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A Cross-Sectional Study of the Prevalence of Overweight and Obesity using Body Mass Index and Waist Circumference among 11–14-Year-old Children in Puducherry

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Abstract

Background: Obesity in children has become more common in recent years around the world. It is estimated that India will have 17 million obese children by 2025. Increased consumption of high-calorie meals deficient in vitamins, minerals, and micronutrients, combined with decreased physical activity, is factors contributing to rising childhood obesity. The aim of this study was to assess the prevalence of overweight and obesity using body mass index (BMI) and waist circumference. **Material and Methods:** The study was a school based cross-sectional study conducted among 1386 students aged 11–14 years from four Private Urban schools of Puducherry. This was measured using WHO BMI-for-age-2007 (5–19 years) charts for boys and girls and for waist circumference using an inch tape with a cut off value at 71 cms. **Results:** The findings reveal that among 1386 children aged 11–14 years the prevalence of overweight and obesity in the study participants was 20.2% and 7.14%, respectively. In the overweight category, girls were overweight (52.5%) when compared to the boys (47.5%) and in the obese category, boys were (51.5%) and girls were (48.4%). The mean waist circumference of students in the overweight category was 76.61 with a standard deviation of 4.32 and in the obese category was 78.7 with a standard deviation of 4.14. A significant association was found between gender and age with the waist circumference at $P < 0.001$. **Conclusion:** The present study findings imply that overweight and obesity are a growing concern in our country and there is an urgent need to create awareness among all stakeholders.

Keywords: Body mass index, Children, Obesity, Overweight, Waist circumference

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Introduction

Obesity in children has become more common in recent years around the world. Around 200 million school children are overweight or obese, according to the International Association for the Study of Obesity and the International Obesity Task Force.[1] It is estimated that India will have 17 million obese children by 2025.[2] This trend has been recorded across India, in both urban and rural areas. It is also more common in boys than in girls, according to studies from various parts of India. In the age group 13–18 years, it was found that 17% of males and 15.8% of girls in Chennai were overweight.[3]

Increased consumption of high-calorie meals deficient in vitamins, minerals, and micronutrients, combined with decreased physical activity, is factors contributing to rising childhood obesity.[4] An increase in the prevalence of childhood obesity is linked to the development of obesity-related medical issues throughout adolescence and, notably, adulthood.[5] The adverse health consequences include insulin resistance, cardiovascular diseases risk factors, and early progression of atherosclerosis which lead to premature deaths.[6] With its widely different geographical, socioeconomic, and cultural norms, there is a dearth of national representative statistics on obesity in children in India. Few studies have been carried out in Puducherry to assess the prevalence of overweight and obesity in the pre-adolescent period. In this study, the prevalence of overweight and obesity was studied using body mass index (BMI) and waist circumference.

Material and Methods

The study was a school-based cross-sectional study among 11–14-year-old school children in Puducherry. The study was conducted among 1386 students from four Private Urban schools of Puducherry.

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The sample size was calculated based on the prevalence of 3% obesity and it was calculated to be 1.164.

$$N=\frac{4PQ}{d^2}$$

$$N=\frac{4\times3\times97}{0.6\times0.6}=1.164$$

After adding the non-response error of 20%, an additional 200 subjects were included. Thus, a total of 1386 students participated in the study. From each school, students who belonged to the age group of 11–14 years were selected by simple random sampling technique until the desired sample reached to about 346 students in each institution. Students who were sick and physically challenged were excluded from the study.

After obtaining permission from the school authorities and consent from the participants parents, the survey was carried out. Ethical clearance was obtained from the Institutional Human Ethics Committee of Sri Ramachandra Institute of Higher Education and Research, Chennai. Trained health workers performed the anthropometric measurements. The weight was measured in Kilograms, using standardized weighing scale with the subject standing erect on center of platform with light clothing and looking erect. The height was recorded using a stadiometer, with the child barefoot upright on ground with heels, buttocks, and shoulder touching the vertical plane with the head held in Frankfurt plane. It was measured in centimeters. Waist circumference was measured using a non-stretchable elastic tape in centimeters. The BMI was calculated using the formula weight in kilograms divided by height in meter square. The WHO BMI-for-age-2007 (5–19 years) charts for boys and girls was used. Median >+1SD to +<3SD was considered as overweight and >3 SD as obesity.[7] The cutoff value for waist circumference in children was 71 centimeters.[8] The data was entered in Microsoft Excel 2016 and Statistical Package for the Social Sciences (SPSS) version 21 was used for the statistical analysis. The mean, frequency, percentage, and Chi-square were used for the study.

Results

Based on the BMI calculation, it was found that out of 1386 students, 20.2% of the students were overweight, 7.14% were obese, and 57.5% of the students had normal weight [Figure 1]. Overweight and obesity also increased as age advanced. It was found that in the age group of 13 years and 14 years, the percentage of children who were overweight was 33% and 25.3%, respectively. Likewise, the percentage of children who were obese during 13 and 14 years was 32.12% and 28.2%, respectively [Table 1].

Based on gender, it was found that in the overweight category, girls were overweight (52.5%) when compared to the boys (47.5%) and in the obese category, boys were obese (51.5%) compared to girls (48.4%) [Table 2].

The mean waist circumference of students in the overweight category was 76.61 with a standard deviation of 4.32 and in the obese category was 78.7 with a standard deviation of 4.14. A significant association was found between gender and age with the waist circumference [Table 3].

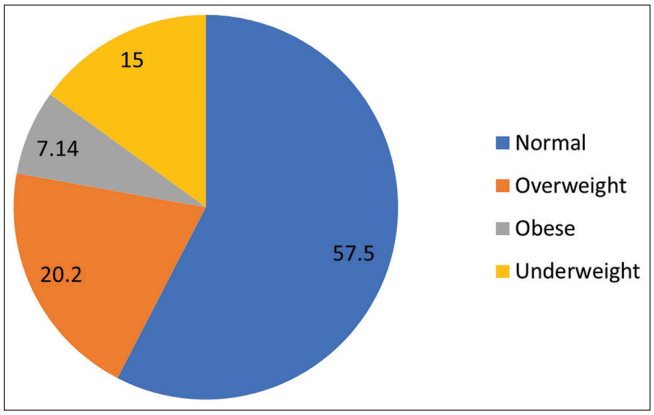

Figure 1: Distribution of students based on BMIbody mass index

Table 1: Frequency and percentage distribution of students based on age

S. No.	Age in years	Overweight (n=280)		Obesity (n=99)	
		N	%	N	%
1.	11	62	22	17	17.17
2.	12	54	19	22	23.12
3.	13	93	33	32	32.12
4	14	71	25.3	28	28.28

Table 2: Frequency and percentage distribution of students based on gender

S. No.	Age in years	Overweight (N=280)				Obesity (N=99)			
		Boys		Girls		Boys		Girls	
		n	%	n	%	n	%	n	%
1.	11	23	8.2	39	13.9	9	9.09	8	8.08
2.	12	28	10	26	9.2	15	15.15	7	7.07
3.	13	42	15	51	18.2	15	15.15	17	17.17
4.	14	40	14.2	31	11.07	12	12.12	16	16.16

Table 3: Association between gender and age with respect to waist circumference among overweight children (*n*=280)

Variables	Waist circumference		Chi-square	P value
	Below 71 cms	Above 71 cms		
Male	15 (53.5%)	118 (42.1%)	11.601	0.001***
Female	15 (53.5%)	132 (47.1%)		
11	32 (11.4%)	50 (17.8%)	18.072	0.000***
12	13 (4.6%)	41 (14.6%)		
13	22 (7.8%)	71 (25.3%)		
14	11 (3.92%)	60 (21.4%)		

***$P<0.001$

Discussion

The present findings reveal that among 1386 children aged 11–14 years, the prevalence of overweight and obesity in the study participants was 20.2% and 7.14%, respectively.

The study findings are similar to a study done in Puducherry, where among 150 students, 18% were overweight and 6% of the children were obese.[9] The study findings are also consistent with another study which was conducted in Rajkot, Gujarat among 1496 children in the age group of 8–18 years. The overall prevalence rate of obesity was 11.1%, and overweight was 15.3% as per the WHO 2007 standards.[10] The higher prevalence of overweight in the present study indicates that more children will become obese, while they become adult indicating rise in number of obesity in coming decades. The present study findings indicate that in the overweight category, girls were overweight (52.5%) when compared to the boys (47.5%) and in the obese category, boys were (51.5%) and girls were (48.4%). In another study, it was observed that prevalence of overweight/obesity was high among males in the younger age group, whereas in the older age group, it was high among females, this could possibly be explained by the hormonal changes influencing growth during adolescence and puberty.[11] Furthermore, obesity can be due to the development of secondary sexual characteristics resulting in fat accumulation and redistribution.[12]

Limitations

The limitation of the study is that the findings may not be representative of the whole country or even of the whole Union Territory of Puducherry. Only private schools from Urban areas were selected. To get a true representation of a country, both

urban and school children should be involved which would give a nationwide prevalence of overweight/obesity.

Conclusion

The present study findings imply that overweight and obesity are a growing concern in our country. There is an urgent need to create awareness which should involve the individual, family, school, community, and the Government and thereby put an end to this growing menace. Thus, inculcating and reinforcing both health eating habits and lifestyle needs to be the norm.

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