

Prevalence of Overweight and Obesity among children and adults aged between 10-25 years in India

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Abstract: **Background:** BMI(kg/m²), eating habits and physical activity are often entangled. Overweight and Obesity in children and adults is a result of poor eating habits and physical activity. **Aim:** To analyze the effect of obesity and overweight on the health of the children and adults aged between 10-25 years in India. **Objective:** To study the eating habits, physical activity and its effects on their BMI(kg/m²) and consider weight management strategies that may help the individual to achieve and maintain weight loss. **Result:** The study concluded that the risk of overweight and obesity in children were caused due to poor eating habits and insufficient physical activity. **Conclusion:** It was observed that the people with overweight and obesity have poor eating habits like less consumption of green leafy vegetables, fruits, cereals and pulses and increased consumption of junk food.

Key Words: Body Mass Index (BMI)(kg/m²), physical activity, eating habits, adult, children, overweight and obesity.

1. INTRODUCTION:

According to WHO, Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health. A body mass index (BMI)(kg/m²) over 25kg/m² is considered as overweight, and over 30kg/m² is considered as obese[1]. BMI was calculated as weight in kilograms divided by the square of height in meters [BMI = weight (kg)/height (m²)] [2].

Category	Grade	WHO	Indian cut off
Underweight		<18.5	
Normal		18.5-24.9	18-22.9
Overweight		25.0-29.9	23-24.9
Obesity	I	30.0-34.9	25-29.9
	II	35.0-39.9	30-34.9
Extreme obesity	III	>40	>35

Reference: A BMI(kg/m²) chart depicting BMI(kg/m²) ranges recommended by WHO and Indian criteria values

While looking into the prevalence, approximately 39% of the global adult population were classified as overweight (Body Mass Index (BMI) 25.0–29.9 kg/m²) or obese (BMI > 29.9kg/m²) in 2014; a doubling since 1975. Whereas the prevalence of obesity was 6.4% among women and 3.2% among men in the year 1975, it had risen to 14.9% and 10.8%, respectively by 2014[3]. In developing countries like India, the prevalence of obesity is increasing and ranges from 8% to 38% in rural and 13% to 50% in urban areas[4]. Globally, about 10% of school children in the 5–17 age groups are obese or overweight. The prevalence of overweight and obesity had increased 8.4% to 15.5% among women between 1998 and 2015, and the prevalence of obesity increased from 2.2% to 5.1% over the same period[5,6,7].

The prevalence of obesity has increased more than 10-fold from 11 million to 124 million school-age children. In addition to this, another 216 million children were estimated to be overweight though not obese in 2016[8]. The International Association for the Study of Obesity (IASO) and International Obesity Task Force (IOTF) reckon that 200 million school children worldwide are either overweight or obese[9]. The prevalence of overweight/obesity among adolescent Indian children rose from 9.8% in 2006 to 11.7% in 2009[10]. The prevalence of overweight/obesity in children in Delhi increased from 16% in 2002 to 24% in 2006[11].

In South India, the prevalence of overweight and obesity in school children was found to be 10.8 and 6.2%, respectively[12]. Another study from Central India found 3.1% (95% CI 2.5–3.8) of children between 10 and 17 years to be overweight and 1.2% (95% CI 0.8–1.8) to be obese and overall, 4.3% were overweight/obese[13]. From Surat, in Western India, Gamit et al. reported the prevalence of overweight and obesity to be 10.2 and 6%, respectively[14]. In Kanpur, the prevalence of overweight and obesity were 4 and 2%, respectively. In North Chennai, the prevalence of overweight and obesity were found as 22.1 % and 4.1% in 2018[15].

In addition to the prevalence, there is a huge number of risk factors that may be associated with overweight and obesity. Obesity and Overweight adversely affect the metabolic health of young people and can result in delayed puberty in boys and advanced puberty in some girls. Risk factors of childhood and adulthood obesity such as(Type 2 diabetes, stroke, and heart disease, High Depression, and stress) is caused by regular eating of high-calorie foods, such as fast foods, candy, and desserts, sugary drinks, including fruit juices and sports drinks, which leads to obesity in some people[16].

Children and adults who don't exercise much are more likely to gain weight as they don't burn many calories. Too much time spent watching television or playing video games also contributes to obesity. One of the major factors of obesity or being overweight is based on family genes. If the child comes from a family of overweight, he or she may be more likely to put on weight even though they are eating a balanced meal. Moreover, obesity and overweight are also caused by psychological factors and socioeconomic factors where personal, family stress or having poor access or have the poor income to buy healthy and nutritious foods so they rely on frozen, cheap, and unhealthy foods. can increase a child's risk of obesity[17]. Childhood and adulthood obesity is due to the consumption of certain medications such as paroxetine (Paxil), and propranolol (Hemangeol)[18].

Poor eating habits play a major role in childhood and adulthood obesity. The major pathway for obesity in today's younger generations is the consumption of higher caloric foods which are rich in sugar, salt, saturated and trans fats, food additives moreover less intake of fruits and green leafy vegetables. Unbalanced meal timings and poor inclusion of all kinds' foods from major five food groups. One of the major reasons for obesity or being overweight is choosing sugary and carbonated drinks over normal drinking water[19].

Decreasing caloric intake and increasing physical activity is the common strategy to treat an obese patient because due to lack of physical activity the energy obtained from the intake of foods is stored as fat and leads to an increase in the weight in the body[20]. It is advisable to reduce the time spent watching television, playing video games, and indulging in doing any kind of physical activity. It is recommended by the American Diabetes Association to work out (strength training, cardio) or do any sort of physical activity at least 150 minutes/day and 25-30 minutes/day[21].

Include lots of fruits, vegetables throughout the day. Encourage eating brown rice, quinoa, oats, broken wheat, or bran fortified products. Restrict the use of refined flour products like cakes, muffins, naans, bakery products, or excess sugar. Replace high fatty foods with dairy, eggs, poultry, fish, beans, soy, and sprouts. Substitute whole fat milk and products with low-fat products[22]. Select low-fat smoothies over high-calorie sugary shakes or ice cream. Eliminate soda or any aerated drinks from the diet. Reducing the frequency of eating outside and portion control is the key to reducing the risk of obesity and being overweight. Consume home-cooked food as much as possible. Discourage eating in front of the television, computer, or other electronic devices[23].

2. METHODS AND MATERIALS:

A prospective observational study was done by Randomized Sample Technique. The sample size given was 40 and the target sample achieved was 80. Children who were overweight and obese between the age group of 10 - 25 years were included in the study. Children and adults not willing to participate were not included. The study was done through google form since it was a survey method. The google form was circulated in social media through the known circle to collect the necessary data.

The questionnaire had 17 questions with options. The questionnaire had demographic data which had the name, age, height, weight, and the main questions were focused on physical activity, consumption of fruits, green leafy vegetables, junk foods, what cereal they consume the most, and strategies which they think they must follow to reduce weight.

3. ANALYSIS AND RESULTS:

In our prospective observational study, the total number of participants was 80 with 60 Females (75%) and 20 males (25%). The mean(\pm SD) BMI(kg/m^2) of the participants was 31.24 ± 3.8041 . All the participants completed the questionnaire in google forms circulated through social media.

10 to 25 Years were categorized into three groups which are 10-15years, 15-20 years, and 20-25years. When looking into the classification of obesity and overweight, in the age group between 10 to 15 years, Obesity (61%) and

overweight (39%). Class I obesity was found to be 11 (55% female and 45% male) out of which (6 female and 5 male) and class II obesity was found to be 3 (100% female and 0 male) out of which (3 female and 0 male) and class III obesity was found to be 3 (100% female and 0 male) out of which (3 female and 0 male).

In the age group between 15 to 20 years, Obesity (73.07%) was more common than overweight (27%). Class I obesity was found to be 15 (87% female and 13% male) out of which (13 female and 2 male) and class II obesity was found to be (100% female and 0 male) out of which (4 female and 0 male) and there is no class III obesity category between the age group 15 to 20 years.

In the age group 20 to 25 years there is only a minor difference in the category of obesity (54%) and overweight (46%). Class I obesity was found to be 9 (67% female and 33% male) out of which (6 female and 3 male) and class II obesity was found to be 5 (80% female and 20% male) out of which (4 female and 1 male).

While looking into the subject’s response to questions related to their meals, eating habits along with their physical activity patterns, the majority of the subjects prefer to consume healthy foods such as fruits and vegetables only once or twice a week and consume junk foods almost every day. Based on the number of meals per day, most subjects (66.3%) reported having 3 meals per day. Regarding the consumption of junk food almost (23.8%) subjects tend to eat every day. While looking into the consumption of green leafy vegetables it was seen that 50% consume weekly once whereas 1.2% consume it on daily basis or twice a week. While analyzing the consumption of fruits it was seen that about 3.63% tend to consume 3 servings of fruits in a week and 53.33% consume 1 serving of fruits in a week. Almost 10% of the participants consume all varieties of cereals especially moong dal(11.25%), rice, and Chickpea (7.5%) whereas 22.5% of subjects don’t consume any kind of cereals on a regular basis.

Based on the physical activity status of the subjects, almost 51.2% of the subjects were physically active once a week such as doing any sort of physical activities such as playing outdoor games, walking(50%), cycling(27.5%), swimming(6.3%). 22.5% of the subjects were physically active on a daily basis and 26.2% subjects were active physically twice or thrice a week. While 1.2% either don’t engage in any sort of physical activity or play sports do some stretching such as yoga, running, volleyball).

Table 1: Respondents’ BMI(kg/m²) and their Opinion on Reduction of Weight (n = 80)

Weight Reduction	BMI(kg/m ²)			Total	Chi square value	P value
	Low	Medium	High			
Diet	8 [47.1]	5 [29.4]	4 [23.5]	17	3.153	0.007**
Physical Activity	10 [35.7]	9 [32.1]	9 [32.1]	28		
Both	16 [45.7]	14 [40.0]	5 [14.3]	35		
Total	34	28	18	80		

Since P value is less than 0.01, it is concluded that there is a significant association between respondents’ BMI(kg/m²) and their opinion on reduction of weight. Based on the low percentage, respondents who are following both diet and physical activity have lower levels of BMI(kg/m²)(45.7%) than the respondents who follow physical activity alone (35.7%). It is also noted that the respondents who follow diet alone also have low levels of BMI (kg/m²)(47.1%).

Table 2: Table Showing Physical activity engaged and active time of respondents (n = 80)

Particulars	Mean Square	F	P Value
Between Groups	27.444	10.978	0.035**
Within Groups	2.500		

Since P value is less than 0.050, the alternate hypothesis is accepted at 5 percent level of significance. Hence it is concluded that there is a significant difference between physical activity engaged and physically active time of respondents.

Table 3: Co-efficient between Food Habit and Physically Active of respondents (n = 80)

Variables	USC	SE	SC	t value	P value
(Constant)	0.042	0.487		0.086	0.001**
Consumption of Green Vegetables	0.484	0.042	0.481	11.420	0.006**

Consumption of Fruits	0.268	0.051	0.211	5.279	0.007**
Consumption of Non-Vegetarian	0.212	0.059	0.124	3.588	0.009**
Consumption of Cereals/Pulses	0.147	0.050	0.108	2.938	0.003**
Consumption of Junk Food	-0.078	-0.051	-0.059	-1.539	0.005**

The coefficient of X_1 is 0.484 which represents the direct relationship between consumption of green leafy vegetables and physically active time of respondents. The estimated positive sign indicates that for each additional unit of consumption of green leafy vegetables, there is a 0.484 unit increase in the physically active time of respondents and it is significant at 1% level.

The coefficient of X_2 is 0.268 which represents the direct relationship between consumption of fruits and physically active time of respondents. The estimated positive sign indicates that for each additional unit of consumption of fruits, there is a 0.268 unit increase in the physically active time of respondents and it is significant at 1% level.

The coefficient of X_2 is 0.212 which represents the direct relationship between consumption of non-vegetarian and physically active time of respondents. The estimated positive sign indicates that for each additional unit of consumption of non-vegetarian, there is a 0.212 unit increase in the physically active time of respondents and it is significant at 1% level.

The coefficient of X_2 is 0.147 which represents the direct relationship between consumption of cereals/pulses and physically active time of respondents. The estimated positive sign indicates that for each additional unit of consumption of cereals/pulses, there is a 0.147 unit increase in the physically active time of respondents and it is significant at 1% level.

The coefficient of X_2 is 0.078 which represents the indirect relationship between consumption of junk food and physically active time of respondents. The estimated negative sign indicates that for each additional unit of consumption of junk food, there is a 0.078 unit decrease in the physically active time of respondents and it is significant at 1% level.

Table 4: Respondents' Gender and BMI(kg/m²) (Chi-square test)(n = 80)

Weight Reduction	BMI(kg/m ²)			Total	Chi square value	P value
	Low	Medium	High			
Male	13 [65.0]	4 [20.0]	3 [15.0]	20	5.557	0.042*
Female	21 [35.0]	24 [40.0]	15 [25.0]	60		
Total	34	28	18	80		

P value is less than 0.01. Hence, it is concluded that there is a significant association between respondents' Gender and their BMI(kg/m²). Based on the row percentage, female respondents have a higher level of BMI(kg/m²) (25%) than male respondents of (15%). It is also noted that male respondents have a lower level of BMI(kg/m²) (65%) than female respondents (35%). Moreover, the majority of the female respondents BMI(kg/m²) is at medium level (40%).

Table 5: Respondents' BMI(kg/m²) and Physical Activity (Chi-square test)(n = 80)

Weight Reduction	BMI(kg/m ²)			Total	Chi square value	P value
	Low	Medium	High			
Walking	5 (27.8)	7 (38.9)	6 (33.3)	18	10.872	0.048*
Yoga	3 (18.8)	7 (43.8)	6 (37.5)	16		
Gym/Work out	8 (53.3)	5 (33.3)	2 (13.3)	15		
Playing & Swimming	12 (63.2)	5 (26.3)	2 (10.5)	19		
Cycling	6 (50.0)	4 (33.3)	2 (16.7)	12		
Total	34	28	18	80		

P value is less than 0.01. Hence, it is concluded that there is a significant association between respondents' BMI(kg/m²) and their involvement in physical activity. Based on the row percentage, respondents who have been involved in walking (33.3%) and yoga (37.5%) have higher levels of BMI(kg/m²) than the respondents of those involved in playing and swimming (10.5%), gym and workout (13.3%) and cycling (16.7%).

4. DISCUSSION:

The purpose of the study was to assess the association of overweight and obesity with eating habits in a sample of 80 participants. Body mass index(BMI)(kg/m²) was used to assess weight status. We found a positive association between gender and BMI(kg/m²) (p-value = less than 0.01) in which male respondents have a lower level of BMI(kg/m²) (65%) than female respondents (35%). Moreover, majority of the female respondents BMI(kg/m²) is at medium level (40%).The higher rate of obesity among females is expected due to lack of sufficient physical activity and consumption of junk foods. While looking into the prevalence, in South India, the prevalence of overweight and obesity in school children was found to be 10.8 and 6.2%, respectively while globally, about 10% of school children in the 5–17 age groups are obese or overweight. In addition to the prevalence, risk factors of childhood and adulthood obesity include regularly eating high-calorie foods, such as fast foods, candy, and desserts, sugary drinks, including fruit juices and sports drinks, lack of sufficient amount of physical activity which leads to obesity in some people.

5. CONCLUSION:

Since P value is less than 0.01, we have statistically found that there is a positive association between respondents' BMI(kg/m²) and gender and their involvement in physical activity. Based on the row percentage given in (table 5), female respondents have high level of BMI(kg/m²) (25%) than male respondents of (15%). It is also noted that male respondents have a lower level of BMI(kg/m²) (65%) than female respondents (35%). Moreover, the majority of the female respondents BMI(kg/m²) is at medium level (40%). The results suggest, with the increase in awareness on the importance of healthy lifestyle which includes healthy eating, being physically active and maintaining a healthy body weight have shown to reduce the incidence and risk factors associated with obesity and overweight in India.

6. LIMITATIONS:

- The findings of this study were done on google forms and were circulated in social media through the known circle to collect the necessary data.
- Limited and assumed sample size
- There is no direct one-on-one person communication as it was done through google forms.
- The number of females is more than the males.

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