Original Research :

Prevalence of Overweight and Obesity among Urban School Children Aged 5 to 10 Years in North India

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Abstract:

Objective: To document the prevalence of overweight and obesity among urban school children aged 5-10 years in Delhi-NCR, India.

Study design: A cross-sectional study.

Setting: Twenty eightprivate schools in urban Faridabad, Haryana.

Participants: 5643 children aged ?5 to <10 years from both sexes

Interventions: Theheight and weight of the children were measured and BMI ecalculated.

Outcome measures: Prevalence of under-weight, normal-weight, overweight and obese was estimated using the BMI based IOTF and IAP criteria. The prevalences for different BMI categories were compared.

Results: Overweight and Obesity in the study population was found to be 6.4% and 2.4% using Cole et al criteria. The prevalence of overweight/ obesity increased with age in both sexes.The prevalence of overweight and obesity increased to 15% and 4.9% respectively using the IAP criteria.Prevalence of under-weight decreased from 33.1% at 5-6 years of age to 25.9% at 9-10 years of age.

Conclusion: A significant proportion of children are overweight and obese in the Delhi-NCR region. With reduction of under-weight proportion, proportion of children with overweight and obesity increased. Different reference cutoff used for classification result in widely different prevalence.

Key words: *Overweight, Obesity, School Children, Body Mass Index.*

Introduction:

India is going through a rapid demographic, epidemiologic and nutrition transition. Because of this rapid transition, India is now struggling with 'double burden malnutrition' that is, the co-existence of under-weight and micronutrient deficiencies along with overweight and obesity in the same society and even same households. Prevalence of childhood overweight and obesity in USA has risen by 3 times (7% in 1980 to 20% in 2008). [1]Studies from different parts of India have reported prevalence of childhood overweight and obesity in the range of 9-14% and 4-6%. [2] But the different age groups, gender selectivity of the subjects in several studies limit the comparability and inference. Childhood obesity is a forerunner of metabolic syndrome, poor physical health, mental disorders, respiratory problems and glucose intolerance. [3] High body fatness (overweight and

obesity)is a known precursor for Type 2 Diabetes and Coronary Heart Disease. Control of overweight and obesity can prevent varied range of non-communicable diseases. Childhood obesity can persist into adulthood and studies have shown that 30% of obesity begins in childhood and out of these obese children, 50-80% becomes obese adults. [4] To prevent overweight, obesity and metabolic disease in adulthood, there is need to target the children and adolescents. Puberty critically influences the body composition of muscle, bone and fat and also the metabolic parameters influencing these. There is need to understand the epidemiology and factors influencing body composition in pre-pubertal, pubertal and post-pubertal age groups. There is need for better documentation of the burden of overweight and obesity among the children of different age and pubertal categories. Changes in urbanization, environment, lifestyle and accordingly behavior at household and individual levels have been proposed as risk factors for overweight and obesity. North India and Delhi NCR region is experiencing fast urbanization along with transition in food and activity in children. This study attempted documentation of the prevalence of overweight and obesity along with the nutritional profile of the school going children in north Indian Delhi-NCR urban region.

Materials And Methods:

This was a cross-sectional study including urban school children aged ? 5 years and ?10 years from Faridabad district, Haryana. We adopted intelligent two stage sampling: (1) selection of schools and (2) selection of the suitable children from the schools. Thirteen private schools were identified randomly from the list with District Education Office. After obtaining consent from parent, all the children in eligible age group were screened for weight, height and estimation of BMI. We restricted to 5-10 years of age only to ensure that the anthropometry and BMI measurements reflect the pre-pubertal age groups only and to avoid the pubertal influences on body fatness. Weight was measured to the nearest 0.1 kg using TANITA® electronic weighing scale with the child was wearing only school uniform (without shoes). Height was measured to the nearest 0.1 cm using TANITA®Leicester Stadiometer while the child standing on barefoot with head in Frankfurt plane position. Three measures for each were obtained and mean of the measure was used for body mass index (BMI) calculation. BMI, which was defined as the ratio of body weight to body height squared, expressed in kg/m2. Every morning, the scale and stadiometer were calibrated with standard weight and height respectively. The research staffs were trained and certified by assessment of inter-and intra-observer agreement with the investigators. To reduce subjective error, all measurements were taken by the same person. Periodically random checks by the investigators were done in the field and the findings were matched for quality assurance.

International Obesity Task Force (IOTF) references for BMI at each age and for each gender were used for classify the children into underweight, normal-weight and overweight (BMI corresponding to <18.5, ?18.5-<25 and ?25 at 18 years of age respectively). [5,6]The reference cutoffs recommended by growth chart committee of Indian Academy of Pediatrics were also used for classification and comparison with the IOTF reference results. [7]Data was recorded on a pre-designed study tools.The study protocol was approved by institutes' ethics committee. Data analysis was done by STATA using descriptive statistics (means and standard deviations).

Results:

We screened a total of 7115 children (boys: 4188 & girls: 2927) from 28 schools in urban Faridabad. Out of these, 5643 (boys: 3300 &girls: 2343) children were in the target age group of ?5 to ?10 years. The children younger than 5 years (n=311), older than 10 years (n=943), without birth record at school (n=207) and children who were unsupportive during anthropometric measurement (n=11) were excluded. The age and sex wise

distribution of the children studied is reflected in Table 1. The distribution of BMI of the subjects was skewed to the right, with a longer tail at higher BMI values (Figure 1). As reflected in Table 2, using age IOTF BMI criteria, the prevalence of overweight alone and obesity in the study population were 6.4%(boys: 6.2%, girls: 6.7%) and 2.4% (boys: 2.6%, girls: 2.1%) respectively. Thus in total 8.8% children were in overweight category (overweight and obese combined).About 30% of the children were in under-weight category, which varied from 33.1% among 5-6 years old children to 25.9% among 9-10 years old children.The prevalence of overweight increased from 4.5% among 5-6 years old children to 5.The prevalence of overweight increased with age for both boys and girls. The prevalence of overweight increased from obesity shown some rising trend across the age group except some variation around ?7-?8 and ?8-?9 year age bands. It was interesting to note that the under-weight prevalence reduction paralleled with the rise in overweight and obesity. As reflected in Table 3, on using the IAP references, the prevalence of overweight increased by 2.5 times (6.4% to 15%) and obesity by 2 times (2.4% to 4.9%). The pattern was similar for the boys and girls across the age bands.

Discussion:

The present study highlights the prevalence of under-weight, over-weight and obesity in pre-pubertal school children aged 5-10 year age.

A study among 5-10 year old school children in Delhi (2008) indicated prevalence of overweight and obesity to be 1.6% and 0.2%. [8] Another study from Delhi covering schools with different fee structure reflected rising (3-5 times) prevalence of overweight and obesity with rise in age and school fees category. [9]A study among 8-18 years old children from Gujarat reported prevalence of overweight and obesity to be 15.8% and 5.1% respectively. Boys had higher prevalence of overweight (5.8% vs 2.6% in girls) and obesity (17.2% vs 10.2% in girls). [10] A study from Assam (children aged 5-14 years) reported the prevalence overweight and obesity to be 3.5% and 2.9% among boys and 4% and 1.2% among girls respectively.[11] In Kerala among children aged 6-15 years, 3% children were obese and 10.2% were overweight. The prevalence was higher among girls than boys. [12] Among Pujabi boys aged 6-11 years the prevalence of overweight and obesity was reported as 12.2% and 5.9% respectively compared to the same among girls as 14.3% and 6.3%.[13] In another report from Kolkata, among 6-9 years old girls overweight and obesity was reported to be 17.2% and 5.6%. [14] From Puducherry among children aged 6-12 years, prevalence of overweight and obesity was 4.4% and 2.1% respectively. There was no significant difference in prevalence among boys and girls. [15] The current study findings revealed comparable prevalence of overweight and obesity among children aged 5-10 years age. Compared to the past reports from Delhi, there is increase in prevalence of overweight/obesity. Although the studies have variable age groups of subjects and used different criteria for classification.

When we used the IAP reference cutoffs, the prevalence of overweight and obesity prevalence increased significantly (by 2-2.5 times). Pooled prevalence of overweight changed from 6.4% to 14.9% and the prevalence of obesity increased from 2.4% to 4.9%. The pattern of difference was similar across all age bands and gender categories. A study from Gujarat also reflected the challenge of using different reference cut-offs for classification. Among 8-18 years old children, the prevalence of overweight and obesity changed from 15.8% and 5.1% with use of IOTF criteria to 19.1% and 14% with use of IAP cutoff and 15.3% and 11.1% with use of WHO cutoff. [10] In another study among 13-18 years old Indian adolescents, wide variation in prevalence of overweight/obesity was observed when compared with IOTF, WHO and Indian reference. [16]

It is also interesting to note that with decrease in prevalence of under-weight prevalence in children, there is proportionate rise in prevalence of

overweight and obesity. The relatively constant proportion of normal-weight children indicates that with age some children are added to the pool of normal-weight children and some children join the overweight/obesity category.

Inclusion of only private schools in Faridabad may be considered as the limitation of the study.

Conclusion:

The present study indicates that a significant proportion of children are overweight and obese in the Delhi-NCR region. There is regular transition of children across the continuum of BMI categories, from under-weight to normal-weight to overweight to obesity. Compared to previous reports shows a rising trend. The reference cutoff used for classification is of importance, as with use of different cut-offs the prevalence change multifold.More studies are needed to develop biophyisiology linked references for classification of childhood overweight and obesity. Uniform adoption of cutoffs for classification of overweight/obesity in children across different development age categories, pre-pubertal, pubertal and adolescents shall provide clearer picture on burden.

What is already known?

Prevalence of overweight and obesity is rising in India and more in urban area.

What this Study Adds?

A significant proportion of children aged 5-10 years are overweight and obese; and the prevalence is dependent on the reference cutoffs used for classification.

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Ethics approval: The study protocol was approved by Ethics committee at Apollo Hospitals (vide EC no 2011/08 dated Mar 5, 2011) and The INCLEN Trust International (vide IIEC-023 dated April 15, 2011).

Conflict of interest: None

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Contributions of Authors:

Dr Manoja Kumar Das: Planning, Data Collection, Data analysis, Manuscript writing.
Dr Vidyut Bhatia: Planning, Data Collection, Manuscript writing.
Dr. Anupam Sibal: Planning, Data Collection, Manuscript writing.

Table 1: Age and sex profile of the children

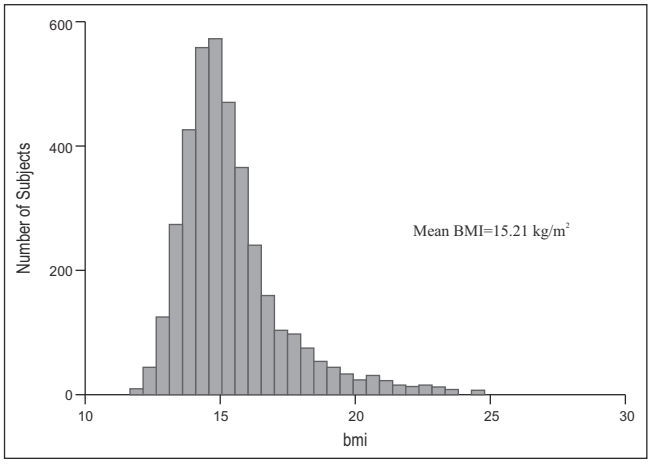
Age (years)	Male N(%)	Female N(%)	Total N(%)
?5 to ?6	598(58.9)	418(41.1)	1016(18)
?6 to ?7	690(58.4)	492(41.6)	1182(20.9)
?7 to ?8	684(58.7)	482(41.3)	1166(20.7)
?8 to ?9	639(56.7)	488(43.3)	1127(20)
?9 to ?10	689(59.8)	463(40.2)	1152(20.4)
Total	3300(58.5)	2343(41.5)	5643(100)

Table 2: Body fatness status (BMI based) of children (using IOTF criteria)5,6

Age (years)	Under weight N (%)		Normal weight N (%)		Over weight N (%)		Obese N (%)		Total N (%)	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
?5 to ?6 (n=1016)	206 (34.4)	130 (31.1)	352 (58.9)	252 (60.3)	28 (4.7)	31 (7.4)	12 (2)	5 (1.2)	598 (100)	418 (100)
?6 to ?7 (n=1182)	236 (34.2)	145 (29.5)	413 (59.9)	299 (60.8)	31 (4.5)	37 (7.5)	10 (1.4)	11 (2.2)	690 (100)	492 (100)
?7 to ?8 (n=1166)	187 (27.3)	145 (30.1)	436 (63.7)	298 (61.8)	36 (5.3)	28 (5.8)	25 (3.7)	11 (2.3)	684 (100)	482 (100)
?8 to ?9 (n=1127)	179 (28)	156 (32)	399 (62.4)	295 (60.5)	42 (6.6)	28 (5.7)	19 (3)	9 (1.8)	639 (100)	488 (100)
?9 to ?10 (n=1152)	183 (26.6)	115 (24.8)	421 (61.1)	3030 (65.4)	66 (9.6)	32 (6.9)	19 (2.8)	13 (2.8)	689 (100)	463 (100)
Total (n=5643)	991 (30)	691 (29.5)	2021 (61.2)	1447 (61.8)	203 (6.2)	156 (6.7)	85 (2.6)	49 (2.1)	3300 (1000)	2343 (100)

Table 3: Prevalence of overweight and obesity among children aged 5-10 years as per different references (n=5643)

Age bands (years)	IOTF criteria5,6						IAP criteria7					
Prevalence	Prevalence of overweight(%)			Prevalence of obesity (%)			Prevalence of overweight (%)			Prevalence of obesity (%)		
Gender	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
?5 to ?6 (n=1016)	4.7	7.4	5.8	2	1.2	1.7	14.9	15.6	15.2	4.8	5	4.9
?6 to ?7 (n=1182)	4.5	7.5	5.8	1.4	2.2	1.8	14.9	15	15	4.9	4.9	4.9
?7 to ?8 (n=1166)	5.3	5.8	5.5	3.7	2.3	3.1	4.9	14.9	14.9	5	5	5.0
?8 to ?9 (n=1127)	6.6	5.7	6.2	3	1.8	2.5	14.7	15	14.8	4.9	4.9	4.9
?9 to ?10 (n=1152)	9.6	6.9	8.5	2.8	2.8	2.8	15.1	14.9	15	4.9	5	4.9
Total (n=5643)	6.2	6.7	6.4	2.6	2.1	2.4	14.9	15.1	15	4.9	5	4.9



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