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Research Article

Prevalence of obesity and its associated risk factors among school children of Berhampur, Odisha, India

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ABSTRACT

Background: The highest prevalence rates of childhood obesity have been observed in developed countries, however, its prevalence is increasing in developing countries as well. Objective was to study the prevalence of obesity among school children & associated risk factors in Berhampur, Odisha, India.
Methods: A cross sectional study in six schools of Berhampur, Odisha was carried out to determine the prevalence of obesity among school children aged 12 to 15 years and its relation to socioeconomic condition, duration of television viewing, dietary habits & family type in Berhampur, Odisha, India.
Results: Overall prevalence of obesity was 1.71% & that of overweight and obesity combined was found to be 7.13% with no statistically significant difference between male and female students. The prevalence of under nutrition was 20.97%.
Conclusions: The prevalence of obesity is quite less compared to that of under nutrition. Obesity detected among school students in this study is more prevalent in higher socioeconomic class. Dietary habits and duration of television viewing do not significantly have any impact on BMI. Statistically significant association was observed between family type and body mass index with normal weight students belonging more to nuclear families.

Keywords: Obesity, Overweight, Socioeconomic status, Television viewing, Dietary pattern, Body mass index (BMI), Family type (nuclear, joint, joint extended)

INTRODUCTION

Globally there is almost an epidemic of obesity in developed countries, particularly in the USA and Europe. The World Health Organization has warned of the escalating epidemic of obesity that could put the population in many countries at risk of developing non-communicable diseases. The rising prevalence of obesity cannot be addressed by a single etiology. Genetic factors influence the susceptibility of a given child to an obesity conducive environment. However, environmental factors, lifestyle preferences, and cultural environment seem to play major roles in the rising prevalence of obesity worldwide.[1,2]

Obesity in not equivalent to overweight, it denotes excess body fat, whereas overweight might relate to fat or other tissues in excess with relation to height. BMI is the preferred method of expressing body fat percentile from clinical measurements. In the past various methods were tried but found wanting.[3] BMI is the index of weight of height squared (BMI = Weight (kg)/ Height $(m)^2$) better reflects the amount of body fat compared with the of muscle or bone & is used for as a proxy for measurement of body fatness for adults in the absence of laboratory or radiographic determinations

Obesity is increasingly recognized as a significant problem in developing countries and countries undergoing economic transition.[4] An epidemic related to

this transition in already unfolding itself in India. Mortality from cardiovascular disease in expected to rise by 60% and overtake deaths from infection disease by 2015-2020.[5] The factors attributing to increasing childhood obesity are increased intake of high-calorie foods that are low in vitamins, minerals and micronutrients coupled with decreased physical activity .[6] This has been termed 'New World Syndrome' and is creating an enormous socioeconomic and public concern in poorer countries.[7]

Asians are more susceptible to the adverse effects of obesity because they have 3 to 5% excess body fat, which is more centrally distributed for the same BMI as that of the Caucasians.[8] In India under nutrition in the major nutritional problem in school children but with rapid socioeconomic development associated with faulty nutrition habits and sedentary life styles obesity among school children is gradually on the rise. In the midst of under nutrition, the socioeconomic consequences of the morbidity & mortality associated with obesity will be immense for a country like India.

METHODS

Study design

A school based cross sectional study was done on sample of students both from government as well as private schools from January 2015 to March 2015.

Sampling & methodology

Population proportionate sample of 1402 students from 6 schools selected randomly were assessed through self-administered structured questionnaire to assess socioeconomic condition, family type, duration of television viewing, predominant diet type & regarding physical activity after obtaining informed consent from school authorities.

Inclusion and exclusion criteria

Students aged between 12 and 15 years were selected. Children with chronic illness as well as those on corticosteroid therapies or on any long term drug therapy were excluded.

Anthropometric measurements

Weight and height were measured by standard methodology. Weight was recorded by a Seca beam balance to the nearest 0.1 Kg. Standing height was measured using a stadiometer and recorded to the nearest 0.1 cm.

BMI: Calculating body mass index by dividing weight in kg by square height in meters.[9]

$$BMI = \text{Weight (kg)}/\text{Height (m)}^2$$

Data analysis

Data collected on different variables were analyzed by using the SPSS version 20 software to find out the correlation between variables (Pearson's product correlation coefficient). P value of <0.05 was considered for statistical significance.

RESULTS

Overall prevalence of obesity was 1.71% and that of overweight and obesity combined was found to be 7.13% (Table 1) with no statistically significant difference between male and female students. The prevalence of under nutrition was 20.97%. The prevalence of obesity among males was 1.9% and that in females was 1.6% and that of under nutrition was 28.7% and 12.4% respectively. Statistically significant association was observed between BMI and socioeconomic status (Table 2). This study does not show any association between duration of television viewing and obesity (Table 3) but significant association was observed between BMI and family type with more number of normal weight children belonging to nuclear families (Table 4). Dietary habits (vegetarian, predominantly non-vegetarian and mixed type) do not correlate with BMI (Table 5). The mean BMI was seen increasing with age (Table 6).

Table 1 shows the age wise distribution of BMI (category). The prevalence of obesity was maximum in 15 years of age (3%).

Table 1: Age wise distribution of BMI (category).

Age	Underweight	Normal	Overweight	Obese	Total
12	54 (17.42%)	236 (76.13%)	16 (5.16%)	4 (1.29%)	310
13	104 (19.05%)	404 (73.99%)	30 (5.49%)	8 (1.47%)	546
14	96 (27.75%)	228 (65.90%)	16 (4.62%)	6 (1.73%)	346
15	40 (20.00%)	140 (70.00%)	14(7.00%)	6 (3.00%)	200
Total	294 (20.97%)	1008 (71.89%)	76 (5.42%)	24 (1.71%)	1402

Table 2: BMI distribution according to the socioeconomic status.

Socioeconomic status	Under-weight	Normal	Over-weight	Obese	Total	Statistics
High	16	180	20	10	226	P = <0.001
	7.1%	79.7%	8.8%	4.4%		
Middle	258	786	56	14	1114	
	23.2%	70.6%	5%	1.2%		
Low	20	42	0	0	62	
	32.2%	67.8%	0.0%	0.0%		
Total	294	1008	76	24	1402	

BMI distribution according to the socioeconomic status was studied. Statistically significant association was observed between the two. The prevalence of obesity was higher in higher socioeconomic group (P <0.05%) (Table 2).

BMI distribution according to the duration of T.V. viewing per day was observed. No statistically significant association was observed between the two (P ≥0.05). In the majority 905 (64.6%) cases, duration of T.V. viewing was less than 1 hour.

Table 3: BMI distribution according to the duration of T.V. viewing per day.

	Category					Statistics
Duration of TV viewing	**Under weight**	**Normal**	**Over weight**	**Obese**	**Total**	
Less than 1 hour	204	644	42	15	905	P = 0.43
	22.5%	71.2%	4.7%	1.6%	64.6%	
1 to 2 hours	75	302	23	8	408	
	18.4%	74%	5.6%	2%	29.1%	
More than 2 hours	15	62	11	1	89	
	17%	69.7%	12.4%	1.1%	6.3%	
Total	294	1008	76	24	1402	

Table 4: BMI distribution according to the family type.

	Category					Statistics
Family type	**Under weight**	**Normal**	**Over weight**	**Obese**	**Total**	
Nuclear	130	585	46	17	778	P = 0.01
	16.7%	75.2%	5.9%	2.2%	55.5%	
Joint	155	382	23	5	565	
	27.5%	67.6%	4%	0.9%	40.3%	
Joint extended	9	41	7	2	59	
	15.3%	69.5%	11.9%	3.3%	4.2%	
Total	294	1008	76	24	1402	

Table 5: Distribution of BMI (Category) according the dietary pattern.

	Category					Statistics
Diet type	**Under weight**	**Normal**	**Over weight**	**Obese**	**Total**	
Vegetarian	25	146	15	3	189	P = 0.6
	13.3%	77.2%	7.9%	1.6%		
Non vegetarian	7	38	3	0	48	
	14.6%	79.2%	6.2%	0%		
Mixed	262	824	58	21	1165	
	22.5%	70.7%	5.0%	1.8%		
Total	294	1008	76	24	1402	

Table 4 shows BMI distribution according to the family type. Statistically significant association was observed between the two (P=0.01). The prevalence of normal weight children was more in the nuclear family group (75.2%). Majority of children 778 (55.5%) belonged to nuclear families.

Table 5 shows the distribution of BMI (Category) according the dietary pattern. No significant association was observed between the two (P=0.6).

Table 6 shows the age wise distribution of means of height, weight and BMI along with standard deviations. Mean height, weight and body mass index was seen gradually increasing with age.

Table 6: Age wise distribution of means of height, weight and BMI.

Age (Years)	N	Mean Height in cm (S.D)	Mean weight in Kg (S.D.)	Mean BMI (S.D)
12	310	151.28 (7.27)	41.82 (7.50)	18.22 (2.85)
13	546	154.06 (7.88)	43.99 (9.09)	18.50 (3.05)
14	346	158.65 (8.06)	46.77 (9.72)	18.52 (3.23)
15	200	161.05 (8.75)	51.55 (10.39)	19.83 (3.44)

DISCUSSION

Of the 1402 students taken for the study, 780 (55.6%) were males and rest were females. In this study the overall prevalence of obesity is 1.71%. The prevalence of underweight among this study group is 20.97 % .The prevalence of overweight & obese combined is 7.13%. In a study among 870 affluent adolescent school children in Delhi, the overall prevalence of obesity was found to be 7.4%.[10] In a pilot study among school boys in Pune city, the prevalence of obesity was found to be 5.7%, whereas the prevalence of overweight was 19.9%[11] In this study the prevalence of obesity and overweight is comparatively less because the students represent all economic groups rather than affluent group as in the above studies.

A study conducted in 1990 amongst 3861 school children reported the prevalence of obesity to be 7.5%.[12] Mohan B et al studied 3326 students from both urban and rural schools in Ludhiana and found the prevalence of overweight and obese in urban children to be 11.63% and 2.53% respectively.[13] The prevalence of the same in rural children was 4.7% and 3.63% respectively.

This study does not show any association between duration of television viewing & obesity. Similar results were obtained in studies by Robinson et al, Tucker L.A. and Wolf A.M. et al, in which they found no significant association between T.V. viewing & obesity.[14-17] However in a study of more than 13500 adolescents and children by Dietz and Gortmaker, a statistically significant association between hours per day of T.V. viewing & prevalence of obesity was reported.[18] In the same study they reported that each hourly increment of T.V. viewing by adolescents was associated with 2% increase in prevalence of obesity. There is statistically significant association between the family type & the BMI category in the present study.

However in the study prevalence of obesity amongst affluence adolescent school children in Delhi, 65% of the children belonged to nuclear families and the overall prevalence of obesity was 7.4%.[10] In this study 55% of the children belong to nuclear families and the overall prevalence of obesity is 1.7%. Observing the relation between the number of members in the family and BMI category, no significant association was found. In the present study 73% of the children belong of families with 4 to 7 members. Normal weight children are highest in the nuclear family group compared to other family type and that of underweight are least in the joint-extended family type.

CONCLUSION

This study found that the prevalence of under nutrition (20.97%) is still the major nutritional disorder in children. But with improving socioeconomic condition, unhealthy life style, faulty feeding habits, lack of open spaces for children to play and do outdoor physical activities, the prevalence of overweight and obesity is bound to increase in due course. The increasing BMI with age in this study probably reflects the faulty eating habits of adolescents with increasing age. Necessary steps should be initiated at all levels as early as possible to prevent the impending health crises of non-communicable disease resulting from this transition. Increased awareness about childhood overweight/obesity including prevailing nutrition problems through publications and symposia for parents and activities at school is important.

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