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A Cross-Sectional Study to Assess the Factors Responsible for Obesity Among School-Going Children of age 15 to 18 Years in Sagar City, Madhya Pradesh

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ABSTRACT

Background: Obesity among adolescents has emerged as a significant public health concern in India, particularly in urban areas. The transition from undernutrition to overnutrition, driven by lifestyle changes, dietary habits, and sedentary behaviours, has led to a rising prevalence of obesity among school-going children. This study was conducted to assess the prevalence of obesity and the associated risk factors among adolescents aged 15 to 18 years in Sagar city, Madhya Pradesh.

Materials and Methods: A descriptive cross-sectional study was conducted among 300 adolescents enrolled in government and private schools in Sagar city. Participants were selected through multistage random sampling. Data were collected using a structured questionnaire and anthropometric measurements. Body Mass Index (BMI) was calculated and classified using WHO criteria. Statistical analysis was performed using SPSS, including chi-square tests and logistic regression to identify associations between obesity and various factors.

Results: Among the 300 students, 174 (58%) were male and 126 (42%) were female. The prevalence of overweight and obesity was 18.7% and 7.7%, respectively. Significant associations were found between obesity and frequent junk food consumption ($p<0.01$), low physical activity ($p<0.05$), screen time greater than 2 hours/day ($p<0.05$), and high socioeconomic status ($p<0.01$). Logistic regression analysis revealed that junk food intake (OR: 2.56), low physical activity (OR: 1.94), high screen time (OR: 2.21), and higher SES (OR: 2.68) were independent predictors of obesity.

Conclusion: The findings demonstrate a substantial burden of adolescent obesity in Sagar city, driven by modifiable lifestyle and socioeconomic factors. There is an urgent need for integrated school-based and community-level interventions that promote healthy eating, physical activity, and responsible screen use to prevent and control obesity in this vulnerable population.

Keywords: Obesity, BMI, school children, junk food, screen time, physical activity, socioeconomic status

INTRODUCTION

Obesity is an emerging global health concern that has escalated into a widespread public health crisis over recent decade. It is defined by an abnormal or excessive accumulation of body fat that presents a risk to health. Obesity is more than just a cosmetic issue as it significantly raises the likelihood of chronic illnesses such as type 2 diabetes, cardiovascular diseases, certain forms of cancer, and musculoskeletal disorders. Globally, the prevalence of obesity has nearly tripled since 1975, and its burden continues to grow across all age groups. Adolescents, in particular, are increasingly affected by obesity due to the rapid urbanization, lifestyle changes, dietary shifts, and the influence of digital media and sedentary behaviours [1].

In India, childhood and adolescent obesity are becoming increasingly prominent, especially in urban areas where access to high-calorie foods, reduced physical activity, and exposure to digital screens have grown significantly [2]. This epidemiological transition from undernutrition to overnutrition is largely influenced by socioeconomic factors, environmental conditions, and behavioural habits. According to the World Obesity Federation, India is projected to be among the top two countries with the highest number of obese children by 2030. Such statistics highlight the gravity of the situation and the urgent need for preventive strategies [3].

The state of Madhya Pradesh, and more specifically, the city of Sagar, represents a microcosm of India's wider urban transition. As an urbanizing district with a diverse socioeconomic profile and an expanding educational infrastructure, Sagar city has witnessed changes in lifestyle behaviours among school-going adolescents [4]. This group is particularly vulnerable due to academic stress, increased screen time, irregular meal patterns, and diminished engagement in physical activity. Despite this, there is a dearth of localized, evidence-based research focusing on the magnitude and determinants of obesity in this population [5].

This study is undertaken to estimate the prevalence of obesity among school-going adolescents aged 15 to 18 years in Sagar city and to analyse the various factors—dietary, behavioural, socioeconomic, and environmental—that may be contributing to this health issue. Understanding these factors is imperative for formulating public health strategies and school-based interventions that are responsive to the unique needs of this population.

AIM

To assess the factors responsible for obesity among school-going children of age 15 to 18 years in Sagar city, Madhya Pradesh

OBJECTIVES

1. To estimate the prevalence of obesity among school-going adolescents.
2. To identify key dietary, behavioural, and socioeconomic risk factors contributing to adolescent obesity.

MATERIALS AND METHODS

Study Design and Area: This was a descriptive, cross-sectional study conducted among school-going children aged 15 to 18 years in Sagar city, Madhya Pradesh. Sagar is a centrally located urban hub with a mix of government and private schools, catering to a diverse student population from varying socioeconomic backgrounds. The urban setting provided a pertinent landscape to study lifestyle-related risk factors of obesity.

Study Duration: The study was carried out over a period of 18 months, following approval from the Institutional Ethics Committee, BMC Sagar.

Study Population: The population consisted of children enrolled in government and private secondary and higher secondary schools. Schools were chosen to represent different parts of the city and different educational boards including Madhya Pradesh Board, CBSE and ICSE).

Inclusion Criteria:

1. Children aged between 15 to 18 years.
2. Enrolled in selected government and private schools.
3. Provided informed assent and obtained parental consent.

Exclusion Criteria:

1. Students with diagnosed chronic illness or congenital conditions affecting weight.
2. Students with incomplete questionnaire responses or unrecorded anthropometric measurements.

Sampling Methodology: Multistage random sampling was used. First, schools were stratified based on their management (government/private) and board of education. From this stratified

list, schools were selected randomly. In the next stage, student participants were selected randomly from school registers, maintaining age criteria.

Sample Size Determination: Using prevalence estimates from previous studies (approx. 20%) [6], a sample size of 300 was determined with a 95% confidence interval and 5% allowable error. However, to account for non-responses and incomplete data, 315 students were enrolled, with 300 finalized after data cleaning.

Ethical Considerations: The study was approved by the Institutional Ethics Committee of Bundelkhand Medical College. Informed consent was obtained from the principals and parents/guardians of the participants. Assent was taken from the students. Data confidentiality and anonymity were ensured throughout.

Data Collection Tools:

1. Structured Questionnaire: Designed to capture demographic details, dietary habits, frequency of junk food consumption, physical activity patterns, screen time, family history of obesity, and parental occupation.
2. Anthropometric Measurements:
    - Height: Measured using a stadiometer to the nearest 0.1 cm.
    - Weight: Measured using a calibrated digital weighing scale.
    - BMI Calculation: Weight in kilograms divided by height in meters squared (kg/m^2).
    - BMI Classification: WHO criteria used for adolescents.

Statistical Analysis: Data were entered into Microsoft Excel and analysed using SPSS software. Descriptive statistics (mean, SD, percentages) were used. Chi-square tests and logistic regression were applied to find associations between obesity and independent variables. Significance was considered at $p<0.05$.

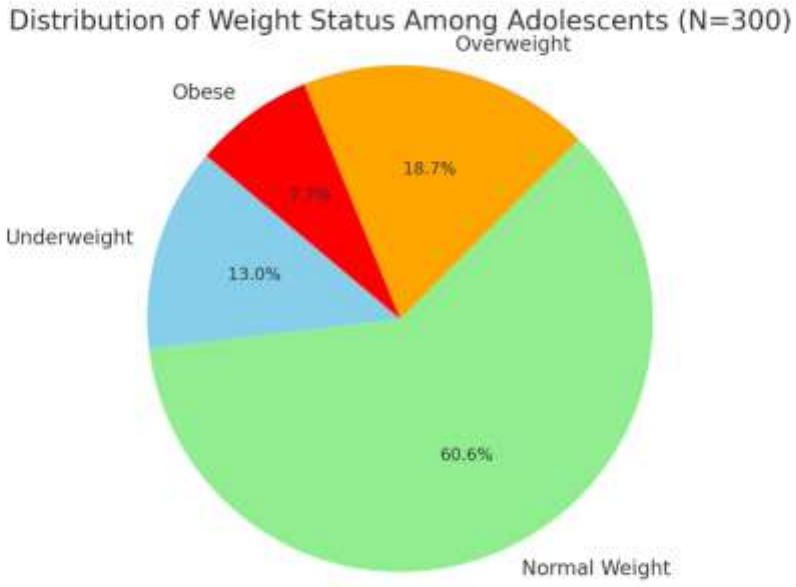
RESULTS

Out of 300 students included in the final analysis, 174 (58%) were males and 126 (42%) were females. The age distribution showed an even spread across the 15–18-year age range.

Table 1: BMI Distribution

BMI Category	Frequency	Percentage
Underweight	39	13.0%
Normal	182	60.7%
Overweight	56	18.7%
Obese	23	7.7%

Figure 1: Pie chart showing the distribution of BMI categories among adolescents



Dietary and Lifestyle Patterns:

- **Junk food consumption:** 61% of overweight/obese students reported eating fast food ≥3 times per week.
- **Physical activity:** Only 38% of overweight/obese students engaged in daily physical activity vs. 69% in the normal BMI group.
- **Screen time:** 73% of overweight/obese students had >2 hours/day of screen time, compared to 41% among students with normal BMI.

Table 2: Risk Factors Associated with Overweight/Obesity

Risk Factor	Association (p-value)
Junk Food Consumption	<0.01
Low Physical Activity	<0.05
High Screen Time	<0.05
High Socioeconomic Status	<0.01

Table 3: Predictors of Obesity Based on Logistic Regression

Risk Factor	Odds Ratio (OR)	95% CI	p-value
Junk Food (≥3/week)	2.56	1.42 – 4.61	<0.01
Low Physical Activity	1.94	1.01 – 3.31	<0.05
Screen Time >2 hrs/day	2.21	1.23 – 4.02	<0.05
High SES	2.68	1.38 – 5.01	<0.01

These results collectively indicate that junk food consumption, physical inactivity, higher screen time, and high socioeconomic status significantly contribute to the risk of obesity among adolescents in this region. These findings are essential to guide targeted interventions and public health strategies.

DISCUSSION

This study aimed to assess the prevalence and associated factors of obesity among school-going adolescents aged 15 to 18 years in Sagar city, Madhya Pradesh. The findings reveal a concerning prevalence of overweight and obesity (26.4%), indicating that more than one-fourth of adolescents in this age group are at risk of lifestyle-related health issues. These results are consistent with national and global trends, reflecting the rapid epidemiological and nutritional transition affecting Indian youth.

Prevalence of Obesity and Overweight

The present study found that 18.7% of students were overweight and 7.7% were obese. These findings are comparable to the results of a study conducted by Kotian et al. (2010) in South India, where the combined prevalence of overweight and obesity among adolescents was 23.8% [7]. Similarly, a cross-sectional study by Gupta et al. (2012) in Delhi found that 24.4% of adolescents were either overweight or obese [8]. These comparable figures from different

regions of India reinforce the increasing burden of adolescent obesity in urban and semi-urban settings.

The findings also align with the World Health Organization's (WHO) global trends indicating a tripling of obesity rates among children and adolescents over the past three decades [9]. In particular, urbanization and changes in lifestyle practices, such as increased screen time and poor dietary habits, have emerged as central contributing factors.

Gender and Age Distribution

Although the present study did not find a statistically significant difference between genders, the proportion of overweight and obese males (30.5%) was slightly higher than females (21.4%). This pattern is echoed in a study by Kapil et al. (2002) which reported that boys had higher rates of overweight and obesity than girls in the 14–17 years age group [10]. The underlying reasons may include gender-based differences in physical activity patterns, dietary freedom, and cultural perceptions about body weight and food choices.

The relatively even age distribution in this study helped ensure that the findings are reflective of adolescents across the entire senior secondary age bracket. Importantly, older adolescents tended to report slightly higher junk food consumption and screen time, which may suggest cumulative exposure to obesogenic behaviors with increasing age.

Dietary Patterns and Junk Food Consumption

One of the most significant findings of this study was the association between frequent junk food consumption and obesity. More than 61% of overweight/obese students reported consuming fast food three or more times a week. This is in agreement with the findings of Mehta et al. (2013), who identified fast food intake as a strong predictor of obesity among school children in Mumbai [11]. Their study showed that adolescents consuming high-energy snacks and carbonated beverages were more than twice as likely to be obese compared to those who did not.

Another study by Kaur et al. (2017) in Punjab also demonstrated that increased consumption of junk food significantly elevated the odds of obesity among adolescents [12]. This may be due to the high caloric density, low nutritional value, and aggressive marketing of such food items, especially to younger populations. Furthermore, the easy availability of processed foods around school premises and the cultural normalization of frequent snacking exacerbate the problem.

Multivariate Logistic Regression Analysis

The logistic regression analysis in this study confirmed that junk food consumption (OR 2.56), low physical activity (OR 1.94), screen time >2 hours/day (OR 2.21), and high SES (OR 2.68) were all independent predictors of adolescent obesity. These odds ratios are similar to those reported in studies by Ranjani et al. (2016) and Patel et al. (2018), which also used multivariate models to isolate behavioral and environmental risk factors [13][14].

CONCLUSION

In conclusion, this study highlights a growing trend of adolescent obesity in Sagar city, closely linked to modifiable risk factors such as poor diet, inactivity, high screen time, and affluent lifestyle. The findings reinforce the need for early, coordinated interventions at the school, family, and policy levels to curb the rising tide of adolescent obesity and its long-term health consequences.

RECOMMENDATIONS

The study recommends strengthening school- and community-based strategies to prevent adolescent obesity. Schools should provide regular nutrition education, ensure daily physical activity, and create awareness to reduce excessive screen time. Tailored interventions for higher socioeconomic groups, including healthy cafeteria policies and parental counselling, are essential. Additionally, collaboration with local health authorities for BMI monitoring, restricting junk food near schools, and promoting access to sports facilities can help in effectively addressing this growing health issue.

STRENGTHS OF THE STUDY

- First study in Sagar city to assess adolescent obesity with multistage sampling and both government and private schools represented.
- Use of standardized WHO BMI classification and robust statistical analysis, including multivariable logistic regression.
- Balanced sample with adequate male and female representation across the 15–18 years age group.

LIMITATIONS

- Being a **cross-sectional study**, it cannot establish causality between risk factors and obesity.
- **Self-reported data** on diet and screen time may be subject to recall and reporting bias.
- Conducted only in school-going adolescents, which excludes out-of-school adolescents who may have different risk profiles.
- The study did not assess detailed dietary intake (calorie/nutrient estimation), which could have provided deeper insights.

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Nil

CONFLICTS OF INTEREST

There are no conflicts of interest

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