Original Research Article

Prevalence of overweight and obesity among rural adolescent school students in Kanchipuram district, Tamil Nadu

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ABSTRACT

Background: Obesity in children and adolescents acts as an independent risk factor in the occurrence of cardiovascular and other non-communicable diseases in their adulthood.
Methods: A cross sectional school based study was done among 934 students aged 14-17 years studying Class 9 to Class 12 in selected four schools of Kanchipuram district in Tamil Nadu, India.
Results: Mean BMI of the study population was 17.78 (SD-3.14). 39 (8.51%) were identified as overweight and 21 as obese (4.58%) among boys. Mean BMI among girls was 18.58 and 44 (9.24%) were identified as overweight and 20 (4.20%) as obese. Among the study population 83 (8.89%) were overweight, 41 (4.4%) were obese and overall the prevalence of overweight and obesity was found to be 13.28%.
Conclusions: Obesity among adolescents is increasing and requires urgent attention. Standardized BMI charts for adolescents to be prepared as per Indian standards.

Keywords: Adolescent, Obesity, Body mass index, School, Prevention

INTRODUCTION

Globally, the prevalence of obesity has increased to alarming levels in the last few decades, which acts as an independent risk factor leading to the development of a number of non-communicable diseases such as diabetes, cardiovascular diseases and cancer. Consequently they result in increase in morbidity and mortality rates, as well as increase in healthcare expenditure. In particular, obesity among children and adolescents is becoming an epidemic due to various life style changes, both in the developed and developing nations.[1] As per World Health Organization (WHO) estimates, 41 million children under five years and more than 340 million children and adolescents in the age group of 5 to 19 years were having overweight or obesity in the year 2016.[2]

Pathogenesis of obesity in young is multi-faceted, including hereditary, metabolic, environmental and socio-demographic factors.[3] Studies done in various parts of India have reported prevalence of obesity among children to be ranging from 3-29%, with more prevalence in urban areas when compared to rural areas.[4] Obesity and overweight among children and adolescents have significant long term health consequences such as adult obesity, higher levels of cholesterol, higher future incidence of coronary artery disease. Limited data are available on the prevalence of overweight and obesity among children and adolescents in Tamil Nadu. So, this study was planned to assess the prevalence of overweight and obesity among the school in the age group of 14-17 years in Kanchipuram district of Tamil Nadu.

METHODS

The study was carried out among four schools in rural Kanchipuram district. Students studying in class 8th to 12th in the age group of 14-17 years were included in the study. The sample size was calculated to be 950, using the formula $n=4pq/d^2$, including 10% non-response rate. After getting permission from the school officials, parent's consent was obtained and students without parent's consent were excluded from the study. The students were selected by simple random technique. After obtaining their basic socio-demographic details, height and weight were measured using stadiometer and portable weighing scale.

Using the data collected, percentiles of Body Mass Index (BMI) were done for each age and gender. Those in the 5th–85th centile were considered as having normal BMI, subjects within 85th-95th centile were taken as overweight and those with more than 95th centile were taken as obese. Microsoft Excel and Statistical Package for Social Sciences were used for data entry and analysis.

RESULTS

The study included 934 participants of which 49% were boys and 51% were girls. Figure 1 shows the age-wise distribution of study subjects. Table 1 shows the socio-economic status of the study population.

Table 1: Socio economic distribution.

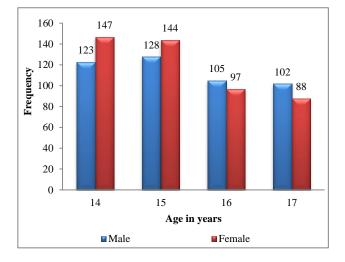| Class	Number	Percentage (%)
I	52	5.6
II	313	33.5
III	246	26.3
IV	238	25.5
V	85	9.1
Total	934	100

Figure 1: Age and sex wise distribution.

Table 2: Mean BMI, BMI percentile, overweight and obesity among boys.

Age	No.	Mean BMI (SD)	BMI Percentile		Over weight No. (%)	Obese No. (%)	Total No. (%)	95% CI
			85th	95th				
14	123	16.07 (3.21)	17.78	22.74	8 (6.50)	6 (4.88)	14 (11.38)	5.77%-16.99%
15	128	16.69 (2.53)	18.49	22.86	12 (9.37)	6 (4.69)	18 (14.06)	8.03%-20.08%
16	105	17.46 (2.43)	19.66	23.54	9 (8.57)	4 (3.81)	13 (12.38)	6.08%-18.68%
17	102	17.80 (2.81)	20.20	23.85	10 (9.80)	5 (4.90)	15 (14.70)	7.82%-21.57%
Total	458	16.95 (2.84)	18.92	22.94	39 (8.51)	21 (4.58)	60 (13.10)	10.00%-16.19%

Table 3: Mean BMI, BMI percentile, overweight and obesity among girls.

Age	No.	Mean BMI (SD)	BMI percentile		Over weight No. (%)	Obese No. (%)	Total No. (%)	95% CI
			85th	95th				
14	147	17.49 (2.69)	19.75	22.52	13 (8.84)	7 (4.76)	20 (13.60)	7.64%-18.55%
15	144	18.42 (2.53)	20.92	23.04	14 (9.72)	6 (4.16)	20 (13.88)	8.23%-19.52%
16	97	19.35 (3.66)	23.72	26.28	10 (10.3)	3 (3.09)	13 (13.40)	6.62%-20.17%
17	88	19.76 (3.79)	23.80	26.65	7 (7.95)	4 (4.54)	11 (12.50)	5.59%-19.41%
Total	476	18.58 (3.21)	21.89	24.50	44 (9.24)	20 (4.20)	64 (13.44)	10.37%-16.50%

From Table 2, it was seen that the mean BMI among boys was 16.95 and it was also observed that the BMI was increasing with age. The 85th percentile and 95th percentile of BMI given in the table were the cut off points for overweight and obesity among boys. According to that 39 (8.51%) were identified as overweight and 21 as obese (4.58%). It was seen that the mean BMI among girls was 18.58 and 44 (9.24%) were identified as overweight and 20 (4.20%) as obese. The mean BMI was found to be increasing with age from 17.49 at 14 years to 19.76 at 17 years of age. Age wise distribution of overweight and obesity was also shown in the Table 3.

Table 4 shows that the mean BMI of the study population was 17.78 with a standard deviation of 3.14 and the mean BMI increases from 16.84 at 14 years to 18.52 at 17 years of age. Among the study population 83 (8.89%) were

overweight, 41 (4.4%) were obese and overall the prevalence of overweight/ obesity was found to be 13.28%.

Table 4: Mean BMI, BMI percentile, overweight and obesity among the study population

Age (years)	No.	Mean BMI (SD)	BMI Percentile		Over weight No. (%)	Obese No. (%)	Total No. (%)	95% CI
			85th	95th				
14	270	16.84 (3.02)	19.61	22.64	21 (7.77)	13 (4.8)	34 (12.59)	8.63%-16.55%
15	272	17.61 (2.67)	20.44	22.94	26 (9.56)	12 (4.4)	38 (13.97)	9.85%-18.09%
16	202	18.50 (3.34)	21.93	24.83	19 (9.41)	7 (3.5)	26 (12.87)	8.25%-17.49%
17	190	18.52 (3.32)	22.17	25.25	17 (8.95)	9 (4.7)	26 (13.68)	8.79%-18.56%
Total	934	17.78 (3.14)	20.82	23.81	83 (8.89)	41 (4.4)	124 (13.28)	11.10%-15.46%

DISCUSSION

Obesity among young children and adolescents has become an established risk factor for diseases such as coronary heart diseases, diabetes mellitus, etc. in adulthood.[5] The prevalence of overweight was found to be 8.89% and 4.4% were obese. Overall among the study group 124 (13.28%) were identified as overweight/obese. A study done in Chennai, Tamil Nadu among urban school children revealed a similar prevalence of overweight (8.0-10.81%) and obesity (5.26-9.52%).[6] Khan et al has reported 16.21% prevalence of overweight (10.44%) and obesity (5.77%) among adolescent boys in Ahmedabad schools.[7] Higher prevalence of overweight (19.9%) and obesity (5.7%) was reported by Khadilkar et al in a study done in Pune, India.[8] A study done in Punjab, has also reported a higher prevalence (obesity-11.1% and overweight-14.2%).[9]

And the mean BMI was 17.78 (SD-3.14). Prevalence was slightly higher among girls (13.44%) when compared to boys (13.10%). Also the mean BMI was higher among girls (18.58) than boys (16.95). The mean BMI increases with age among boys from 16.07 in 14 years to 17.80 in 17 years. Among girls the mean BMI increases from 17.49 at 14 years to 19.76 at 17 years of age. High BMI among girls reported in our study is being supported by other studies in India, which can be due to the basic hormonal differences among the genders.[10,11] Further, classification of BMI in adolescents and children should include other parameters such as waist circumference, waist to height ratio, etc. which are said to be more sensitive in assessing the health risks.[12]

Limitations of the study were non-school going children were not included and further studies are needed to explore the various factors contributing to the increasing prevalence of obesity and overweight among adolescents.

CONCLUSION

High prevalence of overweight and obesity in the study population depicts the effect of rapid urbanization of rural

areas which has resulted in lifestyle changes, such as changes in diet pattern and decreased physical activity. This emphasises the urgent need for screening of adolescents, both in the schools as well as in the community for the prevention of obesity and its consequences. A standardized BMI percentile chart needs to be prepared for the Indian adolescents, which can remove the barriers in identification and comparison of obese adolescents of various parts of the country. Hence, larger multi-centric studies are needed to assess the nationwide prevalence of obesity and also awareness to be created in the population about the rising trend of childhood and adolescent obesity.

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