about hypertension. As in general all the 86 subjects who were found to be hypertensive were absolutely asymptomatic and 2 of them were known hypertensives on medication, which further implicates the need to create knowledge and awareness among school students which is a growing public health problem. Similiar result has been observed in a study done by Alexander et al published in 2003<sup>28</sup>

## **VI. Limitations**

1. All variables were assessed based on qualitative data as reported by verbally by the student. There were limitations in verifying the responses.
2. Repeated examination on different occasions was not done due to time constraint.
3. All measurements were made by single observer.
4. The food habits were assessed based on frequency of consumption and responses were from the child's memory, subject to recall bias.
5. Physical activity was recorded as told by the children, no observation was done.

## **VII. Conclusion**

1. The prevalence of hypertension among the adolescent age group was alarmingly high.
2. Obesity, family history of HTN, gender, and increased waist/hip ratio were found to be the major determinants of Adolescent hypertension.
3. There was no association found between Physical activity and food habits.
4. There is no difference in prevalence in HTN among government, private schools and also with type of curriculum.
5. Awareness about hypertension was very low among the study participants
6. There was no association with Socio economic status and AHTN.

## **VIII. Recommendations**

1. There is a need to create awareness among school students particularly in adolescent age group regarding hypertension and its complications.
2. School authorities should organize screening programmes in school particularly for HTN.
3. Parents should be educated about increasing prevalence of Adolescent hypertension.
4. Children should be educated about good life style and healthy food habits.
5. Awareness programmes should be conducted among school through Medias.
6. Parents should be educated to practice traditional and healthy dietary habits in their home.
7. Parents and teachers should be sensitized on over nutrition and the health hazards of chronic nutrition excess
8. Periodic surveys should be done in schools on adolescent hypertension and tracking of blood pressure should be done, which will us helps in identifying the "at risk" group of children and adolescents, who can develop Hypertension in future period, so that preventive care can be provided for them.

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