

Prevalence of obesity among school children aged 10 to 12 years in Sambalpur

Amit Kumar Mishra¹, Himansu Prasad Acharya², Rama Chandra Giri²

¹Department of Community Medicine, Pondicherry Institute of Medical Sciences, Ganapathichettikulam, Kalapet, Pondicherry, India.

²Department of Community Medicine, V.S.S. Institute of Medical Sciences and Research, Burla, Sambalpur, Odisha, India.

Correspondence to: Amit Kumar Mishra, E-mail: dramitvss@gmail.com

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Abstract

Background: Overweight and obesity are due to more intake of calories than its utilization. This overweight and obesity are the precursors of many fatal conditions. India is now in epidemiological polarization where at one hand we are facing challenges to combat the under nutrition, on the other hand over nutrition starts showing its effects.

Objective: To assess the prevalence of overweight and obesity among school children aged 10 to 12 years in Sambalpur.

Materials and Methods: It was a community-based cross-sectional study conducted in different schools of Sambalpur town of Odisha.

Result: The overall prevalence of overweight and obesity was found to be 9.6%. The prevalence was higher among female (10.7%) students than male students (9%). Comparing the schools, higher prevalence was noticed among students of English medium (13.3%) then the students of Odia medium (6%).

Conclusion: The rapid urbanization and industrialization of underdeveloped areas changes the pattern of eating habits and lifestyle. So steps should be taken to fight against the risk factors causing this increased prevalence of overweight and obesity. Health education to the new generation is one of the most important steps to reduce this morbidity.

KEY WORDS: Overweight, obesity, BMI, CHD and Type 2 Diabetes, medium of school, prevalence

Introduction

Overweight and obesity are defined as excessive accumulation of fat that has a negative impact on health; it may be due to increase in number of fat cells, hyperplastic or due to increase in size, hypertrophic. Fundamentally, it is due to more of consumption and less utilization of calorie resulting in more storage of fat in body. Obesity is the precursor of large number of fatal conditions, such as diabetes, coronary heart

disease, cancers, and osteoarthritis in later stages of life. So far nutrition is concerned, India is in epidemiological polarization, that is, on one end the nation is facing challenges to combat under-nutrition; on the other end the over-nutrition (overweight and obesity) has started appearing in a relatively higher proportion. The World Health Organization (WHO) describes overweight and obesity as one of today's most important public health problems. Obesity has become a major epidemic increasing the burden of public health problems and contributes to 2.6 million deaths worldwide every year.^[1] As the standards of living continue to rise due to rapid industrialization and urbanization, weight gain and obesity are now beginning to pose a growing threat to the health of the citizens thus it needs to be intervened at the right time in the right way. At present, the emerging issue is the increase in number of childhood obesity in developing nations like India, and the socioeconomic and public health burden that will be faced by these nations in the near future.

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The prevalence of overweight and obesity is increasing in a logarithmic way in the country. A study conducted in Kolkata found the overall prevalence rates of overweight and obesity were 28.5% and 4.2%.^[2] In a research in Hyderabad the overall prevalence of underweight was found to be 19.7% according to CDC criteria and 18.85% according to IOTF criteria and the overall prevalence of overweight and obesity was found to be 6.6% and 2.8% by using CDC criteria and 5.3% and 0.3% with IOTF cut-offs respectively.^[3] In a similar study at Bhilai Nagar, the prevalence of overweight and obesity was 23.8% and 8.4%, respectively.^[4] According to a study conducted in a school at Bhubaneswar, Odisha, the overall prevalence of overweight and obesity in school children of 5–15 years was found to be 28.63% (overweight 14.1% and obesity 14.53%).^[5] These studies show that how the overweight and obesity are now an emerging burden to the country.

Material and Methods

The objective of the study was to estimate the prevalence of obesity among school children aged 10–12 years in Sambalpur. The significance of choosing this age group was that this is the earliest part of adolescent age group and as this part of life is the most neglected one, so if we intervene in this period then the future occurrences of fatal outcomes can be reduced. The study was conducted in Sambalpur town of western part of Odisha in the year 2012–2013.

It was a cross-sectional study with stratified random sampling method, carried out from January 2012 to June 2013. The sample size was calculated as 300 ($S = 4pq/d^2$) assuming the prevalence as 25% and taking allowable error as 20%. The schools present in Sambalpur were first stratified in two categories as Odia and English medium. Then 10 schools were selected randomly from two categories, five from each medium of school. Students were selected by systematic random sampling method from the school registers of the selected schools. The ages of the students were verified from their admission registers. Any child with medication history was excluded from the study.

The ethical approval for the research work was obtained from The Ethical Committee, V. S. S. Medical College, Burla. Permission for the research work at school premises was first collected from the District Education Officer, Sambalpur and then from the respective head of the institutions/schools. The assent forms were signed by the students before the

anthropometric measurements for participation in the study.

The prevalence of overweight and obesity was expressed in terms of body mass index (BMI). The weight was measured by a mechanical weighing machine with shoes removed. Height was measured without shoes to the nearest 0.1 cm using a stadiometer. The collected data were analysed by SPSS, version 19.

The WHO classification of BMI as overweight ≥ 25 and obesity ≥ 30 underestimate the burden of overweight and obesity in Asian population. So International Obesity Task Force (IOTF) has proposed the standards for adult obesity in Asia and India as BMI > 23 is overweight and BMI > 25 leads to obesity.^[6] In 2005, IOTF revised the BMI cut-off figures with an emphasis on health risks instead of weight.

BMI (kg/m ²)	Health risk
<18.5	Malnutrition
18.5–23	Normal
23–27.5	Low risk of CHD and Type 2 diabetes
>27.5	High risk of CHD and Type 2 diabetes

Result

The study was carried out in view of the problem of overweight and obesity among school children aged 10–12 years in Sambalpur. From each school 30 students, 15 students from each age group irrespective of sex were selected. Equal numbers of students were chosen from the two age group, 10–11 years and 11–12 years, that is, 150 students from each age group. Out of all the students, 178 (59.3%) were boys and 122 (40.7%) were girls; the male to female ratio was 1.46.

The weight and height means of the students correspond to their age. The mean weight and height of girl students was more than the boys of the same age group (Table 1).

There was minimal difference in overall mean BMI between the two age groups, 19.36 in 10–11 years age group and 19.57 in 11–12 years age group. The median of BMI of 11–12 years age group boys was lower than 10–11 years boys, and similar trend was observed among girls also with median of BMI 19.26 and 18.99 for students of 10–11 years and 11–12 years, respectively. In both the age groups, the mean BMI of female students was more than that of male students (Table 2).

The mean BMI of Odia Medium students (18.41, SD 2.53) was less than English medium students (20.52, SD 2.58). The

Table 1: Weight and height of the study population

Character	Male (n = 178)				Female (n = 122)				Overall	
	10–11 years		11–12 years		10–11 years		11–12 years		Mean (SD)	Median
	Mean (SD)	Median	Mean (SD)	Median	Mean (SD)	Median	Mean (SD)	Median		
Weight(kg)	38.71(8.62)	37.00	40.68(7.44)	39.00	39.30(7.49)	39.39	41.55(7.81)	41.00	39.99(7.92)	39.0
Height(cm)	141(9.00)	139	144(8.00)	143	142(9.00)	142	145(9.00)	145	142.9(8.8)	143

Table 2: BMI of the study population according to age

Age group	Sex	BMI	
		Mean (SD)	Median
10–11 years	Male	19.34 (2.82)	19.21
	Female	19.84 (2.02)	19.26
	Overall	19.36 (2.59)	19.22
11–12 years	Male	19.54 (2.84)	19.11
	Female	19.62 (3.09)	18.99
	Overall	19.57 (2.93)	19.10

Table 3: BMI of the study population according to medium of school

School	Sex	BMI	
		Mean (SD)	Median
Odia medium	Male	18.34 (2.72)	18.64
	Female	18.63 (2.32)	18.79
	Overall	18.41 (2.53)	18.66
English medium	Male	20.70 (2.40)	20.17
	Female	20.22 (2.77)	19.65
	Overall	20.52 (2.58)	20.17

Table 4: Sex- and age-wise distribution of BMI of study population

BMI	Outcome	Sex		Age		Total
		Male	Female	10–11 years	11–12 years	
<15	Starvation	11 (6.2)	09 (7.4)	09 (6)	11 (7.3)	20 (6.7)
15–18.5	Undernourished	35 (19.7)	21 (17.2)	25 (16.7)	31 (20.7)	56 (18.7)
18.5–23	Normal	116 (65.2)	79 (64.8)	105 (70)	90 (60)	195 (65)
23–25	Overweight	10 (5.6)	09 (7.4)	09 (6)	10 (6.7)	19 (6.3)
>25	Obese	06 (3.4)	04 (3.3)	02 (1.3)	08 (5.3)	10 (3.3)
Total		178 (100)	122 (100)	150 (100)	150 (100)	300 (100)

*Figure in parenthesis indicates percentage.

Table 5: BMI according health risk in different sexes and age groups

BMI	Health risk	Sex (n = 300)		Age (n = 300)		Total
		Male	Female	10–11 years	11–12 years	
<18.5	Nutritional deficiency and osteoporosis	46 (25.8)	30 (24.6)	34 (22.7)	42 (28)	76 (25.4)
18.5–23	Healthy range	116 (65.2)	79 (64.8)	105 (70)	90 (60)	195 (65)
23–27.5	Moderate risk for CVD and T2DM	13 (7.3)	12 (9.8)	09 (6)	16 (10.7)	25 (8.3)
>27.5	High risk for CVD and T2DM	03 (1.7)	01 (0.8)	02 (1.3)	02 (1.3)	4 (1.3)
Total		178 (100)	122 (100)	150 (100)	150 (100)	300 (100)

*Figure in parenthesis indicates percentage.

Table 6: BMI and medium of school (English/Odia)

Medium of school	BMI		Total
	BMI > 23	BMI ≤ 23	
English	20 (69)	130 (48)	150
ODIA	09 (31)	141 (52)	150
Total	29 (100)	271 (100)	300

*Figure in parenthesis indicates percentage

mean BMI of Odia medium boys was less than girls and the reverse was seen in students from English medium school (Table 3).

The prevalence of overweight and obesity were 6.3% and 3.3% respectively. The difference of overweight and obesity between sexes is not significant ($p = 0.946$). The prevalence of overweight and obesity among boys was 5.6% and 3.4% respectively, and among girls these were 7.4% and 3.3% respectively. The overall prevalence of overweight and obesity was marginally higher among girls (10.7%) than boys (9.0%) and the difference among them was statistically not significant ($p = 0.946$).

The overall prevalences of overweight and obesity among the 10–11 years and 11–12 years age group are 7.3% and 12.0% respectively. The number of overweight students irrespective of sex in the 10–11 and 11–12 years age group were 9 (3.0%) and 10 (3.3%), respectively and that of obesity were 02 (0.7%) and 08 (2.7%), respectively (Table 4).

The Table 5 shows the different disease conditions they are likely to develop in future if the adverse condition (overweight/obesity) persists. These risks for disease

conditions are only a prediction according to their BMI and the risks are related to specific BMI ranges.

The prevalence of overweight and obesity among the students studying in private schools, English medium (13.3%) was significantly higher ($p 0.032$) than among those studying in government schools, Odia medium school (6.0%). The overall prevalence of overweight and obesity irrespective of school was 9.6%. Two-thirds of the overweight and obesity students belonged to English medium school. The

overweight/obesity, that is, BMI > 23 was significantly associated with medium of school (Table 6).

Discussion

The higher value of weight and height in 11–12 years age group as compared to 10–11 years age group could be due to their physical growth. The higher mean weight and height in the female counterpart may be explained by the rapid growth rate of female during this age period (pre-puberty) as compared to the male counterpart. The study findings were similar to the study by Jahnavi et al. in 2011 among school students^[3] and study conducted by Mushtaq et al. on Pakistan school students in 2011.^[7]

The higher mean BMI of female students than that of male students in both the age groups (10–11 and 11–12 years) is explained by the rapid physical growth of females during this age group and this finding was similar to the findings of a study by Mohanty at Puducherry.^[8] Shah et al. also had the similar observation among 11–12 years school students with mean BMI more among girls than boys.^[9]

The mean BMI of Odia medium boys was less than girls and the reverse was seen in English medium students, here the mean BMI of boys was higher than girls. This finding was supported by the study conducted by Shah et al. at Bhavanagar in an English medium school.^[9]

The overall prevalence of overweight and obesity was higher among girls (10.7%) than boys (9.0%) and this difference of overweight and obesity prevalence among them was statistically not significant ($p = 0.946$). The result was similar to Aggarwal et al., study with no significant difference of prevalence between boys and girls.^[10] In this study, the prevalence of overweight and obesity was much lower as compared to the study by Mandal et al. in English medium school girls of Kolkata, where the prevalence rates of overweight and obesity were 28.5% and 4.2%, respectively.^[2] Sood et al., in their study – Affluent adolescent school girls of Bangalore city, found the prevalence of overweight and obesity to be 13.1% and 5.0%, respectively.^[11] The higher combined prevalence (overweight and obesity) in girls than boys was supported in the study by Shah et al. on school children of Bhavanagar, with combined prevalence of overweight and obesity 16.66% among girls and 12.48% among boys.^[9] In a study in Delhi, Kapil et al. found that among adolescent school children the maximum prevalence of obesity was found during the pubertal period, between 10 and 12 years.^[12] In this study, 25.34% of students were underweight. The underweight proportion of students was much higher than the study findings of Patnaik et al., conducted in an affluent private school in Bhubaneswar with underweight proportion of 11.11%.^[5]

In this study, the prevalence of overweight and obesity was higher in 11–12 years age group than that in 10–11 years age group students, this difference was not statistically significant ($p = 0.227$). This may be explained by higher exposure to adverse environmental factors, as they spent more time

in computers, more time spent on tuitions and thus less physical activities, and more fast food eating habits. The prevalence was lower than that in a study by Aggarwal et al. among school children in Ludhiana, Punjab with 12.7% overweight and 3.4% obesity rates.^[10]

As per the guidelines by the WHO Singapore declaration on Asian population, 2005, the BMI should always be interpreted in terms of risk of CVD and type 2 diabetes. According to the Table 5, the percentage of students in moderate risk in females, (9.8%) was higher than males (7.3%) but the reverse was seen in students in high risk group with male 1.68% and females 0.82%. There was no much difference in proportion of students from each category at risk of nutritional deficiency and osteoporosis and also in healthy range group according to their BMI. In all the students, 65% were in healthy range. Combining the overall risk of CVD and type 2 diabetes, girls (10.6%) were more at risk than boys (9.0%). While considering risk, 8.3% students were in moderate and 1.4% students were in high risk group for developing diseases in future. Comparing age difference, 64% students in moderate risk were in 11–12 years age group, the higher risk among the 11–12 years age group may be due to their higher environmental exposure and high risk behavior.

The higher prevalence of overweight/obesity in English medium school signify that the students of English medium school were at higher risk of developing overweight and obesity than Odia medium school students. This finding of this study was supported by the findings of Bharati et al., study among school going children of Wardha city with odds ratio 2.769.^[13]

Conclusion

The over-nutrition problem (overweight/obesity) was reported higher among female students than male students and more among 11–12 years than 10–11 years age group. A higher proportion of students having BMI >23 were at moderate risk for CVD and type 2 diabetes mellitus development according to the WHO declaration 2005.

High rates of overweight and obesity were found in English medium school students as compared to Odia medium school students. The study shows that overweight and obesity among school children aged 10–12 years is an important health problem in this part of Odisha and that should be focused as early as possible.

Recommendations

It is estimated that obesity alone contributes to 2.6 million deaths worldwide every year and there are more than 300 million obese people worldwide. Overweight is a continuous threat for future obesity in children, by itself a risk factor for different diseases. Hence a right decision at right time for early intervention can reduce the fatal morbidities due to overweight and obesity. Few recommendations are

- More emphasis on primordial and primary level of prevention
- Educating students to increase their physical activities by playing in game periods, avoiding automobiles for transport to school, and involvement in school recreation activities
- Inter personal communication at least to obese students to modify high risk behavior
- Changing the eating pattern from low nutritive, high energy dense food to high nutritive low energy dense food
- Well-designed, well-implemented school programs can effectively promote physical activity and healthy eating behavior among children
- At least one anthropometric examination per year should be carried out and recorded in their health diary
- Restriction of vendors/shops selling fast food/packed snacks around the school campus

References

1. World Health Organization. *Preventing Chronic Diseases: A Vital Investment. World Global Report*. Geneva: World Health Organization, 2005.
2. Mandal A, Mandal GC. Prevalence of overweight and obesity among the urban adolescent English Medium School girls of Kolkata, India. *IJPH* 2012;9(3)
3. Jahnvi A, Chandrika D, Sultana G, Vanita KP. Prevalence of overweight and obesity in school going children, pharmanest. *Int J Adv Pharma Sci* 2011;2(4):369–377.
4. Jain G, Bharadwaj SK, Joglekar AR. To study the prevalence of overweight and obesity among school children (13–17yrs) in relation to their socioeconomic status and eating habits. *Int J Sci Res* 2012;2(6):1–4.
5. Patnaik S, Patnaik L, Patnaik S, Hussain MA. Prevalence of overweight and obesity in a private school of Orissa, India. *Int J Epidemiol* 2011;10(1).
6. WHO/IASO/IOTF. *The Asian Pacific Prospective: Redefining Obesity and Its Treatment*. Health Communications Australia Private Ltd, 2000.
7. Mushtaq MU, Gull S, Abdullah HM, Shahid U, Shad MA, Akram J. Waist circumference, waist–hip ratio and waist height ratio percentiles and central obesity among Pakistani children aged five to twelve years. *BMC Pediatrics* 2011;11:1–15.
8. Mohanty B. The prevalence of overweight and obesity in school going children of Pondicherry, 2008.
9. Shah C, Diwan J, Rao P, Bhabhor M, Gokhle P, Mehta H. Assessment of obesity in school children. *Calicut Med J* 2008;6(3):e2.
10. Aggarwal T, Bhatia RC, Singh D, Sobti PC. Prevalence of obesity and overweight in affluent adolescents from Ludhiana, Punjab. *Indian Pediatr* 2008;45:500–2.
11. Sood A, Sundararaj P, Sharma S, Kurpad AV, Muthayya S. BMI and body fat percent: affluent adolescent girls in Bangalore city. *Indian Pediatr* 2007;44:587–91.
12. Kapil U, Singh P, Pathak P, Dwivedi SN, Bhasin S. Prevalence of obesity among affluent adolescent school children in Delhi. *Indian Pediatr* 2002;39:449–52.
13. DR, Deshmukh PR, Garg BS. Correlates of overweight & obesity among school going children of Wardha city, Central India. *Indian J Med Res* 2008;127:539–43.