

PREVALENCE OF OBESITY AMONG ADOLESCENT SCHOOL CHILDREN IN RURAL AND URBAN SOUTH ODISHA

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Abstract

Despite obesity and overweight being such a pressing health problem of the country, data regarding its magnitude is scarce. Furthermore, there is scarcity of studies regarding the prevalence of obesity and overweight in this part of the country, more so in the regions of southern Odisha and in the age group of adolescents. This study was conducted with an objective of estimating the prevalence of obesity among rural and urban adolescent school children and to assess the risk factors associated with adolescent obesity. This was a cross sectional study conducted in the schools of urban and rural areas of Ganjam district of the state of Odisha between October 2015 to November 2017. The study participants were recruited from among Adolescent high school (8th, 9th, 10th) students from rural and urban areas of Ganjam district. Assuming the prevalence of adolescent obesity as 12.3% from a previous study conducted in Odisha, confidence level as 95% and absolute allowable error as 5% sample size was calculated to be 173 and was rounded off to include total 180 students. Data was collected using standardized questionnaires and descriptive analyses performed. A total of 180 school students were taken out of which 90 were from rural and 90 were from urban schools. The overall prevalence of overweight among urban and rural high school students was found to be 9.44%, and obesity was 5%. Significant associations were found between prevalence of obesity/ overweight with Physical activity pattern like time spent on sedentary activities like TV viewing, studying, using mobile and laptop, time spent on physical activities like outdoor games and mode of conveyance to school as well as eating habits like frequency of eating junk food, drinking carbonated beverages and eating out in hotel/ restaurant and habit of skipping breakfast.

INTRODUCTION

The World Health Organization (WHO) defines obesity as a condition of abnormal or excessive fat accumulation in adipose tissue to the extent that health may be impaired.^[1] The global epidemic of overweight and obesity is an important public health concern across nations.^[2] Obesity and overweight is the 5th leading cause of death worldwide with at least 2.8 million people each year die as a result of being overweight or obese.^[3] Overweight and obesity lead to adverse metabolic effects on blood pressure, cholesterol, triglycerides and insulin resistance. Risks of coronary heart disease, ischemic stroke and type 2 diabetes mellitus increase steadily with increasing body mass index (BMI).^[1]

Children and adolescents are not spared from this either with a ten fold increase in prevalence in this age group over the past 4 decades alone.^[4]

Overweight and obese children are more likely to stay obese into adulthood and to develop non communicable diseases (NCDs) like diabetes, cardiovascular disorders, musculoskeletal disorders especially osteoarthritis and certain types of cancer (endometrial, prostate, breast and colon) at a younger age.^[5]

Low- and middle-income countries (LMIC) like India bear a double burden of both overweight/obesity as well as malnutrition and under nutrition. India has the second highest number of obese children after China with around 14.4 million children having excess body weight.^[6] However, great variability is seen in the prevalence of obesity and overweight not only across states but also in different socio-economic classes, religion and age group. A systematic review showed the pooled prevalence of obesity in India to be around 19% with variation in prevalence ranging from as low as 1.2%

to as high as 25%.^[7] Contrary to previous opinion, obesity and overweight in Indian children are now a significant health challenge in lower socio-economic strata as well.^[8] The rural and urban divide is also rapidly being bridged with various studies done in rural schools showing a prevalence ranging from 3% to 8.5%.^[9,10,11]

Odisha, a poor state classified as Empowered Action Group state faces the double burden of under nutrition and over nutrition.^[12] Various studies conducted in this region again showed a variable prevalence ranging from 12% to 28%.^[12,13,14,15] However, most of the studies conducted were in urban region and does not depict the scenario in rural areas.

Despite obesity and overweight being such a pressing health problem of the country, data regarding its magnitude is scarce. Furthermore, there is scarcity of studies regarding the prevalence of obesity and overweight in this part of the country, more so in the regions of southern Odisha and in the age group of adolescents. With this background, the following study was conducted with an objective of estimating the prevalence of obesity among rural and urban adolescent school children and to assess the risk factors associated with adolescent obesity.

MATERIALS AND METHODS

This was a cross sectional study conducted in the schools of urban and rural areas of Ganjam district of the state of Odisha between October 2015 to November 2017. The study participants were recruited from among Adolescent high school (8th, 9th, 10th) students from rural and urban areas of Ganjam district. Assuming the prevalence of adolescent obesity as 12.3% from a previous study conducted in Odisha, confidence level as 95% and absolute allowable error as 5% sample size was calculated to be 173 and was rounded off to include total 180 students.^[14]

A list of schools in urban area and rural blocks of Ganjam district was obtained from the District Education Office. Two schools from urban area and two from rural blocks were selected using table of random numbers. Urban schools were selected from Berhampur Municipality area and rural schools one each from Kukudakhandi and Hinjlicut block. The students of class 8th to 10th constituted the study population. One section from each class was selected randomly and from each section 15 students were taken. The roll numbers of the students were obtained from the attendance register and selection was done by systematic random sampling. Students who were physically challenged or those who refused consent were excluded from the study.

A pre-designed and pre-tested questionnaire was used to record relevant data. The questionnaire had following parts

1. Socio-demographic variables like age, gender, caste, parents education and occupation, type of family, socio economic status etc.
2. Physical activity like time spent on outdoor games, mode of transport from home to school, time spent on mobile, T.V viewing etc
3. Eating habits like type of diet, frequency of intake of junk food, carbonated drinks, fruits etc
4. Anthropometric measurements like height, weight, waist circumference and hip circumference.

The study instrument was validated using a pilot study among 20 students from a school in the field practice area of Urban Health and Training Centre, Ankuli. Permission from district education authorities was obtained. Permission was also taken from the Head Masters and the selected schools were visited on working days. After explaining the purpose of the study informed consent was obtained from all the study participants. In each class the respective class monitor was asked to help in data collection. Height, weight, waist circumference and hip circumference of the students was measured and noted down. In case of female students a lady teacher was requested to be present at the time of taking anthropometric measurements. Clearance from the Institutional ethical committee was obtained prior to the beginning of the study. Informed consent/assent was obtained from all the study participants and their teachers.

Data that was collected was coded, entered and analysed using IBM SPSS ver.16.0. Proportions were calculated for categorical variables and compared using chi square test. Mean and standard deviations were estimated for continuous variables as the measures of central tendency and dispersion respectively. Means were compared using unpaired t-test. Appropriate charts and diagrams were obtained where necessary. All analysis was done at a preset alpha error of 5% and results expressed at confidence levels of 95%.

RESULTS

A total of 180 school students were taken out of which 90 were from rural and 90 were from urban schools. Overall the mean age of study population was 14.79 ± 1.107 . Most of the students were of 14-15 year in urban and 15-16-year-old in rural school. Both in rural and urban school majority of the study population was male. In rural areas 51% and in urban area 33.4% of the students belong to lower middle class families. The detailed socio-demographic characteristics is given in [Table 1].

Out of the 4 school included in the study 2 were from rural and 2 from urban area. All the schools in rural area were Odia medium and only 1 school in urban area was English medium. All of the school included were public schools, had health checkups although not regularly and had playground. Mid-day meal service was provided in all the Odia medium schools

and canteen services were available only in the single English medium school.

The overall prevalence of overweight among urban and rural high school students was found to be 9.44%, and obesity was 5%. The mean of height, weight, waist circumference(WC), head circumference (HC),

Body Mass Index (BMI) and waist hip ratio (WHR) of rural and urban school students are given below in [Table 2].

The details of the covariates of obesity and overweight are given below in [Table 3].

Table 1: Socio-demographic characteristics of the study population

Variables		Rural (N=90)		Urban (N=90)		Total (N=180)	
		N	%	N	%	N	%
Age (Years)	13-14	9	10.0%	12	13.3%	21	11.7%
	14-15	26	28.9%	29	32.2%	55	30.6%
	15-16	30	33.3%	28	31.1%	58	32.2%
	16-17	18	20.0%	14	15.6%	32	17.8%
	≥17	7	7.8%	7	7.8%	14	7.7%
Gender	Male	62	68.9%	58	64.4%	120	66.7%
	Female	28	31.1%	32	35.6%	60	33.3%
Religion	Hindu	82	91.2%	74	82.3%	156	86.6%
	Others	8	8.8%	16	17.7%	24	13.4%
Caste	SC/ST	6	6.7%	5	5.6%	11	6.1%
	OBC	17	18.9%	26	28.8%	43	23.9%
	General	67	74.4%	59	65.6%	126	70.0%
Family type	Nuclear	28	31.1%	64	71.1%	92	51.1%
	Joint	62	68.9%	26	28.9%	88	48.9%
Siblings	0	19	21.1%	31	34.4%	50	27.8%
	≥1	71	78.9%	59	65.6%	130	72.2%
Birth order	1	34	37.8%	36	40.0%	70	38.9%
	2	37	41.1%	29	32.2%	66	36.7%
	≥ 3	19	21.1%	25	27.8%	44	24.4%
Socio-economic status	Upper class (class I)	4	4.4%	8	8.9%	12	6.7%
	Upper middle class (class II)	5	5.6%	13	14.4%	18	10.0%
	Middle class (class III)	12	13.3%	24	26.7%	36	20.0%
	Lower middle (class IV)	46	51.1%	30	33.4%	76	42.2%
	Lower (class V)	23	25.6%	15	16.6%	38	21.1%
Fathers education	Illiterate	3	3.3%	2	2.2%	5	2.8%
	Primary	46	51.2%	24	26.7%	70	38.9%
	Secondary	38	42.2%	36	40.0%	74	41.1%
	Higher	3	3.3%	28	31.1%	31	17.2%
Fathers occupation	Labourer/Farmer	34	37.8%	22	24.5%	56	31.1%
	Semi-skilled	24	26.7%	20	22.2%	44	24.5%
	Service	25	27.7%	34	37.7%	59	32.7%
	Business	7	7.8%	14	15.6%	21	11.7%
Mother's education	Illiterate	10	11.1%	3	3.3%	13	7.2%
	Primary	46	51.1%	40	44.4%	86	47.8%
	Secondary	34	37.8%	32	35.6%	66	36.7%
	Higher	0	0.0%	15	16.7%	15	8.3%
Mother's occupation	Housewife	64	71.1%	62	68.9%	126	70.0%
	Working	26	28.9%	28	31.1%	54	30.0%

Table 2: Anthropometric measurements of rural and urban school students

Variable (Mean, S.D)	Rural	Urban	T test
Height (in mts)	1.51± 0.082	1.49± 0.089	0.0146± 0.012, t= 1.140, p= .256
Weight (in kgs)	45.57± 8.62	48.23± 10.29	2.644 ± 1.41, t= 1.868, p= .063
BMI	19.90 ± 3.14	21.39 ± 4.01	1.486 ± 0.527, t= 2.766, p= 0.006
Waist Circumference (in inches)	25.74± 4.2	28.13 ± 5.11	2.39± 0.69 t=3.432 , p =0.001
Hip circumference (in inches)	27.85 ± 3.67	29.27 ± 4.21	1.42 ± .0.58 , t= 2.409 , p= 0.017
WHR	0.92 ± 0 .054	0.96 ± 0.087	0.038 ± 0.01, t= 3.502 , p= 0.001

Table 3: Correlates of overweight and obesity in school children

Variables/Correlates		Overweight/Obesity				Total		Chi sq. and P values
		Present		Absent		N	%	
		N	%	N	%			
Time spent on studying after school	≥ 4 hrs/day	18	22.2%	63	77.8%	81	45%	X2=7.209, P = 0.007
	< 4hrs/day	8	8.1%	91	91.9%	99	55%	
Time Spent On Television Viewing	> 1hr/day	20	35.1%	37	64.9%	57	31.7%	X2=29.764, P < 0.001
	≤ 1hr/day	6	4.9%	117	95.1%	123	68.3%	
Time spent on smartphone	≥ 2hrs/day	19	34.5%	36	65.5%	55	30.6%	X2=26.027, P < 0.001
	< 2hrs/day	7	5.8%	113	94.2%	120	66.7%	
	Don't own mobile	0	0.0%	5	100%	5	2.7%	

Time spent on computer	≥ 2hrs/day	12	85.7%	2	14.3%	14	7.8%	X2=62.566, P < 0.001
	< 2hrs/day	2	11.8%	15	88.2%	17	9.5%	
	Don't own computer/ laptop	12	8.1%	137	91.9%	149	82.7%	
Means of transport to school	Car/bike/auto	11	37.9%	18	62.1%	29	16.1%	X2=16.627, P = 0.002
	Public transport	5	19.2%	21	80.8%	26	14.5%	
	Walk/cycle	10	8%	115	92%	125	69.4%	
Time spent on outdoor games	None	18	62.1%	11	37.9%	29	16.1%	X2=26.027, P < 0.001
	< 1hr/ day	6	12.5%	42	87.5%	48	26.7%	
	≥ 1 hr/day	2	1.9%	101	98.1%	103	57.2%	
Involvement in household activities	No	14	18.2%	63	81.8%	77	42.8%	X2= 1.52, P = 0.217
	Yes	12	11.6%	91	88.4%	103	57.2%	
Duration of sleep	< 6hr/day	9	15%	51	85%	60	33.3%	X2= 2.872, P = 0.238
	6-8 hrs/day	11	11.5%	85	88.5%	96	53.4%	
	> 8hrs/day	6	25%	18	75%	24	13.3%	
Breakfast intake	Irregular	15	36.6%	26	63.4%	41	22.7%	X2=21.061, P < 0.001
	Regular	11	7.9%	128	92.1%	139	77.3%	
Type of diet	Mixed	22	13.1%	146	86.9%	168	93.4%	X2= 3.712, P = 0.054
	Only vegetarian	4	33.3%	8	66.7%	12	6.6%	
Intake of carbonated drinks	≥ 3 times/ week	18	25.4%	53	74.6%	71	39.5%	X2= 11.288, P = 0.001
	< 3 times/ week	8	7.3%	101	92.7%	109	60.5%	
Intake of junk food	≥ 3 times/ week	22	21.8%	79	78.2%	101	56.1%	X2= 10.026, P = 0.008
	< 3 times/ week	4	5.1%	75	94.9%	79	43.9%	
Type of food in school lunch	Mid-day meal	7	6.6%	99	93.4%	106	58.9%	X2=38.210, P < 0.001
	Canteen	9	60%	6	40%	15	8.4%	
	Vendors Outside	5	41.7%	7	58.3%	12	6.6%	
	Home	5	10.6%	42	89.4%	47	26.1%	
Intake of fruits	≥ 3 times/ week	7	13.7%	44	86.3%	51	28.3%	X2= 0.029, P = 0.863
	< 3 times/ week	19	14.7%	110	85.3%	129	71.7%	
Eating out in restaurant /hotels	Rarely (<1 time/ month)	16	11.0%	129	89%	145	80.6%	X2= 7.017, P = 0.008
	Occasionally (2-3times/month)	10	28.6%	25	71.4%	35	19.4%	

DISCUSSION

This cross-sectional study aimed to compare the prevalence and correlates of obesity/overweight among rural and urban children in south Odisha. Combined prevalence of overweight and obesity was found to be 14.4%. Previous systematic reviews have shown a wide variation of prevalence in this age group. One such review showed a prevalence of overweight among adolescent varying between 3 to 24.7% and obesity between 1.5 to 14% and another the prevalence of overweight and obesity ranged from 2.2 to 25.8% and 0.73% to 14.6% respectively.^[7,16]

Both obesity and overweight was found to be higher in urban school students 6.66% and 11.12% respectively, than rural school students where it was 3.33% and 7.78% respectively, although the difference was not statistically significant. This is corroborated by other studies from India, but this difference was variable in nature.^[16,17,18] Prevalence of obesity was found to be significantly greater in older students, but variables like gender and caste were not found to be significantly associated with the prevalence of obesity. Other authors have found highest prevalence of obesity and overweight in class 9th and 10th students.^[19] While in our study, a higher proportion of males were obese compared to females, but in other studies, females were found to be more obese.^[20,21] Although, not statistically significant prevalence of obesity/ overweight was found to be

highest in upper and middle socio-economic class. Similar findings have been reported by others as well.^[22,23]

Significant association were also found between hours of television and/or smartphone and laptop use and obesity/ overweight. This is corroborated by a few other studies in India.^[10,24,25] Prevalence of obesity/overweight was found to be least in students who walked or cycled to their schools. As walking/cycling act as a form of physical activity and help in maintaining a healthy body weight, this may be the possible explanation for the association seen. This has been reported by others as well.^[26,27] Consumption of carbonated drinks and irregular breakfast was associated with higher prevalence of obesity. Prevalence of obesity/ overweight was found to be least in students who ate mid-day meal (6.6%) followed by those who bought lunch from home (10.6%) and highest in students who had their Tiffin from canteen (60%) of the school. Food cooked at home is usually more balanced than food eaten from canteen or from vendors outside where they mainly sell packaged junk food and fried foods. Similar results were also observed in another study conducted in school students of Uttarakhand and Karnataka with least prevalence of obesity in students having mid-day meal.^[18,28]

While our study has a sufficient sample size and meets the parameters outlines in the objectives, it has a few limitations. This is a cross sectional study and as such causal inferences could not be made. Also the

sample size does not permit for powered estimates of correlations.

CONCLUSION

The present study suggests that obesity and overweight is a public health problem in both rural and urban high school students of Odisha and this is equally prevalent in urban and rural regions. Significant associations were found between prevalence of obesity/ overweight with Physical activity pattern like time spent on sedentary activities like TV viewing, studying, using mobile and laptop, time spent on physical activities like outdoor games and mode of conveyance to school as well as eating habits like frequency of eating junk food, drinking carbonated beverages and eating out in hotel/ restaurant and habit of skipping breakfast.

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