Prevalence of Childhood Obesity in an Affluent School in Telangana Using the Recent IAP Growth Chart: A Pilot Study

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Abstract

Aims and Objectives: To study the prevalence of obesity in children in an affluent school in Hyderabad, Telangana, using the recent Indian Academy of Paediatrics (IAP) growth charts and to compare the same with the Centre for Disease Control and Prevention (CDC) charts. **Methods:** A cross-sectional study was conducted in an affluent school of Hyderabad in January 2018. After getting appropriate permission, anthropometry measurements of the school children were done. The data were collected from students of Classes 4–10. Each class had three sections. Each section had around 25–30 students. Body mass index (BMI), calculated as weight (kg)/height^2 (m^2) was used to classify the participants using age- and gender-specific cut-points as per CDC growth charts and the recent IAP charts. **Results:** A total of 544 students were studied. About 52% were boys ($n = 288$) and 48% were girls ($n = 256$). Using the IAP charts, 24.6% were obese and 35.8% were overweight. Using the CDC criteria, the prevalence of obesity and overweight was 15.4% and 26.1%, respectively. The mean BMI in the obese group was 25.6 ± 3.5 kg/m^2 and in the overweight group was 21.1 ± 1.9 kg/m^2. The prevalence of obesity and overweight was more in girls (obesity 32.8% versus 17.3% and overweight 44.5% versus 28.1%, respectively). The highest prevalence of childhood obesity was seen in the 8–10 years age group. **Conclusions:** Our study reflects the increased prevalence of obesity and overweight in the adolescent age group, using the recent IAP criteria.

Keywords: Adolescents, obesity, school children

INTRODUCTION

Obesity has become a pandemic and it has been estimated that about 13% of the world's adult population (11% of men and 15% of women) are obese.[1] The increased economic development and nutrition transition has led to a dramatic increase in the prevalence of obesity in children, especially in the developing countries. Over 340 million children and adolescents aged 5–19 are reported to be overweight or obese. The prevalence of overweight and obesity among children and adolescents aged 5–19 has risen dramatically from just 4% in 1975 to just over 18% in 2016. The rise has occurred similarly among both boys and girls.[1] Childhood obesity is a major health issue that needs early diagnosis and prevention strategies, especially because a large percentage of these children become obese adults. According to the Center for Disease Control and Prevention (CDC), overweight is defined as a body mass index (BMI) at or above the 85th percentile and below the 95th percentile for children and teens of the

same age and sex. Obesity is defined as a BMI at or above the 95th percentile for children and teens of the same age and sex. Due to the increasing trend of higher BMIs in children around the world, it is not possible to have any ideal population on whom ideal weight/BMI charts can be constructed. Country specific growth charts have been designed to assess the development of children between 5 and 18 years of age. Several studies have been published about the growth in children from various parts of India in the last decade and they have reported an increase in the prevalence of obesity in Indian children. There is a potential problem of "normalizing" obesity when charts are produced from the data from these studies.

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Hence, the recent IAP growth charts (2015) have employed the statistical approach recommended by WHO to remove children with unhealthy weight in order to tackle the problem of "normalizing" obesity.[2] As there are sparse data on this subject, we studied the prevalence of obesity in children in an affluent school in Hyderabad, Telangana, using the recent IAP growth charts and compared the prevalence of obesity in these school children using both the recent IAP charts and the CDC charts.

MATERIALS AND METHODS

The present study was a cross-sectional study conducted in a private English Medium School of Hyderabad during January 2018. After getting permission from the school authorities and the Institutional Ethics Committee, our team had participated in the annual anthropometry measurements of the school children aged between 9 and 15 years. The data were collected from students of Classes 4–10. The total number of students in this study was 544. Each class had three sections. Each section had around 25–30 students. All students in each section who were present on the day of the survey were screened for overweight and obesity. The authors had performed standardized anthropometrical measurements of the students in school uniform without shoes. Weight was measured in the upright position without shoe to the nearest 0.1 kg using calibrated electronic weighing machine. Height was measured without shoes to the nearest 0.1 cm using calibrated stadiometer. Children who had given history of chronic diseases/medications/ bony deformities affecting height were excluded from the study. BMI, calculated as weight (kg)/height^2 (m^2), was used to classify the participants according to their weight status using age- and gender-specific cut-points as per CDC growth charts as well as the recent IAP charts.

Statistical analysis

Information thus collected was entered in an excel spread sheet. Descriptive statistics for continuous variables are presented as minimum, maximum, mean, and standard deviation; categorical variables are presented as frequencies. Statistical analysis was done using the online tool available at https://www.calculatorsoup.com.

RESULTS

A total of 544 students were studied; *n* = 288 (52%) were boys. Out of the 544 students examined, 24.6% were obese and 35.8% were overweight. Only 38.78% of the students had a normal BMI. When we had interpreted the results using the CDC criteria, the prevalence of obesity and overweight were 15.4% and 26.1%, respectively [Table 1 and Figure 1]. The mean BMI in the obese group was 25.6 ± 3.5 kg/m^2 and in the overweight group was 21.1 ± 1.9 kg/m^2 [Table 2]. The prevalence of obesity and overweight was more in girls than in boys (obesity 32.8% versus 17.3% and overweight 44.5% versus 28.1%, respectively) [Table 3]. The highest prevalence of childhood obesity was seen in the 8–10 years

Table 1: Classification of children based on BMI*[2,6]

Criteria	Normal	Obesity	Overweight	Underweight
IAP	211 (38.7)	134 (24.6)	195 (35.8)	4 (0.7)
CDC	303 (55.6)	84 (15.4)	142 (26.1)	15 (2.7)

*Values are represented in numbers and percentage or frequency (%)

Table 2: Distribution of BMI value in different groups*[2,6]

Criteria	Normal	Obesity	Overweight	Underweight
IAP	17.48±2.0	25.65±3.54	21.18±1.97	13.17±0.70
CDC	18.54±2.2	26.90±3.56	22.65±2.10	14.18±1.05

*BMI values are represented in Mean±SD

age group (31.6% obese and 37.3% overweight) [Table 4]. According to class, the highest prevalence of obesity was seen in students studying in the fourth class (34.1%) and that of overweight was seen in the eighth class (44.1%) [Table 5].

DISCUSSION

The overall prevalence of overweight and obesity in the school children in our study was 35.84% and 24.63%, respectively. Only 38.78% of the students had a normal BMI. In the last decade, many studies have been published on the increasing prevalence of obesity in school children in India using various growth charts and cut-off points (IOTF-Cole *et al.*,[3] WHO,[4,5] CDC,[6] Gomez classification,[7] Must *et al.* classification,[8] Rosner *et al.* classification,[9] Agarwal charts 1992,[10] 2001,[11] Eliz Health Path for Adolescents and Adults (EHPA),[12] Pandey *et al.*,[13] Khadilkar *et al.*[14]). A systematic review of this topic[15] had reported a combined prevalence of 19.3% of childhood overweight and obesity from the pooled data after 2010, which was a significant increase from the earlier prevalence of 16.3% reported in 2001–2005. There has also been a reported increased prevalence among the urban children compared to their rural counterparts.[16]

In one of the largest studies from South India, the reported prevalence of overweight and obesity in school children from the Union Territory of Pondicherry was 4.98% and 2.24%, respectively.[17] The study had employed the CDC criteria for the classification of the children according to BMI. This is in contrast to our study, which had reported a much higher prevalence by both the CDC as well as the recent IAP criteria (35.84% overweight and 24.63% obesity according to IAP criteria; 26.10% overweight and 15.44% obesity according to CDC criteria). These differences reflect the fact that our study included only children from an affluent school, whereas this study had a mix of children from both the urban and rural backgrounds. This study had also reported a higher prevalence of obesity among females, which was similar to our study. This difference could be attributed to inherent hormonal differences.[18]

One of the largest studies in the adolescent age group was the Global School Based survey in 2007 on 8130 students.[19] This study employed the WHO criteria for classification of

Table 3: Distribution of children according to gender[2,6]

Classification	IAP criteria*				CDC criteria*			
Gender	Normal	Obesity	Over weight	Under weight	Normal	Obesity	Over weight	Under weight
Male (*n*=288)	153 (53.125)	50 (17.36)	81 (28.12)	4 (1.38)	197 (68.40)	24 (8.33)	52 (18.05)	15 (5.2)
Female (*n*=256)	58 (22.65)	**84 (32.81)**	**114 (44.53)**	0 (0)	106 (41.40)	**60 (23.43)**	**90 (35.15)**	0 (0)

*Values are represented in numbers and percentage or frequency (%)

**Table 4: Distribution of children according to age-group[2,6]**

Classification	IAP criteria*				CDC criteria*			
Age	Normal	Obesity	Over weight	Under weight	Normal	Obesity	Over weight	Under weight
8 to 10 years (*n*=174)	55 (31.60)	55 (31.60)	65 (37.35)	1 (0.57)	84 (48.27)	39 (22.41)	46 (26.43)	5 (2.87)
11 to 12 years (*n*=163)	62 (38.03)	41 (25.15)	59 (36.19)	1 (0.61)	92 (56.44)	22 (13.49)	47 (28.83)	2 (122)
12 to 14 years (*n*=140)	63 (45)	25 (17.85)	51 (36.42)	1 (0.71)	84 (60)	16 (11.42)	35 (25)	5 (3.57)
15 to 16 years (*n*=67)	33 (49.25)	13 (19.40)	20 (29.85)	1 (1.49)	43 (64.17)	7 (10.44)	14 (20.89)	3 (4.47)

*Values are represented in numbers and percentage or frequency (%)

Table 5: Distribution of children according to class[2,6]

Classification	IAP criteria*				CDC criteria*			
Class	Normal	Obesity	Over weight	Under weight	Normal	Obesity	Over weight	Under weight
4th (*n*=79)	20 (25.31)	27 (34.17)	31 (39.24)	1 (1.26)	36 (45.56)	19 (24.05)	21 (26.58)	3 (3.79)
5th (*n*=89)	31 (34.83)	27 (30.33)	30 (33.70)	1 (1.12)	43 (48.31)	20 (22.47)	23 (25.84)	3 (3.37)
6th (*n*=80)	35 (43.75)	19 (23.75)	32.5 (29.21)	0 (0)	48 (60)	9 (11.25)	22 (27.5)	1 (1.25)
7th (*n*=86)	31 (36.04)	22 (25.58)	33 (38.37)	0 (0)	49 (56.97)	13 (15.11)	24 (27.90)	0 (0)
8th (*n*=68)	26 (38.23)	11 (16.17)	30 (44.11)	1 (1.47)	43 (63.23)	7 (10.29)	17 (25)	1 (1.47)
9th (*n*=67)	33 (49.25)	11 (16.41)	23 (34.32)	0 (0)	39 (58.20)	6 (8.95)	18 (26.86)	4 (5.97)
10th (*n*=75)	35 (46.66)	17 (22.66)	22 (29.33)	1 (1.33)	45 (60)	10 (13.33)	17 (22.66)	3 (4)

*Values are represented in numbers and percentage or frequency (%)
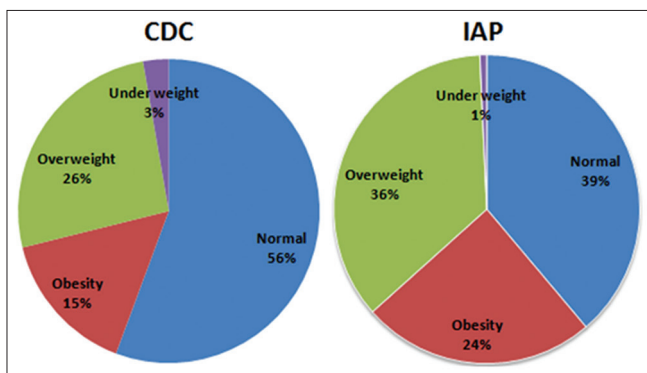
Figure 1: Classification of children based on BMI

the students according to BMI. The prevalence of obesity was 2.1% and that of overweight was 10.8%. There was a slightly higher prevalence of both overweight and obesity in the boys as compared to the girls, in contrast to our study. The stark difference in the reported prevalence of obesity and overweight in our study and this study could be due to the different criteria used and the population studied. In a study[20] done in Hyderabad, which included a large number of adolescents (*n* = 1208) aged 12–17 years belonging to lower, middle, and upper socioeconomic status, the overall prevalence of overweight was 7.2%, and although it was statistically nonsignificant, the prevalence was more in girls as compared to boys (8.2% in girls and 6.1% in boys). The prevalence of obesity was 1.6% in boys and 1% in girls. The study had used the IOTF criteria for defining obesity and overweight. Again the differences demonstrated between our study and this study done in the same region could be due to the cut-off points and the population studied. A comparative analysis between the previous studies on obesity and overweight in the adolescent age group and our study is elaborated in Table 6. It is evident from the comparative analysis [Table 6] that our study has reported the highest prevalence of obesity and overweight in this age group, primarily because of two factors: first, the criteria used (recent IAP) and second, the population studied (affluent school children).

The importance of the findings of our study lies in the fact that we cannot ignore the rising prevalence of obesity in India, which is gradually snowballing into a giant epidemic. Giving due consideration to the secular trends in change in BMI owing to the changing food habits and lifestyle in our country, one cannot overemphasize the need to use country specific and time specific growth charts for assessing the prevalence of this new epidemic. The recent IAP charts prove to be a good tool in quantifying this problem, and hence,

Table 6: Comparison of previous studies on obesity and overweight prevalence in the adolescent age group

Author	Year	Region	Age group (years)	Sample size (*n*)	Criteria used	Overweight prevalence (%)			Obesity prevalence (%)		
						Overall	Boys	Girls	Overall	Boys	Girls
Kapil *et al.*[21]	2002	New Delhi	10-16	870	IOTF-Cole *et al.*	24.7	23.1	27.7	7.4	8.3	5.5
Subramanyam *et al.*[22]	2003	Chennai	10-15	707* (1981) 610* (1998)	IOTF-Cole *et al.*	9.6 9.7	-	-	5.9 6.2	-	-
Chhatwal *et al.*[23]	2004	Punjab	9-15	2008	WHO	14.2	15.7	12.9	11.1	12.4	9.9
Khadilkar and Khadilkar[24]	2004	Pune	10-15	1228 #	IOTF-Cole *et al.*	19.9	19.9	-	5.7	5.7	-
Sidhu *et al.*[25]	2005	Punjab	10-15	640	Must *et al.*	10.9	9.9	12	5.6	5.0	6.3
Rao *et al.*[26]	2007	Pune	9-16	2223	IOTF-Cole *et al.*	-	27.5	20.9	-	-	-
Global School Based Student Health Survey (CBSE)[19]	2007	-	13-15	8130	WHO	10.8	11.6	9.7	2.1	2.5	1.5
Unnithan and Syamakumari[27]	2007	Kerala	10-15	3886	IOTF-Cole *et al.*	17.7	-	-	5	-	-
Jain *et al.*[28]	2010	Meerut	10-16	2785	EHPA		18.4	19.7		10.8	5.3
Kumar *et al.*[29]	2011	Udipi	12-15	500	WHO	3			2.6		
Chandra *et al.*	2018	Hyderabad	9-15	544	IAP 2016	35.8	28.1	44.5	24.6	17.3	32.8

*Only females studied, #Only males studied

country-wide studies on both rural and urban children using these charts are the need of the hour to assess this looming issue. The actual prevalence of obesity and overweight needs to be assessed uniformly throughout the country in order to curb this menace at an early stage before our next generation gets crippled due to the complications arising from this noncommunicable disease.

Our study has a few limitations. We have only studied children from one affluent school; hence, the prevalence may not actually indicate the true population prevalence. First, studies need to be conducted in both the rural and urban sectors, giving consideration to the socioeconomic status as well. Second, our study has not looked into the dietary aspects and the activity levels in these children. These causative factors need to be studied in detail so that health education and corrective measures can be employed in that direction. Family history of obesity and BMI of the parents and siblings would have thrown some light on the genetic and environmental factors involved. Despite these limitations, our study still has brought out the rising prevalence of obesity and overweight in adolescents and serves as a pilot study based on the findings of which future large-scale extensive studies need to be planned.

Conflicts of interest
There are no conflicts of interest.

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