Prevalence of High Blood Pressure among Adolescents in a Private University in Nigeria

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Abstract

Objectives

High blood pressure among adolescents is not as researched as it is among adults, notwithstanding that hypertension in adults is being tracked back to childhood. This study identified the prevalence of hypertension among adolescents, the age related pattern of prevalence and associated risk factors.

Method

A cross sectional study was conducted among university students who presented for pre-admission medical examination. Blood pressure measurement was conducted and cut off reading was based on JNC VII classification for hypertension.

Results

A total of 952 students had complete data. Participants were aged 14 – 19 years with a mean age of 16.6 ± 1.03 years. Prevalence of hypertension among the adolescents was 6.4%. High blood pressure (HBP) distribution was as follows; systolic HBP (54%), diastolic HBP (31.15%) and combined systolic and diastolic HBP (14.75%). The risk factors significantly associated with HBP were male gender, obesity, overweight, alcohol, smoking and high blood sugar (p values 0.001, 0.039, 0.001, 0.016, and 0.001 respectively). However family history of hypertension was not significantly associated with hypertension (p=0.053). The majority of the adolescents with hypertension were unaware of the morbidity.

Conclusion

Hypertension is identifiable in adolescents and it appears to increase with age. Notable risk factors for hypertension in adults are also associated with hypertension among adolescents. Regular screening will improve awareness and help mitigate the complications of this condition.

Keywords

Adolescent, hypertension, cardiovascular risk factors, point blood pressure measurement, awareness.

Introducion

High blood pressure has since been suggested to start early in life. Typically hypertension was thought to be a disease of the older people, but there has been an increased identification of cardiovascular risks and hypertension among adolescents and young adults, a finding scientists and healthcare providers are beginning to realize.¹

The World Health Organization (WHO) defines adolescence as the age group between 10 and 19 years.² Adolescents comprise approximately one-fifth of the world’s population and most of them (84%) live in developing countries, thus making a study of this population an important one.

Hypertension among adolescents is increasingly being seen in the university clinics, some in whom end organ abnormalities are already present. Intervention at this stage of care may be too late. They also have identifiable cardiovascular risk factors that coexist with the hypertension. Despite several epidemiological reports on detection and prevalence of hypertension in adult population, there is dearth of information on adolescent hypertension in many parts of the world.³⁴

There have been varied reports on the prevalence of hypertension among adolescents ranging from 0-36%⁵.⁶⁷

This wide disparity may be related to sample size, race, sex, age, environmental and social factors. Studies that have concentrated on hypertension among adolescents in Nigeria done in areas with similar age, sex, environmental and social factors have reported prevalence of 3.7%, 24.8% and 16.9% respectively. These representing prevalence values following one – session/ point blood pressure assessment among adolescents.⁸⁻¹²

The type of hypertension in adolescents is not similar to those of adults. Children and adolescents have a much higher incidence of secondary hypertension compared with adults.¹³⁻¹⁴ Renal parenchyma disease and renovascular diseases account for most cases of secondary hypertension in them.¹⁵⁻¹⁷ Furthermore some cardiovascular risk factors have been identified...
to be present among adolescents. These risk factors include sex, overweight, obesity, smoking, alcohol, diabetes mellitus and family history of hypertension. 1,8-10

This is worrisome because complications of longstanding hypertension for example left ventricular hypertrophy, which is the most common clinical evidence of end organ damage in this age group (41%) can occur. 11-23

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. 20

In addition, attention has been drawn to hypertension among adolescents because this subset of adolescents may become adults with hypertension. 24

In view of the foregoing, this study was aimed at determining the prevalence of high blood pressure among adolescents newly admitted into Babcock University, to show the pattern of prevalence across the adolescent age range and finally identify association between cardiovascular risk factors and presence of high blood pressure.

Methods

A cross sectional study was conducted at the Family Medicine department, Babcock University Teaching Hospital, located within Babcock University, Ilishan-Remo, Ogun State, Nigeria. Babcock University is a Seventh - day Adventist institution of higher learning attended by students from all geo- political zones in Nigeria.

At the beginning of the 2014/2015 session, about 3000 students presented to the Family Medicine Department domiciled at the General outpatient Department for pre- admission medical screening. A written informed consent form was signed and questionnaire was administered to all students present.

The questionnaire was designed to elicit bio data, anthropometric indices, personal and family medical history, lifestyle habit, and laboratory parameters such as fasting lipid profile, fasting and random blood sugar, two hour post-prandral, HbA1c, Hepatitis B surface antigen and Hepatitis C virus status.

Blood pressure readings were taken in one session, with a minimum of two readings per participant. Prior to the reading, participants were instructed to sit quietly for at least five minutes. Similar methods have been used in other studies. 1,8-10

Participants were asked to remain seated and quiet during the process of blood pressure measurements using mercury sphygmomanometer. A proper-size cuff was placed, covering two-third of the bare left upper arm 2cm above the cubical fossa.

The arm was positioned at heart level and supported on a table. The patient's back was supported and both feet were on the floor. The cuff bladder was inflated 30mmhg above the point of disappearance of the palpated radial pulse. The first reading was taken on first contact by the nurses. A second reading was taken by the physician and any recording of raised blood pressure was rechecked by the physician and that was taken as standard. 27

The systolic blood pressure (SBP) was determined by the onset of the “tapping” Korotkoff sound (K1) while the diastolic blood pressure (DBP) was determined by the fifth Korotkoff sound (K5). 1

High blood pressure was defined based on Joint National Committee VII (JNC VII) which categorized hypertension as normal, pre-hypertension and hypertension as shown in Table 1 below. 26

JNC VII was found comparable to and parallels the staging of hypertension as determined by the percentile based normogram. 21

Table 1: Classification of hypertension

<table>
<thead>
<tr>
<th>CLASSIFICATION</th>
<th>SBP (mmhg)</th>
<th>DBP (mmhg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORMAL</td>
<td>&lt;120</td>
<td>&lt;80</td>
</tr>
<tr>
<td>PRE-HYPERTENSION</td>
<td>120-139</td>
<td>80-89</td>
</tr>
<tr>
<td>STAGE 1 – Hypertension</td>
<td>140-159</td>
<td>90-99</td>
</tr>
<tr>
<td>STAGE 2 – hypertension</td>
<td>≥160</td>
<td>≥100</td>
</tr>
</tbody>
</table>

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A total of 1499 questionnaires were retrieved from the students. The data of all participants aged 10 – 19 years (n=1314) were extracted, out of which 952 had complete entry and included in the current report. Statistical analysis was done using the SPSS version 17. Parameters such as mean and standard deviation were calculated. Chi square test was used to test significance of association between hypertension and cardiovascular risk factors. A p-value of < 0.05 was considered significant.

Results

The current sample of 952 adolescent students consisted of 339 males and 613 females, giving a male to female ratio of 1:1.8. Participants had a mean age of 16.6± 1.03 years.

The mean SBP / DBP among male students were 123.4±11.6 / 67.3±9.6 mmHg, while the mean SBP/ DBP among female students was 115.6±10.9 / 67.6±8.9mmHg.

The prevalence of hypertension was 6.4% (61 of the 952 students). The male adolescents had higher prevalence of hypertension (11.2%) compared with the females (3.8%).

Types of hypertension among the participants

The type of high blood pressure distribution is as shown in figure 1. The systolic high blood pressure had the highest prevalence of 33 (54.10%), followed by diastolic high blood pressure, 19 (31.15%), and then combined systolic and diastolic high blood pressure, 9(14.75%).

Prevalence of Hypertension by Age

The prevalence of hypertension by age highlighted in Table 2 below shows that hypertension was highest among students aged 18 years (10.7%).

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Number of students</th>
<th>Number with hypertension</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>4</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>15</td>
<td>88</td>
<td>4</td>
<td>4.6%</td>
</tr>
<tr>
<td>16</td>
<td>403</td>
<td>22</td>
<td>5.5%</td>
</tr>
<tr>
<td>17</td>
<td>279</td>
<td>19</td>
<td>6.8%</td>
</tr>
<tr>
<td>18</td>
<td>121</td>
<td>13</td>
<td>10.7%</td>
</tr>
<tr>
<td>19</td>
<td>57</td>
<td>3</td>
<td>5.3%</td>
</tr>
<tr>
<td>Total</td>
<td>952</td>
<td>61</td>
<td>6.4%</td>
</tr>
</tbody>
</table>

Table 2: Prevalence of hypertension according to age
Association between Hypertension and Cardiovascular Risk Factors

Table 3 provides information on the association between identified risk factors and hypertension. It can be seen that positive family history of hypertension showed no statistically significant association to hypertension, which is at variance to the others as shown below.

This study further revealed that those who were aware that they were hypertensive before this study was only 13.3% of adolescent students diagnosed with hypertension while 86.7% of adolescent students with hypertension were unaware they had high blood pressure.

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>No Hypertension</th>
<th>Hypertension Present</th>
<th>Total</th>
<th>X^2</th>
<th>Df</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>301 (88.8%)</td>
<td>38 (11.2%)</td>
<td>339 (100%)</td>
<td>20.243</td>
<td>1</td>
<td>0.001*</td>
</tr>
<tr>
<td>Female</td>
<td>590 (96.2%)</td>
<td>23 (3.8%)</td>
<td>613 (100%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overweight/Obesity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>699 (94.5%)</td>
<td>41 (5.1%)</td>
<td>740 (100%)</td>
<td>4.242</td>
<td>1</td>
<td>0.039*</td>
</tr>
<tr>
<td>Yes</td>
<td>191 (90.1%)</td>
<td>20 (9.5%)</td>
<td>211 (100%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of alcohol intake</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>68 (85.0%)</td>
<td>12 (15.0%)</td>
<td>80 (100%)</td>
<td>11.107</td>
<td>1</td>
<td>0.001*</td>
</tr>
<tr>
<td>No</td>
<td>821 (94.5%)</td>
<td>48 (5.5%)</td>
<td>869 (100%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of smoking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>6 (66.7%)</td>
<td>3 (33.3%)</td>
<td>9 (100%)</td>
<td>10.904</td>
<td>1</td>
<td>0.016*</td>
</tr>
<tr>
<td>No</td>
<td>880 (93.8%)</td>
<td>55 (6.2%)</td>
<td>938 (100%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of diabetes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>174 (87.4%)</td>
<td>25 (12.6%)</td>
<td>199 (100%)</td>
<td>15.947</td>
<td>1</td>
<td>0.001*</td>
</tr>
<tr>
<td>No</td>
<td>702 (95.3%)</td>
<td>35 (4.7%)</td>
<td>737 (100%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family history of hypertension</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4 (66.7%)</td>
<td>2 (33.3%)</td>
<td>6 (100%)</td>
<td>7.149</td>
<td>1</td>
<td>0.053</td>
</tr>
<tr>
<td>No</td>
<td>873 (93.7%)</td>
<td>59 (6.3%)</td>
<td>932 (100%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion

The prevalence of hypertension among the participants was 6.4%. This is comparable to a study done in Mysore, India among adolescents which had similar prevalence of 6.1%.

Other studies have also documented prevalence ranging from 2-5%. Higher prevalence values noted may come from disparity in region and population characteristics including age and sex.

There was a preponderance of systolic hypertension in the current study. This was similarly reported by Sunder (16.3%) and other authors. Systolic hypertension in this age group is known to track into adulthood, thus making detection of blood pressure pattern important during childhood and adolescence.

Among the students who had a consistently elevated blood pressure, a trend was apparent which suggested that hypertension appeared to be increasing with age, peaking at 18yrs. There was a drop at age 19yrs, which could be due to the smaller proportion of participants with this age. Similar findings have been previously documented by other authors.

The increase in the prevalence of high blood pressure with age may be due to hormonal changes related to pubertal growth spurt as reported by Bugaje et al.

Furthermore, a look at the risk factors associated with hypertension among the adolescents studied here identified a significant association of male gender (p=0.001), obesity/overweight (p=0.039), alcohol (p=0.001), smoking (p=0.016) and high blood sugar (p=0.001). However family history of hypertension was not significantly associated with hypertension (p value =0.053)

Several studies conducted in Nigeria and elsewhere reported higher rates of high blood pressure in males compared to females during adolescence and early adulthood.

However, one study showed no gender disparity while Ujunwa et al. reported a female preponderance. Raised levels of blood pressure in males compared to females are explained on the basis of lack of endogenous oestrogen. Evidence suggests that estrogen may modulate vascular endothelial function, causing vasodilatation.

Obesity and overweight were statistically significantly associated with hypertension. Previous studies demonstrated that blood pressure is associated with raised Body Mass Index (BMI).

In a study that specifically correlated obesity with hypertension in adolescents (the study did not distinguish between overweight and obese subjects), the authors demonstrated 2- and 3-fold increases in point hypertension in overweight/obese males and females, respectively.

Obesity is associated with increased arterial stiffness and various hemodynamic changes that may contribute to hypertension. It is a well documented finding that there is a familial tendency for hypertension.

However, this association was not observed in the current study. This may be as a result of low reporting or lack of awareness by the participants. Alcohol and smoking were significantly associated with the presence of hypertension in the study group. However, similar significance was not found in a few studies done in India, though it is strongly associated with adult hypertension.

There was also significant association between diabetes and hypertension. Diabetes is an important risk factor for atherosclerosis and its complications, including heart attacks and strokes.

In consonance with previous reports, the majority (86%) of the participants were not aware that they had hypertension.

Vanhecke et al., among others, demonstrated that adolescents lack knowledge regarding the risk of cardiovascular disease and similar observations were made in the current study. Grad et al. reported that only the children who had had their blood pressure previously examined displayed good knowledge about hypertension.

One of the limitations of the current study is the lack of follow-up measurements of blood pressure. Secondly, eliciting family history of hypertension by self-report alone has a low sensitivity.

Also, the accuracy of self reported indices like smoking or alcohol could not be verified. This study is further limited in demonstrating causality between risk factors and hypertension. Further studies should be conducted to determine the incidence of hypertension in this study group in those who are not hypertensive but have other cardiovascular risk factors. The factors that may be necessary to assess their knowledge of hypertension will be useful in designing preventive strategies in an adolescent population, in further studies.

Conclusion

The prevalence of hypertension among teenagers in the current study is 6.4%, a finding consistent with previous research on adolescent hypertension. The male gender plays a risk factor for the development of hypertension in adolescents.

Furthermore, all the cardiovascular risk factors assessed in this study, except for a positive family history of hypertension were associated with hypertension.

These findings reflect a changing trend and the need to look out for cardiovascular disease even among adolescents. There is need for awareness campaigns in this regard, targeting the adolescent population.

This should be aimed at lifestyle modifications and regular screening of adolescents through effective school health programs.
Declaration of Interest

The authors declare no competing interest.

Acknowledgement

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References

23. Belsha CW, Wells TG, McNiece KL, Seib


