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Research Article

Prevalence of obesity and overweight among school children of Pune city, Maharashtra, India: a cross sectional study

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ABSTRACT

Background: Obesity is associated with an increased risk of morbidity and mortality as well as reduced life expectancy. The last two decade of previous century have witnessed dramatic increase in health care cost due to obesity and related issues among children and adolescents. The objective of the study was to find out prevalence of obesity and overweight among school children.
Methods: The present cross sectional study was undertaken during July 2009 to April 2011 in randomly selected 4 schools of Pune city. Total 1281 children between the age group of 10 to 15 years were examined after taking written informed consent of their parents using pre-designed, pre-tested, semi-structured performa. Anthropometric measurements were taken and BMI were calculated. The prevalence of overweight and obesity were determined based on the IOTF (International Obesity Task Force) criteria. Thus collected data was analyzed using Microsoft Excel and Open- Epi Software. (Version 2.3)
Results: Out of 1281 children, 704 were from government schools and 577 were from private schools. Out of total children 54.09% were males. According to Modified Kuppuswamy Classification, all children of Private Schools belonged to Upper Class whereas it was so only in 27.41% of Government School children who belonged maximally to Upper Middle Class 378 (67.5%). Prevalence of obesity and overweight among children of government school was 2.98% and 8.23% respectively. Prevalence of obesity and overweight among children of private school was 8.83% and 12.13% respectively. Prevalence of both obesity and overweight was found to be maximum in 15 years age group both in Government schools and private schools. Overall prevalence of obesity and overweight was 5.62% and 9.99% respectively.
Conclusions: High prevalence of obesity and overweight in school children indicate an urgent need to increase awareness via education and motivation of all stakeholders. This will go a long way in preventing childhood obesity and thus ultimately stemming the rising tide of non-communicable diseases such as diabetes and cardio vascular disease in India.

Keywords: Prevalence, Obesity, Overweight, School children, BMI

INTRODUCTION

Obesity is associated with an increased risk of morbidity and mortality as well as reduced life expectancy. The last two decade of previous century have witnessed dramatic increase in health care cost due to obesity and related issues among children and adolescents.[1] Childhood obesity affects both developed and developing countries of all socio-economic groups, irrespective of age, sex or ethnicity. The prevalence of obesity is increasing worldwide in almost every country in all the age groups. The steep increase has prompted this development to be

called an epidemic and because it is worldwide, a pandemic.[2]

It has been estimated that worldwide over 22 million children under the age of 5 are obese, and one in 10 children is overweight.[3] Globally the prevalence of childhood obesity varies from over 30% in USA to less than 2% in Sub-Saharan Africa. Currently the prevalence of obese school children is 20% in UK and Australia, 15.8% in Saudi Arabia, 15.6% in Thailand, 10% in Japan and 7.8% in Iran.[4] In China, the prevalence of obesity among children aged 7-9 years increased from 1-2 percent in 1985 to 17 percent among girls and 25% among boys in 2000.[5] In addition, obesity prevalence varies across socio-economic strata. In developed countries, children of low socio-economic status are most affected than their affluent counterparts. The opposite is observed in developing countries: children of upper socio-economic strata are more likely than poor children to be obese.[6]

Indian data regarding current trends in childhood obesity are emerging. Available studies of Delhi and Chennai has shown the prevalence of 7.4% and 6.2% respectively.[7,8] A study conducted among adolescent school children in South Karnataka has shown the prevalence of overweight and obesity to be 9.9% and 4.8% respectively.[9] Aetiopathogenesis of childhood obesity is multifactorial. Interactions between genetic, neuroendocrine, metabolic, psychological, environmental and socio-cultural factors are clearly evident in childhood obesity.[10] There are numerous psychological, physical and economic consequences of obesity. Childhood obesity affects self-esteem and has negative consequences on the cognitive and social development. Conditions such as type 2 diabetes mellitus, hypertension and hypercholesterolemia, which were noted primarily in adults, are becoming more common among children with the increase in the prevalence of obesity. Childhood obesity itself is a predictor of adult obesity and of higher than expected adult morbidity and mortality. Due to difficulty in the treatment of obesity in adults and the many long-term adverse effects of childhood obesity, prevention of childhood obesity has now been recognized as a public health priority. With this background in mind, the present study was undertaken to know the prevalence of obesity in school children of Pune city.

METHODS

The present study was a cross sectional study undertaken in 4 schools, which were selected randomly from list of all schools in Pune city during July 2009 to April 2011. All children between the age group of 10 to 15 were included after written informed consent of their parents. To give equal representation to different type of socio demographic strata of society, two schools chosen were Government and two were Private. The sample size was calculated based on an estimated prevalence of obesity of 8% by pilot study, with 80% power, 95% confidence and 5% level of significance with an allowable error of 20% to obtain an age and gender-specific representative sample of children. 1150 school going children of age group 10 to 15 years was the calculated sample size of the study but since all the children, studying in class 5th to 10th, of the selected schools, belonging to the 10 to 15 year age group were included in the study population, the final sample size was 1281 children. These children were examined using pre-designed, pre-tested, semi-structured performa. Height was measured in centimetres (cm) using a stadiometer. Weight was measured in kilograms (Kg) using a standardized weighing machine. Body mass index (BMI) was calculated using the formula weight (Kg) divided by height in square meters. Waist circumference was measured in centimetres using a non-stretchable fiber measuring tape. The prevalence of overweight and obesity were determined based on the IOTF (International Obesity Task Force) criteria. Thus collected data was analysed using Microsoft Excel and Open- Epi Software (Version 2.3).

RESULTS

Table 1: Gender wise distribution of the children according to their types of school.

Type of School	Number of Males (%)	Number of Females (%)	Total (%)
Children in Government School	389 (55.25)	315 (44.74)	704 (100)
Children in Private School	304 (52.68)	273 (47.31)	577 (100)
Total	693 (54.09)	588 (45.90)	1281(100)

X^2value=0.843, D.F. =1, p=0.3585

Out of 1281 children, 704 were from government schools and 577 were from private schools. There were 55.25% males and 44.74% females in Government schools. Similarly, males formed 52.68% and females formed 47.31 % in Private schools. Overall, in the whole study population, males were 54.09% and females were 45.9% (Table 1). According to Modified Kuppuswamy Classification, all children of Private Schools belonged to Upper Class whereas it was so only in 27.41% of Government School children who belonged maximally to Upper Middle Class 378 (67.5%).

Prevalence of obesity and overweight among children of government school was 2.98% and 8.23% respectively. Prevalence of obesity was found to be maximum in 15 years age group (5.55%) and overweight was found to be maximum in 13 years age group (14.51%). Age groups were found significantly associated with obesity and overweight in the children of government schools (Table 2).

Prevalence of obesity and overweight among children of private school was 8.83% and 12.13% respectively. Prevalence of both obesity and overweight was found to be maximum in 15 years age group (11.82% and16.12% respectively). Age groups were not found significantly associated with obesity and overweight in the children of private schools (Table 3).

Out of 1281, the total number of obese children identified in whole study population was 72 (5.62%) and number of overweight children was 128 (9.99%). The prevalence of obesity as well as overweight was found to be higher amongst children of Private schools (8.83% and 12.13% respectively) as compared to that of children of Government schools (2.98% and 8.23% respectively). Significant difference was found between prevalence of obesity in children of private and Government schools (Table 4).

Table 2: Distribution of children in government schools according to age group and category of BMI.

Age Group (In Years)	Obese	Overweight	Normal	Total	Age Group(In Years)	Obese	Overweight	Normal
	Number	%	Number	%		Number	%	Number
10-	2	1.96	5	4.9	10	2	1.96	5
11-	2	1.6	7	5.6	11	2	1.6	7
12-	2	1.72	4	3.44	12	2	1.72	4
13-	4	3.22	18	14.51	13	4	3.22	18
14-	4	3.6	12	10.8	14	4	3.6	12
15-	7	5.55	12	9.52	15	7	5.55	12
Total	21	2.98	58	8.23	Total	21	2.98	58

X^2value=16.55; D.F. = 5; p=0.0054

Table 3: Distribution of children in private schools according to age group and category of BMI.

Age group(in years)	Obese	Overweight	Normal	Total	Age group(in years)	Obese	Overweight	Normal
	Number	%	Number	%		Number	%	Number
10-	7	6.79	7	6.79	10-	7	6.79	7
11-	8	10.38	8	10.38	11-	8	10.38	8
12-	6	5.6	15	14.01	12-	6	5.6	15
13-	8	7.92	15	14.85	13-	8	7.92	15
14-	11	11.45	10	10.41	14-	11	11.45	10
15-	11	11.82	15	16.12	15-	11	11.82	15
Total	51	8.83	70	12.13	Total	51	8.83	70

X^2value=6.486; D.F. = 5; p= 0.2618

Table 4: Distribution of children according to the type of school and category of BMI.

Type of School	Obese	Overweight	Normal	Total	Type of School	Obese	Overweight	Normal
	Number	%	Number	%		Number	%	Number
Government	21	2.98	58	8.23	Government	21	2.98	58
Private	51	8.83	70	12.13	Private	51	8.83	70
Total	72	5.62	128	9.99	Total	72	5.62	128

X^2value=22.87; D.F. = 1; p<0.0001

Overall, the total number of obese children identified in whole study population was 72 (5.62%) and numbers of overweight children were 128 (9.99%). Overall prevalence of obesity was more among female population (6.8%) as compared to that in males (4.62%). Though the prevalence of overweight was more among males (10.25%). Different categories of BMI and gender of the children were not significantly associated (Table 5).

Table 5: The overall distribution of children according sex and BMI category.

Sex	Obese	Overweight	Normal	Total	Sex	Obese	Overweight	Normal
	Number	%	Number	%		Number	%	Number
Male	32	4.62	71	10.25	Male	32	4.62	71
Female	40	6.8	57	9.69	Female	40	6.8	57
Total	72	5.62	128	9.99	Total	72	5.62	128

X^2 value=0.6444; D.F. =1; p=0.4221

DISCUSSION

In our study according to Modified Kuppuswamy Classification, all children of Private Schools belonged to Upper Class whereas it was so only in 27.41% of Government School children who belonged maximally to Upper Middle Class 378 (67.5%). Similarly, in study done by Premanath et al in Mysore, there were 54.5% were males and 46.1% were females of different socio economic class.[11] In a study conducted by Kaneria et al in Udaipur, found that out of 518 study population, 268 (51.7%) belonged to Upper Class and 250 (48.2%) belonged to Middle Class.[12]

In our study the prevalence of obesity as well as overweight was found to be higher amongst children of Private schools (8.83% and 12.13 %, respectively) as compared to that of children of Government schools (2.98% and 8.23% respectively). Significant difference was found between prevalence of obesity in children of private and Government schools. Prevalence of both obesity and overweight was found to be maximum in 15 years age group both in Government schools and private schools. The findings of Government school are consistent with the findings of study done by Shabana et al in Chennai were prevalence of obesity and overweight among children of Government schools was 3.1% and 8.37 %, respectively.[13] They also found that prevalence of obesity was more in 14 and 15 years age group as compared to the younger age group. The findings of Private schools are consistent with the study done by S Kumar et al in Davangere, were prevalence of obesity in affluent schools were 5.74% and increased with increasing age.[14]

In our study the prevalence of obesity and overweight was more in females (3.8% and 8.57% respectively) as compared to males (2.31% and 7.96% respectively). Similarly the prevalence of obesity among females of private school (10.25%) was more as compared to that in males (7.56%). These findings are consistent with the study done by S Kumar et al in Davangere, where obesity prevalence among females (8.82%) was more than that among males (4.10%).[14] It is also similar to the observation of Agarwal K.N. et al which showed obesity prevalence among girls (6.7%) to be higher as compared to that amongst boys (5.4%).[15]

In our study the prevalence of obesity as well as overweight was found to be higher amongst children of Private schools (8.83% and 12.13 %, respectively) as compared to that of children of Government schools (2.98% and 8.23% respectively). Similar findings were also obtained in the studies done by Karur S et al, Unnitan et al and Marwaha et al.[16-18]

In our study overall prevalence of obesity and overweight was 5.62% and 9.99% respectively. Similar prevalence of obesity and overweight in school children were found in studies done by Kapil et al, Kotian et al, Premnath et al and Kadilkar et al.[7,9,11,19]

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