

## Prevalence and Determinants of Obesity among Rural School-Going Adolescents in Andhra Pradesh: A Cross-Sectional Study

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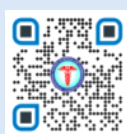
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### ABSTRACT

**Background:** Childhood obesity is an emerging public health challenge globally, with increasing prevalence in developing countries, including India. Adolescents represent a critical age group for early prevention of lifestyle-related disorders.

**Objectives:** To estimate the prevalence of obesity among school-going adolescents in rural Andhra Pradesh and identify associated risk factors.

**Methods:** A school-based cross-sectional study was conducted from January 2023 to April 2023 among 300 adolescents aged 10–15 years in Parthipadu village, the rural field practice area of Katuri Medical College, Guntur. Anthropometric data were collected using standardized tools and obesity was classified using the ELIZ growth chart. Data on sociodemographic, dietary and lifestyle factors were obtained using a pretested semi-structured questionnaire. Analysis was done using SPSS v25.

**Results:** The prevalence of obesity was 14.7% and overweight 22.7%. Significant associations were observed between obesity and higher socioeconomic status, daily milk consumption, junk food intake, lack of outdoor play, and not practicing yoga. No significant associations were found with gender, type of diet, or screen time. Obesity was more common among females (15.9%) and among upper (25.5%) and upper middle-class children (33.3%).

**Conclusion:** The burden of adolescent obesity in rural Andhra Pradesh is considerable. Lifestyle factors such as dietary habits, physical activity and junk food consumption were key determinants. School-based and community interventions are urgently required to prevent early onset of obesity and its long-term consequences.

**Keywords:** Obesity, Adolescents, School going.

### INTRODUCTION

Obesity has emerged as a major non-communicable disease worldwide, extending beyond adults to children and adolescents. The World Health Organization (WHO) describes childhood obesity as one of the most serious public health challenges of the 21st century.<sup>1,2</sup> Global estimates show that over 340 million children and adolescents aged 5–19 years were overweight or obese in 2016, with prevalence rising four-fold since 1975.<sup>3</sup> In India, the ICMR study reported obesity prevalence ranging from 11.8% to 31.3%.<sup>4</sup> Although often regarded as a disease of urban and affluent populations, recent trends indicate a growing burden in rural settings as well. Obesity in adolescence increases the risk of diabetes, hypertension, cardiovascular diseases, certain cancers like colon cancer and breast cancer.<sup>5–9</sup> Also it seen that child hood obesity also affects mental health, as the children being labelled as obese is leading to social isolation, inept social functioning, and unsatisfactory social skills.<sup>10</sup> Given the long-term health consequences and the preventable nature of obesity, early detection and intervention are essential. However, most Indian studies have focused on urban school children, with limited evidence from rural areas. This study aimed to assess the prevalence of obesity and its associated factors among school-going adolescents in rural Andhra Pradesh.

## MATERIALS AND METHODS

A school-based cross-sectional study was conducted between January 2023 and April 2023 in Parthipadu village, the rural field practice area of Katuri Medical College, Guntur, located approximately 15 kilometres from Guntur city. The study population comprised adolescents aged 10 to 15 years studying in classes 6 to 10. A total of 300 students who met the eligibility criteria and consented to participate were included, while those with known skeletal deformities, chronic diseases, or on any medication were excluded. The sample size of 300 was determined based on an estimated prevalence of 24.6% from a prior study in Telangana by Naval Chandra et al.,<sup>11</sup> with 5% absolute precision.

A two-stage sampling technique was employed, wherein one school was randomly selected from the five schools within the village during the first stage, followed by the simple random selection of students from that school until the required sample size was achieved. Data were collected using a pre-tested, semi-structured questionnaire that recorded demographic, socioeconomic, dietary, and lifestyle factors. Anthropometric measurements, including height and weight, were obtained using standardized tools, and Body Mass Index (BMI) was classified according to the ELIZ growth chart as shown in figure 1.<sup>12</sup> Data analysis was performed using SPSS version 25, with frequencies and proportions calculated for descriptive statistics. Associations between variables were tested using the Chi-square test, with a p-value of less than 0.05 considered statistically significant.

Ethical approval was obtained from the Institutional Ethics Committee of Katuri Medical College. Informed consent was obtained from school authorities and parents, and assent from students.

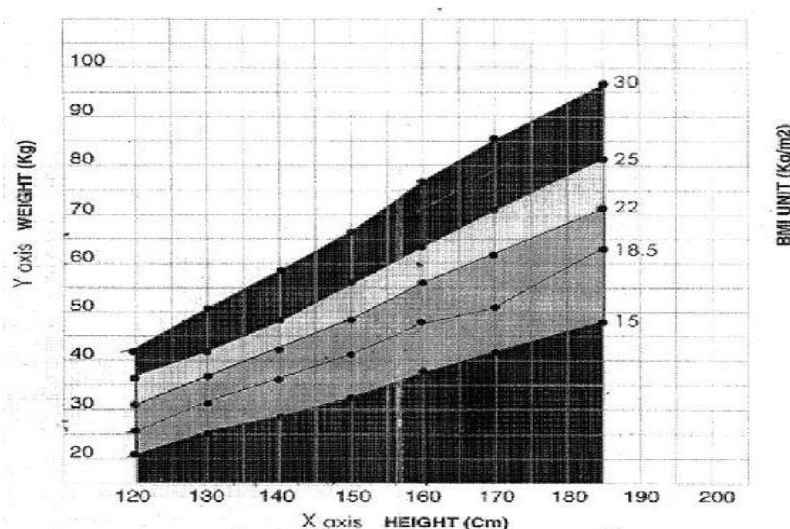


Figure 1: ELIZ Health Path for Adolescents and Adults (EHPA)-Growth Assessment Chart<sup>12</sup>

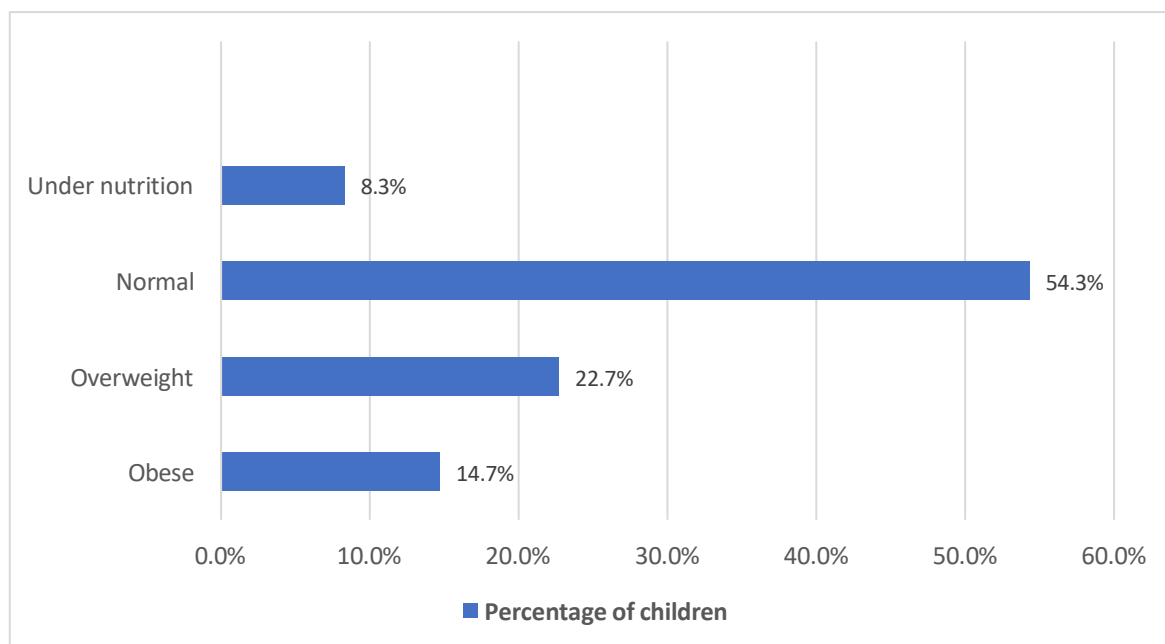
## RESULTS

Among the 300 students studied, 124 (41.3%) were males and 176 (58.7%) females, with mean age  $13.28 \pm 1.29$  years. The majority (54.3%) had normal BMI, 8.3% were undernourished, 22.7% overweight, and 14.7% obese as shown in figure 2. For analysis, overweight and normal children were categorized as non-obese (85.3%).

Obesity was more prevalent among females (15.9%) than males (12.9%), though not statistically significant. Religion was significantly associated with obesity ( $p=0.05$ ), with higher prevalence among Muslims (19.7%) and Hindus (18.8%) compared to Christians (2.7%) as shown in table 1. Father's occupation status (clerical/shop/farm work, 32.6%,  $p=0.014$ ) and higher socioeconomic class (upper 25.5% and upper middle 33.3%,  $p=0.001$ ) were significantly associated with obesity as shown in table 2 and 3. Father's and mother's education showed no significant association.

It is observed that obesity was significantly higher among those consuming milk and milk products daily (20.1%,  $p=0.01$ ), frequent junk food consumers ( $>3$  times/week, 23.5%,  $p=0.0005$ ), as shown in table 4 and 5. Also obesity was higher among those with lower fruit consumption. Type of diet (vegetarian vs mixed) and frequency of non-vegetarian consumption showed no significant association.

It is also observed that, playing outdoor games daily was protective (27.5% among those playing once a week,  $p=0.0005$ ) as shown in table 6. Yoga practice was also protective (17.4%,  $p=0.027$ ) as shown in table 7. Screen time (>3 hours/day) showed higher obesity prevalence (16.6%) but was not statistically significant.



**Figure 2: Distribution of study subjects according to Grade on ELIZ chart**

**Table 1: Association between Religion and obesity.**

RELIGION	ELIZ			
	OBESE	NON-OBESE	TOTAL	p-value
HINDU	30 (18.8%)	130 (81.2%)	160	0.05
MUSLIM	12 (19.7%)	49 (80.3%)	61	
CHRISTIAN	2 (2.7%)	73 (97.3%)	75	
OTHERS	0(0%)	4 (100%)	4	
TOTAL	44	256	300	

**Table 2: Association between father's occupation and obesity**

Father's Occupation	ELIZ			
	OBESE	NON-OBESE	TOTAL	p-value
Unskilled worker	2(8.7%)	21 (91.3%)	23	0.014
Semiskilled worker	14 (11.4%)	109 (88.6%)	123	
Skilled worker	10 (14.5%)	59 (85.5%)	69	
Clerical/shop/farm	14 (32.6%)	29 (67.4%)	43	
Semi professional	4 (11.4%)	31 (88.6%)	35	
Professional	0(0%)	7(100%)	7	
Total	44	256	100	

**Table 3: Association between Socioeconomic status and obesity**

Socioeconomic class	ELIZ			
	Obese	Non-Obese	Total	P value
Upper class	12 (25.5%)	35 (74.5%)	47	
Upper middle class	10 (33.3%)	20 (66.7%)	30	

Middle class	10 (10.4%)	86 (89.6%)	96	0.001
Lower middle class	8 (7.5%)	98 (92.5%)	106	
Lower class	4 (19%)	17 (81%)	21	
Total	44	256	300	

**Table 4: Association between milk consumption and obesity**

Milk consumption	ELIZ			P value
	Obese	Non-Obese	Total	
ever consume milk or milk products	2 (7.4%)	25 (92.6%)	27	0.010
Consume 1-3 times in a week	8 (7.7%)	96 (92.3%)	104	
Consume daily/ more than 3 times a week	34 (20.1%)	135 (79.9%)	169	
Total	44	256	300	

**Table 5: Association between junk food consumption and obesity**

Eating junk food	ELIZ			P value
	Obese	Non-Obese	Total	
> 3 times in a week	38 (23.5%)	124 (76.5%)	162	0.0005
< 3 times in a week	6 (4.3%)	132 (95.7%)	138	
Total	44	256	300	

**Table 6: Association between playing outdoor games and obesity**

Playing outdoor games	ELIZ			P value
	Obese	Non-Obese	Total	
Once in a week	28 (27.5%)	74 (72.5%)	102	0.0005
1-3 times in a week	7 (9.6%)	66 (90.4%)	73	
More than thrice in a week or daily	9 (7.2%)	116 (92.8%)	125	
Total	44	256	300	

**Table 8: Association between yoga and obesity**

YOGA	ELIZ			P value
	Obese	Non-Obese	Total	
Does yoga	6 (7.3%)	76 (92.7%)	82	0.027
Does not practice yoga	38 (17.4%)	180 (82.6%)	218	
Total	44	256	300	

## DISCUSSION

This study found the prevalence of obesity among rural adolescents to be 14.7%, this is near similar to a study by Parekh Alok on prevalence of overweight and obesity, done among 176 children from rural and 213 from urban government schools of Surat on school adolescent children of 14-16 years age which revealed the prevalence of obesity to be 12.8 and 14.6% in rural and urban schools respectively.<sup>13</sup> The finding of this study is higher than many previous Indian studies conducted in rural areas (ranging from 2–7%) but comparable to some urban settings.<sup>14,15,16</sup> This suggests that rural communities are undergoing rapid lifestyle and nutritional transitions. Our findings are consistent with studies reporting a strong association between obesity and higher socioeconomic status,<sup>14,17,18</sup> indicating that affluence may promote unhealthy dietary choices and sedentary lifestyles. The significant role of junk food consumption is in line with the study done by Gayatri D, who in their study established that obesity is more common with students consuming food/snacks that are considered unhealthy.<sup>19</sup> This study shows that the prevalence of obesity is significantly higher in children who are involved in outdoor playing once in a week in comparison with children who play outdoor games for 1-3 times in a week or more

suggesting that physical inactivity increases the risk of obesity. Our study enlightened that prevalence of obesity is significantly lower among children who practice yoga than those in children do not practice yoga. This implies that practicing yoga could be a protective factor in preventing obesity.

The protective role of outdoor games and yoga emphasizes the need for structured physical activity and culturally acceptable interventions in rural schools. The significant association of obesity with daily milk consumption is noteworthy and may be linked to the type and quantity of milk products consumed, possibly high-fat dairy. Similar associations have been reported in earlier Indian studies.<sup>20,21</sup>

Contrary to some studies, we did not find gender or screen time to be statistically significant factors. This may be due to uniform exposure to television and mobile phones among both genders in rural settings.

## CONCLUSION

The study highlights a considerable burden of obesity (14.7%) among rural adolescents in Andhra Pradesh, with significant associations with dietary and lifestyle behaviours. Interventions targeting reduced junk food consumption, promotion of outdoor games, and incorporation of yoga in school curricula are essential to curb the rising trend of obesity. Early action in adolescence is crucial to prevent progression into adulthood and to reduce the risk of chronic diseases.

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