

Impact of Socioeconomic Status on Prevalence of Overweight and Obesity among Children and Adolescents in Urban India

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Abstract: To determine the prevalence and risk factors of overweight and obesity among the school children aged 8-15 years. A cross sectional design was adopted and 3 schools (2 private and 1 corporation schools) were selected by stratified cluster-sampling technique. Data was collected by interviewer administered method by trained research officers using a pre- tested and validated questionnaire to a total sample of 1193 school children from grades IV to X (i.e.) aged 8 to 15 years. Prevalence rates were calculated using WHO-BMI for age percentile chart 2007. Regression analysis was done to determine the risk factors associated with overweight. The overall prevalence of overweight was 12.1% among the children and 15.5 % among the adolescents. Both overweight (22%) and obesity (13.7%) were highest among girls from affluent families. The mean anthropometric measurements, prevalence of overweight and obesity were higher among the urban affluent children. Factors associated with overweight were upper socioeconomic status (OR-3.4, CI-1.8 to 6.7, $P < 0.0001$) and greater than 2 hours television watching (OR -2.5, CI- 1.1 to 5.4, $P < 0.0001$). The children had grossly inadequate knowledge about healthy lifestyle habits. Overweight and obesity are predisposing factors for many diseases. These findings suggest the need for early intervention programs, targeting the children from affluent society.

Keywords: Obesity, Overweight, Prevalence, School Children, Socioeconomic Status, Urban India.

INTRODUCTION

The 21st century epidemiological transition is manifesting in the form of shift towards increase in prevalence of non-communicable diseases (NCD's) and a decline in communicable diseases. There is established evidence that all NCD's are associated with overweight and obesity. Excess body fat is associated with insulin resistance, impaired glucose tolerance, hypertension, atherosclerotic risk factors and type 2 diabetes among children and adolescents [1-4]. Persistence of overweight and obesity into adulthood leads to cardiovascular disease risk, type 2 diabetes, hyperlipidemia, hyperinsulinemia, arthritis, sleep disorders and behavioral problems and cancer [5, 6]. At a time when various public health policies were targeted and implemented to prevent malnutrition and stunted growth among the pediatric population of developing countries, today, overweight and obesity has also become a major public health concern especially in the urban areas [7, 8].

This study was done to assess the prevalence of overweight and obesity among the school children using the recently published WHO 2007 sex specific body mass index (BMI) for age percentile chart, which is considered to provide an appropriate reference curves for the world population aged 5 – 19 years [9]. This study is the first of its kind in India to report the latest figures using these charts. There is virtually no data from India assessing knowledge and awareness levels of children about healthy lifestyle habits, hence it was also assessed simultaneously.

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MATERIALS AND METHODOLOGY

Study Design and Subjects

A cross sectional study was done on 1193 primary and secondary school children aged 8 to 15 years (IV grade to X grade) using stratified cluster sampling in Chennai. Generally, in India, children from low socioeconomic status (LSES) study in corporation schools which impart free education and children from upper socioeconomic status (USES) attend the private schools with fee structure of around 30,000 Indian rupees (INR)(750US\$) per annum. According to population probability sample 2 private schools and 1 corporation school were included in the study. Since the range of age distribution was wide, the study subjects were categorized into 2 groups – Children (8-12 years) and Adolescents (13-15 years). The study was limited to 8-15 years age, as children below 8 years were not cooperative and unable to respond to questions. The authorities did not grant permission to include students above 15 years.

The study protocol was approved by the ethics committee of the institution.

Data Collection

A well designed, pre-tested and validated questionnaire was administered to students of Grades IV to X after getting permission and written consent from the school principals. Data collection was carried out during September 2007 to February 2008. Anthropometric measurements were recorded and the survey instrument was interviewer administered by 2 well trained research officers.

Survey Instrument Details

The instrument contained 3 parts- a) Socio-demographic details b) anthropometric measurements c) questions on

knowledge, attitude and practice related to obesity, diabetes, diet, physical activity and TV watching.

Anthropometric Measurements and Definitions

Anthropometric measurements taken in the study include weight in kilograms (kg), height in centimeters (cm) and waist circumference in centimeters (cm). Height was measured with a standing stadiometer with a precision of 1mm and weight was taken without shoes and recorded on a digital scale (Equinox, India) to the nearest 0.1 kilogram. Waist circumference was measured using a flexible tape placed mid way between the costal margin and iliac crest after expiration. BMI was calculated using the formula, weight in kg/(height in meter)². The definition for overweight is BMI ≥85th percentile and obesity is BMI ≥97th percentile according to WHO 2007 sex specific BMI for age percentile charts.

Knowledge Scores

The percentage of respondents, who gave correct answers to questions regarding knowledge were assessed. Correct answers were awarded scores and total score was computed. The maximum attainable knowledge score was 8. The scores obtained by the children were then compared across age, socioeconomic status and gender.

Data Analysis

Data were analyzed using the statistical software SPSS version 10.0. Prevalence rate for overweight and obesity was calculated based on the BMI values and cut off as defined above. Mean and standard deviation (SD) was calculated for anthropometric measurements. Test of significance for proportions was done by chi square test. A p value of <0.05 was taken as statistically significant. Multiple logistic regression analysis was done to determine the factors associated with overweight and obesity.

RESULTS

The overall prevalence of overweight (≥ 85th percentile) was 12.1% among the children and 15.5 % among the adolescents irrespective of SES and gender. Age and sex-specific prevalences of overweight and obesity are presented in Table 1. The prevalence of overweight and obesity was significantly higher among girls than boys (P < 0.0001) and this was markedly seen in adolescence. There were highly significant differences in the prevalence of overweight and obesity between LSES and USES (P<0.05).

The anthropometric details of 1193 school children (boys: girls; 656: 537) is shown in Table 2. The students from USES had higher mean values of all growth parameters (p<0.0001) except adolescent males. The age wise distribution of mean values of BMI and waist circumference of the study subjects are shown in Figs. (1 and 2) respectively, which showed significant differences between SES ($\chi^2 = 36.5$; p<0.0001).

Multiple logistic regression analysis showed that the factors associated with overweight are USES and watching TV for more than 2 hours daily. Children and adolescents from USES had 3.4 times higher odds of being overweight compared to those from LSES (confidence interval (C.I.): 1.8 – 6.7; p<0.0001). Watching television for more than 2 hours daily increased the odds ratio (OR) of being overweight (OR = 2.5) compared to children who watched television occasionally (C.I.: 1.1 – 5.4; p<0.0001). Levels of physical activity did not appear as a significant factor in the regression analysis. However, re analysis of quartiles of physical activity with prevalence of overweight using chi square test showed significant independent association (children; $\chi^2 = 8.5$, p = 0.04 and adolescents; $\chi^2 = 13.6$, p=0.004).

Levels of knowledge about healthy lifestyle did not show significant association with overweight in this study but the children had poor awareness on healthy lifestyle habits. Mean knowledge scores attained by children are shown in

Table 1. Age and Gender Specific Prevalence of Overweight and Obesity

Condition	LSES				USES			
	Children		Adolescents		Children		Adolescents	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
	n=92	n=85	n=42	n=42	n=292	n=233	n=230	n=177
Overweight	9	8	2	4	29	39	31	39
	(9.8)	(9.4)	(4.8)	(9.5)	(9.9)	(16.7)*	(13.5)*	(22.0)*
Obese	4	2	-	1	30	32	19	20
	(4.3)	(2.4)	-	(2.4)	(10.3)*	(13.7)*	(8.3)*	(11.3)*

Data are shown in no (%).

According to WHO 2007 BMI-for-Age percentile chart:

Cut off for Overweight; ≥85th percentile.

Cut off for Obesity; ≥97th percentile.

There were significant differences (p< 0.05) seen in the prevalence of overweight and obesity between the two groups of socio economic status.

LSES – low socio economic status; HSES – high socio economic status.

*Denotes statistical significance P<0.05.

Table 2. Mean and SD Values of Anthropometric Measurements of School Children from Lower and Upper Socioeconomic Status

Measures	Children						Adolescents					
	(Age 8-12 years)						(Age 13-15 years)					
	Boys		P value	Girls		P value	Boys		P value	Girls		P value
	LSES	USES		LSES	USES		LSES	USES		LSES	USES	
	n=92	n=292		n=85	n=233		n=42	n=230		n=42	n=177	
Height (cm)	139.4 ±8.3	144.4 ±9.3	<0.0001	140.1 ±9.8	148.4 ±9.3	<0.0001	160.0 ±10.7	159.2 ±9.5	0.608	154.7 ±6.1	159.8 ±7.0	<0.0001
Weight (Kg)	31.8 ±8.0	35.5 ±9.9	<0.0001	32.3 ±9.2	41.5 ±11.7	<0.0001	45.1 ±11.0	48.7 ±12.9	0.090	43.6 ±10.7	54.5 ±12.8	<0.0001
BMI (Kg/m ²)	16.2 ±2.7	16.9 ±3.4	<0.071	16.2 ±2.9	18.5 ±3.9	<0.0001	17.9 ±2.7	19.0 ±3.7	0.066	18.8 ±3.1	21.3 ±4.4	<0.0001
WC (cm)	57.8 ±8.5	63.5 ±9.8	<0.0001	57.2 ±7.7	64.8 ±9.5	<0.0001	64.8 ±8.7	69.4 ±9.6	0.004	62.0 ±6.6	69.5 ±9.9	<0.0001

LSES – Low socio economic status; USES – Upper socio economic status;
 BMI – Body Mass Index; WC- Waist Circumference.
 P<0.05 denotes statistical significance.

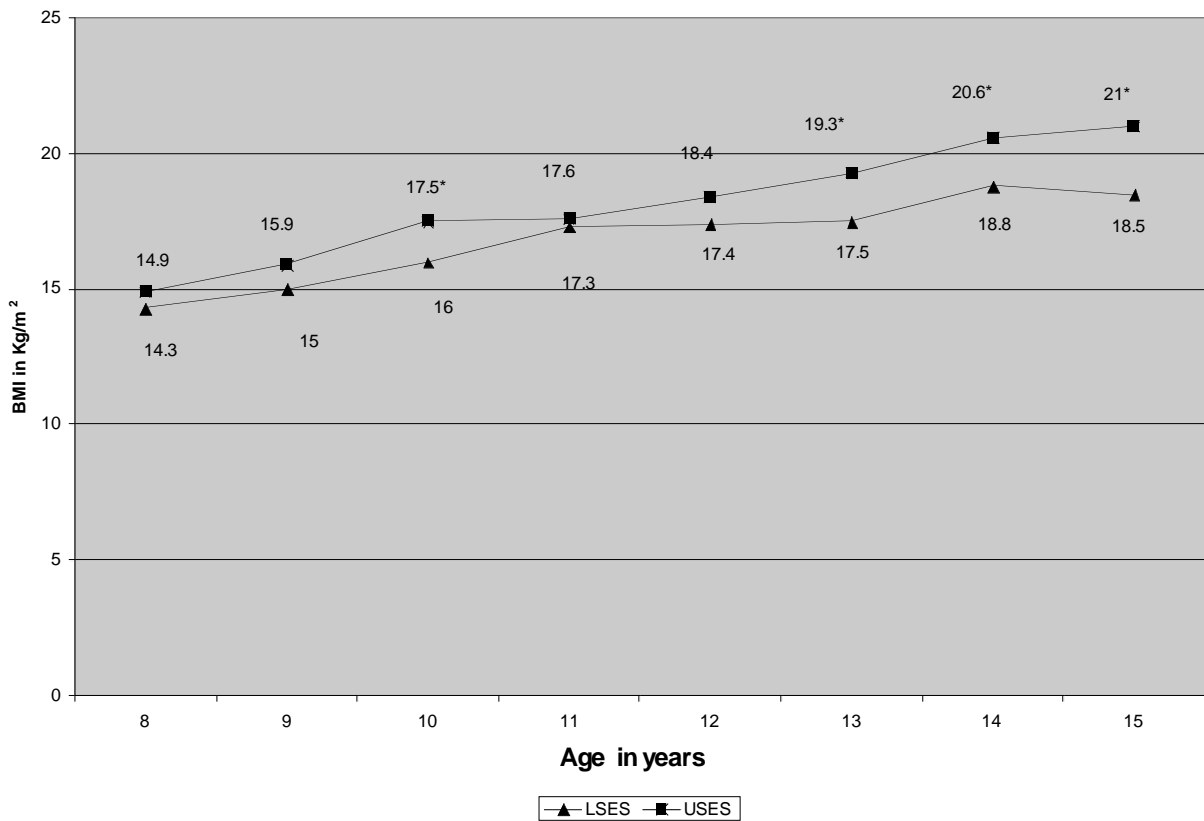


Fig. (1). Distribution of mean BMI values according to age.

* Denotes statistical significance P < 0.05.

Age wise presentation of the mean values of body mass index (BMI) in Kg/m² for schoolchildren from upper socioeconomic status (USES) and low socioeconomic status (LSES).

Table 3. Higher scores were obtained by children aged 13 years and older, female gender and children from USES (p<0.0001). 50th percentile for LSES fell on score 3 whereas it was on score 5 for USES.

DISCUSSION

An important finding of this study is an ever burgeoning prevalence of overweight among the urban school children

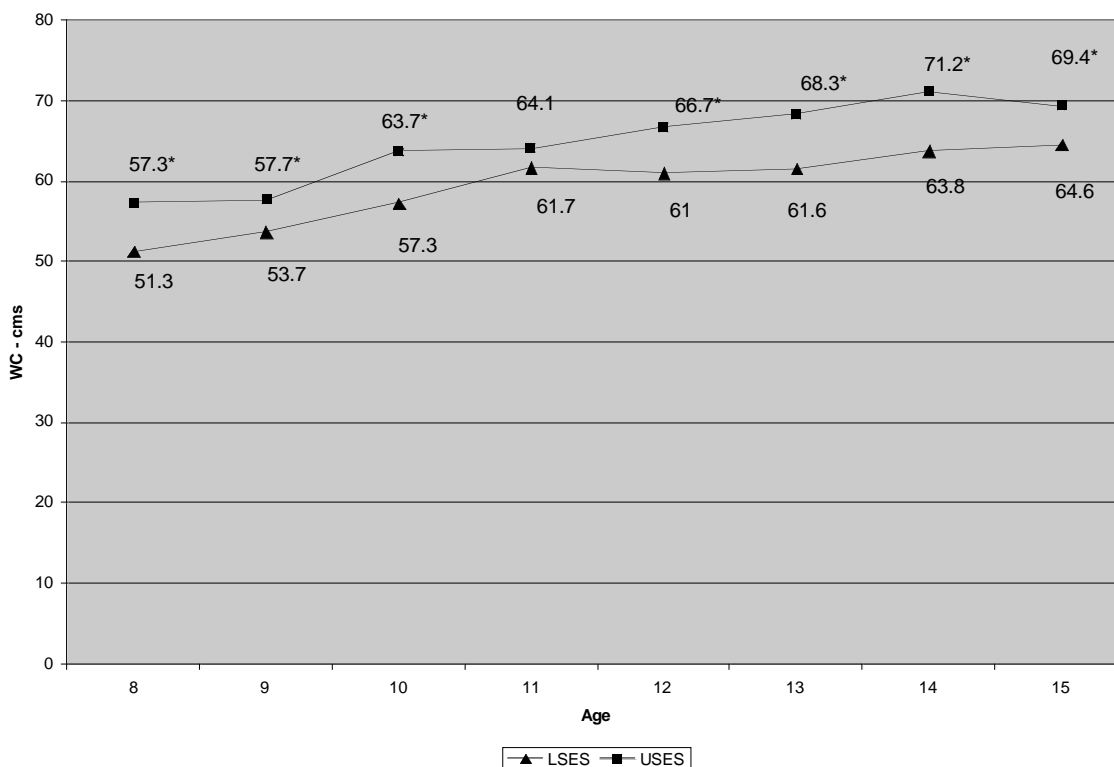


Fig. (2). Distribution of mean values of waist circumference according to age.

* Denotes statistical significance P < 0.05.

Age wise presentation of the mean values of waist circumference (WC) in centimeters (cm) for schoolchildren from upper socioeconomic status (USES) and low socioeconomic status (LSES).

Table 3. Mean Values of Knowledge Scores According to Age, Gender and Socioeconomic Status

	Variables n=1193	Total n (%)	Mean Score	SD	P Value
Age in Years	8-12	702(58.4)	3.6	1.9	<0.0001
	13-15	491(41.3)	5.2	1.8	
Gender	Male	656(55.0)	3.9	1.8	<0.0001
	Female	537(45.0)	4.8	2.2	
SES	USES	932(78.1)	4.6	1.9	<0.0001
	LSES	261(21.9)	3.1	1.9	

SD – Standard Deviation.

P<0.05 Denotes statistical significance.

when compared to previous surveys in India [10, 11]. Subramanyam, *et al.* [11] showed the prevalence of overweight and obesity among affluent girls aged 10- 15 years in Chennai was 9.6% and 6.2% respectively in 1998. Our study has shown higher figures which is suggestive of the obesity epidemic in 21st century.

Another finding of this study is the socioeconomic influence in the prevalence of overweight and obesity. Prevalence of overweight and obesity was significantly higher among the USES. The mean values of BMI and waist circumference when compared with standard WHO 2007 reference charts, fell below the 50th percentile for subjects

from LSES while for USES, they were between 50th and 85th percentile. Hence we infer that overweight and obesity is more in USES. These results show consistency with results from other Indian studies [12]. Female gender had higher preponderance to overweight and was more prominent in USES. However puberty and growth spurt which occur at an earlier age for girls may account to confounding effect. It has been reported that the number of adipose tissue cells increase during these periods followed by slowdown after puberty [13]. Reports from other studies showed that the prevalences are marginally lesser during post pubertal period [14]. Results from studies done in India and other parts of the

globe also showed that female gender are at risk of being overweight and obese [15-17].

The study showed widespread prevalence of unhealthy lifestyle habits. Percentage of children scoring minimum of 0 and maximum of 8 among the LSES were 5.2% and 2.4 % respectively while it was 0.5% and 7.6 % for USES children. Rapid epidemiological transition is currently sweeping across India, which has a direct impact on food habits and lifestyle. Springing up of fast-food outlets and easy availability of junk food is a matter of concern. Today's children prefer these foods to fruits and vegetables [18-21]. In our study, we found that the children from private schools consumed more of fast food items and carbonated drinks as all these food items were easily available in their school canteen. Further research is required to collect complete data on quality and quantity of food consumption, eating behavior and to determine its association with knowledge which was beyond the scope of this study.

Though the children were well informed about the good effects of physical activity, we found that they were not engaged in daily physical activity. Only 30 % of the overweight and obese children were engaged in atleast 60 minutes of daily physical activity, which is suggestive of the sedentary lifestyle of the younger generation. The recent trend is that the school children concentrate more on academics and are involved in less of sports and activities. Leisure hours are spent in watching TV or playing computer/video games, thus explaining the sedentary lifestyle of today's school children. These findings were consistent with other studies [15, 20, 22, 23].

The two factors- USES and TV watching showed significant association with overweight and obesity in this study. Unlike other studies, although levels of physical activity did not come out as a risk factor in the regression analysis, it showed independent association using chi-square test. Normal values of BMI were distributed in the higher tertiles of physical activity [22, 23].

Nevertheless obesity is a result of complex interaction between genetic and environmental factors [24, 25]. Further research is recommended to explore the link between gene-environment-obesity relations among children. Moreover since the WHO 2007 charts were derived from heterogeneous data sets across 22 countries, a lot of research is needed to establish its accuracy and correlate with external environmental factors.

To summarize, our results suggest that childhood obesity is on the rise especially among the urban affluent children and the knowledge about lifestyle related diseases like obesity and diabetes and their prevention is very poor. Moreover the persistence of unhealthy practices among the children must be given attention. The health impact of increasing prevalence of overweight and obesity among children and adolescents is a matter of serious concern. Heart disease and diabetes were rare among children and young adults in the previous century. But today, supposed to be the diseases of the elderly, these diseases are frequently occurring in the younger generation. This study has thus highlighted the need to not only improve the awareness on prevention of childhood obesity among children but a need

to motivate and reinforce them to practice healthy lifestyle is utmost essential.

RECOMMENDATION

These findings suggest a need for planning school based intervention programs for preventing childhood obesity and increasing the level of awareness on the ill effects of obesity, among parents, teachers and children in order to control the escalating prevalence. Certain guidelines and policies like school canteen policy, healthy food practices, inclusion of health related topics in curriculum and compulsory physical training classes must be introduced in the schools. There must be a multi sector approach from the government, school authorities and parents to introduce policies and guidelines to curb on the obesity menace and to help today's children to live a long healthy life tomorrow.

CONFLICT OF INTEREST

Conflict of Interest is none.

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