

# Prevalence of Obesity And Its Associated Risk Factors Among School Going Adolescents in Semi Urban Area.-A Cross Sectional Study

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## ABSTRACT:

Obesity is a global epidemic, emerging as a major health challenge in children and adolescents.

**Objectives:** To study the prevalence and correlation of risk factors for overweight and obesity in school going adolescents between 12 to 17 years of age.

**Methods:** A cross-sectional study was Conducted at Dhanalakshmi Srinivasan matriculation higher secondary school for a duration of 18 months .After getting permission from the school authorities and Institutional Ethics committee children were included as per inclusion criteria. Measurement of height, weight, and BMI done for all the children between 12 – 17years of age. The obesity is diagnosed as per IAP growth standards, children with BMI above 27th adult equivalent are termed as obese and those between 23rd and 27th adult equivalent are termed as overweight. All children must fill out the structured questionnaire under the guidance of health personnel, to assess various factors which may influence adolescent weight.

**Results:** The results indicate a high prevalence of overweight (21.6%) and obesity (28.2%), particularly among boys, Variables related to screen time, including watching television and television watching hours showed statistically significant associations with the outcome variable. Among dietary behaviors, type of snacks preferred ,Eating behavior-related factors such as desire to control overeating consuming food while sad or bored ,consuming food as a reward and inappropriate behavior after bingeing were also significantly associated with the outcome. In contrast, physical activity measures, parental advice, and household-related activities did not demonstrate statistically significant associations .

**Conclusion:** Obesity is prevalent among adolescents and Screen-related behaviors (television viewing and video gaming) and other emotional eating patterns (eating when bored, reward-based eating, and loss of control over eating) were significantly associated with the outcome variable .In contrast, physical activity, dietary habits, and parental influence did not show statistically significant associations with the outcome .

**Keywords:** activity, children, eating, habits, obesity, screen.

## Introduction

Obesity has become a major public health concern worldwide, with the prevalence increasing dramatically over the past few decades. Obesity has reached epidemic proportions all over the world, and the number of overweight or obese infants and young children (aged 0 to 5 years) increasing from 32 million in 1990 to 41 million in 2016 <sup>1</sup>Childhood obesity is alarming as it tends to track into adulthood and leads to long-term health consequences <sup>2</sup>. Obesity in childhood might be a risk factor for several health issues like hypertension, dyslipidemia, chronic inflammation, increased risk of fractures, psychosocial problems and increases the chance for morbidity and mortality in future <sup>3</sup>.

School-going children and adolescents are an important target group for studying the obesity epidemic. Schools provide easy access to a large population sample for epidemiological studies. As children spend much of their working hours in school, the school environment and policies could have a strong influence on their dietary and physical activity behaviour<sup>4</sup>. Understanding the diet patterns, physical activity levels and obesity profile of students can be used in school-based intervention programs for promoting healthy behaviours. Schools also enable a standardized measurement of obesity parameters like body mass index (BMI), skin-fold thickness and waist circumference in children <sup>5</sup>.

Some studies have also reported on the dietary pattern and physical activity among school students, which influence their obesity levels. Unhealthy diet and sedentary lifestyle were important predictors of obesity among Chennai school children <sup>5</sup>. A study in New Delhi found that diets were deficient in fruits and vegetables while high in junk foods <sup>6</sup>. Many students reported low physical activity levels. Understanding these proximal behavioral factors can help plan appropriate interventions.

To conclude, research shows that the prevalence of obesity among school-going children and adolescents in India is high, mirroring global trends. Prevalence is higher in urban areas and among students of higher socioeconomic status. Unhealthy dietary patterns like junk food consumption and sedentary lifestyles have emerged as important predictors of obesity. Further research on representative samples can help determine the true magnitude of the problem. School-based interventions incorporating dietary modification, physical activity and policy changes are essential to curb the obesity epidemic among students in the critical developmental age group.

## Methodology:

This study was a school based cross sectional study, among adolescent students between 12 to 17 years of age attending Dhanalakshmi Srinivasan Matriculation and Higher Secondary school, Perambalur. The study was conducted between November 2022 to April 2024, for about 18 months.

### Sample size:

According to Naval Chandra et al study (54), considering the prevalence of overweight as 35.8% with a

$$n = \frac{z^2 \times \hat{p}(1-\hat{p})}{\epsilon^2}$$

precision of 3% and 95% confidence interval, the sample size is calculated as

$Z_{1-\alpha/2}$  - two tailed probability for 95% confidence interval = 1.96

p (%) - prevalence of Overweight = 0.358

d (%) - precision or allowable error for Overweight = 0.03

$N = 1.96^2 \times 0.358 \times (1 - 0.358) / 0.03^2$  N = 981.01

Thus, the total sample size required for the study is 981

## Selection Criteria for Patients

### Inclusion Criteria:

- All school going children between 12 to 17 years of age attending Dhanalakshmi Srinivasan Matriculation Higher Secondary School, Perambalur.

### Exclusion Criteria:

- Children whose parents deny the consent for the study.
- Children who are known case of any endocrine or genetic diseases which can cause obesity, will be excluded from the study.

## Methodology:

After getting permission from the Institutional Ethics committee and school authorities the children were enrolled as per inclusion criteria. Measurement of height, weight and BMI done for all the children between 12 – 17 years of age. BMI will be calculated as Wt (kg) /Ht (m<sup>2</sup>). With IAP BMI reference chart, children will be classified as underweight, normal, overweight and obese. Children with BMI above 27th adult equivalent are termed as obese and those between 23rd and 27th adult equivalent are termed as overweight. Blood Pressure measurement will be done. Systolic and diastolic BP in relation to age, sex and height related reference range will be expressed with 5th, 10th, 90th and 95th percentile (5). All children will fill the structured questionnaire under the guidance, to assess various factors which may influence adolescent weight. Students queries will be clarified if any while filling the questionnaire. At the end, health education regarding diet, physical activity and behavioral modifications to prevent obesity will be provided. • Before completing the questionnaire a brief orientation is provided regarding the study objectives and how to fill up the survey. Some of the essential factors are included such as educational levels of parents, socioeconomic status, frequency of junk food consumption, intake of vegetable, fruits, meats and so on.

Statistical analysis will be performed with the Statistical Package for the Social Sciences (SPSS, version 13, Chicago, IL, USA). For continuous data from the entire study population -Mean, Median, Standard deviation and Range will be calculated. For categorical data - Number and Percentages will be calculated. Continuous variable with normal distributions will be analysed with student t test. • Chi square test will be used for

measurement of non-normal distribution. Multinomial logistic regression analysis will be used to find out correlation..

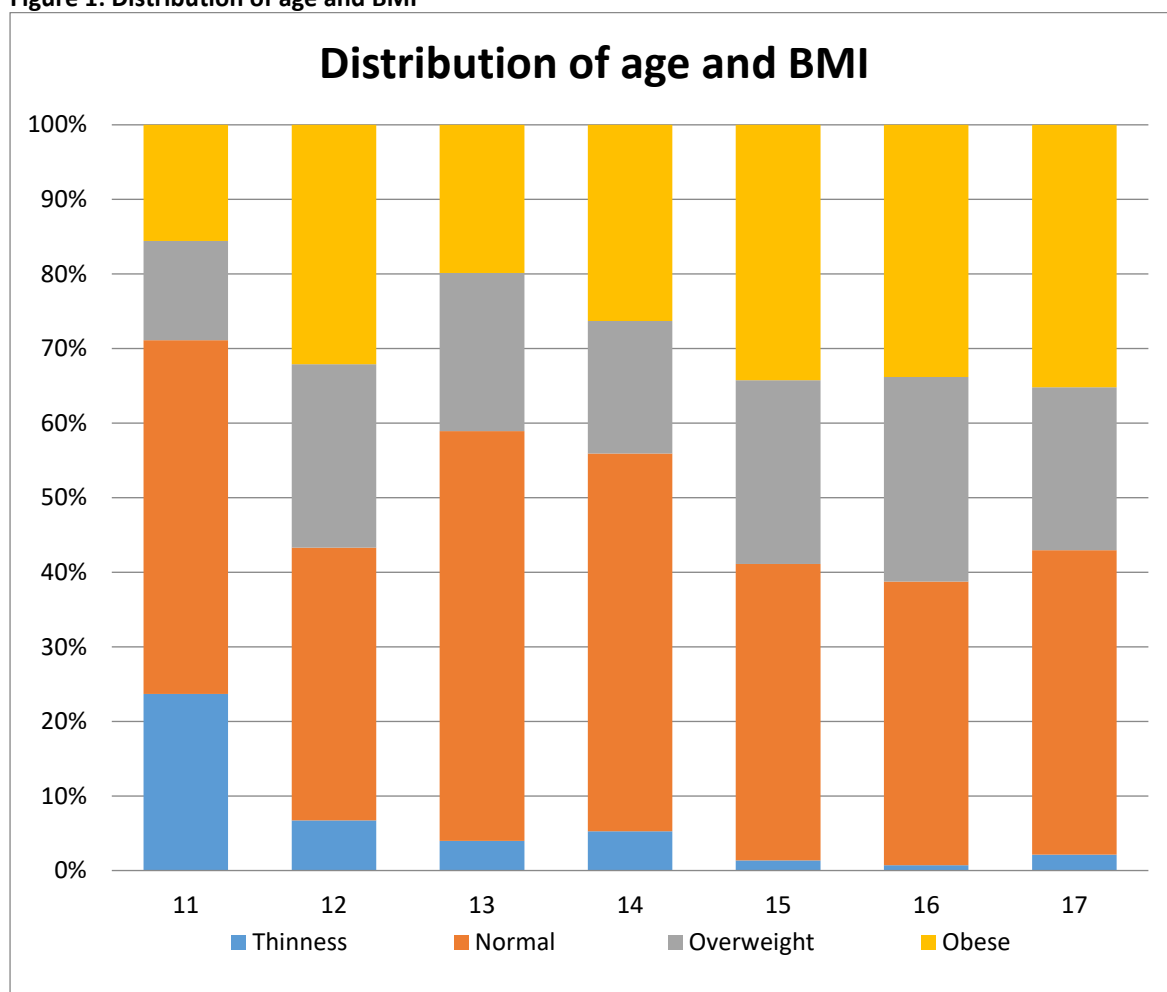
## Results

The study was conducted among children between 11 years to 17 years of age studying between 5<sup>th</sup> standard to 12<sup>th</sup> standard in a School, Perambalur. A total of 1002 students were included in the study. The mean age group of the study population is 14.03 years. In the study population almost equal numbers of students were selected from each age group as in FIG 1. 54.3% of them were boys and 45.7% of them were Girls as in FIG 2.

### Figure Caption:

In our study we observed the difference in BMI as per IAP Classification among different age groups in the study population and the difference is found to be statistically significant with p value <0.05. As age increases the proportion of students in overweight and obese group also increases as shown in FIG 1.

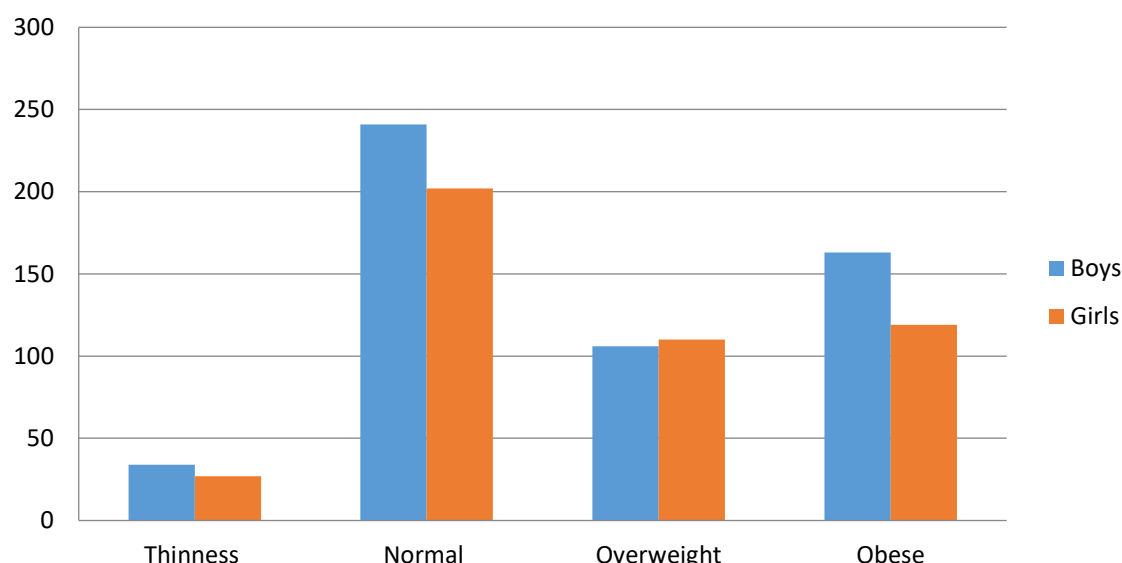
**Figure 1: Distribution of age and BMI**



In our study we observed the difference in BMI as per IAP Classification among different gender in the study population and the difference is found to be statistically not significant with p value > 0.05. except in obese group where the proportion of boys were more than girls, in all other parameters we found similar proportions as shown in FIG 2.

**Figure 2: Gender and BMI – IAP Classification**

## Gender and BMI – IAP Classification



The results indicate a high prevalence of overweight (21.6%) and obesity (28.2%), particularly among boys, who were more frequently classified as overweight and obese compared to girls.

98.3% of the students were consuming non-vegetarian diet and only 1.7% of them were Vegetarian diet. We have observed that most of the students spend more time on watching television with 93.5% and that 51.5% of the students spent at least 1 hr in watching television. Though only very few students own a mobile phone, majority of others 93.7% of them use their parents mobile phone for spending time or for playing games.

In our study we observed that 91.2% of the students like to consume more snacks, out of that bakery products were the most preferred snack with 40.3%, followed by oily foods with 37% and only 12.9% of them referred homemade snacks.

We also observed that 98.4% of the students in our study group preferred to play outdoor games.

Multinomial logistic regression analysis was done to eliminate the confounding factors and to identify actual factors that are significantly associated with different variables and BMI classification shown in table 1.

| Effect                                             | Model Fitting Criteria             | Likelihood Ratio Tests |    |      |
|----------------------------------------------------|------------------------------------|------------------------|----|------|
|                                                    | -2 Log Likelihood of Reduced Model | Chi-Square             | df | Sig. |
| Watching Television <sup>1</sup>                   | 2163.035                           | 25.327                 | 3  | .000 |
| Television watching hours <sup>1</sup>             | 2166.640                           | 28.932                 | 9  | .001 |
| Owning a mobile phone                              | 2140.202                           | 2.495                  | 3  | .476 |
| Playing in parents mobile                          | 2139.371                           | 1.664                  | 3  | .645 |
| Hours spent in playing videogames <sup>1</sup>     | 2232.146                           | 94.439                 | 9  | .000 |
| Skipping Meals                                     | 2138.628                           | .920                   | 3  | .821 |
| Type of snacks preferred                           | 2159.007                           | 21.299                 | 9  | .011 |
| Consuming large quantity after skipping a meal     | 2145.121                           | 7.414                  | 3  | .060 |
| Consuming food without hunger                      | 2146.100                           | 8.392                  | 6  | .211 |
| Desire to control overeating <sup>1</sup>          | 2266.434                           | 128.726                | 3  | .000 |
| Consuming food while sad/bored <sup>1</sup>        | 2151.539                           | 13.831                 | 3  | .003 |
| Consuming food as a reward <sup>1</sup>            | 2147.828                           | 10.120                 | 3  | .018 |
| Inappropriate behaviour after binging <sup>1</sup> | 2146.591                           | 8.884                  | 3  | .031 |

|                                                     |          |        |   |      |
|-----------------------------------------------------|----------|--------|---|------|
| Preferring to take lunch in groups                  | 2141.056 | 3.349  | 3 | .341 |
| Preference to consume unhealthy foods               | 2141.020 | 3.313  | 3 | .346 |
| Consuming Vegetable/fruits rich in fibre frequently | 2139.636 | 1.928  | 3 | .587 |
| Preference to consume dairy products                | 2144.318 | 6.610  | 3 | .085 |
| Advise by parents on following healthy diet         | 2138.991 | 1.284  | 3 | .733 |
| Preference to play indoor games                     | 2139.918 | 2.210  | 3 | .530 |
| Preference to play outdoor games                    | 2137.751 | .043   | 3 | .998 |
| Practicing sports at school                         | 2138.943 | 1.235  | 3 | .745 |
| Habit of waking up early                            | 2138.517 | .809   | 3 | .847 |
| Habit of sleeping at day time during weekends       | 2151.413 | 13.705 | 3 | .003 |
| Parents advise on doing exercises                   | 2138.295 | .588   | 3 | .899 |
| Reported physical activity                          | 2140.061 | 2.354  | 6 | .884 |
| Helping mothers in household chores                 | 2138.242 | .534   | 3 | .911 |

<sup>1\*</sup> factors that are significantly associated with different variables and BMI classification.

## Discussion

In our study we have observed almost equal proportion of students in each year, which ranges from 13.4% TO 15.2% in 11 to 17 years age groups. The total number of male students involved in our study was 54.3% and females were 45.7% in our study group, Gayathri et al in their study they had included high proportion of girls with 55.3% and boys with 44.7%.<sup>6</sup>

In the study group, the mean weight was observed as 53.3 kgs with a standard deviation of 13.9 kgs, and the mean height in the study group was 154.5 cms with a standard deviation of 9.1 cms, Rohilla et al in their study observed that the mean weight increases from 34.7kgs to 55.09 kgs with age between 10 to 19 years a similar finding was observed in our study where the mean weight of the study group ranges from 32.78 kgs to 64.42 kgs.<sup>7</sup>

Majority of the students in the study group with 61.8% were reported to be involved with mild physical activity and 24%. Students with moderate physical activity, only 13.7% students were observed with vigorous physical activity a similar observation was made by a Wathrkar et al at Kanpur, where only 15.6% of the students involves with physical activity occasionally.<sup>8</sup>

In our study we observed that 10.3% and 16.1% of the boys were found to be overweight and obese, whereas in girls 10.8% and 11.7% of them were found to be in overweight and obese category respectively. Gorantla et al observed a contrast finding, where overweight and obesity prevalence is more in females with 13% and 10.1% in boys.<sup>9</sup> Rohilla et al observed that the overweight and obese category was more in males than in females.<sup>8</sup> Dhansekhar et al had a contrast finding from our study with 22.1% were in overweight group and 4.1% were in obese category and the prevalence is more in girls with 51.5%<sup>10</sup>

The prevalence of overweight and obesity among students it increases with age in adolescent group, at 11 years of age the proportion of overweight was around 13.1% and obese with 13.7% whereas it steadily increases by age, and in 16 years age group the proportion of overweight was 27.2% and obese was 29% respectively, this results were similar to the observation made by Ranjani et al<sup>11</sup> where they observed the prevalence of obesity was 11.8% in students between 10-12 years age group, to 19.4% overweight and obesity in 13-16 years age group. But a contrast observation was made in another study with increase in age they observed decrease in prevalence of overweight and obesity.<sup>12</sup>

It was reported that 93.7% of the students spend atleast one hour per day in playing video games. We have also observed that 19.3% and 26.4% of the students in the overweight and obese category were used to play videogames daily.

We have also observed that 21% and 28% of them were found to be in overweight and obese group respectively, which was also statistically significant, Watharkar et al observed that 21.47% of the students spent more than 2 hours on watching television, similarly Gayathri et al in her study they observed that 70% of

the students spent more than 1-2 hours in watching television, mobile phone or laptops<sup>6,8</sup>. In our study we have observed the attitudes of students regarding their eating habits and attitudes, in that 85% of the students reported that they consume food even in the absence of hunger and the prevalence of overweight and obese in such students were more and it was statistically significant. 7.1% of the students in the study group has reported that they don't have any control over overeating.

In our study we have observed that 40.3% of the students and 37% of them prefer to have bakery items and oil/fried items as their snacks. 91.9% of the students preferred to consume snack only in the evening time. Gorantla et al<sup>9</sup> in their study observed that high prevalence of overweight and obesity among students consuming oil rich foods and frequent consumption of bakery items with 16.4% to 13. % in their study population respectively. A similar finding was observed in various articles that high calorie diet is strongly associated with overweight and obesity among adolescents,<sup>13,14,15</sup> similarly in our study the prevalence of overweight and obesity was 24% and 23.6% among students consume snacks twice in a day which was more compared to the prevalence when it was taken once in a day. Gayathri et al<sup>6</sup> also observed that 44% of the students in their study group consume unhealthy snacks everyday.

In our study group we have observed the consumption vegetables and fiber in their diet was very less, only 28.4% of the students in the study group has reported it. The prevalence of overweight and obesity was almost similar in both the groups, whereas in another study<sup>16</sup> they observed that 43.8% of the students consume fruits and vegetables daily..

We have observed that only 0.6% of the students prefer to play indoor games and the remaining students 99.4% of them doesn't prefer to play indoor games. 98.1% of the students in the study group prefer to play outdoor games, surprisingly 21% and 27.1% of the students were in overweight and obese category among students who prefer outdoor games, a contrast findings were seen in Rohilla et al<sup>7</sup>, where the prevalence of overweight and obesity was less in students who prefer outdoor games.

**Conclusion:** The prevalence of overweight and obesity among the study population in DHSS School, Perambalur was high and that is a concern. This study highlights the need for addressing various lifestyle factors such as screen time, healthy dietary practises, adequate physical activity is required to manage and prevent obesity among adolescents. This involves the role of health care workers, educators, parents and adequate awareness to adolescents to provide an appropriate intervention required at different level to contribute healthier outcome among school going children.

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