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Research Article

Prevalence and determinants of obesity and overweight among school children of Ahmedabad City, Gujarat: a cross sectional study

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ABSTRACT

Background: 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. The objective of the study was to know the prevalence and determinants of obesity in school children of Ahmedabad city.
Methods: The present cross sectional study was undertaken during September 2015 to December 2015 in randomly selected 10 schools of Ahmedabad city, Gujarat by Department of Pediatrics and Community Medicine of GMERS Medical College, Dharpur-Patan, Gujarat, India. Total 2562 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 proforma. 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 SPSS 17 (Trial version).
Results: Out of 2562 children males were 54.09% and females were 45.9%. Prevalence of obesity and overweight was 5.62% and 9.99% respectively. Overall prevalence of obesity was more among female population (6.8%) as compared to that in males (4.62%). The prevalence of obesity was found to be highest among 15 years age group (8.22%). 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 >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: High prevalence of obesity and overweight in school children indicate an urgent need to increase awareness via education and motivation of all stakeholders.

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

INTRODUCTION

Worldwide, disease profile are transforming at a rapid pace catching the attention of medical professionals and policy makers alike. This is particularly true in low and middle-income countries that form the major chunk of global population. The emerging epidemics of obesity, cardiovascular disease and diabetes form the crux of this phenomenal change. Among these entities, obesity has become a colossal epidemic causing serious public health concern and contributes to 2.6 million deaths worldwide every year.[1] The prevalence of obesity has increased 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. 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. 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. [3]

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. 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.[4]

Aetiopathogenesis of childhood obesity is multifactorial. Interactions between genetic, neuroendocrine, metabolic, psychological, environmental and socio-cultural factors are clearly evident in childhood 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.[4] With this background in mind, the present study was undertaken to know the prevalence and determinants of obesity in school children of Ahmedabad city.

METHODS

The present study was a cross sectional study undertaken in 10 schools, which were selected randomly from list of all schools in Ahmedabad city during September 2015 to December 2015 by Department of Paediatrics and Community Medicine of GMERS Medical College, Dharpur-Patan, Gujarat, India. 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. 2400 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 2562 children. These children were examined and interviewed 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. Before conducting the study approval was obtained from institutional ethical committee for human research. Data safety and confidentiality was also given due consideration. The file containing identity related details was kept password protected and the filled Performa were kept in lock with key accessible only to researcher. Various determinants of obesity and overweight were studied by interviewing children. Thus collected data was analysed using SPSS 17 (Trial Version).

RESULTS

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

Sex	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
Male	66	4.8	140	10.1	1180	85.1	1386	100
Female	78	6.7	116	9.8	982	83.5	1176	100
Total	144	5.4	256	9.6	2162	84.4	2562	100

X^2 value=4.19; D.F.= 2; p=0.12

Out of 2562 children males were 54.09% and females were 45.9%. Overall, the total number of obese children identified in whole study population was 144 (5.62%) and numbers of overweight children were 256 (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).

Table 2: Distribution of children according their age and BMI category.

Age group (in years)	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
10-	18	4.39	24	5.85	368	89.76	410	100
11-	20	4.95	30	7.43	354	87.62	404	100
12-	16	3.59	38	8.52	392	87.89	446	100
13-	24	5.33	66	14.67	360	80	450	100
14-	30	7.25	44	10.63	340	82.13	414	100
15-	36	8.22	54	12.33	348	79.45	438	100
Total	144	5.62	256	9.99	2162	84.39	2562	100

X^2 value=40.13; D.F.=10; p<0.0001

Table 3: Distribution of children according to their total sports-physical activity per week and their BMI category.

Total sports physical activity time per week	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
≤ 2 Hours	40	9.30	60	13.95	330	76.74	430	100.00
>2 Hours	104	4.88	196	9.19	1832	85.93	2132	100.00
Total	144	5.62	256	9.99	2162	84.39	2562	100.00

X^2 value= 24.153; D.F.=2; p<0.0001

Table 4: Distribution of children according to their total sedentary time before TV/Computers daily and their BMI category.

Total sedentary time for TV/computers daily	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
≤ 2 Hours	80	14.39	82	14.75	394	70.86	556	100
>2 Hours	64	3.19	174	8.67	1768	88.14	2006	100
Total	144	5.62	256	9.99	2162	84.39	2562	100

X^2value=128.59; D.F.=2; p<0.00001

The prevalence of obesity was found to be highest among 15 years age group (8.22%). The prevalence of overweight was maximum in 13 year age group (14.67%). The chi square test applied between different age groups and BMI category (Obese and Overweight taken together and Normal) was found to be highly significant, indicating thereby the statistical association of increasing age with the prevalence of obesity and overweight (Table 2).

The numbers of children with total sports-physical activity times per week ≤2hr were only 430. 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 3). The number of children, who spent above 2 hours in front of television or computers for any purpose, was 556 (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).

The number of children with daily calorie intake >RDA (Recommended Dietary Allowance) was 474 (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 numbers of children taking junk foods more than twice a week were 1392 (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 1522 (59.4%) as

compared to those who took mix diet who were 1040 (40.59%). The prevalence of obesity and overweight was 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 78 (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.

Table 5: Distribution of children according to their daily total calorie intake in terms of RDA (Recommended Dietary Allowance) and BMI category.

Recommended dietary allowance (RDA)	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
> RDA	88	18.57	72	15.19	314	66.24	474	100
≤ RDA	56	2.68	184	8.81	1848	88.51	2088	100
Total	144	5.62	256	9.99	2162	84.39	2562	100

X^2 value=211.8, D.F. =2, p<0.0001

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

Junk food frequency per week	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
>2 times	124	8.91	186	13.36	1082	77.73	1392	100
≤2 times	20	1.71	70	5.98	1080	92.31	1170	100
Total	144	5.62	256	9.99	2162	84.39	2562	100

X^2value=109.26, D.F. =2, p<0.00001

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

Type of diet	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
Vegetarian	68	4.47	150	9.86	1304	85.68	1522	100
Mix	76	7.31	106	10.19	858	82.50	1040	100
Total	144	5.62	256	9.99	2162	84.39	2562	100

X^2value=9.67, D. F=2, p=0.0007

Table 8: Distribution of children according to history of obesity in either parents or their BMI category.

History of obesity in either parent	Obese		Overweight		Normal		Total	
	Number	%	Number	%	Number	%	Number	%
Present	36	46.15	14	17.94	28	35.89	78	100
Absent	108	4.34	242	9.74	2134	85.90	2484	100
Total	144	5.62	256	9.99	2162	84.39	2562	100

X^2value=262.6, D.F=2, p< 0.00001

DISCUSSION

In our study the prevalence of obesity was more in females (6.8%) as compared to males (4.62%), but the prevalence of overweight was slightly higher in males (10.25%) as compared to females (9.69%). These findings are consistent with the study done by Ghonge S et al and S Kumar, et al in Davangere, where obesity prevalence among females (8.82%) was more than that among males (4.10%).[2,5] 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%).[6]

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 Ghonge S et al, Kapil et al, Kotian et al, Premnath et al and Kadilkar et al.[3,7-10]

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 Ghonge S et al and Kotian et al.[3,8] 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 Kumar S et al 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.[5]

In our study prevalence of obesity and overweight was significantly higher in the group who spent >2hours daily in front of television or computers. The findings are comparable to that of study done by Ghonge S et al and Shabana et al in Chennai which showed that greater than 2 hours television watching (or-2.5, p<0.0001) was associated with obesity.[3,11] The study done by Kuriyan R et al 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.[12]

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 Ghonge S et al and Kapil et al which showed increased total calorie among obese and overweight group as compared to normal children.[3,7] These findings were also similar to that of study done by Ghonge S, et al and Seema Jain, et al.[3,13] In our study significant association was found between junk food consumption and obesity. Similar findings were also obtained in the studies done by Ghonge S et al, S Kumar, et al, Kotian et al, and Jain Set al.[3,5,8,13]

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 Ghonge S et al and Kumar S et al in Davengere parental history of obesity was present for 32.7% of obese children.[3,5] 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 al who found no significant association with family history of obesity.[13]

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. 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. 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.

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