



**STUDY OF PREVALENCE OF OBESITY, OVERWEIGHT & HYPERTENSION AMONG
SCHOOL CHILDREN OF BHUBANESWAR, ODISHA & ITS RELATION TO
SOCIOECONOMIC CONDITIONS, TELEVISION VIEWING, FAMILY TYPE &
PREDOMINANT DIET TYPE**

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ABSTRACT

Objective: To study the prevalence of obesity, overweight & hypertension among school going adolescent children & its relation to socioeconomic conditions, television viewing & eating pattern in Bhubaneswar, Odisha. **Materials and Methods:** A school based cross sectional study was carried out to determine frequency, distribution of overweight, obesity & hypertension among urban school going adolescents (12 to 19 years) of both sexes & its relation to socioeconomic conditions, duration of television viewing & eating habits in Bhubaneswar city of Odisha. **Results:** Overall prevalence of obesity was 1.7% & that of overweight & obesity combined was found to be 7% with no statistically significant difference between male and female students. The prevalence of undernutrition was 21.26%. The prevalence of obesity among males & females was 2.0% & 1.4% respectively & that of undernutrition was 29.0% & 12.6% respectively. The study shows that the prevalence of hypertension to be 7.2%. **Conclusion:** Obesity is more prevalent in children of higher socioeconomic status than those in the lower ones, but undernutrition is still the major problem among school children. There is association between hypertension and BMI, similar to that observed in other established studies. Higher social class, watching TV for more than 4 hours a day are associated with increased prevalence of overweight/obesity whereas family type, dietary habits are not significantly associated.

KEYWORDS: Adolescent obesity, overweight, hypertension, socioeconomic conditions, television viewing, eating pattern.

INTRODUCTION

Globally there is almost an epidemic of obesity in developed countries, particularly in the USA and European countries. In the year 1998, WHO aptly designated obesity as a global epidemic. Obesity is not equivalent to overweight. Obesity 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.^[1] BMI is the index of weight of height squared { $BMI = WT (kg) / HT(m)^2$ } 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.

It is also increasingly recognized as a significant problem in developing countries and countries undergoing economic transition.^[2] The adverse health consequences of the rapid nutrition transition in the Asian region are

now beginning to get noticed. These include insulin resistance, type 2 diabetes, hypertension, coronary artery disease, hyperlipidemia, metabolic syndrome (syndrome x), stroke & certain cancers. An epidemic related to this transition is already unfolding itself in India. Mortality from cardiovascular disease is expected to rise by 60% and overtake deaths from infection disease by 2015 – 2020.^[3] 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.^[4] This has been termed 'New World Syndrome' and is creating an enormous socioeconomic and public concern in poorer countries.^[5]

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.^[6]

Though in India undernutrition is one of the major problems threatening the fabrics of child health,

childhood & adolescent obesity in steadily upcoming. In the midst of undernutrition, the socioeconomic consequences of the morbidity & mortality associated with obesity will be immense for a country like India.

MATERIALS AND METHODS

A school based cross sectional study was carried out to determine frequency, distribution of overweight, obesity & hypertension among urban school going adolescents (12 to 19 years) of both sexes & its relation to socioeconomic condition, duration of television viewing & eating habits. Population proportionate sample of 1524 students were selected at random from 8 schools and were assessed through self administered structured questionnaire to assess socioeconomic condition, family type, duration of television viewing & predominant diet type, after obtaining informed consent from school authorities. Anthropometric measurements of 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. Blood pressure was recorded by a mercury sphygmomanometer in all children. All the children were made to sit comfortably for 30 minutes before their blood pressure was recorded, in sitting posture in the right upper limb. Those with high blood pressure, had their blood pressure rechecked after one hour of rest. Those blood pressure more than 95th percentile for age, sex and height were again rechecked the next day. Those having persistently elevated blood

pressure as per the above criteria were considered hypertensives. The values of height and weight were converted to body mass index by the formula.

$$\text{BMI} = \text{weight in kg} / (\text{height in meter})^2$$

Those BMI more than 85th & 95th percentile for age and sex were considered as overweight and obese respectively. Those BMI less than the 5th percentile for age and sex were grouped as underweight. The rest were taken as normal. To access the socio-economic and behavioral risk factors for overweight and obesity, data was analyzed by SPSS 20.0. Non-parametric tests were used to compare data in two or more groups.

Data analysis

Proportion, Chi-square test.

RESULT

Overall prevalence of obesity was 1.7% & that of overweight & obesity combined was found to be 7% with no statistically significant difference between male and female students. The prevalence of undernutrition, evidenced by underweight is 21.26%. The prevalence of hypertension is 7.2%. The prevalence of obesity among males is 2.0% & that in females is 1.4%. & that of underweight is 29.0% & 12.6% respectively. The study shows that the prevalence of hypertension to be 7.2%.

Table 1 shows the age wise distribution of BMI (Category). The prevalence of obesity was maximum in 16 years of age (3%).

AGE	BMI (Category)				Total
	Underweight	Normal	Overweight	Obese	
12	0(0%)	6 (100.00%)	0(0%)	0(0%)	6
13	54(17.42%)	236 (76.13%)	16(5.16%)	4 (1.29%)	310
14	104 (19.05%)	404 (73.99%)	30 (5.49%)	8 (1.47%)	546
15	96 (27.75%)	228 (65.90%)	16 (4.62%)	6 (1.73%)	346
16	40(20.00%)	140 (70.00%)	14(7.00%)	6 (3.00%)	200
17	26(25.49%)	72(70.59%)	2 (1.96%)	2(1.96%)	102
18	4 (33.33%)	6(50.00%)	2 (16.67%)	0(0%)	12
19	0(0%)	2(100.00%)	0(0%)	0(0%)	2
Total	324(21.26%)	1094(71.78%)	80(5.25%)	26 (1.71%)	1524

Table 2 shows BMI distribution according to the socioeconomic status. Statistically significant association was observed between the two. The prevalence of obesity was higher in higher socioeconomic group.

Socioeconomic Status	CATEGORY				Total	Statistics
	Under-weight	Normal	Over-weight	Obese		
High	20 8.1%	196 79.0%	22 8.9%	10 4.0%	248	Chi-Square Value = 25.102 Df = 6.00 P = < 0.001
Middle	278 23.3%	856 71.7%	58 4.9%	14 1.2%		
Low	26 31.7%	54 65.9%	0 0.0%	2 2.4%	82	
Total	324	1094	80	26		

Table 3 shows that BMI distribution according to the duration of T.V. viewing per day. No statistically significant association was observed between the two ($P = > 0.05$). In the majority 499 (65.5%) cases, duration of T.V. viewing was less than 2 hours.

Duration of TV viewing	CATEGORY					Total	Statistics
	Under weight	Normal	Over weight	Obese			
Less than 2hrs	224 22.4%	714 71.5%	44 4.4%	16 1.6%	998 65.5%	Chi-Square Value 6.317 Df = 6 P = 0.389	
2 to 4 hrs	82 19.2%	312 73.2%	24 5.6%	8 1.9%	426 27.9%		
More than 4 hrs	18 18.0%	68 68.0%	12 12.0%	2 2.0%	100 6.6%		
Total	324	1094	80	26	1524		

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 419 (55%) belonged to nuclear families.

Family Type	CATEGORY					Total	Statistics
	Under weight	Normal	Over weight	Obese			
Nuclear	142 16.9%	630 75.2%	48 5.7%	18 2.1%	838 55%	Chi- Square Value = 16.791 Df = 6 P = 0.01	
Joint	170 27.8%	412 67.3%	24 3.9%	6 1.0%	612 40.1%		
Joint extended	12 16.2%	52 70.3%	8 10.8%	2 2.7%	74 4.9%		
Total	324	1094	80	26	1524		

Table 5 shows the distribution of BMI (Category) according the dietary pattern. No significant association was observed between the two ($P = 0.582$).

Diet type	CATEGORY					Total	Statistics
	Under Weight	Normal	Over weight	Obese			
Vegetarian	16	78	8	2	104	Chi – Square Value = 4.705 Df = 6 P = 0.582	
	15.4%	75.0%	7.7%	1.9%			
Non Vegetarian	5	22	2		29		
	17.2%	75.9%	6.9%				
Mixed	141	447	30	11	629		
	22.4%	71.1%	4.8%	1.7%			
Total	162	547	40	13	762		

Table 6 shows the age wise distribution of means of height, weight & BMI along with standard deviations. Mean height was seen gradually increasing according to increasing age. Whereas mean weight and BMI after an initial decrease as one goes from 12 to 13 years was seen as gradually increasing with increasing age.

Age(Years)	N	Mean Ht. in cm (S.D)	Mean Wt. in Kg (S.D.)	Mean BMI (S.D)
12	6	150.00 (5.29)	46.67 (4.16)	20.71 (0.78)
13	310	151.28 (7.27)	41.82 (7.50)	18.22 (2.85)
14	546	154.06 (7.88)	43.99 (9.09)	18.50 (3.05)
15	346	158.65 (8.06)	46.77 (9.72)	18.52 (3.23)
16	200	161.05 (8.75)	51.55 (10.39)	19.83 (3.44)
17	102	164.03 (8.32)	52.70 (7.89)	19.47 (2.97)
18	12	167.66 (6.83)	56.50 (12.68)	20.02 (3.62)
19	2	169.00	56.00	19.64

Table 7 shows the Blood Pressure category in relation to BMI (Category). Statistically significant association was observed between the two ($P < 0.001$).

BMI Category	Blood Pressure Category		Total	Statistics
	Normal	Hypertension		
Underweight	322 99.4%	2 0.6%	324	Chi – Square Value = 41.972 Df = 3 P = < 0.001
Normal	1008 92.1%	86 7.9%	1094	
Overweight	70 87.5%	10 12.5%	80	
Obese	14 53.8%	12 46.2%	26	
Total	1414	110	1524	

Table 8 shows the relation between obesity & overweight combined with blood pressure category. Statistically significant association was observed between the two ($P < 0.001$).

BMI Category	Blood Pressure Category		Total	Statistics
	Normal	Hypertension		
Overweight & Obese	84 79.2%	22 20.8%	106	Chi – Square Value = 15.587 Df = 1 P = < 0.001
Others	1230 93.8%	88 6.2%	1418	
Total	1414	110	1524	

Table 9 shows the relation between sex and blood pressure category. No statistically significant association was observed between the two ($P = 0.606$).

Sex	Blood Pressure Category		Total	Statistics
	Normal	Hypertension		
Male	746 92.3%	62 7.7%	808	Chi – Square Value = 0.266 Df = 1 P = 0.606
Female	668 93.3%	48 6.7%	716	
Total	1414	110	1524	

DISCUSSION

Study of prevalence of obesity, overweight & hypertension among adolescent school children & its relation to socioeconomic conditions, television viewing, family & diet type was carried out in eight schools of Bhubaneswar, Odisha during the period extending from January 2014 to February 2014. Of the 1524 students taken for the study, 808 (53%) were males and rest were females. In this study the overall prevalence of obesity is 1.7%. The prevalence of underweight among this study group is 21.26%. The prevalence of overweight & obese combined is 7%. In a study among 870 affluent adolescent school children in Delhi, the overall prevalence of obesity was found to be 7.4%.^[7] 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%.^[8] In this study the prevalence of obesity & 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%.^[9] Mohan B *et al.*^[10] studied 3326 students from both urban

and rural schools in Ludhiana & found the prevalence of overweight and obese in urban children to be 11.63% and 2.53% respectively. The prevalence of the same in rural children was 4.7% and 3.63% respectively.

In this study the prevalence of hypertension is 7.2%. The prevalence of hypertension among overweight & obese both combined is 20.8%, whereas that in others is 6.2%. Jagadesan, *et al.*^[11] in a study of urban school children in Chennai reported the prevalence of hypertension in children more than 10 years & adolescents to be 8%. The prevalence of hypertension among overweight/obese children and adolescents was 20.4% compared to 5.2% among their non-obese counterparts. This study does not show any association between duration of television viewing & hypertension. Similar results were obtained in studies by Robinson *et al.*^[12,13], Tucker L.A.^[14] & Wolf A.M. *et al.*^[15], in which they found no significant association between T.V. viewing & obesity. However in a study of more than 13500 adolescents and children by Dietz and Gortmaker^[16], a statistically significant association between hours per day of T.V. viewing & prevalence of obesity was reported. 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.

Similar studies relating the BMI category to the family type is not available for comparison. However in the study prevalence of obesity amongst affluent adolescent school children in Delhi ⁽¹⁰⁾, 65% of the children belonged to nuclear families and the overall prevalence of obesity was 7.4%. 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 & BMI category, no significant association was found. Similar study relating the above two factor is not available for comparison. In the present study 81% of the children belong of families with 4 to 7 members. There is statistically significant association between the family type & the BMI category in the present study (Table 4). The prevalence of normal weight children is highest in the nuclear family group compared to other family types. The prevalence of underweight is least in the joint – extended family type groups and in the same group more children were overweight and obese compared to other family groups. Similar studies relating the BMI category to the family type is not available for comparison. However in the study prevalence of obesity amongst affluent adolescent school children in Delhi ⁽¹⁰⁾, 65% of the children belonged to nuclear families and the overall prevalence of obesity was 7.4%. In this study 55% of the children belong to nuclear families and the overall prevalence of obesity is 1.7%.

CONCLUSION

The present study shows the prevalence of obesity and overweight (including obesity) to be 1.7% and 7% respectively. But undernutrition, evidenced by underweight prevalence of 21.26% is still the major nutritional disorder in children. Obesity is more prevalent in children of higher socioeconomic status than those in the lower ones (Table 2) & was highest at 16 years of age (Table 1). The study shows that the prevalence of hypertension to be 7.2%. Watching TV for more than 4 hours a day is associated with increased prevalence of overweight/obesity (Table 3) whereas family (Table 4) & dietary type are not significantly associated (Table 5). The mean BMI was seen decreasing with age initially followed by a gradual increase (Table 6), which may relate to pubertal growth spurt. There is an association between hypertension and BMI, similar to that observed in other established studies (Table 7). The prevalence of hypertension among overweight & obese both combined is 20.8 %, whereas that in others is 6.2%. (Table 8) but no significant association was observed sex & blood pressure (Table 9).

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