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Original Research Article

Prevalence of overweight, obesity and hypertension among school going children in District Kanpur, Uttar Pradesh, India: a longitudinal study

Pramod K. S. Yadav[1], Mukesh B. Yadav[2]*, Chetna Yadav[3]

[1]Department of Pediatrics, SMMH Government Medical College, Saharanpur, Uttar Pradesh, India
[2]Department of Pediatrics, Government Medical College, Banda, Uttar Pradesh, India
[3]Department of Obstetrics and Gynaecology, SMMH Government Medical College, Saharanpur, Uttar Pradesh, India

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***Correspondence:**
Dr. Mukesh B. Yadav,
E-mail: yadavmukeshb1@gmail.com

ABSTRACT

Background: India is undergoing a rapid epidemiological transition with increased urbanization and socio-economic development which has resulted in a dramatic change in lifestyle, consisting of physical inactivity, diet rich in fat, sugar and salt coupled with a high level of mental stress. Obesity is one of the most common diseases worldwide and the prevalence in school aged children appears to be increasing. Thus, the present study was planned to establish an association between body mass index (BMI) with hypertension among 10-16 years children.
Methods: Present longitudinal study was conducted on 350 children in private schools of District Kanpur and children 12-16yrs of age have included in the study. BMI for age charts was used to assess the obesity and blood pressure was measured by sphygmomanometer and Blood pressure values were compared to the values given by the update of 1987 task force report of the National high blood pressure Education Programme Co-ordinating Committee and children who were found prehypertensive or hypertensive were followed up after 4 weeks duration.
Results: In present study the prevalence of overweight and obesity was found 4%,2% respectively. Prevalence of Pre-hypertension and hypertension was found 1.14%, 2.57% respectively and pre-hypertension and hypertension were found more in overweight and obese participants.
Conclusions: Prevalence of pre-hypertension and hypertension is more among overweight and obese children. Overweight and obesity are not only risk factor for hypertension but also other diseases, so health education should regularly give about the obesity and its deleterious effects in later part of life.

Keywords: Hypertension, Kanpur, Obesity, Overweight, Pre-hypertension

INTRODUCTION

Developing countries like India is undergoing a rapid epidemiological transition with increased urbanization and socio-economic development which has resulted in a dramatic change in lifestyle, consisting of physical inactivity, diet rich in fat, sugar and salt coupled with a high level of mental stress. This has led to increased incidence of lifestyle diseases like hypertension, type 2 Diabetes Mellitus, dyslipidemia, obesity and ischemic heart diseases.[1] Obesity can be seen as the first wave of a defined cluster of non-communicable diseases called "New World Syndrome" creating an enormous socio-economic and public health burden in poorer countries.[2]

Obesity, overweight and hypertension in school children and adolescents are emerging as newer health problems in developing countries like India. The magnitude of

overweight ranges from 9 to 27.5% and obesity ranges from 1 to 12.9% among Indian children.[3-6] Overweight and obesity are increasingly prevalent nutritional disorder among children and adolescents in the world.[7] Presently in India also there is sharp rise in number of children and adolescents with obesity. Overweight children have a greater chance of becoming overweight adolescents and obese adults compared to children of normal weight.[8] The severity of obesity and age of onset affect the likelihood of persistence of obesity into adulthood and thus entrainment of obesity induced morbidities like pre-hypertension and hypertension.[9] Numerous health problems are associated with adolescent overweight including hypertension, respiratory disease, several orthopaedic disorders, diabetes mellitus and elevated serum lipid concentrations.[10] Obese children are also reported to have increased heart rate variability and blood pressure variability. Increased arterial blood pressure is a major risk factor for cardiovascular, cerebro-vascular and renal disease. Indeed, high blood pressure or hypertension may be considered as a major cause of morbidity and mortality in many populations. The insidious and steady history of hypertension in adults indicates that essential hypertension in adults is a result of process, that starts early in childhood and adolescent life, but probably goes unnoticed.[11]

So that preventive measures, early detection and modifying the risk factors can protect these children from developing complications and thereby reducing the morbidity and mortality. This study also forms a basic data which may help to design suitable school based programme of physical activity and nutritional education in reducing obesity and hypertension.

METHODS

Present study was conducted among the school going children between the age group of 10-16 years of age from May 2009-April 2010. 350 children of the age 10-16 years were included in the study. Sample size was calculated by using $4pq/L^2$ where prevalence of overweight and obesity was taken 16.9% at 5% of allowable error. List of private schools was obtained from the District education officer; the schools were selected by stratified random sampling method. Consent was taken from the head of the institutions. Age of the children was confirmed from the records of the school. A pre-designed and pre-structured questionnaire was administered to the subjects. Anthropometric data like, height measured with stadiometer and weight was measured with a digital weighing scale. BMI-for-age charts (recommended by Centres for Disease Control and Prevention (CDC) were used to find out the BMI. BP was taken by using standard mercury sphygmomanometer with the subject seated and the arm extended over the table at the level of heart. Three measurements were taken at an interval of 5 min each and mean of these readings were taken as average systolic blood pressure and average diastolic blood pressure. Blood pressure values were compared to the values given by the update of 1987 task force report of the National high blood pressure Education Programme Co-ordinating Committee. Children were classified into three groups as follows (as per guidelines of the above committee):

- BP <90th percentile-Normal (N) Blood pressure (compared to age, sex and height percentile in each age group)
- BP=90-95th percentile-Pre-hypertension (PHTN)
- BP >95th percentile-Hypertension (HTN).

In those children, whose systolic and or diastolic BP value was found more than 95th percentile for age, sex and height, two sets of BP reading were taken at an interval of 4 weeks. If systolic and or diastolic BP was found to be persistently more than 95th percentile for age, sex, and height then child was classified as hypertensive and informed the class teacher and head of the institute for further investigation.

Statistical analysis

Data was entered in Microsoft excel, analysed by using SPSS 15.0 and appropriate statistical tests were applied.

RESULTS

Present study was conducted among the school going children between the age group of 10-16 yrs of age. 350 children were participated in the study. Out of 350 children 40% (140) were female and 60% (210) were male. It was observed that 94% (329) of the participants were normal, 4% (14%) overweight, 2% (7) obese (Figure 1).

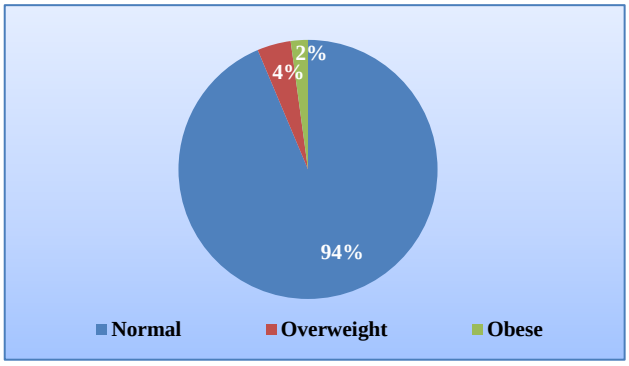

Figure 1: Distribution of participants according to BMI.

Figure 2 depicts that 93.57% (327) of female and 93.30% (326) of male participants were normal and 4.20% (14) female, 4.70% (16) male were overweight and 2.14% female and 2.30% of male were obese. Out of 140 female 93.5% (131) were normal, 4.2% (6) overweight and 2.14% (3) were found obese. Out of 210 female participants 93.3% (196 were normal, 4.7% (10) overweight and 2.3% (4) were obese.

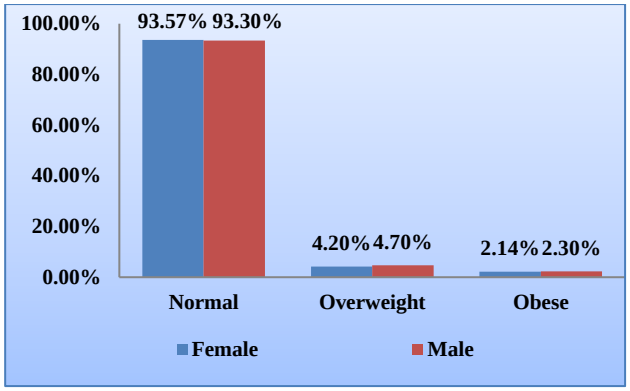

Figure 2: Distribution BMI according to sex.

Table 1 shows that out of 350 of participants 16(4.57%) participants were overweight and 7(2%) were obese. overweight and obese participants were more in male participants than female, but the difference was not significant.

Table 1: Distribution of participants according to BMI.

Sex	Normal	Overweight	Obese	Total
Female	131 (93.57%)	6 (4.2%)	3 (2.14%)	140 (100%)
Male	196 (93.3%)	10 (4.7%)	4 (2.3%)	210 (100%)
Total	327 (93.42%)	16 (4.57%)	7 (2%)	350 (100%)

Chi square value=0.066, p value=0.96

Table 2 predicts that total 4 (1.14%) of the participants had pre-hypertension and 9(2.57%) were hypertensive. Out of 4 pre-hypertensives, 3(2.14%) female and 1(0.47%) male participants were pre-hypertensive. The prevalence of hypertension was found 2.57%, of which 3.5% were female and 1.9% were male and this difference of pre-hypertension and hypertension were found statistically significant.

Table 2: Distribution of participants according to hypertension.

Sex	Normal	Pre-hypertensive	Hypertensive	Total
Female	132 (94.28%)	3 (2.14%)	5 (3.5%)	140 (100%)
Male	205 (97.61%)	1 (0.47%)	4 (1.9%)	210 (100%)
Total	337 (96.28%)	4 (1.14%)	9 (2.57%)	350 (100%)

Chi square value=0.21, p value<0.05

Table 3: Association of BMI with hypertension.

BMI	Normal	Pre hypertensive	Hypertensive	Total
Normal	323 (97.77%)	2 (0.61%)	2 (0.61%)	327
Overweight	13 (85.5%)	1 (6.25%)	2 (12.5%)	16
Obese	3 (42.85%)	1 (14.28%)	3 (42.85%)	7
Total	337 (96.28%)	4 (1.14%)	9 (2.57%)	350 (100%)

Chi square value=87.25, p value<0.001

Table 3 describes that 97.7% healthy children had normal blood pressure and 0.61% had pre-hypertension and hypertension respectively. 85.5% of overweight children were normotensive while 6.25% were pre-hypertensive and 12.5% of the overweight children were hypertensive. 42.5% of obese children were having normal blood pressure and 14.28% were pre-hypertensive and 42.5% were hypertensive and the difference was found to be significant.

DISCUSSION

In present study 94% of the participants were normal, of which 93.57% of female and 93.30% of male were normal. Prevalence of overweight and obesity was found 4%and 2% respectively of which 4.20% female, 4.70% male were overweight and 2.14% female and 2.30% of male were obese. Study conducted by Arora and Patel showed that the overall prevalence of overweight was 8.8% among children, 7.8% in boys, 10.2% in girls. While the overall prevalence of obesity was 2.9%, from that 2.7% were boys and 3.2% were girls.[12] Gamit SS et al reported prevalence of overweight 10.2% and obesity. 6%, in Surat city. The prevalence of overweight and obesity was 12.4% and 8.2% in boys whereas it was 7.2% and 2.7% in girls.[13]

The difference may be because of eating habits differences of the children of present study. Prevalence of hypertension in the present study was found to be more significant in overweight and obese children as compared to normal weight children both in urban and rural population. This relationship has been reported by other studies as well.[14-19] Studies from India have also shown similar findings.[14,22-24]

Elevated blood pressure at any age, in either sex is a contributor for all forms of cardiovascular disease.[14] The asymptomatic nature of hypertension in early phases of its onset during adolescence increases the chances of developing complications during adulthood. Prevalence of hypertension in the present study was found to be more significant in overweight and obese children as compared to healthy weight children. This relationship has been reported by other studies in India.[15,23]

Present study has some limitations as authors measured body mass index (BMI) for obesity and did not consider measurements like waist-hip ratio, skin-fold thickness which measures fat mass. As far as BP measurement is concerned, authors did not consider the salt intake by individual, diet, physical activity. These factors can affect the data. Early detection of obesity and hypertension is very crucial. Obesity and hypertension start in initial period of life. As blood pressure was measured in the field may cause anxiety and apprehension that might have affected a group of children. So, the intervention to prevent the related morbidities like stroke, Myocardial Infarction, respiratory disorders should be started in the childhood only.

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