Original Research Article

Association between obesity and anxiety among an adolescent population of Rajkot district, Gujarat, India: a cross sectional and descriptive study

Dipal Patel*

Department of Paediatrics, Gujarat Medical Education and Research Society Medical College, Gandhinagar, Gujarat, India

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*Correspondence:
Dr. Dipal Patel,
E-mail: prthptl231@gmail.com

ABSTRACT

Background: Proper good nutrition are essential for mental development, physical growth, health and wellbeing and survival of adolescents. School based data of India shows a prevalence of obesity is 5.6% to 24.0% among children and adolescents. Psychosocial complications associated with obesity include poor self-image, depression, and difficulties in both social environment and home. This study was carried out with an objective to find out prevalence of malnutrition and associated factors.

Methods: A cross sectional study conducted among 1026 school going adolescents from 4 schools of Rajkot, Gujarat, India. Depression and anxiety were measured using Beck Depression Inventory and Beck Anxiety Inventory. Chi-square test was applied as test of significance.

Results: Majority of the students (58.1%) were belonged to early adolescent age group. About 67.1% were males. About 16.6% were underweight and 1.2% were obese. Overweight was more prevalent in girls (5.6%) as compared to boys (1.2%). Prevalence of anxiety and depression was 9.9% and 18.5% respectively. Anxiety was frequently found in overweight and obese adolescents (82.0%) as compared to only underweight and normal adolescents (7.1%, p<0.0001).

Conclusions: The prevalence rate of overweight and obesity were 9.7% and 4.3%. Girls are more affected with overweight. Significant number of adolescents was suffering from anxiety (9.9%) and depression (18.5%). Anxiety was frequently found in overweight and obese adolescents. There is need of immediate action to prevent adolescent obesity. Assessment of anxiety and depression among students with proper counselling should be carried out at least once a year.

Keywords: Adolescent, Anxiety, Depression, Obesity, Underweight

INTRODUCTION

Today, every fourth person in India is an adolescent (10-19 years). According to the World Health Organization (WHO), adolescence is the period of life that extends from 10 to 19 years. Adolescence is divided into three phases: (1) Early age- 10-13 years (2) Middle age- 14-16 years (3) Late- 17-20 years. Proper good nutrition are essential for mental development, physical growth, health and wellbeing and survival of adolescents. Increased nutritional needs to this juncture relate to the fact that adolescents gain up to 50% of their adult weight, more than 20% of the adult height and 50% of their skeletal/bone mass during this period. The rapid adolescent growth spurt demand extra nutritional requirements. Inadequate nutrition in this
period can retard growth and sexual maturation and lead to chronic diseases. Inadequate nutrition of girls during adolescence can have serious consequences throughout the reproductive year.\textsuperscript{4}

School based data of India shows a prevalence of obesity is 5.6\% to 24.0\% among children and adolescents. Potential medical complication of obesity include hypertension, diabetes mellitus, dyslipidemia, coronary artery disease, stroke, premature joint destruction, arthritis, cholecystitis, some cancers and premature deaths. Obesity can also interfere to psychosocial development. Psychosocial complications associated with obesity include poor self-image, depression, and difficulties in both social environment and home.\textsuperscript{4}

This study was carried out with an objective to find out prevalence of malnutrition and associated factors.

METHODS

This cross sectional study was carried out during April 2014 to December 2015 after approval from Institutional Ethics Committee of the P. D. U. Govt. Medical College, Rajkot. Total four schools of Rajkot were randomly selected by computer generated random number.

Inclusion criteria

- Students from 5th to 12th standard (10-19 years)
- Both gender

Exclusion criteria

- Adolescents who were absent on the day of visit were excluded
- Those who denied consent were excluded.

Total 1026 adolescents (688 boys and 338 girls) were included. Written informed consent was taken from each participant. A predefined questionnaire was given to be filled by themselves. Questionnaire included information regarding age, sex, standard, socioeconomic status and health problems. Height, weight and blood pressure were recorded. Body mass index (BMI) was calculated using the formula weight (Kg) divided by height in square meters (m\textsuperscript{2}). Nutritional status of adolescent is classified according to World Health Organization approved CDC age specific BMI charts. Undernutrition was defined as BMI<5 percentile, overweight is defined as BMI between 85-95 percentile and obesity is defined as BMI>95 percentile. Beck Anxiety Inventory (BAI) with 21 items was used as psychological instrument for detecting early symptoms of depression in adolescents.\textsuperscript{5} Score of 1-10 is normal, 11-16 is mild mood disturbance, 17-20 is borderline clinical depression, 21-30 is moderate depression, 31-40 is severe depression and >40 as extreme depression.

The data were entered into Microsoft excel 2010 spreadsheet and analyzed using EPI INFO Version 7 software. Qualitative data were presented as frequency and percentage and compared with Chi square test. The p-values equal to or less than 0.05 was considered as significant.

RESULTS

Total 1026 students of 10-19 age groups were included in this study. Socio-demographic detail is shown in Table 1.

### Table 1: Socio-demographic detail of study participants.

| Socio demographic detail | Number of students | Percentage |
|--------------------------|--------------------|------------|
| Age (years)              |                    |            |
| 10-13                    | 596                | 58.1\%     |
| 14-16                    | 390                | 38.0\%     |
| 17-19                    | 40                 | 3.9\%      |
| Gender                   |                    |            |
| Male                     | 688                | 67.1\%     |
| Female                   | 338                | 32.9\%     |
| Socioeconomic status     |                    |            |
| I (upper class)          | 51                 | 5.0\%      |
| II (upper middle class)  | 228                | 22.2\%     |
| III (lower middle class) | 451                | 42.5\%     |
| IV (upper lower class)   | 240                | 23.4\%     |
| V (lower class)          | 56                 | 5.6\%      |
| Total                    | 1026               | 100.0\%    |

Majority of the students (596, 58.1\%) were belonged to early adolescent age group and only 40 students (3.9\%) were in late adolescent age group. Mean age was 13.3 years with SD of 1.64 years. Out of 1026 students, 688 (67.1\%) were males and 338 (32.9\%) were females with male to female ratio 2.03:1. Maximum adolescents (451, 42.5\%) were coming from class III followed by class IV (240, 23.4\%) and class II (56, 5.5\%).

Table 2 shows that out of 688 boys, 158 boys (23.0\%) belonged to class IV and Class V whereas out of 338 girls, 138 girls (40.8\%) belonged to class IV and Class V. This observation indicates that proportion of girls from lower socioeconomic class was significantly higher as compared to boys (p<0.0001).

Figure 1 shows that majority of students were from grade VIII (28.1\%), grade VII (27.6\%) and grade VI (23.3\%). Very few numbers of students in the grade 5, 10, 11 and 12 can be explained by their absenteeism and their reluctance to participate in the study.
Table 2: Socioeconomic status according to gender.

| Socio-economic status   | Boys       | Girls      | Total     | Chi square and p-value |
|-------------------------|------------|------------|-----------|------------------------|
| Class I, II and III     | 530 (77.0%)| 200 (59.1%)| 730 (71.2%)| \( \chi^2=34.36, \text{df}=2, p<0.0001 \) |
| Class IV and V           | 158 (23.0%)| 138 (40.8%)| 296 (28.8%)|                        |
| **Total**               | **688 (100%)** | **338 (100%)** | **1026 (100%)** |                        |

Figure 1: Grade wise distribution of school going adolescents (N=1026).

Figure 2: Nutritional status of patients according to WHO CDC growth chart.

Table 3: Relationship of various socio-demographic factors to nutritional status.

| Associated factors          | Nutritional status | Underweight <5th percentile (%) | Normal 5-85th percentile (%) | Overweight 85-95th percentile (%) | Obese >95th percentile (%) | Total |
|-----------------------------|---------------------|---------------------------------|------------------------------|----------------------------------|-----------------------------|-------|
| **Age ( \( \chi^2=3.28, \text{df}=3, \text{p-value}=0.77 \))** |                     |                                 |                              |                                 |                             |       |
| 10-13 years                 | 102 (17.1%)         | 471 (79.0%)                     | 16 (2.7%)                    | 7 (1.8%)                        |                             | 596   |
| 14-16 years                 | 64 (16.4%)          | 311 (79.7%)                     | 11 (2.8%)                    | 4 (1.0%)                        |                             | 390   |
| 17-19 years                 | 4 (10.0%)           | 35 (87.5%)                      | 0 (0.0%)                     | 1 (2.5%)                        |                             | 40    |
| **Gender ( \( \chi^2=20.65, \text{df}=3, \text{p-value}=0.0001 \))** |                     |                                 |                              |                                 |                             |       |
| Boys                        | 106 (15.4%)         | 566 (82.3%)                     | 8 (1.2%)                     | 8 (1.2%)                        |                             | 688   |
| Girls                       | 64 (18.9%)          | 251 (74.3%)                     | 19 (5.6%)                    | 4 (1.2%)                        |                             | 338   |
| **Socioeconomic status ( \( \chi^2=5.51, \text{df}=3, \text{p-value}=0.13 \))** |                     |                                 |                              |                                 |                             |       |
| Class I, II and III         | 114 (15.6%)         | 593 (81.2%)                     | 15 (2.1%)                    | 8 (1.1%)                        |                             | 730   |
| Class IV and V              | 56 (18.9%)          | 224 (75.7%)                     | 12 (4.1%)                    | 4 (1.4%)                        |                             | 296   |
| **Total**                  | **170**             | **817**                         | **27**                       | **12**                          |                             | **1026** |

Figure 2 shows that more than 3/4th of adolescents (817, 79.6%) have normal weight. Total 170 (16.6%) were underweight and 12 (1.2%) were obese.

Factors associated with nutritional status were presented in Table 3. Proportion of underweight was higher in early adolescent (17.1%) and middle adolescent (16.4%) as compared to late adolescent (10.0%) but statistically not significant (p=0.77). Similarly obesity was more prevalent (2.5%) in late adolescent as compared to middle (1.0%) and early adolescent (1.8%) but statistically not significant (p=0.77). Overweight is more prevalent in girls (19, 5.6%) as compared to boys (8, 1.2%) as p-value was 0.0001. Proportion of underweight and obese was nearly similar in girls and boys (boys versus girls: underweight - 15.4% versus 18.9%, obese-12.2% versus 1.2%). Significant difference was not observed for nutritional status among adolescent of different socioeconomic status.

In Table 4, anxiety was observed in 102 adolescents (9.9%). About 82.0% overweight and obese adolescents...
had anxiety as compared to only 7.1% underweight and normal adolescents which was statistically significant (p<0.0001).

**Table 4: Relation between nutritional status and anxiety of school going adolescents.**

| Nutritional status          | Anxiety | Total |
|-----------------------------|---------|-------|
|                            | Absent  | Present |       |
| Under weight and normal     | 917 (92.9%) | 70 (7.1%) | 987   |
| Over weight and obese       | 7 (18.0%) | 32 (82.0%) | 39    |
| Total                       | 924 (90.1%) | 102 (9.9%) | 1026  |

$\chi^2=235.4, \ df=1, \ p\text{-value}<0.0001$

Table 5 shows total 190 adolescent (18.5%) were suffering from depression. Proportion of depression was higher in overweight and obese adolescent (25.6%) as compared to underweight and normal adolescent (18.2%) but statistically not significant.

**Table 5: Relation between nutritional status and depression of school going adolescents.**

| Nutritional status          | Depression | Total |
|-----------------------------|------------|-------|
|                            | Absent     | Present |       |
| Underweight and normal      | 807 (81.8%) | 180 (18.2%) | 987   |
| Overweight and obese        | 29 (74.4%) | 10 (25.6%) | 39    |
| Total                       | 836 (81.5%) | 190 (18.5%) | 1026  |

$\chi^2=0.91, \ df=1, \ p\text{-value}=0.33$

**DISCUSSION**

In this study, prevalence of underweight, overweight and obese among adolescents was 16.6%, 2.6% and 1.2% respectively.

Other studies from India documented higher prevalence of overweight and obese than present study (Prasad RV et al: Overweight- 9.7%, Obese- 4.3%; Brahmbhatt et al: Overweight- 13.3%, Obese- 5.4%; Chhatwal J et al: Overweight- 14.2%, Obese- 11.1%; Shah et al: Overweight- 9.2%, Obese- 5.6%;). Chhatwal J et al reported that the prevalence of obesity was higher in higher socioeconomic class group as compared to lower socioeconomic class group. Eating habit like junk food, chocolates, eating outside at weekend and low physical activity like exercise, sports, TV watching/computer game having remarkable effect on overweight and obesity.

In the present study, prevalence of anxiety and depression was 9.9% and 18.5% respectively. Anxiety was frequently found in overweight and obese adolescents (82.0%) as compared to only underweight and normal adolescents (7.1%, p<0.0001). However, nutritional status was not associated with depression (Overweight and obese adolescent- 25.6% versus underweight and normal adolescent- 18.2%).

In a study by Rath et al analysis of data indicated that obese individuals possessed higher level of depression as compared to non-obese individuals. In the present study, it was observed that depression was not significantly associated with obesity but in study by Chauhan S et al, showed highest prevalence of depression was seen in obese (48.7%) study subjects and a statistically significant association was found between BMI and depression which is contrary to present study.

Limitation of present study was the lack of full participation of 10-12th standard students this may have imposed a selection bias.

**CONCLUSION**

The prevalence rate of overweight and obesity were 9.7% and 4.3%. Girls are more affected with overweight. Significant number of adolescents was suffering from anxiety (9.9%) and depression (18.5%). Anxiety was frequently found in overweight and obese adolescents. There is need of immediate action to prevent adolescent
obesity. Assessment of anxiety and depression among students with proper counselling should be carried out at least once a year.

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