A study on prevalence of hypertension among high school children in Shivamogga City - a cross sectional study.

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Abstract

Background and objectives: Hypertension in children is an emerging public health issue attracting the attention of medical professionals worldwide. Hence early detection of blood pressure in children is very important to prevent future development of hypertension and its complications in adult life. Therefore an epidemiologic study was conducted with the objectives 1)To estimate the prevalence of pre-hypertension and hypertension among high school children. 2)To study the risk factors associated with the hypertension. Methodology: Observational cross-sectional study was conducted from July-2014 to June-2015 among high-school children aged 13 to 16 years in urban area of Shivamogga city in Karnataka state. Pre-tested questionnaires were used to collect the data from children. Blood pressure and Anthropometric measurements (height and weight) were recorded as per the WHO guidelines. Average of three readings of blood pressure was considered. A child was said to be having hypertension or pre-hypertension if, systolic and/or diastolic blood pressure greater than or equal to 95th percentile and 90th to below 95th percentile for height, age and sex respectively. Results: The total study population comprised of 1200 students aged between 13 – 16 years. The overall prevalence of pre-hypertension was found to be 5% and that of hypertension was 8.58% among study subjects. Prevalence of hypertension was higher among 15 - 16 year children (11.48%) as compared to 13 - 14 year (6.66%). The socio-economic status, BMI status, junk food intake, playing outdoor game, watching TV, playing video/mobile game were found to be significantly associated with hypertension. Conclusion: Prevalence of hypertension and pre-hypertension was high among school children aged 13-16 years in Shivamogga city. Obesity, Junk food intake, less Physical activity were the risk factors for childhood hypertension.

Key-words: Hypertension, Pre-hypertension, childhood hypertension, CVD, BMI, Junk food.

Introduction

Hypertension means increased pressure (tension) in arteries. Most of the people think that, hypertension affects only aged people, but it is now apparent that it affects people of all ages including young children. WHO has named Hypertension as a “silent killer” because a person could have it for years without even knowing it. It can be a very dangerous if not treated right away and properly.

WHO has reported in "World Health Day 2013" that, globally cardiovascular disease accounts for approximately 17 million deaths in a year, nearly one third of the total. Of these, complications of hypertension account for 9.4 million deaths worldwide every year. Hypertension is responsible for 45% of deaths due to heart disease.2

Hypertension is a chronic condition and it has a role in the causation of coronary heart disease, stroke and other vascular complications like peripheral vascular disease, renal impairment, retinal haemorrhage and visual impairment.3 In developed countries, hypertension is reported to be the fourth contributor to premature death and seventh in developing countries.4 It has been identified as a leading risk factor for mortality and ranked third as a cause of disability- adjusted life-years.5 In 2008, worldwide, approximately 40% of adults aged 25 and above had been diagnosed with hypertension; the number...
of people with the condition are 1 billion in 2008 \(^7\) and this is predicted to increase to 1.56 billion by 2025.\(^7\)

Hypertension had been considered relatively uncommon in children and adolescents. However, this may be changing primarily because of the influence of the childhood obesity epidemic. Hypertension in children is an emerging public health issue attracting the attention of medical professionals worldwide. Prevalence of hypertension in children is estimated to be 1-2% in developed countries.\(^8\) Not many studies are done in India, small surveys in school children suggest a prevalence ranging from 2-5%.\(^9\)

The level of risk factors during childhood and adolescence tends to track into the youth and late adulthood also. Thus, children who have higher levels of body weight, blood pressure, blood glucose and cholesterol, will tend to have high level of these parameters during adulthood also.\(^10\) Hence early detection of blood pressure in children is very important to prevent future development of hypertension and its complications in adult life.

In this context, the present study was conducted to estimate the prevalence of Hypertension among high school children and to study the risk factors associated with the Hypertension among school children aged 13-16 years in Shivamogga city.

**Materials and Methods**

Observational cross-sectional study was conducted among high-school children aged 13 to 16 years in urban area of Shivamogga city in Karnataka state. Study was conducted from 1\(^{st}\) July-2014 to 30\(^{th}\) June-2015 for a period of 12 months. School children aged 13 to 16 years in the study area were included in the study and children who were absent during data collection even after two visits were excluded from the study.  

A list of government and private schools was obtained from the Deputy Director of Public Instructions (DDPI) Office Shivamogga. From that list, four schools were selected by using random sampling method. Sample size was calculated on relative precision method by taking prevalence as 5% and by using the following formula: 

\[
 n = \frac{Z_{1-\alpha/2}^2 \cdot P \cdot (1-P)}{\varepsilon^2}
\]

Where, 

\[ Z_{1-\alpha/2} = 1.96, P = 0.05, \varepsilon = 0.35 \]

and sample size was found to be 596. Since, sampling design of the study was cluster random sampling, the sample size was multiplied by Design Effect of 2. Final Sample size was 1192 which was rounded off to 1200. This was achieved by selecting 300 children from randomly selected 4 schools. Ethical clearance was obtained by Institutional Ethics Committee, Shivamogga Institute of Medical Science, Shivamogga.

**Method of data collection:** The study was conducted among school children of aged 13 to 16 years in Shivamogga city. A prior permission was obtained from school principal to conduct the study by explaining the study protocol. Informed consent was obtained from the parents or guardian.

All the children were interviewed personally using semi-structure questionnaire. This questionnaire comprised of the questions regarding socio demographic details, physical activities and diet. Blood pressure and Anthropometric measurements (height and weight) were recorded as per the WHO guidelines. Average of three readings of Blood pressure was considered.

The height measurement scale was fixed to the wall and height was measured without any footwear. The student stood straight with heels, buttocks, back touching the wall and stretching upwards to the fullest extent with arms hanging on the side. The head was aligned so that the lower rim of the orbit and the auditory canal were in the horizontal plane.

Weight was measured by digital weighing machine without any footwear with clothing (school uniform). BMI was calculated and children were identified as overweight if BMI was more than 85\(^{th}\) percentile and obese if BMI was more than 95\(^{th}\) percentile (IAP Growth Monitoring Guidelines for Children from Birth to 18 Year).\(^11\)

The complete procedure of BP measurement was explained to children. The BP was measured after a period of quiet for at least 5 minutes so as to decrease the anxiety. The BP was measured in sitting posture with hand resting on examining table with cubital fossa supported at the level of the heart. Mean of three consecutive BP readings at the interval of five minutes was taken.

A child was said to be having hypertension if, systolic and/or diastolic blood pressure was greater than or equal to 95\(^{th}\) percentile for height, age and sex and a child was said to be having pre-hypertension if, systolic or diastolic blood pressure were greater than or equal to 90\(^{th}\) percentile but less than 95\(^{th}\) percentile for height, age and sex.\(^12\)

**Statistical analysis:** The collected data were coded and the tabulated on Microsoft Excel sheet. Analysis was done by using Epi-Info - 7 software. The \(\chi^2\)-test was used to analyse the association between hypertension with various factors.

**Results**

This study was conducted in the urban area of Shivamogga. Four schools were selected randomly from the list of schools available from the DDPI office. The total sample size of the study population comprised of 1192 which was rounded off 1200.

The total study population comprises of 1200 students aged between 13 – 16 years. Among them 629(52.42%) were males and 571(47.58%) were females.
721(60.08%) students fall in to the 13 – 14 years age group and comprising of 50.49% boys and 49.51% girls. 479(39.92%) students were in 15 – 16 years age group and comprising of 55.32% boys and 44.68% girls.

**Figure 1: Prevalence of Pre-hypertension and Hypertension.**

In the present study out of 1200 students 60(5%) children were found to be pre-hypertensive and 103(8.58%) were found to be hypertensive (Figure 1).

**Table 1. Association between Hypertension and Socio-demographic factors.**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Normal</th>
<th>HT</th>
<th>Total</th>
<th>$\chi^2$ Value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-14 years</td>
<td>673(93.34)</td>
<td>48</td>
<td>721</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-16 years</td>
<td>424(88.52)</td>
<td>55</td>
<td>479</td>
<td>8.53</td>
<td>0.0034</td>
</tr>
<tr>
<td>Boys</td>
<td>593(94.28)</td>
<td>36</td>
<td>629</td>
<td>0.006</td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>504(88.27)</td>
<td>67</td>
<td>571</td>
<td>13.7</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

In this study prevalence of hypertension was more among 15 – 16 years age group and Girls. This shows that there is a association between hypertension and age of the students and sex. This association was statistical significant at p<0.05(Table 1).

The prevalence of Hypertension was more in the students with BMI status >85th percentile, intake of Junk food more than 3 times in a week, playing outdoor games ≤ 2 hour in a day, watching TV >2hours in a day and playing Video/Mobile game >2hours in a day and showed statistically significant with Hypertension at p<0.05 (Table 2).

**Discussion**

The present descriptive cross - sectional study was conducted among 1200 school children in urban area of Shivamogga, Karnataka. In our study the prevalence of pre hypertension and hypertension among school children aged 13 - 16 years was found to be 5% and 8.6% respectively. But review of literature suggests that variation in the prevalence of hypertension was due to place of the study, urbanisation and economic status of the country.

**Table 2. Association between Hypertension and various risk factors.**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Normal</th>
<th>HT</th>
<th>Total</th>
<th>$\chi^2$ Value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤85th percentile</td>
<td>(94.20)</td>
<td>59</td>
<td>1017</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;85th percentile</td>
<td>(75.96)</td>
<td>44</td>
<td>183</td>
<td>65.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Vegetarian</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;3 times in week</td>
<td>(95.83)</td>
<td>33</td>
<td>791</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Junk food intake</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;2 hour in a day</td>
<td>(77.78)</td>
<td>66</td>
<td>432</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hours of playing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>outdoor games</td>
<td>&gt;2 hour in a day</td>
<td>(95.18)</td>
<td>37</td>
<td>768</td>
<td>38.5</td>
</tr>
<tr>
<td>Hours of TV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>watching per day</td>
<td>&gt;2 hour in a day</td>
<td>(92.86)</td>
<td>70</td>
<td>981</td>
<td>58</td>
</tr>
<tr>
<td>Hours of playing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video/Mobile game</td>
<td>≤ 2 hour in a day</td>
<td>(94.27)</td>
<td>44</td>
<td>768</td>
<td>4.92</td>
</tr>
<tr>
<td>games</td>
<td>&gt;2 hour in a day</td>
<td>(86.34)</td>
<td>59</td>
<td>432</td>
<td>22.1</td>
</tr>
</tbody>
</table>

In our study prevalence of Hypertension was 8.6% which was comparable with Studies done in in Pondicherry 8.5%,14 in Western India 6.8%,15 in Congo 10.1%,13 and in Seychelles 7.8%.15 Low prevalence of Hypertension was reported inBijapur, Karnataka 4%,18Sudan 4.9%,17and in Egypt 4%,13 and High prevalence of hypertension was reported in Tamilnadu 20.1%20 and in South Africa 29.4%.21These differences in the prevalence were due to demographic, social and economic transition of developing and third world countries.

In the present study prevalence of hypertension was higher in the age group 15 - 16 years (11.48%) and it increased with increasing age.Study done by Jasmin S Sunder et al on hypertension in school children showed that the prevalence of hypertension was increasing with the age among children. It was lowest among students of VIII standard than among X, XI and XII students respectively.20 A study done in rural area of Wardhastates that Mean SBP and DBP level was found to be increasing from 6 years to 16 years.22 Studies done by Pushpa Krishna et al,23Anisa M Durrani et al,24 and Raja Danashekar and Vinoth R25 showed that mean blood pressure increased significantly with age.
In the present study prevalence of Hypertension was more among girls (11.73%) than boys (5.72%). Study done by Yuvaraj BY in Chitradurga showed that prevalence of hypertension to be more in females (4.2%) compared to males (1.3%). But some studies conducted in Tamilnadu and Western India showed prevalence of Hypertension to be more in the boys as compared to girls.

In our study the prevalence of hypertension was 24.04% among children with the BMI Status >85th percentile and 5.80% in children with BMI Status ≤85th percentile. A study done by Jasmine S Sunder and Andriska J et al. showed that the prevalence of hypertension was high among obese individuals compared with lean children.

In the present study frequent junk food (fast food) intake showed statistically significant association with hypertension. This could be due to the ingredients involved in the preparation of junk food. These ingredients usually contain more fat and calorie but less nutritive value. The study conducted by Kotian MS also showed statistical significant association between daily intake of chocolate and prevalence of overweight among adolescents.

In the present study there was significant association between hypertension and hours of TV watching. Prevalence of Hypertension was 15.07% in children who watch TV more than 2 hours in a day. This is probably because of sitting ideally in front of TV which results in decreased catabolism and increased adipose tissue accumulation. Another reason is that, the children who watch TV for longer hours tend to have more food while watching TV which results in weight gain and obesity. The results were comparable with the study done by Perrie E. Pardee where he discussed that the odds of hypertension for children. Watching TV for more than 4 hours was 3.3 times greater than the children watching TV for less than 2 hours.

In our study prevalence of hypertension was more among the children who played video/mobile game for >2 hour. This could be due the more stress which occurs during playing video/mobile games.

The prevalence of hypertension was more in the children who played outdoor games for less than 2 hours in a day. In contrast, a study done by Jasmine S Sunder et al. did not show any significant association between the physical activity and hypertension. Similar findings were found in the study done by Soundarssanane MB et al. and Raja D.

**Conclusion:** The result of our study concludes that there was high prevalence of hypertension among school children aged 13-16 years in Shivamogga city. Our study confirms the variations in BP level as per age and gender. Obesity, junk food intake and less physical activity were the risk factors for childhood hypertension.

**Recommendations:** There is a need for implementation of a comprehensive CVD prevention program in schools which include health education of eating right types of foods of nutritious nature with due emphasis on sports and physical activity. Routine blood pressure measurements should be taken in school children to improve the detection, prevention and treatment of hypertension.

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**References**


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