



Original Research Article

Prevalence of Anthropometric and Blood Pressure Related Health Issues in School Going Children from Surat City, India

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Received: 10/09/2013

Revised: 08/10/2013

Accepted: 09/10/2013

ABSTRACT

Background: Since physical inactivity is in the rise among young children in the wake of increase in use of technology for entertainment rather than activity, childhood obesity and its secondary effects on blood pressure have been the topics of interest among health professionals. This study was conducted to determine the prevalence of overweight and obesity, prehypertension and hypertension among school going children from Surat. It also aimed at finding the correlation between these parameters.

Methods: A total of 1143 students in the age group of 8-15 years from three schools were selected for the study. Height, weight and blood pressure measurements were taken. BMI was calculated from height and weight recorded. Blood pressure was classified as prehypertension and hypertension based on systolic and diastolic blood pressure percentiles matched for age, gender and height.

Results: Prevalence of overweight, obesity and prehypertension, hypertension was 11.4% and 17.7% respectively. Girls outweighed boys in anthropometric and blood pressure measurements. 34.2% students were underweight out of which 14.9% were females and 19.3% were males.

Keywords: Obesity, Overweight, Prehypertension, Hypertension, School going children.

INTRODUCTION

Obesity is considered as an independent risk factor for various chronic diseases including prehypertension and hypertension. Hypertension (HT) is the fourth commonly contributing factor for premature death in well developed countries and seventh in still developing countries. ^[1] It has evolved as one of the prime causes of increasing burden of chronic disease. ^[2] Childhood obesity increases the risk of morbidity irrespective of its persistent into

adulthood. ^[3] Longitudinal data obtained from the Framingham study have indicated that Systolic Blood Pressure (SBP) values between 120/139 mm Hg are associated with a more than two fold increase in relative risk of cardiovascular disease as compared with those with normal SBP levels below 120 mm Hg. ^[4] The Associated Chambers of Commerce and Industry of India (Assocham) and the Pricewaterhouse Coopers (PWC) in a joint report said 65 million people were affected by

hypertension in 2008 and that in the years ahead it was likely to see a quantum leap of over 135 million to touch a figure of 200 million by 2015. A direct relationship between elevations in blood pressure (BP) and increasing age of individuals in the population is noted. This age related rise in BP is primarily considered responsible for an increase in both incidence and prevalence of HT. [5] National guidelines from the British Hypertension Society recommend that people in Britain aged between 16 and 18 years should be screened at least once every five years. [6]

The primary objective of this study was to determine the prevalence of overweight and obesity, prehypertension and hypertension among young school going children from Surat city. It also aimed at assessing the degree to which obesity or overweight is associated with prehypertension or hypertension. This data and its analysis can be of significance in providing further scope for considering obesity as a potential factor of contribution to the increasing blood pressure issues.

METHODS

This cross sectional study was conducted from March 2012 to March 2013. Data was collected from three schools in urban Surat which were selected by purposive sampling. Study population included 1143 young children (676 girls and 467 boys) in the age group of 8-15 years. Prior written consent from concerned authority of Surat district to conduct this study in any of the schools was obtained after clear explanation of the objectives of the study. The number of students in respective classes with divisions and their date of birth were obtained from school records. Height was measured using standard procedures of the participants standing straight with arms hanging by the sides, without footwear. Weight was

measured with school uniform, without footwear. Body Mass Index (BMI) was calculated from the measured height and weight. BP measurements were recorded using Omron HEM 711 DLX Automatic Blood Pressure instrument (Accuracy, BP: ± 4 mm Hg, Pulse: ± 5 , validated by Association for the Advancement of Medical Instrumentation, AAMI and European Society of Hypertension). Both SBP and Diastolic BP (DBP) were measured along with pulse rate (PR). Participants were made comfortable and relaxed before the testing procedure. BP was measured in right arm, in sitting posture with arm elevated to the level of heart. Three readings were recorded with a rest interval of 1 minute and the average of these readings was used for analysis. All investigators were trained professionals in the procedures of measurement which minimized possible variations. To avoid diurnal variations in BP, all measurements were taken before 12 pm.

Data analysis was done by computing percentiles of height, SBP, DBP and BMI. BMI-for-age charts (Table. 1) were used to assess weight in relation to stature for children as recommended by Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (2005).

Table. 1: BMI categories based on percentile adjusted to age and weight.

Percentile Range	BMI Category
Less than 5th percentile	Underweight
5th percentile to 85th percentile	Normal or healthy
85th percentile to 95th percentile	Overweight
Equal to or higher than 95th percentile	Obese

Prevalence of prehypertension and hypertension were calculated according to the Fourth Report of National Institute of Health (NIS, US) on the Diagnosis, Evaluation and Treatment of High Blood Pressure in Children and Adolescents. [7] The child's measured SBP and DBP were

checked with numbers provided in the gender based clinical growth chart (for boys or girls) according to the child's age and height percentile. If the SBP and or DBP value was below the 90th percentile, the child was termed normotensive. BP between the 90th and 95th percentile was prehypertension and above 95th percentile was hypertension.

Spearman correlation coefficient was used to determine the correlations between age, height, weight, average SBP, average DBP, PR and BMI. All statistical analyses were performed using SPSS v 20.0

RESULTS

Out of 1143 children, there were 676 girls and 467 boys and the percentage distribution is shown in Fig 1.

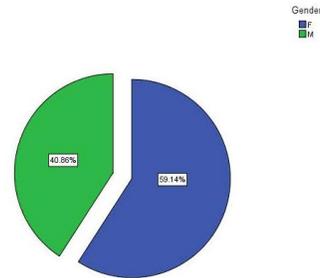


Figure. 1: Gender wise distribution of children

Overall prevalence of obesity in our study (Table.2) was 3.6% with 5.3% girls and 1.1% boys in this category. Under the overweight category, we found a total prevalence of 7.8% with 9.8% girls and 4.9% boys. There was high prevalence of underweight children (34.2%), with 25.1% of girls and 47.3% of boys observed under this category, from the results of our study.

Table. 2: Prevalence (%) of underweight, overweight and obesity among girls and boys.

Gender	BMI Percentile			
	<5th	5th	>85th	>95th
Girls (n=676)	25.1	59.8	9.8	5.3
Boys (n=467)	47.3	46.7	4.9	1.1
Total (n=1143)	34.2	54.4	7.8	3.6

Table. 3: Prevalence (%) of Prehypertension and Hypertension among girls and boys.

Gender	SBP Percentile			DBP Percentile		
	HT	PHT	Total	HT	PHT	Total
Girls (n=676)	9.6	11.1	20.7	1.8	4.9	6.7
Boys (n=467)	6.4	7.1	13.5	0.9	2.8	3.7
Total (n=1143)	8.3	9.4	17.7	1.4	4.0	5.4

Table. 4: Cross tabulation of BMI percentile and SBP percentile.

SBP Percentile	BMI Percentile			
	<5th	5th	>85th	>95th
HT (n=95)	15.8	58.9	12.6	12.6
PHT (n=108)	13.0	60.2	18.5	8.3

Table. 5. Spearman (rho) Correlation Coefficients.

	Age	SBP	DBP	PR	BMI
Age		.546**	.385**	-.274**	.471**
SBP	.546**		.729**	-.001	.516**
DBP	.385**	.729**		.100**	.382**
PR	-.274**	-.001	.100**		-.119**
BMI	.471**	.516**	.382**	-.119**	

**Correlation is significant at the 0.01 level (2-tailed).

In our present study, total prevalence of systolic pre hypertension was 9.4% and that of systolic hypertension was 8.3%. The prevalence dropped comparatively in

diastolic percentiles with 4% pre hypertensives and 1.4% hypertensives. It was also observed that the prevalence of pre hypertension and hypertension was higher in

girls (11.1% and 9.6%) than in boys (7.1% and 6.4%) respectively in both systolic and diastolic percentiles (Table. 3).

Significantly high prevalence of hypertension was observed (Table. 4) in underweight children (15.8%) than in overweight and obese children (12.6% each). However, it was observed that prehypertension was higher in >85th percentile of BMI (18.5%), followed by <5th percentile (13%) than in children under the >95th percentile (8.3%).

With Spearman (rho) correlation coefficient, positive correlations between all parameters were observed, except between age and PR, BMI and PR which showed negative correlation. Correlation analysis between SBP and PR showed statistical non significance as can be observed from Table. 5. Significant correlation existed between age and both SBP, DBP ($r=.546$, and $.385$, $p<0.01$) showing increase in BP with age. Strong positive correlation between age and BMI ($r=.471$, $p<0.01$) was also noticed. SBP was found to be positively correlated with DBP ($r=.729$, $p<0.01$) and BMI ($r=.516$, $p<0.01$). There was a positive correlation between BMI and DBP ($r=.382$, $p<0.01$). PR was not found to be significantly correlated to SBP while it had a positive correlation with DBP. Age and BMI were found to have significant negative correlations with PR ($r=-.274$ and $.119$, $p<0.01$ respectively).

DISCUSSION

Prevalence of overweight, obesity, pre hypertension and hypertension among young children countrywide is difficult to estimate as there are vast regional differences. Various studies in the past have approximated it with varying percentages. [8-13] This study focused on determining the prevalence of overweight, obesity and hypertension, prehypertension among young school children from Surat.

Prevalence of underweight was found higher in boys (47.3%) than girls (25.1%) and the combined overweight and obesity percentage was high in girls (15.1%) than boys (6%). Shah C et al, [14] found higher percentage of girls in underweight category and combined overweight and obesity also higher in both genders, in their study conducted in Bhavnagar. The prevalence of underweight was more than overweight and obesity in our study, which is in accordance to results of their study. However, overall prevalence of underweight (34.2%) in our study was less than the above study (70.37%), and a study conducted in Mumbai [15] (40.2%). It was higher than studies conducted in Punjab [16] and Karnataka [17] (1.5% and 1.1% in girls and boys respectively).

In 1998, Thakore et al, [18] in their study found 2.3% prevalence of hypertension among children studying in primary schools in Surat which was found to be very low when compared to the results of the present study. Results of our study were also found to be in contrast to those by Veena et al [17] who found an overall prevalence of systolic hypertension to be 2% in females and 1.7% in male and 0.8% in both genders for diastolic hypertension.

In the present study, we found girls highly prevalent to hypertension (9.6% for SBP and 1.8% for DBP) and prehypertension (11.1% for SBP and 4.9% for DBP) than boys (6.4% hypertensive, 7.1% prehypertensive for SBP and 0.9% hypertensive, 2.8% prehypertensive for DBP) which was found to be against the findings of Chadha et al. [19] Our results of prevalence of hypertension being high in SBP than DBP percentiles were in contrast to that of Vivek et al [20] who concluded DBP percentiles being higher than SBP in their study. However, differences in outcome measures and mild variations in age groups of children included in the above

mentioned studies make direct comparisons impractical.

The correlations observed in the present study were stronger than those found by Vivek et al ^[20] and Sharma BK et al. ^[21]

CONCLUSION

While overweight and obesity were considered to be in the rise, the present study additionally found more percentage of school children in the underweight category which is a point of concern. Prehypertension had higher prevalence than hypertension in this age group among both genders which explains the need to include regular measurements of blood pressure at school levels which might bring into light, asymptomatic children who are potential candidates for hypertension in the coming years.

Since pre hypertensives are not candidates for drug therapy owing to their BP levels, and should be firmly and unambiguously advised to adopt healthy lifestyles, it is important to identify children at high risk of developing HT, so that these children, their parents and clinicians are alerted to this risk and encouraged to intervene and to prevent or delay the disease from progressing into potentially a global burden.

ACKNOWLEDGEMENTS

The Authors acknowledge the management of Sarvajani Medical Trust for their support in initiating and conducting this study. We also acknowledge all the district educational and school authorities and our participants for extending their cooperation and willingness to be a part of this study.

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How to cite this article: Saravanan M, Rangwala MT, Deepti S et. al. Prevalence of anthropometric and blood pressure related health issues in school going children from Surat city, India. Int J Health Sci Res. 2013;3(11):18-23.
