

Research Article

Determinants 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 main objective of the study was to find out determinants 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, India. 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. Various determinants of obesity and overweight were studied by interviewing children. Thus collected data was analyzed using Microsoft Excel and Open- Epi Software (Version 2.3).

Results: Out of 1281 children, 54.09% were males. Overall prevalence of obesity and overweight was 5.62% and 9.99% respectively. The prevalence of obesity and overweight was significantly higher amongst less active group (9.3 % and 13.95%, respectively) as compared to more active group. Prevalence of obesity and overweight was significantly higher in the group of children who spent >3 hours for study and who spent >2 hours daily in front of television or computers. The prevalence of obesity and overweight was significantly higher amongst group of children who took daily calories above RDA (18.57% and 15.19% , respectively) as compared to the other group. The prevalence of obesity and overweight was significantly higher in them (8.91% and 13.36%) as compared to those who took junk food less than or equal to 2 times per week (1.71% and 5.98%, respectively). The prevalence of obesity and overweight among children having parents with history of obesity was 46.15% and 17.94%, respectively which was significantly higher than those without parental history of obesity (4.34% and 9.74%).

Conclusions: The prevalence of obesity and overweight was significantly higher in children with sedentary lifestyle, high consumption of junk food and high calorie diet with positive family history of obesity.

Keywords: Prevalence, Determinants of 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 decades 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% in 1985 to 17% 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 study the determinants 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 -15 were included after written informed consent of their parents. 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 10-15 years were 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 - 15 year age group were included in the study population, the final sample size was 1281 children. These children were examined and interviewed using pre-designed, pre-tested, semi-structured Performa. Height was measured in centimeters (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 centimeters using a non-stretchable fiber measuring tape. The prevalence of overweight and obesity were determined based on the IOTF (International Obesity Task Force) criteria. Various determinants of obesity and overweight were studied by interviewing children. Thus collected data was analyzed using Microsoft Excel and Open- Epi Software (Version 2.3).

RESULTS

Out of 1281 children males were 54.09% and females were 45.9%. Overall, the total number of obese children identified in whole study population was 72 (5.62%) and number 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 1).

The numbers of children with total sports-physical activity time per week ≤ 2 hr were only 215. The prevalence of obesity and overweight was significantly higher amongst less active group (9.3% and 13.95% respectively) as compared to more active group (Table 2).

The number of children who had total sedentary period for studies per day above 3 hours were 429 and prevalence of obesity and overweight was

significantly higher in this group (7.23% and 11.42%, respectively) than the other group of children who spent ≤ 3 hours for study per day (Table 3).

The number of children who spent above 2 hours in front of television or computers for any purpose,

was 278(21.7%). The prevalence of obesity and overweight was significantly higher (14.38% and 14.75%) amongst those who spent greater time in front of television or computers as compared to the other group who spent ≤ 2 hours in front of television or computers per day (Table 4).

Table 1: Gender wise distribution of children according their BMI category.

Sex	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
Male	32	4.62	71	10.25	590	85.14	693	100
Female	40	6.8	57	9.69	491	83.50	588	100
Total	72	5.62	128	9.99	1081	84.38	1281	100

X²value=0.6444; D.F.=1;p=0.422

Table 2: Distribution of children according to duration of their total sports-physical activity period per week.

Total sports physical activity time per week	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
≤ 2 Hours	20	9.30	30	13.95	165	76.74	215	100
>2 Hours	52	4.88	98	9.19	916	85.93	1066	100
Total	72	5.62	128	9.99	1081	84.39	1281	100

X²value=11.46; D.F.=1; p=0.0007; OddsRatio=1.851, C.I.=1.291-2.65

Table 3: Distribution of children according to duration of study period per day and BMI category.

Total Sedentary time for studies daily	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
> 3 hours	31	7.23	49	11.42	349	81.35	429	100
≤ 3 hours	41	4.81	79	9.27	732	85.92	852	100
Total	72	5.62	128	9.99	1081	84.39	1281	100

X²value=4.51;D.F. =1;p=0.033;Odds Ratio=1.398;C.I. =1.025-1.907

Table 4: Distribution of children according to total sedentary time in front of TV/computers daily and BMI category.

Total sedentary time for TV/computers daily	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
>2 hours	40	14.39	41	14.75	197	70.86	278	100
≤ 2 hours	32	3.19	87	8.67	884	88.14	1003	100
Total	72	5.62	128	9.99	1081	84.39	1281	100

X²value=49.29; D.F. =1; p<0.00001; Odds Ratio=3.054; CI=2.214-4.214

Table 5: Distribution of children according to daily total calorie intake in terms of RDA and BMI category.

Recommended dietary allowance (RDA)	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
$> RDA$	44	18.57	36	15.19	157	66.24	237	100
$\leq RDA$	28	2.68	92	8.81	924	88.51	1044	100
Total	72	5.62	128	9.99	1081	84.39	1281	100

X²value=72.65; D.F.=1; p<0.0000; OddsRatio=3.924; CI=2.822-5.455

Table 6: Distribution of children according to junk food frequency per week and BMI category.

Junk food frequency per week	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
>2 times	62	8.91	93	13.36	541	77.73	696	100
≤2 times	10	1.71	35	5.98	540	92.31	585	100
Total	72	5.62	128	9.99	1081	84.39	1281	100

X²value=51.27; D.F.=1; p<0.00001; Odds Ratio =3.438; CI=2.416-4.892

Table 7: Distribution of children according to the type of diet and BMI category.

Type of Diet	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
Vegetarian	34	4.47	75	9.86	652	85.68	761	100
Mix	38	7.31	53	10.19	429	82.50	520	100
Total	72	5.62	128	9.99	1081	84.39	1281	100

X²value=2.366; D. F.=1; p=0.1240

Table 8: Distribution of children according to history of obesity in either parent and BMI category.

History of Obesity in either Parent	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
Present	18	46.15	7	17.94	14	35.89	39	100
Absent	54	4.34	121	9.74	1067	85.90	1242	100
Total	72	5.62	128	9.99	1081	84.39	1281	100

X²value=71.79; D.F.=1; p<0.00001; Odds Ratio =3.438; CI=2.416-4.892

The number of children with daily calorie intake >RDA (Recommended Dietary Allowance) was 237 (22.7%). The prevalence of obesity and overweight was significantly higher amongst group who took daily calories above RDA (18.57% and 15.19% respectively) as compared to the other group as shown in Table 5.

The number of children taking junk foods more than twice a week were 696 (54.33%). The prevalence of obesity and overweight was significantly higher in them (8.91% and 13.36%) as compared to those who took junk food less than or equal to 2 times per week (1.71% and 5.98% respectively) as shown in Table 6.

The number of children taking vegetarian diet was 761 (59.4%) as compared to those who took mix diet who were 520 (40.59%). The prevalence of obesity and overweight was not significantly higher amongst those who took mix diet (7.31% and 10.19%, respectively) as compared to vegetarians as in Table 7.

The number of children with either parents having history of obesity was 39 (3.04%). The prevalence of obesity and overweight among children having parents with history of obesity was 46.15% and 17.94%, respectively which was significantly higher than those without parental history of obesity (4.34% and 9.74%) as in Table 8.

DISCUSSION

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,⁷ Kotian et al,⁹ Premnath et al¹¹ and Kadilkar et al.¹²

In our study the prevalence of obesity and overweight was significantly higher amongst less active group (9.3% and 13.95% respectively) as compared to more active group. Similar results were obtained in the study done by Kotian et al.⁹ They showed that obesity was 21 times higher among those children participating less than two hours / week in any type of physical activity. In a study done by S.Kumar et al¹³ in Davengere showed that those with absent physical activity had 2 times more risk of falling in obese group as compared to those who had more physical activity.

In our study prevalence of obesity and overweight was significantly higher in the group who spent >3 hours for study and who spent >2hours daily in front of television or computers. The findings are comparable to that of study done by Shabana et al¹⁴ in Chennai which showed that greater than 2 hours television watching (or -2.5,p<0.0001) was associated with obesity. The study done by Kuriyan R et al¹⁵ in South India also found that the adjusted odds of being overweight for children who viewed television for greater than or equal to 2 hours/day was 19.6 (p = 0.001), when

compared to children who viewed television for less than or equal to 45 minutes/day.

In our study the prevalence of obesity and overweight was significantly higher amongst group of children who took daily calories above RDA (18.57% and 15.19% respectively) as compared to the other group. It is comparable to the findings of Kapil et al⁷ which showed increased total calorie among obese and overweight group as compared to normal children. These findings were also similar to that of study done by Seema Jain et al¹⁶, which showed prevalence of obesity to be 12.51% in those who ate extra calories than recommended for that age and sex as compared to 7.2% among those took less than or equal to recommended calories ($p < .05$). In our study significant association was found between junk food consumption and obesity. Similar findings were also obtained in the studies done by Kotian et al,⁹ S.Kumar et al¹³ and Seema Jain et al.¹⁶

In our study the prevalence of obesity and overweight among children having parents with history of obesity was 46.15% and 17.94% respectively which was significantly higher than those without parental history of obesity (4.34% and 9.74%).

These findings are consistent with another study done by S.Kumar et al¹³ in Davengere parental history of obesity was present for 32.7% of obese children. Children with parental history of obesity showed 25.2 times more chances of developing obesity than normal children. 33.8% of the obese girls and 31.6% of the obese boys had history of parental obesity. The findings are in contrast with the study done by Seema Jain et al¹⁶ who found no significant association with family history of obesity.

CONCLUSION

The prevalence of obesity and overweight was significantly higher in children with sedentary lifestyle, high consumption of junk food and high calorie diet with positive family history of obesity. Childhood obesity leads to its related non-communicable diseases and psychosocial health problems in children. This is because Childhood obesity is a crucial issue that needs to be addressed urgently. Changing dietary practices and maintenance of regular physical activity starting as early as infancy through parental initiative and social support interventions are the most important strategies to tackle childhood obesity. There is definitely a need for well-planned, large-scale studies using standardized methodologies to estimate the prevalence and determinants of obesity and overweight in school children. When planning these studies it is necessary to ensure that importance is given to accurate evaluation of socio economic status and representation of the different regions of India. A comprehensive study including anthropometric data, biochemical data, clinical signs and

dietary intake data among the same group of children will give a better insight into the situation.

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