



PREVALENCE OF OVERWEIGHT AND OBESITY IN ADOLESCENTS FROM EASTERN UTTAR PRADESH

Pediatrics

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ABSTRACT

Background: Obesity is major public health problem across the globe and its prevalence and severity is increasing day by day in adolescents due to increased use of multimedia devices and lifestyle changes in developing countries like ours.

Aims & Objectives: To estimate the prevalence of overweight and obesity in adolescents aged 10-19 years.

Methods: This observational study was done in Hind institute of medical sciences, Safedabad, Barabanki. All adolescents attending our outpatient in Department of Pediatrics and Department of Obstetrics and Gynaecology from January to September 2020 were included after applying exclusion criteria and obtaining a written consent from the adolescent and parent/guardian. On a preformed Performa, we noted the Demographic data, History, examination, anthropometric measurement of weight and height. BMI was calculated as $BMI = \text{weight (kg)} / \text{height}^2 (\text{m}^2)$ and Centre for disease control and prevention percentile ranking was used to categorize overweight between 85th to <95th percentile and obese ≥ 95 th percentile. Statistical analysis of data was done using Chi square test and SPSS software version 17.

Results: 415 adolescents were enrolled comprising 206 girls and 209 boys. Overall prevalence of overweight and obesity was 14.94 % of which 5.06% were obese and 9.88% were overweight. Among the girls, 16 (7.77%) were obese and 20 (9.71%) were overweight, while in boys, 5 (2.39%) were obese and 21 (10.05%) were overweight. Adolescent girls were significantly reported to be more obese and overweight (p value=0.044076).

Conclusions: Obesity among adolescents is escalating unrestrained and thus early education about healthy lifestyle strategies needs to be nurtured among adolescents

KEYWORDS

Adolescent, Obesity, Overweight

INTRODUCTION

India is home to world's largest adolescent population in the world and nearly about one fourth of India's population is contributed by adolescents.^[1] Adolescence is a stage of changeover from childhood to adulthood and is generally divided into three phases: Early (10-13 years), mid (14-16 years) and late adolescence (17-19 years). During this stage of life, changes occur first in physical maturity, reproductive capability, then psychological and social maturity.^[2]

Abnormal or excessive fat accumulation in one's body thereby causing a risk to health are defined as Overweight and Obesity. Obesity is major public health problem across the globe and its prevalence and severity is increasing day by day in adolescents due to increased use of multimedia devices and sedentary lifestyle changes in developing countries like ours.^[3,4] The International obesity task force (IOTF) calculated the global prevalence of obesity in children of 5-17 years to be 10%.^[5,6]

The prevalence of obesity has tripled from 1975 to 2016 all over the world. The prevalence of obesity among children and adolescents aged 5-19 has increased from 4% in 1975 to 18% in 2016 all over the world. This increase had been similar among boys and girls between age 5-19 year i.e., 18% of girls and 19% of boys were overweight while 6% of girls and 8% of boys were obese in 2016.^[7]

In India, childhood obesity is rising over the past few decades because of increasing hours of inactivity by more use of mobiles, laptops, video games and computers which had superseded old outdoor games and curtailed their social interactions.^[8] Prevalence of obesity was found to be 5.6-24% among children and adolescents in India from School based data.^[9] A recent study from Tamil Naidu, India reported prevalence of overweight and obesity among rural adolescent school students to be 13.28%.^[10] Persistent obesity during adolescence were more likely in Obese girls.^[11]

The objective of this study was to estimate the prevalence of overweight and obesity in adolescents aged 10-19 years.

METHODS

This observational study was conducted in Department of Paediatrics and Department of Obstetrics and Gynaecology in Hind institute of medical sciences, Safedabad, Barabanki from January to September 2020. Using OpenEpi free online software, we calculated the sample size of 384 with 50% anticipated frequency, confidence level of 95% and margin of error 5%.^[12] We conducted actual study on 415 adolescents although the estimated sample size was 384.

INCLUSION CRITERIA:-

All adolescents attending our outpatient were included after obtaining written consent from the adolescent and parent/guardian.

EXCLUSION CRITERIA:-

Adolescents with chronic systemic illnesses, endocrine disorders and those on long term >4 weeks therapy with steroids or other weight gain causing drugs were excluded from study.

On a preformed Performa, we noted the Demographic data, History, examination, anthropometric measurement of weight and height using standard technique with same calibrated balance and stadiometer. Body Mass Index (BMI) was calculated as $BMI = \text{weight (kg)} / \text{height}^2 (\text{m}^2)$ as it recommended for use in children and adolescents for classifying adiposity. We used BMI percentiles for distribution of early, mid and late adolescents into normal, obese and overweight.

Centre for disease control and prevention (CDC) percentile ranking was used to categorize weight status as Healthy weight between 5th percentile to < 85th percentile, overweight between 85th to < 95th percentile and obese equal to or > 95th percentile. The revised CDC growth charts consisted of total 20 charts in two sets of 10 charts each. Set 1 has the outer limits of the curves at the 5th and 95th percentiles and Set 2 has the outer limits of the curves at the 3rd and 97th percentiles. Both the sets consisted of 5 charts for girls and 5 charts for boys.^[13] CDC Body mass index-for-age (BMI-for-age) charts from ages 2 to 20 years for boys and for girls were used for percentile ranking.

STATISTICAL ANALYSIS:

Mean, standard deviation, Chi square test, paired student t-test and p-value were calculated using SPSS software version 17 (p-value < 0.05 being significant).

RESULTS

In the present study, 415 adolescents were enrolled comprising 206 girls and 209 boys after applying inclusion and exclusion criteria. Adolescents were divided into 3 groups based on the age as early (10-13 year), mid (14-16 year) and late (17-19 year). The early group had 155 adolescents of which 101 were female and 54 were males, the middle group had 148 adolescents of which 62 were females and 86 were males and the Late group had 112 adolescents of which 43 were females and 69 were males respectively [Figure 1]

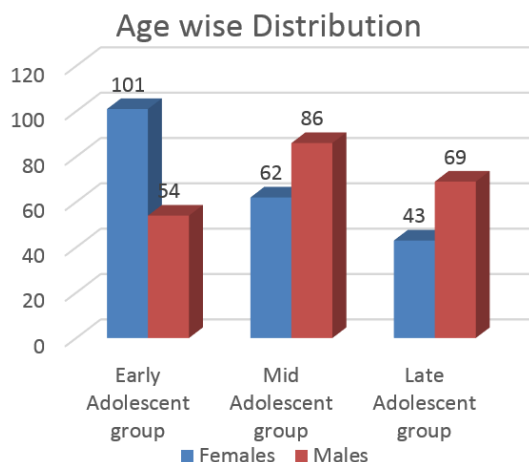


Figure 1: Age Wise Distribution Of Adolescents (n=415)

Out of 415 total adolescents, 353 (85.06%) had normal BMI and 62 (14.94 %) had BMI above normal range out of which 41 (9.88%) were overweight and 21 (5.06%) were obese. Among 206 girls, 170 (82.52%), 20 (9.71%) and 16 (7.77%) were normal, overweight and obese respectively. While among 209 boys, 183 (87.56%), 21 (10.05%) and 5 (2.39%) were normal, overweight and obese respectively. It was found that overall proportion of girls was higher in the obese and overweight groups, i.e., 17.48% as compared to boys i.e., 12.44% and the differences were statistically significant. Overall, Adolescent girls were significantly reported to be more obese and overweight (p value = 0.044076). [Table 1]

Table 1 Distribution Of Normal, Obese And Overweight Adolescents According To BMI Percentiles (n=415) *

BMI percentile	Female	Male	Total
Normal	170 (82.52)	183 (87.56)	353 (85.06)
Overweight	20 (9.71)	21 (10.05)	41 (9.88)
Obese	16 (7.77)	5 (2.39)	21 (5.06)
Total	206 (100)	209 (100)	415 (100)

χ^2 test = 6.2437, P-value = 0.044076.

Number in parenthesis indicate percentage

*statistically significant (p value < 0.05)

In Early adolescent age group of 155 subjects, 141 (90.97%) had normal BMI, and 14 (9.03%) had BMI above normal range out of which 8 (5.16 %) were overweight and 6 (3.87%) were Obese. Among 101 girls, 95 (94.06%), 2 (1.98%) and 4 (3.96%) were normal, overweight and obese respectively. While among 54 boys, 46 (85.19%), 6 (11.11%) and 2 (3.70%) were normal, overweight and obese respectively. Adolescent boys were significantly reported to be more obese and overweight statistically in early adolescent age group (p value = 0.049922). [Table 2]

Table 2 Distribution Of Normal, Obese And Overweight In Early Adolescent Age Group According To BMI Percentiles (n=155) *

BMI percentile	Female	Male	Total
Normal	95 (94.06)	46 (85.19)	141 (90.97)
Overweight	2 (1.98)	6 (11.11)	8 (5.16)
Obese	4 (3.96)	2 (3.70)	6 (3.87)
Total	101 (100)	54 (100)	155 (100)

χ^2 test = 5.9946, P-value = 0.049922

Number in parenthesis indicate percentage

*statistically significant (p-value < 0.05)

In Mid adolescent age group of 148 subjects, 126 (85.14%) had normal BMI, and 22 (14.86%) had BMI above normal range out of which 16 (10.81%) were overweight and 6 (4.05%) were Obese. Among 62 girls, 47 (75.81%), 10 (16.13%) and 5 (8.06%) were normal, overweight and obese respectively. While among 86 boys, 79 (91.86%), 6 (6.98%) and 1 (1.16%) were normal, overweight and obese respectively. Adolescent girls were significantly reported to be more obese and overweight statistically in mid adolescent age group (p value = 0.017291). [Table 3]

Table 3 Distribution Of Normal, Obese And Overweight In Mid Adolescent Age Group According To BMI Percentiles (n=148) *

BMI percentile	Female	Male	Total
Normal	47 (75.81)	79 (91.86)	126 (85.14)
Overweight	10 (16.13)	6 (6.98)	16 (10.81)
Obese	5 (8.06)	1 (1.16)	6 (4.05)
Total	62 (100)	86 (100)	148 (100)

χ^2 test = 8.1152, P-value = 0.017291

Number in parenthesis indicate percentage

*statistically significant (p-value < 0.05)

In Late adolescent age group of 112 subjects, 86 (76.79%) had normal BMI, and 26 (23.21%) had BMI above normal range out of which 17 (15.18%) were overweight and 9 (8.03%) were Obese. Among 43 girls, 28 (65.12%), 8 (18.60%) and 7 (16.28%) were normal, overweight and obese respectively. While among 69 boys, 58 (84.06%), 9 (13.04%) and 2 (2.90%) were normal, overweight and obese respectively. Adolescent girls were significantly reported to be more obese and overweight statistically in late adolescent age group (p value = 0.021495). [Table 4]

Table 4 Distribution Of Normal, Obese And Overweight In Late Adolescent Age Group According To BMI Percentiles (n=112) *

BMI percentile	Female	Male	Total
Normal	28 (65.12)	58 (84.06)	86 (76.79)
Overweight	8 (18.60)	9 (13.04)	17 (15.18)
Obese	7 (16.28)	2 (2.90)	9 (8.03)
Total	43 (100)	69 (100)	112 (100)

χ^2 test = 7.6799, P-value = 0.021495.

Number in parenthesis indicate percentage

*statistically significant (p < 0.05)

In our study the mean BMI (standard deviation) in early, mid and late adolescents was 18.59 (2.91) kg/m², 19.09 (3.09) kg/m² and 20.14 (4.12) kg/m² respectively indicating an increasing trend BMI with age (p-value 0.04436) [Table 5].

Table 5 Distribution Of Mean BMI [Standard Deviation (SD)] In Early, Mid And Late Adolescent Age Group *

Group	Mean BMI (Standard Deviation) (Kg/m ²)		Total Mean BMI (SD) (Kg/m ²)
	Female	Male	
Early Adolescent group	19.35 (2.93)	17.19 (2.30)	18.59 (2.91)
Mid Adolescent group	20.11 (3.64)	18.35 (2.39)	19.09 (3.09)
Late Adolescent group	21.26 (5.32)	19.44 (2.98)	20.14 (4.12)

t- value = 2.23901, p-value = 0.04436

*statistically significant (p < 0.05)

DISCUSSION

In our study, out of 415 subjects enrolled, 62 (14.94 %) had BMI above normal range out of which 41 (9.88%) were overweight and 21 (5.06%) were obese which was similar to study done by Chandrakala P et al which showed that prevalence of overweight and obesity as 7% 4.2% respectively in adolescents between 12-18 years.^[14] Another similar study by Kapil U et al showed that prevalence of overweight and obesity was 24.7% and 7.4% respectively among children aged between 10-16 years.^[9]

In present study, Adolescent girls (17.48%) were reported to be more obese and overweight as compared to boys (12.44%) and the differences were statistically significant (p value = 0.044076). Our findings were similar to study done by Marwaha RK et al which showed significantly higher prevalence of overweight among

schoolgirls (19.01%) as compared to upper socioeconomic status school boys (16.75%).^[15] Prevalence of overweight and obesity among adolescent girls were reported to be 9.71% and 7.77 % respectively which were similar to study done in Chennai by Subramanyam et al which showed prevalence of overweight and obesity in school girls aged between 10-15 years to be 9.67% and 6.23% respectively.^[16]

In present study, Adolescent boys were significantly reported to be more overweight and obese statistically in early adolescent age group (p value=0.049922) which was comparable to study done by Chhatwal J et al which reported the prevalence of overweight and obesity in school-children aged 9-15 years was higher in boys as compared to girls (15.7% vs 12.9%, 12.4% vs 9.9%).^[17]

Adolescent girls were significantly reported to be more obese and overweight statistically in mid adolescent age group (p value =0.017291) and late adolescent age group (p value= 0.021495) which was comparable to a 20-year cohort study from South Africa done by Lundeen EA et al. who reported that 11–12 years to 13–15 years and 13–15 years to 16–18 years periods had highest obesity incidence density rates among adolescent girls. These periods in females indicate puberty onset and sexual dimorphism leading to rapid growth and development so as to acquire more fat mass as well as muscle and skeletal mass.^[18] Another study done in adolescent age 13-18 year in urban India by Ramachandran et al. was opposite to our study which showed higher prevalence of overweight in boys 17.8% as compared to girls (15.8%).^[19]

The rising trend of BMI (kg/m²) with age from early, mid to late adolescence in present study was comparable to study done by Chandrakala P et al (18.59 vs 16.25; 19.09 vs 17.34; 20.14 vs 17.7).^[14]

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DECLARATIONS

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REFERENCES:

- [1] Dobe, M. (2015). WPHA: World Federation of Public Health Associations. Journal of public health policy, 36(4), 502-513.
- [2] Ghai, O. P., Gupta, P., & Paul, V. K. (2006). Adolescent Health and development. Pediatrics, 6, 66.
- [3] Raj, M., & Kumar, R. K. (2010). Obesity in children & adolescents. The Indian journal of medical research, 132(5), 598.
- [4] Robinson, T. N., Banda, J. A., Hale, L., Lu, A. S., Fleming-Milici, F., Calvert, S. L., & Wartella, E. (2017). Screen media exposure and obesity in children and adolescents. Pediatrics, 140(Supplement 2), S97-S101.
- [5] Bhave, S., Bavdekar, A., & Otiv, M. (2004). IAP national task force for childhood prevention of adult diseases: childhood obesity. Indian pediatrics, 41(6), 559-576.
- [6] Lobstein, T., Baur, L., & Uauy, R. (2004). Obesity in children and young people: a crisis in public health. Obesity reviews, 5, 4-85.
- [7] World health organisation. Fact sheet: Obesity and overweight, 2020. Available at <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>. Accessed 30 October 2020.
- [8] Singh, M., & Sharma, M. (2005). Risk factors for obesity in children. Indian Paediatr, 42, 183-5.
- [9] Kapil, U., Singh, P., Pathak, P., Dwivedi, S. N., & Bhasin, S. (2002). Prevalence of obesity amongst affluent adolescent school children in delhi. Indian pediatrics, 39(5), 449-452.
- [10] Danasekaran, R., & Ranganathan, K. (2019). Prevalence of overweight and obesity among rural adolescent school students in Kanchipuram district, Tamil Nadu.
- [11] Baker, S., Barlow, S., Cochran, W., Fuchs, G., Klish, W., Krebs, N., ... & Udall, J. (2005). Overweight children and adolescents: a clinical report of the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition. Journal of pediatric gastroenterology and nutrition, 40(5), 533-543.
- [12] Open-Source Epidemiologic Statistics for Public Health Sample size calculator, 2020. Available at <http://openepi.com/SampleSize/SSPropor.htm>.
- [13] CDC Growth Charts: United States, 2020 Available at https://www.cdc.gov/growthcharts/clinical_charts.htm. Accessed 30 October 2020
- [14] PC, A. (2016). A study of prevalence of overweight and obesity in adolescents. Int J Contemp Pediatr, 3(3), 960-4.
- [15] Marwaha, R. K., Tandon, N., Singh, Y., Aggarwal, R., Grewal, K., & Mani, K. (2006). A study of growth parameters and prevalence of overweight and obesity in school children from Delhi. Indian pediatrics, 43(11), 943.
- [16] Subramanyam, V., Jayashree, R., & Rafi, M. (2003). Prevalence of overweight and obesity in affluent adolescent girls in Chennai in 1981 and 1998. Indian pediatrics, 40(8), 775-779.
- [17] Chhatwal, J., Verma, M., & Riar, S. K. (2004). Obesity among pre-adolescent and adolescents of a developing country (India). Asia Pacific journal of clinical nutrition, 13(3).
- [18] Lundeen, E. A., Norris, S. A., Adair, L. S., Richter, L. M., & Stein, A. D. (2016). Sex differences in obesity incidence: 20—year prospective cohort in South Africa. Pediatric obesity, 11(1), 75-80.
- [19] Ramachandran, A., Snehalatha, C., Vinita, R., Thyayil, M., Kumar, C. S., Sheeba, L., ... & Vijay, V. (2002). Prevalence of overweight in urban Indian adolescent school children. Diabetes research and clinical practice, 57(3), 185-