

# Prevalence of Childhood Obesity and Overweight Among 6-12 Years of Children in Lucknow City and Its Association with Socio-Demographic Factors

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## ABSTRACT

Childhood obesity has reached pandemic levels in India. It is a significant contributing factor to various health conditions in children. There is a paucity of comprehensive data on obesity prevalence among elementary age group. Therefore, this study aims to find out the overweight and obesity prevalence among school going children of age group 6-12 years in Lucknow city. This was a cross-sectional study with a sample size of 509 students going to both private and government schools. Sample group was selected through systematic random sampling. Height, weight and BMI were measured. Respondents were categorized as obese, overweight and normal based on IAP BMI cut-offs. Socio-demographic data were systematically gathered through administration of structured questionnaires. Results were statistically analyzed using descriptive and chi-square test. The study determined that the combined prevalence rate of obesity and overweight in Lucknow city was 29.7%. 13.6% of boys and 14.4% of girls were obese. Respondents related to lower and upper middle class ( $p < .001$ ) and having working parents ( $p = .001$ ), especially mothers ( $p = 0.00$ ), were the affected highest. It can be concluded that overweight and obesity rates are getting higher in children. To address these escalating rates the

implementation of robust nutritional education programs is necessary that specifically target both children and parents.

**Keywords:** Childhood, Obesity, Overweight, Prevalence, Body mass index, Children

## INTRODUCTION

Childhood obesity has become the most pressing issue worldwide, as it has several health repercussions that persist throughout a child's life and into adulthood. The most common include hypertension, musculoskeletal abnormalities, asthma, obstructive sleep apnea, insulin resistance, type 2 diabetes, psycho-social impacts, peer rejection, classroom bullying, and with tracking of obesity in adulthood, increased morbidity and mortality in adulthood.<sup>[1]</sup>

According to World Health Organization 37 million children, under the age of five, were overweight or obese in 2022, and over 390 million children and adolescents, aged 5-19 years, were obese or overweight in 2022.<sup>[2]</sup>

With the continuous efforts of developed countries, obesity rates have plateaued there. However, it is still rising in low- and middle-income countries<sup>[3]</sup> like India. The prevalence in India is estimated to be 2.6%<sup>[4]</sup> in under five children while it ranges from 3.6 to 11.7% among 5-19-year-old children and adolescents.<sup>[5]</sup>

Several factors contribute to childhood obesity, for instance, genetics, reduced

physical activity, increased sedentary behaviors, excessive screen time, energy-dense dietary intake, and obesogenic environment (Lanigan et al., 2019).<sup>[6]</sup> As these factors pertain to regional beliefs, practices, and local factors, it is crucial to gather localized data in order to gain a deeper understanding of the local facts and scenarios. This knowledge will inform effective intervention strategies. The prevalence of overweight and obesity in Lucknow is not extensively documented, and data on this issue remains limited, specifically among the elementary age group of 6 to 12 years. Most of the available data is based on adolescents aged 10-19 years.

With this background in mind, the present study was undertaken to determine the prevalence of overweight and obesity among school-going children aged 6 to 12 years in Lucknow city.

## MATERIALS & METHODS

### Study design

This was a cross-sectional study conducted among school-going students of age group 6-12 years studying in grades I to V. The study was carried out between January to March 2022 in public and private schools in the city of Lucknow, Uttar Pradesh.

### Sample Size

Considering the prevalence of obesity in Indian children to be around 20%, the sample size was calculated at 90% interval with 5% confidence limits with a design effect of 1 to achieve 95% power of the study using the following formula,

$$n = \frac{[DEFF * N(1-p)]}{[(d^2/Z^2_{1-\alpha/2} * (N-1) + p * (1-p))]}$$

where,

n = sample size

DEFF = design effect

N = population size

p = the estimated proportion

d = desired absolute precision or absolute level of precision

The sample size was calculated to be 348. Considering a 15% dropout rate, the final

sample size came to 400. Considering the sensitivity of the topic, a total sample size of 509 respondents was taken.

### Sampling technique

Multi-stage random sampling technique was used to select the sample. First, whole Lucknow was divided into five zones – East, West, North, South, and Central. Secondly, one public and one private school were selected randomly from each zone. Thus, a total of 10 schools were selected. Lastly, from the selected schools, through systemic random sampling, every tenth student was selected from the attendance register from each class including each section. If the selected student did not consent to participate, the next student on the list was selected.

### Data Collection and Tools of Investigation

An open-ended pre-tested questionnaire was developed and used to record socio-demographic data. The questionnaire was attached to respondents' almanacs and sent to homes to be filled out by parents. The anthropometric measurements – height, and weight were recorded in the school. Body weight was measured to the nearest 0.1 kg by a standardized portable digital weighing scale from Inbody, Korea. A stadiometer was used to measure height to the nearest 0.1 cm from SECA, Germany. Waist circumference was measured to the nearest 0.1 cm using non-stretchable measuring tape from SECA, Germany. Body Mass Index (BMI) was calculated using the standard formula: Weight (kg)/Height (m<sup>2</sup>). Obesity, overweight, and underweight were identified using IAP BMI charts for boys and girls. Children were graded as obese on or above the 27<sup>th</sup> adult equivalent line and overweight on the 23<sup>rd</sup> adult equivalent to the 27<sup>th</sup> adult equivalent line.

## RESULT

A total of 509 respondents aged 6-12 years studying in classes I to V were included in the study, of which 286 (56.2%) were boys and

223 (43.8%) were girls. Table 1 represents the detailed distribution of respondents. Utilizing IAP 2015 cut-offs, 80 (15.7%) respondents were found to be overweight and 71 (14%) were obese. The combined prevalence of obesity and overweight came out to be 29.7%. Among boys 13.6% were obese and 15.4% were overweight, and among girls, 14.4% were obese and 16.2% were overweight (Table 2). Obesity and overweight were most prevalent among the 9-, 11-, and 12-years age groups. The prevalence of obesity & overweight was significantly higher in private schools than in

government schools (p=0.00), among the upper, lower middle and upper middle class (p<.001), and in respondents whose mothers' occupation was semi-professional and professional (p=0.00). A significant association was also seen between the number of siblings and high BMI levels (p=0.026). The maximum prevalence was among those who had one sibling (34%). BMI levels were also significantly high where both parents were working (p=0.001). No significant association was found between the type of family and BMI levels (Table 3).

**Table 1: Distribution of respondents based on Age and Type of School**

	Boys		Girls		Total	
	N	%	N	%	N	%
Age (years)						
6	33	6.48	37	7.26	70	13.8
7	39	7.66	22	4.32	61	12.0
8	51	10.01	37	7.26	88	17.3
9	42	8.25	38	7.46	80	15.7
10	54	10.6	32	6.28	86	16.9
11	40	7.85	23	4.51	63	12.4
12	27	5.30	34	6.67	61	12.0
Total	286	56.2	223	43.8	509	100.0
Type of School						
Government	157	54.9	115	51.6	272	53.4
Private	129	45.1	108	48.4	237	46.6

**Table 2: Gender-wise Prevalence of Obesity and Overweight among 6-12 years children of Lucknow city.**

Gender	Obese		Overweight		Non-obese/overweight	
	N	%	N	%	N	%
Boys	39	13.6	44	15.4	203	70.9
Girls	32	14.4	36	16.2	154	69.4
Total	71	14.0	80	15.7	357	70.3

**Table 3: Correlates of Obesity and Overweight**

Characteristics	BMI category								Chi-square	p-value
	Obese		Overweight		Normal		Underweight			
	N	%	N	%	N	%	N	%		
<b>Type of School</b>										
Government	12	4.4	35	12.9	215	79.0	10	3.7	55.359	0.000
Private	59	25.0	45	19.1	129	54.7	3	1.3		
<b>Type of Family</b>										
Nuclear Family	43	15.0	40	13.9	196	68.3	8	2.8	2.018	0.569
Joint family	28	12.7	40	18.1	148	67.0	5	2.3		
<b>No. of Siblings</b>										
0	8	19.0	0	0.0	32	76.2	2	4.8	14.338	0.026
1	34	13.4	52	20.6	161	63.6	6	2.4		
2	29	13.6	28	13.1	151	70.9	5	2.3		
<b>Mother's Occupation</b>										
Professional	24	61.5	13	33.3	2	5.1	0	0.0	256.94	0.000
Semi Prof.	26	36.6	29	40.8	16	22.5	0	0.0		
Clerical/shop owner/farmer	9	15.8	6	10.5	37	64.9	5	8.8		
Skilled worker	10	9.1	22	20.0	77	70.0	1	0.9		
Semi-skilled	0	0.0	7	7.4	84	88.4	4	4.2		
Unskilled worker	0	0.0	0	0.0	63	98.4	1	1.6		
Unemployed	2	2.8	3	4.2	65	90.3	2	2.8		
<b>Socio-economic Status</b>										
Lower	0	0.0	0	0.0	20	90.9	2	9.1	66.355	<.001
Upper Lower	4	5.7	2	2.9	58	82.9	6	8.6		

Lower Middle	30	14.6	22	10.7	149	72.7	2	2		
Upper Middle	27	16.4	43	26.1	94	57.0	1	0.6		
Upper	10	21.7	13	28.3	23	50	0	0.0		
<b>Parent's Employment Status</b>										
Both parents employed	42	15.6	54	20.1	166	61.7	7	2.6	22.217	0.001
One parent employed	29	14.4	26	12.9	142	70.3	5	2.5		
No parent employed	0	0.0	0	0.0	36	97.3	1	2.7		

## DISCUSSION

India has the second-highest number of obese children in the world.<sup>[7]</sup> The current study found an overall prevalence of 29.7% for childhood obesity & overweight among school-going children aged 6 to 12 years in Lucknow city. No comparable data was found for the similar age group as majority of the studies were done on the adolescents. This proportion corresponds with Ranjani et al. who reported a prevalence rate of 20.7% in northern India.<sup>[8]</sup> Chandra et al. found a prevalence of 24.6% obesity and 35.8% overweight in Hyderabad.<sup>[9]</sup> In Delhi and its suburbs, at least 40% of children and adolescents aged 5 to 17 years were overweight or obese in 2019.<sup>[10]</sup> Gupta and Rathore recorded a prevalence of 11.29% in Lucknow City among students aged 6 to 14.<sup>[11]</sup> These variations are consistent with the anticipated 9.1% annual increase in childhood obesity by 2035.<sup>[12]</sup>

This study found the prevalence of obesity & overweight to be higher in private schools compared to government schools. These findings are similar to the study done by Varghese et al. which showed a two times higher prevalence in private schools than in government schools.<sup>[13]</sup> These results could be explained by the difference in socio-economic status of children going to private and government schools. The higher socioeconomic status of private school students may give them access to expensive high-caloric energy-dense foods. Also, the higher study pressure of private schools reduces these children's physical activity, leading them to become overweight and obese.

Our research also reveals significant disparities in obesity rates across different socioeconomic strata. While the highest obesity and overweight rates were observed in the upper class, with 21.7% classified as

obese and 28.3% falling into the overweight category, it is essential to recognize that both the lower middle class and the upper middle class also exhibited elevated rates of obesity. Similar results were exhibited by Varghese et al.<sup>[13]</sup> and Singh et al. 2023.<sup>[14]</sup> This effect might be the consequence of widespread consumption of unhealthy fried and oily foods within households. Moreover, the easy availability of locally produced junk food by small vendors, coupled with the increasing purchasing power of people, contributes to this concerning trend.

In addition, the prevalence also increased with both parents' employment and specifically mothers' employment. The highest percentages were found in the professional and semi-professional occupations of mothers. These results are supported by Fitzsimons and Pongiglione<sup>[15]</sup>, Kundu et al.<sup>[16]</sup> and Karki et al.<sup>[17]</sup> This is most likely due to the stressful and long working hours in professional and semi-professional occupations, which leads to children staying at home without mothers and are likely to be more sedentary, ordering food from outside or house help preparing meals with high fat, sugar, and salt content. Furthermore, the prevalence of obesity and overweight came out to be inversely proportional to number of siblings. Obesity rates were highest in single children and overweight rates in children having one sibling. Varghese et al.<sup>[13]</sup> and Bohn et al.<sup>[18]</sup> findings were in line with these results. The possible explanation could be the boredom of being single or the influence of siblings on food choices. Not much data is available related to such behavior and further investigation is required.

## CONCLUSION

In conclusion, overweight & obesity prevalence among school-going children

aged 6-12 years in Lucknow city came out to be 29.7%. Major contributors to the high prevalence were high socio-economic status, and employment of both the parents, especially mothers in highly professional jobs. To control this increasing prevalence rate, more robust nutrition education intervention programs are warranted for both children and parents which can help them comprehend the importance of healthy eating and give them several strategies to do so.

#### **Declaration by Authors**

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