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Prevalence of Hypertension and Associated Risk Factors among Urban School Adolescents in Lady Bhore Catchment Area of Bhopal City

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ABSTRACT

Introduction: Hypertension is a major public health problem worldwide and is associated with high mortality and morbidity. With globalization bringing more lifestyle modifications, adolescents are now exposed to multiple risk factors which makes them highly prone towards hypertension at a younger age.

Objectives: 1.To find out the prevalence of hypertension amongst school going children in the age group 10-18 years. 2. To find out the risk factors for adolescent hypertension.

Materials and Methods: A cross-sectional study was done among 404 school adolescents in Bhopal, data was collected by predesigned questionnaire and anthropometric measurement was done. Analysis was done using MS Excel and Epi- info 7.

Results: A total of 404 students were included in the study, 242 males and 162 females. The mean age was 14.54 years. Prevalence of hypertension among adolescents was found to be 15.3 % (14.04% among boys and 17.3 % among girls) and the prevalence of pre hypertension was 19.8% (19.0% of boys and 20.9% of girls were pre hypertensive).

Conclusion: The overall prevalence of hypertension among adolescents (10-18 years) was found to be 15.3%. Gender, obesity, positive smoking status and lack of physical activity were identified as risk factors for hypertension.

Keywords: Hypertension, Adolescent, Bhopal, Risk-factor

INTRODUCTION

Hypertension is a major public health problem all over the world and is one of the most important risk factors for coronary artery disease and cerebrovascular disease. Around 1 billion of the adult world population was found to have hypertension in the year 2000 and this is expected to increase to 1.56 billion by 2025.[1]

The increasing rate of cardiovascular diseases (CVD) has become an alarming health problem across the globe.[2]The Global Burden of Diseases study has reported that by the year 2025, CVD would be the major cause of death all over the world including the developing countries.[3]According to World Health Report 2002, CVD will be the largest cause of death and disability in India by 2020.[4] South Asians have a higher prevalence of coronary artery disease as compared to other ethnic groups.[5]Currently Indians experience CVD deaths at least a decade earlier than their counterparts in developed countries. Whereas the rates of coronary artery disease have declined by 60% in the US, the rates have increased by 300% in India over the past 30 years. The Global Burden of Disease study estimates that 52% of CVD deaths occur below the age of 70 years in India as compared to 23% in developed countries.[6]Hypertension accounted for 7% of disability adjusted life years (DALYs) in 2010.[7]

Though hypertension is a problem of adult age, but its etiologic process begins in childhood. Evidences accumulated globally have documented the prevalence of childhood hypertension 1-2% in the developed countries and 5-10% in the developing countries.[8] The prevalence of adolescent hypertension in various Indian studies ranges from 0.96% to 11.4%.[9]

Adolescence is an important developmental stage in the life span of an individual as it is a transition period to adulthood. During adolescence teenagers start making individual choices and develop personal life styles. With globalization bringing more lifestyle modifications, adolescents are exposed to multiple risk factors including obesity.[10] Unfortunately many of the lifestyle choices adopted by adolescents are a real threat to their health and well being like cigarette smoking and low levels of physical activity predisposing them to obesity, hypertension and dyslipidemia.[2] This may be worsened by the add-on effect of family history of premature coronary artery disease and academic stress.[2]Most of the behaviors and risk factors are preventable or modifiable if appropriate lifestyle modification is applied and thus early adolescence is the appropriate time for intervention where the lifestyle changes can be easily inculcated.

Also the atherosclerotic processes are initiated early in childhood and are modified over the life course by both genetic and environmental interactions and can be curbed early during adolescence by appropriate lifestyle changes.[11]As the symptoms of childhood hypertension are largely nonspecific, most children with essential hypertension are likely to be asymptomatic and may hence go unnoticed.[12] Thus, identification and prevention of risk factors for CVD among children and adolescents may prove to be the most cost effective way of prevention of premature CVD in India. The data on prevalence of pre hypertension and hypertension in adolescents is scanty in India [13-17] and thus this study was conducted with an aim to identify the prevalence and the factors determining the risk of hypertension among adolescents.

AIMS AND OBJECTIVES

The study was conducted to find out the prevalence of hypertension amongst school going children in the age group 10-18 years; and also to find out the risk factors for adolescent hypertension.

MATERIALS AND METHODS

A prospective cross-sectional study was carried out over a period of three months from September 2015 to November 2015, among adolescents studying in selected higher secondary schools of Bhopal district in ward no.8, which comes under Lady Bhore Urban Health Training Centre catchment area and is the field practice area of Department of Community Medicine, Gandhi Medical College, Bhopal. Initially a list of higher secondary schools in the study area was prepared. All the students admitted in 6th to 12th standards during the academic year 2015-2016 in these schools in the study area constituted the sampling frame. Considering the lowest prevalence of hypertension of 0.6% as reported by Geethadevi et al.[18] alpha error of 5% and 1% absolute allowable error, the sample size calculated was 386 which was rounded to 400. We randomly selected three schools from ward no. 8 of Bhopal district (1 Govt. school and 2 private schools). From the selected schools one section was randomly selected from each of the classes from 6th to 12th standards. All the students in the selected section those who were present on the day of study and willing to participate were included which constituted a total of 404 students. Those children who suffered from any chronic illness were excluded from the study.

The study was carried out after taking permission from The Head of the Department of Community Medicine, GMC, Bhopal and after obtaining ethical clearance from Institutional Ethical Committee. Permission from school authorities was also sought after explaining the objectives as well as the method of study and they were also told that it included no invasive procedures. Assent was obtained from the minor students and consent from those who were 18 years.

A pre-designed questionnaire was used for data collection which included respondents' sociodemographic details, family history of hypertension and risk behaviors related to smoking, junk food consumption and physical activity.

Height, weight and blood pressure recording of all 404 students were done. Height was measured to the nearest centimeter with the subject standing in an erect position against a wall and with the head positioned and hence the top of external auditory meatus was in level with the inferior margin of the bony orbit. Weight was measured to the nearest 500 gm with the subject standing motionless on a digital weighing machine. Blood pressure was recorded in sitting position in right arm (for consistency) by auscultatory method using a mercury sphygmomanometer with appropriate sized cuff covering about 2/3 of the upper arm completely. SBP and DBP was recorded by following AHA (American Heart Association) guidelines. Measurements were taken after seating the subjects at rest for five minutes. Blood pressure was measured three times, with an interval of 5 minutes for each

individual. Average of all three readings was taken as final observation.

Pre hypertension was defined as average Systolic Blood Pressure (SBP) or Diastolic Blood Pressure (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 on at least three separate occasions.[19]

Age adjusted Body Mass Index (BMI) was found out.BMI lesser than 5th percentile was considered underweight. BMI ranging from 5th to less than85th percentile was considered normal. BMI from 85th to less than 95th percentile was considered overweight. BMI greater than 95th percentile were taken as obese.[20]

Data were entered in MS Excel 2007 and statistical analysis was carried out using Epi-info 7.1. Proportions and percentages were used to summarize categorical variables. Chi-square test was used to find out association between blood pressure and selected socio demographic and behavioral variables. A P value ≤0.05 was considered as statistically significant.

RESULTS

A total of 404 students were included in the study of which 242 (59.90%) were males and 162 (40.10%) were females. The mean age was 14.54years (Table 1). Overall the mean SBP was 119.7mm of Hg and mean DBP was 75.5mm of Hg. Among males the mean SBP was 121.59 mm of Hg which was higher than females (117.01mm of Hg). The mean DBP was also higher for males (76.53mm of Hg) than females (74.21 mm of Hg). In the present study, the prevalence of hypertension among adolescents was found to be 15.3 % (14.04% among boys and 17.3 % among girls). However, the prevalence of pre hypertension was 19.8% (19.0% of boys and 20.9% of girls were pre hypertensive) (Table 2).

Table 1: Age and sex distribution of study subjects

Age (years)	Male (n=242)(%)	Female (n=162)(%)	Total (n=404)(%)
10	2 (0.83)	4 (2.47)	6 (1.49)
11	20 (8.26)	9 (5.56)	29 (7.18)
12	20 (8.26)	25 (15.43)	45 (11.13)
13	33 (13.64)	26 (16.05)	59 (14.6)
14	17 (7.02)	12 (7.41)	29 (7.18)
15	56 (23.14)	46 (28.39)	102 (25.24)
16	30 (12.39)	19 (11.73)	49 (12.13)
17	45 (18.59)	14 (8.64)	59 (14.6)
18	19 (7.85)	7 (4.32)	26 (6.44)

The prevalence of children with normal BMI was 57.9%.30.6% children were underweight with respect to their age, height and gender. 5.9% children were classified as overweight and 5.4% were found to be obese (Table 3). Mean BMI for males (18.31) and females (18.01) was almost same.

Table 4 shows distribution of blood pressure according to different variables.With regard to gender, 28.1% of males and 45.7% of females were either pre-hypertensive or hypertensive and the difference was statistically significant (P <0.05). Regarding nutritional status 50% of obese/overweight subjects were pre hypertensive/hypertensive whereas only 33.2% normal subjects were hypertensive, the difference was found statistically significant (P <0.05). With regard to smoking status, 12.5% of study subjects who smoked were found to be pre hypertensive/ hypertensive and this was found to be statistically significant (P<0.05). Low physical activity evolved as a significant risk factor in this study (P<0.05). Out of those who exercised <30 min/day, 40.4% were found to be pre hypertensive/ hypertensive while among those who exercised >30 min/day, only 31% were pre hypertensive or hypertensive. Socio-economic status, family history of hypertension and frequency of consumption of junk food did not show statistically significant association with blood pressure.

Table 2: Prevalence of pre hypertension and hypertension among study subjects

Classification	Male (n=242)	Female (n=162)	Total (n=404)
Normal (SBP & DBP <90th percentile)	162 (66.9)	100 (61.7)	262 (64.8)
Pre hypertension (SBP or DBP ≥90th percentile but <95th percentile	46 (19)	34 (20.9)	80 (19.8)
Hypertension (SBP &/or DBP ≥95th percentile	34 (14.04)	28 (17.3)	62 (15.3)

Figure in parenthesisi indicate percentage

Table 3: Body Mass Index for age

Body mass index for age	Number (N=404) (%)
Underweight (BMI for age < 5th percentile)	124 (30.6)
Normal weight (BMI for age 5th to <85th percentile)	234 (57.9)
Overweight (BMI for age 85th to <95th percentile)	24 (5.9)
Obese (BMI for age >95th percentile)	22 (5.4)

Table 4: Relation between levels of blood pressure and different variables among study subjects

Variables	Normal (%)	Pre-HTN + HTN (%)	Total	Significance
Gender				
Male	174(71.9)	68(28.1)	242	0.0003*
Female	88(54.3)	74(45.7)	162	
Nutritional status				
Normal+ Underweight	239(66.8)	119(33.2)	358	0.025*
Overweight+ Obese	23(50.0)	23(50.0)	46	
Smoking status				
Yes	14(87.5)	2(12.5)	16	0.04*
No	248(63.9)	140(36.1)	388	
Physical activity				
<30 min/day	106(59.6)	72(40.4)	178	0.047*
>30 min/day	156(69.0)	70(31.0)	226	
Family H/O HTN				
No	221(64.1)	124(35.9)	345	0.42
Yes	41(69.5)	18(30.5)	59	
Socio-economic status				
High	199(66.8)	99(33.2)	298	0.17
Low	63(59.4)	43(40.6)	106	
Frequency of eating junk food				
Up to 3 times a week	192(64.9)	104(35.1)	296	0.99
>3 times a week	70(64.8)	38(35.2)	108	

*statistically significant

DISCUSSION

Adolescent Hypertension is an emerging health problem in India. It is important to determine the prevalence of hypertension and pre hypertension in children as early identification leads to early interventions. In the present study, 15.3% school children had hypertension and an additional 19.8% had pre hypertension, which is an alarming situation. The prevalence of hypertension in various other Indian studies ranges from 0.46% to 11.9%.[18,19,21,22] The prevalence of blood pressure in this study is higher than those reported in other Indian studies such as Mohan et al[15], Sharma, et al[23]. A higher prevalence of hypertension in this study can be probably due to influential factors like genetic inheritance (as consanguinity is common in this part of Bhopal), dietary habits and lifestyle factors.

In the present study prevalence was higher among females (17.3 % among females and 14.04% among male). Several studies reported gender difference in blood pressure. Higher prevalence among females could be due to excessive stress taken by females as compared to males. Gang hu et al[24] also reported higher female prevalence, whereas prevalence was higher among males in the study carried out by Sunder et al[25], while no gender difference was seen in study done by Gupta et al.[26]

Regarding nutritional status 50% of obese/ overweight subjects were pre hypertensive/ hypertensive whereas only 33.2% normal subjects were hypertensive, the difference was found statistically significant (P <0.05). Sorof et al[27] also found higher prevalence of hypertension in obese children as compared to non-obese (33% *v/s* 11%).

In present study hypertension was more prevalent among smokers. Prevalence was higher among those who did exercise for <30 min/day, as compared to those who exercised for >30 min/day and the difference was statistically significant (p<0.05).

Current study could not find the any significant association between family histry of hypertension whereas study by M. Verma et al shows positive association with family history.[28] Significant association could not be found with socioeconomic status and frequency of eating junk food with hypertension but study by Kaczmareket al has mentioned about association in various dimensions of socioeconomic status.[29]

CONCLUSION

The prevalence of hypertension (15.3%) as well as pre hypertension (19.8%) among the adolescents was alarmingly high and thus necessitates urgent intervention, primordial prevention in the form of lifestyle modification. Gender, obesity, smoking and lack of physical activity were found to be the major determinants of adolescent hypertension. Awareness about hypertension and healthy lifestyle was very low among the study participants.

RECOMMENDATIONS

There is a need to create awareness among school students particularly in adolescent age group regarding hypertension and its complications and thus periodic educational programs must be conducted by the school authorities to motivate students to adopt healthy lifestyle and food habits.

Blood pressure recording should be a part of school health program and therefore, school authorities should organize screening programs in their respective schools to identify and treat hypertension early to prevent its late complications.

LIMITATIONS

It was school based study and due to time constraints only a selected group of students from schools in a single ward were chosen for study. Repeated blood pressure recordings on different occasions were not done, again due to time constraint. All variables were assessed based on the responses given verbally by the students.

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