# **Research Article**

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# Prevalence of overweight and obesity among school going children of 10-16 years age in government, aided and unaided schools of Tumkur city, Karnataka, India

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#### **ABSTRACT**

**Background:** Childhood overweight and obesity are global problems that are on the rise. Obesity in children appears to increase the risk of subsequent morbidity, whether or not obesity persists into adulthood. The prevalence of childhood obesity is increasing rapidly worldwide. In developing countries such as India, especially in urban populations, childhood obesity is emerging as a major health problem. The aim is to assess the magnitude of overweight and obesity in government aided and unaided schools of Tumkur city, India.

Methods: This is a cross sectional study including a total of 2207 students, aged 10-16 years selected from 10 schools in Tumkur city, India was evaluated during Nov 2012 till April 2014. Recommended cut-off points for Indian children (IAP Classification 2012) were utilized to assess overweight and obesity.

**Results:** Overall prevalence of overweight and obesity among school going children was 13.14%. It was more in boys (13.24%) than girls (13.04%), respectively. Prevalence was higher in unaided (16.8%) school children than in Government. (3.8%) and aided (9.4%) school children. Prevalence of childhood overweight was found to be 7.02% and prevalence of obesity was 6.12%.

Conclusions: The overall prevalence of overweight and obesity among school children age 10-16 years in Tumkur city, India was found to be 13.14%. The prevalence of overweight and obesity was more in unaided compared to government schools. Prevalence was 3.8% in government, 9.4% among aided and highest in unaided (16.8%) school children. Overweight and obesity showed an increasing trend with age.

Keywords: Overweight, Obesity, School children, Prevalence, BMI

# INTRODUCTION

Obesity has become a global health problem, affecting more than 1.3 billion adults in both developed and developing countries. 1,2,4 Globally, the prevalence of childhood obesity varies from over 30% in USA to less than 2% in sub-Saharan Africa.<sup>5</sup> The prevalence of childhood obesity is increasing rapidly worldwide.<sup>6,7</sup> Childhood obesity has more than tripled in the past 30

years. Most individuals develop their eating and activity patterns during childhood. Childhood obesity was considered as a problem in affluent countries, however obesity in children and adolescents is gradually becoming a major public health problem in many developing countries, including India.6

Evidence suggests that childhood obesity is increasing at a rapid rate. The childhood obesity accelerated rapidly in

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European countries like UK, France, Netherlands, Poland, Germany, Spain and Czech republic from 1965-2012 (Figure 1). The childhood obesity has tripled in Canada and doubled in USA and Japan in last 20 years and has doubled in UK in the last 10 years. Studies from Iran, China, Malaysia, UK, Australia, Finland and Brazil have shown increasing trend of childhood obesity.

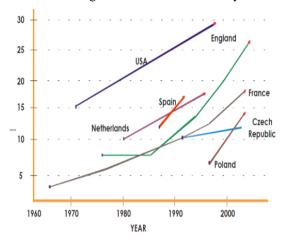


Figure 1: Prevalence of overweight children (5-11 years) in Europe.

Effective prevention of adult obesity will require the prevention and management of childhood obesity. <sup>10</sup> Overall, obesity in childhood appears to increase the risk of subsequent morbidity, whether or not obesity persists into adulthood. <sup>11</sup> It is believed that 50-80% of obese children will continue to be obese in adulthood. <sup>12</sup>

#### **METHODS**

This cross-sectional study was conducted during the period from Nov 2012 to April 2014 in Tumkur city, situated along National Highway 4 nearly 72 Km from Bengaluru, capital of Karnataka, India.

There were 102 high schools in the city during the year 2012, 21 were government, 20 were aided and 61 were unaided. Of these 102 schools, 10 schools (10%) were selected by systematic random sampling. As per probability proportionate to size, two government schools, two aided and six unaided schools were selected and equal proportion of higher primary and high schools were selected under each category.

Of the 2336 students, 2207 students were included for the study from 10 schools after applying inclusion and exclusion criteria's. All students from age group of 10 year to 16 years completed by date of birth were selected for study. After obtaining ethical permissions from ethical committee of Sri Siddhartha medical college, BEO (block education officer) of Tumkur, India and school authorities, the class teachers were briefed on the purpose of the study and verbal consent was obtained from all students before measuring their height and weight. Body mass index (BMI) was used to assess

obesity based on the BMI charts developed by Indian academy of pediatrics (IAP).<sup>3</sup> BMI was calculated by using the below formula<sup>13</sup>

BMI = weight in kilograms / (height in meter)<sup>2</sup>

The BMI recorded was compared against Body Mass Index percentile charts as per IAP, 2012 Guidelines.<sup>3</sup> Students who had BMI for age and sex  $>85^{th}$  but  $<95^{th}$  percentile of reference population were classified as overweight. Students who had BMI for age and sex  $\geq$ 95th percentile of reference population were classified as obese.<sup>14</sup>

#### Inclusion criteria

• Children 10-16 yearrs of age group from selected schools from both genders were included for study.

#### Exclusion criteria

- Children who were absent on the day of interview even on second visit.
- Children who had chronic illness, endocrine problems, physical and mental defects were excluded by history and physical examination.
- Children hailing from outside Karnataka.

Sample population: 2207 students.

### Statistical analysis

After taking measurements and collecting information, statistical data were tabulated in accordance with variables and analyzed. Data collected was entered in MS Excel spread sheet (version 2007). Descriptive statistical analysis was done. Further analysis was done using inferential statistical tests by using Epi Info<sup>™</sup> 7.1.1.14. For all statistical tests, p-value of <0.05 was considered as statistically significant. The results for continuous variable were given as mean±standard deviation and as proportions and percentages wherever relevant. Interpretations were drawn after appropriate statistical analysis.

## **RESULTS**

Out of 2207 school children from 10 to 16 years old, 1066 (48.3%) were girls and 1141 (51.7%) were boys. Prevalence of overweight was 7.02% (155) and obesity was 6.12% (135) respectively (Table 1).

We observed that, in the age group of 14-15 years prevalence of overweight was highest (8.2%) and prevalence of obesity (8.6%) was at its peak in the age group of 11-12 years (Table 1).

In government it was observed 108 (31.6%) of underweight where as in unaided school we observed

overweight 114 (8.35%) and obese 116 (8.5%) group was more than underweight group 109 (8%) (Table 2).

Out of 2207 students, prevalence of overweight was 7.02% (155) and obesity was 6.12% (135) respectively. Prevalence of underweight was 11.96% (264) and normal nutritional status was 74.9% (1653) respectively. Overall prevalence of overweight and obesity was 13.14% (Figure 2).

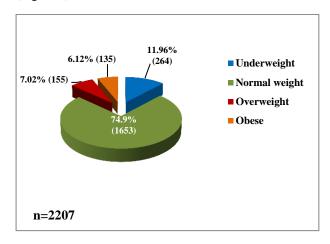


Figure 2: Prevalence of underweight, normal weight, overweight and obese (n=2207).

The mean BMI of Boys were 17.42 (SD $\pm$ 3.12) and for girls were 18.17 (SD $\pm$ 3.34) respectively. The mean BMI from age 10 years to 16 years (Table 3) shows an increasing trend with increasing age in both boys and girls.

Of the 2207 students 290 were found to be overweight and obese. Their socio-economic classification assessed by modified Kuppuswamy's classification (AICPI for Jan 2014-15 showed that majority 167 (57.58%) of the subjects belonged to class II, remaining were equally distributed among the other three SE classes. However distribution of SES was found to be not statistically significant. (p>0.05).

Table 1: Prevalence of overweight and obesity in different age groups.

Age group	No of students in each group	Overweight	Obese	Total
10-11	343	25	17	42
10 11	3 13	(7.29%)	(4.96%)	(12.3%)
11-12	407	27	35	62
		(6.63%)	(8.60%)	(15.3%)
12-13	423	29	29	58
		(6.86%)	(6.86%)	(13.7%)
13-14	394	26	17	43
		(6.60%)	(4.31%)	(10.9%)
14-15	366	30	23	53
		(8.20%)	(6.28%)	(14.6%)
15-16	274	18	14	32
		(6.57%)	(5.11%)	(11.8%)
Total	2207	155	135	290
		(7.02%)	(6.12%)	(13.1%)

Chi-square value=14.5391, df=5, Probability=0.0246, Association=Significant

Table 2: Malnutritional status observed in different types of schools.

Type of school	Underweight	Normal weight	Overweight	Obese	Total
Government	108 (31.58%)	221 (64.62%)	10 (2.92%)	3 (0.88%)	$n_1 = 342$
Aided	47 (9.4%)	406 (81.2%)	31 (6.2%)	16 (3.2%)	$n_2 = 500$
Unaided	109 (7.99%)	1026 (75.16%)	114 (8.35%)	116 (8.5%)	$n_3 = 1365$
Total	264 (11.96%)	1653 (74.9%)	155 (7.02%)	135 (6.12%)	N= 2207

Table 3: Gender distribution of students according to their mean BMI and SD.

Age in years	Boys			Girls		
	No. of observation	Mean BMI	SD	No. of Observation	Mean BMI	SD
10	169	16.17	±2.38	174	16.54	±2.58
11	213	16.72	±2.92	194	17.42	±3.27
12	228	17.25	±3.22	195	17.65	±3.47
13	202	17.56	±3.30	192	18.23	±3.26
14	192	17.93	±3.25	174	19.43	±3.62
15	137	18.91	±3.77	137	19.76	±3.85
Total	1141	17.42	±3.12	1066	18.17	±3.34

#### **DISCUSSION**

Prevalence of overweight and obesity was 13.14% in school going children; however nearly 12% (264) of children were underweight and 74.9% (1653) were of normal weight. In a similar study conducted by Kapil U (used WHO classification) on 10-16 years old school children in Delhi, prevalence of overweight and obesity was 7.4%.16 In our study in the age group of 14-15 years prevalence of overweight was 8.2% which was the highest and prevalence of obesity (8.6%) was at its peak in the age group of 11-12 years.

A cross sectional study, conducted by Cherian AT (used WHO classification), in June 2012, showed prevalence of obesity was 3% for boys and 5.3% for girls. However, in our study, 13.24% of boys (overweight and obesity was 6.75% and 6.49% respectively) and 13.04% of girls (overweight and obesity was 7.32% and 5.72% respectively) were obese and the difference between them was not statistically significant.

In this present study prevalence of overweight and obesity in government school children was 3.8% (13), in aided schools children 9.4% (47) and in unaided school children 16.8% (230). Gradual rise in prevalence of obesity by age among both boys and girls was observed in government, aided and unaided schools children. Similar observations were made by Ramachandran Y. were rising prevalence of childhood obesity in Government (4.9%), Aided (5.5%) and Unaided (7.2%) schools was seen. 18 Socio-economic background of students seemed to play a role in risk of obesity. In our study, higher prevalence of obesity was seen in class II and above socioeconomic status (as per modified Kuppuswamy's socioeconomic scale), compared with class III and IV. The study by Ramachandran also showed higher prevalence of obesity among higher socioeconomic groups. 19

Limitation of the study was that, Rural school children were not included in this study. Hence we could not compare our study with many other studies in the literature.

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