

## Overweight and Obesity in Children Aged 5 to 14 Years: A Cross Sectional Study

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### Abstract

**Background:** In this era, overweight and obesity in children is now one of the most seriously rising public health challenges among many countries including India. Also, overweight and obese children are more likely to develop non-communicable diseases like diabetes and cardiovascular diseases at younger age. The main purpose of this study is to estimate the prevalence of overweight and obesity in children.

**Material and Methods:** It was a cross sectional study conducted among 2486 children (1352 girls, 1134 boys) belonging to age group 5 to 14 years in Sambalpur municipality area of Western Odisha. This study was approved by Institutional Ethical Committee. Children with abnormal growth pattern and those who are below 5 years and above 14 years were excluded from the study. Study subjects were categorised as normal weight, overweight and obese as per International Obesity Task Force (IOTF) guidelines and compared with socio economic status. Anthropometric data were analysed using SPSS, BMI calculator.

**Results :** Prevalence of overweight and obesity among children was 15.84%, 6.01% in boys and 18.65%, 7.32% in girls respectively. Again, female children from upper socio-economic society were at greater risk of being overweight and obese than their male counterpart showing significant disparity in growth parameters.

**Conclusion :** Obesity epidemic in children is one of the serious public health concerns. Although overweight and obesity are of multifactorial origin, results of this study provide an early insight to parents, caregivers and society as a whole for early prevention and control of this problem as prevention is better than cure.

**Keywords:** Overweight, Obesity, school going Children, BMI.

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### Introduction

The most serious public health challenges of 21st century is childhood obesity. The problem is global as per evidenced by many researchers and is steadily affecting many low and middle income countries. Countries like India are going through an economic and nutrition transition.<sup>[1]</sup> The prevalence of overweight and obesity among children has been increased at an alarming rate because of nutrition transition which may be associated with a change in dietary habits, decrease in physical activities etc. Since last few decades, there has been an increase in the percentage of overweight and obesity among children of Indian urban families.<sup>[2]</sup> Globally, in 2016 the number of overweight children under the age of 5 is estimated to be over 41 million.<sup>[3]</sup> Almost half of all overweight children under 5 live in Asia & one-quarter live in Africa (WHO).

Overweight and obese children are more likely to stay obese into adulthood and are prone to develop non-communicable diseases like type-II DM (Diabetes Mellitus), cardiovascular diseases, cancer and other comorbid conditions.

Also obesity in children is more likely to increase the morbidity at a younger age.<sup>[4-6]</sup> Previous studies have shown that approximately 14-15% of all 15 years old children are overweight in USA.<sup>[7]</sup>

Overweight, obesity as well as their related diseases are largely preventable. Therefore prevention of childhood obesity needs high priority as it provides an opportunity to prevent further progression of disease into adulthood. Therefore, an attempt was made to assess the prevalence of overweight and obesity among healthy children aged between 5-14 years in Western Odisha.

### Aim and Objectives

Primary objective of this study was to estimate the prevalence of overweight and obesity in children between 5 to 14 years of age. Secondary objective was to assess the impact of socio-economic status on the height, weight and BMI (Body Mass Index) percentile of children as per their age, sex and gender.

### Methodology

The cross-sectional study was conducted in VIMSAR Burla, a tertiary healthcare centre in Western Odisha. A total of 2486 children aged 5-14 years were enrolled in the study. Among them, 1352 were girls and 1134 were boys.

School going children between 5 to 14 years of age were included in the study only after obtaining written informed consent from their parents. Children below 5 years and above 14 years were excluded from the study. Children attending outpatient department of paediatrics in Veer Surendra Sai institute Medical Science and research (VIMSAR) during study period were recruited in this study. Children having hormonal disorder and growth abnormality were excluded from the study. The period of the study was from January 2018 to July 2019 for a period of one year.

Height was measured by stadiometer and weight was measured by using a digital weighing machine after calibration. BMI was calculated by using formula weight(kg)/height (m<sup>2</sup>). Data was recorded on a proforma. Sex and age specific basal metabolic index (BMI) was calculated using BMI calculator. Socio-economical status was assessed by using modified Kuppuswamy scale.

Data was collected with the help of predesigned questionnaire. Anthropometric data like height, weight and BMI of each study participant was measured after inclusion in the study. Children were categorized into different groups as per classification of BMI by IOTF (International Obesity Task Force) guidelines as shown in the following [Table 1].<sup>[8]</sup> Also, BMI charts of each category was constructed separately for lower socio-economic, middle socioeconomic and upper socioeconomic classes.

Children having >95<sup>th</sup> percentile of BMI were obese, >85<sup>th</sup> to < 95<sup>th</sup> percentile were overweight and >5<sup>th</sup> to <85<sup>th</sup> were healthy weight. Children with BMI less than 5<sup>th</sup> percentile was considered underweight.

**Table 1: ?**

IOTF	Classification
BMI percentile	CLASS
<5 <sup>th</sup>	Underweight
≥5 <sup>th</sup> to <85 <sup>th</sup>	Healthy weight
≥85 <sup>th</sup> to <95 <sup>th</sup>	Overweight
≥95 <sup>th</sup>	Obese

Statistical analysis was done by using SPSS 20 version. Chi-square test was applied and Microsoft excel was used for graphical representation of the results. P value < 0.05 was considered as significant for all statistical test.

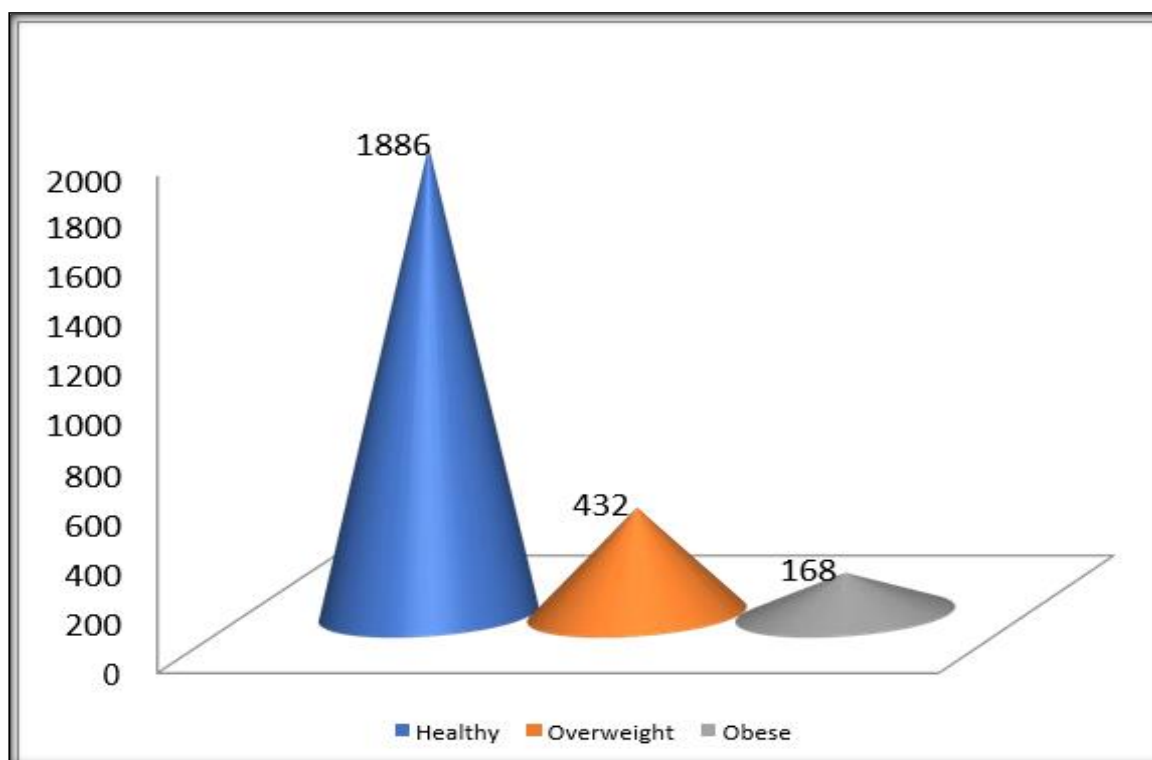
## RESULTS

A total of 2486 children were included in this study. Out of them, 1134 were male and 1132 were female. Male female ratio was 0.5:0.6. The age group of all study participants were between 5 to 12 years old. Prevalence of obese, overweight and healthy children among all subjects was 6.75% (168), 17.37% (432) and 75.86%(1886) respectively as shown in [Table 2].

**Table 2: Prevalence of healthy, overweight and obese children among all subjects.**

Variables	Healthy	Overweight	Obese	Total
Number	1886	432	168	2486
Percentage	75.86%	17.37%	6.75%	100%

The graphical representation of the above table -2 is shown in [Figure 1].

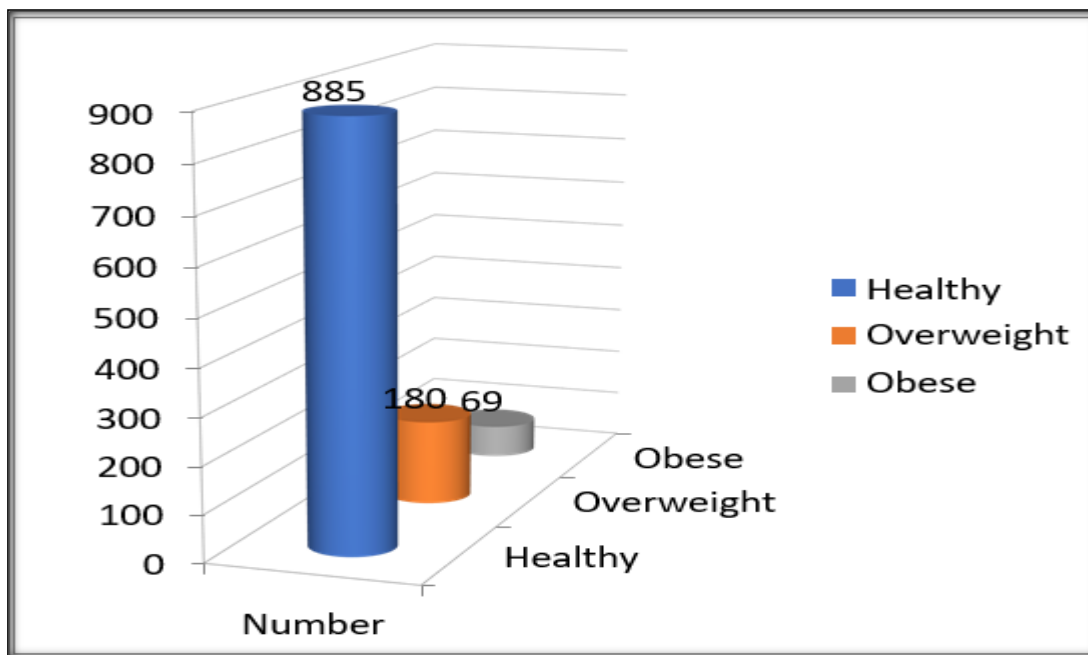


**Figure 1: ?**

Again we compared the prevalence of overweight, obesity in both male and female children separately and found that out of 1134 male children, 6.08% (69) were obese, 15.87% (180) were overweight and 78.04% (118) were healthy as shown in table-3. The graph showing the prevalence among boys was depicted in [Figure 2].

**Table 3: Prevalence among boys.**

Variables	Healthy	Overweight	Obese	Total
Number	885	180	69	1134
Percentage	78.04%	15.87%	6.08%	100%



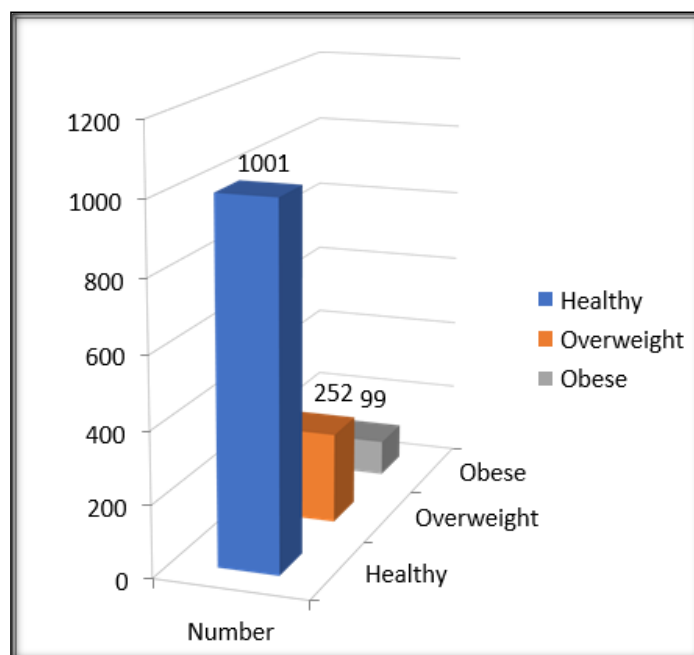
**Figure 2: (Prevalence among boys)**

This study also showed that among the girl children, 7.32% (99) were obese, 18.83% (252) were overweight and 74.03% (1001) were healthy as shown in [Table 4].

**Table 4: (Prevalence among girl children)**

Variables	Healthy	Overweight	Obese	Total
Number	1001	252	99	1352
Percentage	74.03%	18.83%	7.32%	100%

The graphical representation of the [Table 4] has been shown in [Figure 3] below.



**Figure 3: Prevalence of overweight and obesity among girls**

When we compared the prevalence data of boys and girls with their socio-economical status, we found that number of children belonging to upper- and middle-class children were significantly higher than the children belonging to lower socioeconomic class in both male and female.

We also observed that, from the middle socioeconomic class male children, about 5.24%(31) were obese, 15.73%(93) were overweight and 79.01%(467) were healthy as shown in table-5. In the present study, we observed that around 5.06% (19) were obese, 16.53% (62) were overweight children and 78.4%(294) were healthy belonging to upper socioeconomic class. The p-value was 0.005 which was significant.

**Table 5: SES & BMI percentile in male**

Variable	LSES	MSES	USES	P-value
Healthy	158 (94.04%)	467 (79.01%)	294 (78.4%)	0.005371
Overweight	08 (4.7%)	93 (15.73%)	62 (16.53%)	
Obese	02 (1.19%)	31 (5.24%)	19 (5.06%)	

In this study, we also observed that about 5.72% (17) girls were obese, 18.85% (56) were overweight and 75.42% (224) were healthy girls belonging to upper socioeconomic status. Whereas from middle class family, 4.96% (39) were obese, 17.45% (137) were overweight and 77.57% (609) were healthy girl children.

**Table 6: SES and BMI percentile in girls**

Variable	LSES	MSES	USES	P-value
Healthy	251 (92.96%)	609 (77.57%)	224 (75.42%)	0.00001
Overweight	13 (4.8%)	137 (17.45%)	56 (18.85%)	
Obese	6 (2.22%)	39 (4.96%)	17 (5.72%)	

## DISCUSSION

Overweight and obesity among children is now an emerging concern worldwide as it may have adverse impact in morbidity and mortality patterns in adult life.<sup>[9]</sup> Since last few decade, various research studies from India had suggested the growing problem of obesity in children.<sup>[10,11]</sup> Non-communicable diseases like type-II DM is increasing in an alarming way even in children as per the previous studies.<sup>[12,13]</sup> The National Health and Nutrition Examination survey (NHANES) data in United States shows epidemic proportion of this problem.<sup>[3]</sup>

In present study, overall prevalence of overweight & childhood obesity is 17.37% & 6.75% respectively. Earlier studies from Chennai & Delhi had also reported similar findings.<sup>[14]</sup> As per NHANES data1999-2000, 30.3% were >85<sup>th</sup> % tile & 15.3% were > 95<sup>th</sup> %tile of BMI of children.

Again we also observed that in our study, the number of obese girl children were more (7.32%) as compared to the obese boys which was 6.08%. Also overweight percentage was 18.63% in girls which was more than male children i.e. 15.8%. This result is in accordance with the study of Subramanyam et al.<sup>[15]</sup> Similar type of result has been found in another previous study [10]. One study has found that females are more obese than male because of hormonal difference.<sup>[16]</sup> However, a study from Delhi from a single school reported 8% obesity among boys & 6% obesity for girls.

When the BMI result of this study was compared with different socio-economical strata, we found another significant point that the prevalence of overweight & obesity in upper socio-economical status (USES) was more than the other classes in a comparable age group in both male and female. Similar results reported in a previous study by Ramachandran et al study.<sup>[7]</sup>

On comparing ICMR survey (1956-1965) we found children today are taller & heavier compared to their counterparts 50 years ago.<sup>[17]</sup> There are also several studies from different parts of the country like Punjab, Maharashtra, South India, Delhi reporting higher prevalence of overweight and obese school going children in urban area ranging from 3% to 29% than the rural areas.<sup>[18]</sup>

Overweight and obesity are of multifactorial in origin. The limitations of our study was that the causative factors of overweight and obesity were not considered. However, the strength of this study is that it provides an overview of the burden of obesity among the children between 5-14 years of age. This can be used for future comparison by health care providers and policy makers.

## CONCLUSION

Basing on result of this study, it can be concluded that it is necessary to prevent obesity and overweight in children as early as possible. Childhood overweight and obesity increases the risk of premature illness and many other complications later in adulthood leading to death also. Again here, the girl children belonging to upper socio-economical class are more overweight and obese as compared to their male counterpart. Here, BMI is not only used as outcome to determine obesity but also a useful anthropometric index for cardiovascular risk and other non-communicable diseases. Prevalence of childhood obesity and its associated health hazards can be reduced at population level by meaningful education, intervention and health promotion to parents, teachers at school level and to the children themselves.

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