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Behavioural Determinants for Obesity: A Cross-sectional Study Among Urban Adolescents in India

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Objectives: To measure the prevalence of behavioural risk factors for obesity among urban adolescent school children in Chennai, India.
Methods: This study was performed as a cross-sectional study using a World Health Organization-designed Global School-based Student Health Survey questionnaire (modified for India) among adolescent school children studying in 30 randomly selected secondary and higher secondary schools in Chennai city. 1842 adolescents studying in the VIII to XII standards were randomly selected for the study.
Results: In the present study, 40.7% of the students ate fruit one or more times per day and 74.5% of the students ate vegetables one or more times per day. Nearly 20% of the students ate fast food items on 4 to 7 days during the previous week. Among the students, 30.4% watched television for more than two hours per day. Nearly 68% of the girls and 22% of the boys did not participate in outdoor sports activities. When the pattern of physical activity of the students was assessed, it was observed that 15.6% were inactive, 43.4% were minimally active, and the remaining 41.0% belonged to the category of health enhancing physical activity. Among the students, 6.2% were overweight and 5.2% were obese.
Conclusions: The prevalence of risk factors for obesity was quite high among the adolescents. This study also showed that a great proportion of overweight/obese adolescents had a correct perception of their body weight and they were making efforts to modify risk factors such as television viewing, computer use, a sedentary lifestyle, and unhealthy dietary habits.

Key words: Dietary behaviour, Motor activity, Overweight, Obesity, Adolescent

INTRODUCTION

Obesity is one of the major global problems affecting children and adolescents. During adolescence, teenagers start to make individual choices and develop a personalized lifestyle. Many of these lifestyle choices are related to risk factors for obesity, such as unhealthy diet patterns, increased TV watching, and lack of physical activity, all of which are largely modifiable.

In India, although under-nutrition and micronutrient deficiencies continue to be major public health problems, over-nutrition and obesity are also emerging as a major problem in many states [1,2]. The quality of life in the urban population has changed to a great extent during the last decade, resulting in a substantial increase in childhood as well as adult obesity in the urban population.

It has been observed that 30% of cases of obesity begin in childhood, and among them, 50% to 80% become obese adults. In a Harvard study, morbidity from cardiovascular disease, diabetes, obesity-related cancers, and arthritis was 50% to 100% higher in obese individuals who were also obese as

children [3]. Obesity is associated with other co-morbidities such as dyslipidaemia [4], hypertension [5], the metabolic syndrome [6], and polycystic ovarian disease [7].

Dietary patterns that include a higher intake of fruits and vegetables, which are good sources of complex carbohydrates, vitamins, and minerals, are associated with a decreased risk for obesity [8]. Children and adolescents tend to consume low quantities of fruits and vegetables and to have a high intake of fast foods and carbonated drinks [9,10]. The frequency of watching TV and computer use is high among adolescents and they have replaced outdoor games and other social activities in this age group. Previous intervention studies in school-aged children have supported television and video viewing as causes of childhood obesity [11,12]. Adequate physical activity during childhood and adolescence helps to build and maintain healthy bones and muscles and control weight.

Modifying behaviours at a young age is much easier than at later ages. Comprehensive school-based health education programmes would be the cost effective approach to favourably modifying obesity risk factors. The Global School-based Student Health Survey (GSHS) designed by the World Health Organization (WHO) and modified for India [13] is a low-cost school-based survey that assesses the behavioural risk factors related to obesity and other non-communicable diseases among young people aged 13 to 15 years. So far, only one study [14] in India using the GSHS questionnaire, which was carried out in New Delhi, has been published, but the drawback of the study was that the sample was not randomly selected, and therefore, it would not be appropriate to generalize the study results to all school children of India. The limitations of other similar studies in India were coverage of only a single school and non-random selection of the study population. Hence, the present study was undertaken to address the prevalence of behavioural risk factors for obesity among randomly selected urban adolescent students from both private and government schools in Chennai, Tamil Nadu.

METHODS

This was a cross-sectional study conducted among students in standards VIII-XII in 2009 in Chennai, Tamil Nadu, India. Out of 658 secondary and higher secondary schools in Chennai city, as listed on the Tamil Nadu government website [15], 60 schools were selected randomly and approached for permission. The schools which gave permission were included in the study (n=30). Among them were 17 private and 13 public schools.

The sample size was calculated based on the study [14] done in New Delhi, which showed the prevalence of overweight or obesity to be 17.65%. With the allowable error as 10% of prevalence, the sample size required was 1724. Expecting a 10% refusal to participate in the study, we arrived at a sample size of 1896. Thus the number of students selected from the 30 schools was 1896, and the number from each school was 64.

A sampling frame was prepared by enlisting the students names using attendance registers of all the sections in the VIII-XII standard classes, and from them, 64 students were selected by a simple random sampling technique. The randomly selected students were asked to assemble in a separate room and were briefed about the study, and the consent forms were distributed to them to be signed by their parents. During the subsequent visit, data was collected from students whose parents provided consent. Data were collected using an age appropriate modified GSHS self-administered questionnaire. The questionnaire was printed in English and Tamil.

Dietary practices were assessed by questions on vegetable intake, fast food intake, fruit consumption, and eating junk food. Any involvement in sports at school or in the community and the time spent at home for activities like watching TV, doing academic work, and computer use were also found.

The physical activity of the students was computed based on their activity in the previous one-week period, according to their responses to the standardized International Physical Activity Questionnaire (short form) [16]. The specific types of activity assessed were walking, moderate intensity activities, and vigorous intensity activities; and their frequency (measured in days per week) and duration (time per day) for each specific type of activity was also recorded. Students who reported vigorous intensity activity on three days, aggregating 1500 metabolic equivalent of task (MET) min/wk, or 7 days of any combination of walking and moderate or vigorous intensity activities accumulating at least 3000 MET min/wk were considered to have health enhancing physical activity (HEPA). Students were considered to be minimally active if they reported three or more days of vigorous activity of at least 20 minutes per day or 5 or more days of moderate-intensity activity or walking of at least 30 minutes per day or 5 or more days of walking or moderate-intensity or vigorous intensity activities achieving a minimum of at least 600 MET-min/wk. Students who did not

meet the criteria for being considered minimally active or HEPA active were considered to be inactive.

Height and weight were measured by two trained field workers. The students' body mass index (BMI) was calculated, and their corresponding BMI percentiles were calculated from the US Centers for Disease Control and Prevention (CDC) growth charts [17]. The students were also classified as underweight (<5th%), normal weight (≥5th% and <85th%), overweight (≥85th and <95th%), and obese (≥95th%), according to the guidelines from the CDC. Ethical approval for this study was obtained from the Institutional Ethics Committee of Sri Ramachandra University, Porur, Chennai. Data were analysed using SPSS version 15.0 (SPSS Inc., Chicago, IL, USA). Pearson's chi-squared test was used to find statistical significance. The independent effects of the predictor variables were calculated by logistic regression models to estimate the adjusted odds ratio (OR) and 95% confidence intervals (CIs). As carbonated drink intake, duration of academic activities, outdoor games, TV watching, computer use, and levels of physical activity were not associated with obesity/overweight, they were not included in the multivariable model.

RESULTS

This study was carried out among 1842 students studying in the VIII to XII standards randomly selected from 30 schools in the city of Chennai. The participants' response rate was 97.15% based on 1896 sampled students. The non-response was because of parents' refusal to sign the consent form.

There were 895 (48.6%) boys and 947 (51.4%) girls included in this study. Among the students, 760 (41.3%) were in the 12- to 14-year-old age group and the remaining 1082 (58.7%) were in the 15- to 18-year-old age group. Information on the father's and mother's education was available for only 1282 and 1249 students, respectively. The fathers of 514 (27.9%) of the students and mothers of 394 (21.4%) of the students had an education higher than the 10th standard. In this study, 1078 (58.5%) students were studying in private schools and 764 (41.5%) students were studying in government, government-aided, or trust-managed schools.

Dietary Behaviour

The following results pertain to the previous 30 days as reported by the students at the time of data collection. Regarding their dietary pattern, 40.6% were vegetarians. Overall,

40.7% of the students ate fruit, such as oranges, apples, or bananas, one or more times per day. Overall, 74.5% of the students usually ate vegetables, such as cucumbers, green salad, or tomatoes, one or more times per day (Table 1).

Overall, 13.7% of the students reported drinking carbonated drinks such as Pepsi, Coke, or Mirinda one or more times per

Table 1. Dietary practices and daily activities of the adolescents surveyed

Variable	Male	Female	Total	95% confidence interval
Dietary practices				
Diet				
Vegetarian	345 (46.1)	403 (53.9)	748 (40.6)	38.4, 42.8
Mixed diet	550 (50.3)	544 (49.7)	1094 (59.4)	57.2, 61.4
Fruit intake				
Never/occasional	494 (55.2)	600 (63.4)	1094 (59.4)	57.2, 61.4
1 or 2 times/d	343 (38.3)	323 (34.1)	666 (36.2)	34.0, 38.4
3 or more times/d	58 (6.5)	24 (2.5)	82 (4.5)	3.5, 5.4
Vegetable intake				
Never/occasional	194 (21.7)	276 (29.1)	470 (25.5)	23.5, 27.5
1 or 2 times/d	540 (60.3)	558 (58.9)	1098 (59.6)	57.4, 61.8
3 or more times/d	161 (18.0)	113 (11.9)	274 (14.9)	13.3, 16.5
Carbonated drink intake during the previous 7 d				
Never	748 (83.6)	841 (88.8)	1589 (86.3)	84.7, 87.9
1 or 3 times	132 (14.7)	95 (10.0)	277 (12.3)	10.8, 13.8
4 or more times	15 (1.7)	11 (1.2)	26 (1.4)	0.9, 1.9
Fast food intake during last seven days				
Never	119 (13.3)	158 (16.7)	277 (15)	13.4, 16.6
1-3 d	545 (60.9)	609 (64.3)	1154 (62.6)	60.4, 64.8
4-7 d	231 (25.8)	180 (19.0)	411 (22.3)	20.4, 24.2
Daily activities				
Watching TV for more than two hours every day	278 (31.1)	282 (29.8)	560 (30.4)	28.3, 32.5
Computer use for more than two hours every day	292 (32.6)	218 (23.0)	510 (27.7)	25.7, 29.7
Academic activities for more than two hours every day	489 (54.6)	573 (60.5)	1062 (57.7)	55.4, 60.0
Outdoor sports activities for more than one hour every day	320 (35.8)	85 (9.0)	405 (22.0)	20.1, 23.9
Transport to school by walking/cycling	637 (71.2)	567 (59.9)	1204 (65.4)	63.2, 67.5

Values are presented as number (%).

Table 2. Health enhancing physical activity (HEPA) among the adolescents surveyed

Characteristics	Total	HEPA active n (%)	95% confidence interval	p-value
Age (y)				
12-14	760	362 (47.6)	44.0, 51.1	<0.001
15-18	1082	393 (36.3)	32.4, 39.2	
Sex				
Male	895	540 (60.3)	57.1, 63.5	<0.001
Female	947	215 (22.7)	20.0, 25.4	
Type of school				
Private	1078	438 (40.6)	37.7, 43.5	0.71
Government/government-aided/trust-managed	764	317 (41.5)	38.0, 44.9	
Father's education (n=1282)				
Up to X standard	768	338 (44.0)	40.5, 47.5	0.24
More than X standard	514	209 (40.7)	36.4, 44.9	
Mother's education (n=1249)				
Up to X standard	855	372 (43.5)	40.4, 46.6	0.53
More than X standard	394	164 (41.6)	36.7, 46.5	
Academic activities per day				
Up to 2 h	780	370 (47.4)	43.9, 50.9	<0.001
More than 2 h	1062	385 (36.3)	33.4, 39.2	
TV hours per day				
Up to 2 h	1282	504 (39.3)	36.6, 41.9	<0.05
More than 2 h	560	251 (44.8)	40.7, 48.9	
Computer use per day				
Up to 2 h	1332	534 (40.1)	37.5, 42.7	0.21
More than 2 h	510	221 (43.3)	39.0, 47.6	

Table 3. Prevalence of overweight/obesity by sociodemographic status

Characteristics	Total	Overweight/obese (n)	Percent	95% confidence interval	p-value
Age (y)					
12-14	760	105	13.8	11.3, 16.2	<0.01
15-18	1082	105	9.7	7.9, 11.5	
Sex					
Male	895	86	9.6	7.7, 11.5	<0.05
Female	947	124	13.1	10.9, 15.2	
Father's education (n=1282)					
Up to 10th standard	768	64	8.3	6.3, 10.2	<0.001
More than 10th standard	514	75	14.6	11.5, 17.6	
Mother's education (n=1249)					
Up to 10th standard	855	69	8.1	6.4, 9.8	<0.001
More than 10th standard	394	61	15.5	11.9, 19.1	
Type of school					
Private	1078	154	14.3	12.2, 16.4	<0.001
Government/government-aided/trust-managed	764	56	7.3	5.5, 9.1	

day during the previous 7 days. The difference in the intake of carbonated drinks between the male (16.5%) and female (11.2%) students was significant ($p<0.05$). Among the students, 411 (22.3%) ate fast food items like cakes, burgers, pizza, noodles, puffs, and fried chaat snacks on 4 to 7 days during the previous week. A significantly higher proportion of male students (25.8%) than female students (19%) ($p<0.05$) ate fast food items on more than 3 days.

Physical Activity

Among the students, 30.4% watched television for more than two hours per day. Nearly 35% of students did not use a computer, while 37% did so for less than two hours and 28% did so for more than two hours every day. A significantly higher proportion of boys (32.6%) than girls (23.0%) ($p<0.001$) used computer for more than two hours a day. Overall, 57.7%

spent more than two hours every day on academic activities like reading, writing, and homework assignments. A significantly higher proportion of girls (60.5%) than boys (54.6%) ($p=0.01$) spent more than two hours on academic activities.

Among the students, 54.2% involved themselves in outdoor sports activities. Nearly 68% of the girls and 22% of the boys did not participate in outdoor sports activities at all. Nearly 36% of the boys and 9% of the girls involved themselves in outdoor sports activities for more than one hour per day, and this difference was statistically significant ($p<0.001$). Among the students, 794 (43.1%) walked to school daily, 410 (22.3%) rode a bicycle, and the remaining 34.6% students commuted by school bus or public transport, or used some type of motorised vehicle. Nearly 71% of the boys and 60% of the girls walked or cycled to school daily. This difference was statistically significant ($p<0.001$) (Table 1).

The International Physical Activity Questionnaire was used to assess the pattern of physical activity of the students. It was observed that 15.6% (95% CI, 13.9 to 17.3) were inactive, 43.4% (95% CI, 41.1 to 45.7) were minimally active, and the remaining 41.0% (95% CI, 38.7 to 43.2) belonged to the category of HEPA active. The HEPA of adolescents is significantly associ-

Table 4. Correlates of overweight/obesity among the adolescents surveyed

Characteristics	Total	Over-weight/ obese (n)	Per-cent	95% confidence interval	*p*-value
Fast food intake					
≤3 d/wk	1431	182	12.7	11.0, 11.4	<0.001
4-7 d/wk	411	28	6.8	4.4, 9.2	
Carbonated drink intake					
≤3 times/wk	1816	203	11.3	9.8, 12.8	0.41
4-7 times/wk	26	7	15.2	4.1, 34.3	
Studying/academic activities per day					
Up to 2 h	780	87	11.2	9.0, 13.4	0.78
More than 2 h	1062	123	11.6	9.7, 13.5	
Outdoor games per day					
Up to 1 h	1437	167	11.6	9.9, 13.3	0.57
More than 1 h	405	43	10.6	7.6, 13.6	
TV hours per day					
Up to 2 h	1282	156	12.2	10.4, 14.0	0.12
More than 2 h	560	54	9.6	7.2, 12.0	
Computer use					
Up to 2 h	1332	151	11.3	9.6, 13.0	0.89
More than 2 h	510	59	11.6	8.8, 14.4	
Physical activity					
Inactive/minimally active	1087	128	11.8	9.9, 13.7	0.54
Health enhancing physical activity	755	82	10.9	8.7, 13.1	
Transport to school					
Walking/cycling	1204	120	10.0	8.3, 11.7	<0.01
Motorised vehicle	638	90	14.1	11.4, 16.8	

Table 5. Logistic regression correlates of overweight/obesity among adolescents

Explanatory variables	OR[*]	95% CI[*]	*p*-value
Age (12-14 y vs. 15-18 y)	1.469	0.981-2.201	0.06
Sex (male vs. female)	0.604	0.411-0.888	0.01
Type of school (private vs. Government/ government-aided/trust managed)	2.118	1.364-3.288	0.001
Father's education (upto 10th standard vs. more than 10th standard)	0.809	0.517-1.267	0.35
Mother's education(upto 10th standard vs. more than 10th standard)	0.650	0.413-1.023	0.06
Fast food consumption (1-3 d/wk vs. 4-7 d/wk)	0.525	0.306-0.900	0.02
Mode of transport (walking,cycling vs. motorised vehicle)	1.426	0.973-2.089	0.07

[1]Odds ratios (95% confidence intervals) are adjusted for all variables in the model.

ated with a lower age group (12 to 15 years), male sex, and lesser duration of time spent in academic activities (Table 2). Regarding physical training classes in schools, 56.6% of students reported that their physical training classes during the previous week had been cancelled for academic or other reasons. Nearly 16% of students reported that they had physical training class for one day during the previous week.

Overweight and Obesity

Among the students, 5.2% were obese, 6.2% were overweight, 57.1% were of normal weight, and 31.5% were underweight as per the age and gender adjusted BMI percentiles of the WHO child growth standards. The prevalence of overweight/obesity was 11.4% (95% CI, 9.9 to 12.8). Of the overweight/obese students, 33% incorrectly perceived that they were either underweight or of normal weight. The study

showed significant associations between the overweight/obesity of adolescents and the younger age group, female sex, a high level of father's and mother's education, and the type of school they were attending (Table 3). A significantly higher proportion of students who did not eat fast food items during the previous 7 days and students who commuted by motorised vehicle were overweight/obese than other students. The BMI status of adolescents was not significantly associated with carbonated drink intake, duration of academic activities or outdoor games, or physical activity levels (Table 4).

A logistic regression analysis of predictor variables showed that the sex of adolescents, type of school, and fast food consumption were significantly associated with overweight/obesity (Table 5). Overweight/obesity was significantly less common among male students than among females (OR, 0.6; 96% CI, 0.4 to 0.8). A significantly greater proportion of adolescents studying in private schools were overweight/obese than the students studying in government, government-aided, or trust-managed schools (OR, 2.1; 95% CI, 1.3 to 3.2). Increased fast food consumption was negatively associated with overweight/obesity (OR, 0.5; 96% CI, 0.3 to 0.9).

DISCUSSION

The present study reports on the dietary behaviour, levels of physical activity, and prevalence of overweight and obesity among school-going adolescents in Chennai. A smaller proportion (40%) of adolescents regularly eat fruit than those who ate fast food items (85%) regularly. One third of the ado-

lescents watched television for more than two hours every day. Nearly 45% of the students did not involve themselves in any outdoor sports activities. A high proportion of adolescents (60%) were either inactive or minimally active. Overall, 11.4% of them were overweight or obese.

In the present study, regular fruit consumption one or more times per day was reported by nearly 40% of adolescents, which was similar to the findings in Delhi [14]. Vegetable consumption three or more times per day was reported by only 15% of students. Though there is convincing evidence that fruits and vegetables decrease the risk for obesity, diabetes, and cardiovascular disease [18], the intake of fruits and vegetables among adolescents was found to be low.

Food consumed in fast food restaurants was usually higher in fat content, while containing fewer fruit and vegetables and other healthful nutrients [19]. Eighty-five percent of the students reported eating fast food in the past 7 days, out of which 22% ate out more than three days. Similar findings were reported in Chandigarh [10]. The low consumption of fruits and vegetables and relatively high intake of fast food among the adolescents indicated that personal preferences played an important role in their dietary habits beyond economic considerations.

With growing affluence and a dramatic increase in TV watching and computer use documented in India, it is likely that a greater proportion of adolescents have sedentary behaviour. The present study confirms this fact and notes that nearly 60% of the adolescents were inactive to minimally active and only 41% were HEPA active. HEPA was lower in the adolescents of the older age group (15 to 18 years) and the boys reported more health enhancing activity than the girls. Similar findings have been reported from studies in developed countries [20-22] and India [23]. When we did the analysis, we found that homework or studying after school hours among the older adolescents was not significantly greater than for the younger group. However, in Chennai, the usual practice is to conduct special classes for older adolescents in the schools themselves, extending regular school hours and thus increasing the duration of academic work. When we analysed the daily activities of the adolescents, we found that a significantly greater proportion of older adolescents (32.9%) than younger adolescents (26.8%) ($p<0.005$) watch television for more than two hours per day and a significantly smaller proportion of older students (19.4%) than younger adolescents (25.7%) ($p<0.001$) was involved in outdoor sports activity more than 1

hour per day. In India, most families do not allow girls to play outdoor games after they attain menarche, which could be the reason for a significantly lower proportion of girls reporting HEPA. This is a matter of concern, as HEPA is essential for the musculoskeletal and cardiovascular health and fitness of adolescents. It is important that parents make efforts to reduce young people's time spent watching TV and involve them in outdoor sports activities. Since adolescents spend one third of the day in school, strengthening school physical education programmes would be effective in improving the levels of physical activity of both boys and girls. In this study, physical training sessions were not followed as scheduled due to academic or other reasons. It is important that teachers understand the importance of adolescents' being physically active and cooperate by strictly following the norms for physical education in every school.

In the present study the prevalence of overweight and obesity was 6.2% and 5.2%, respectively, among the adolescents. This prevalence in the southern part of India is much lower than that reported from other countries (33% in Italy [24], 49% in Taiwan [25], over 15% in South Africa [26]). This difference could be because of differences in socioeconomic status and dietary behaviours of adolescents in these study areas and as well as differences in their genetic makeup. The prevalence of obesity (5.2%) among the students observed here was supported by the study findings from Chennai [27], reporting a prevalence of 6.2%. Studies in Thiruvananthapuram, Kerala [28] and Delhi [14] based on similar CDC guidelines reported a higher prevalence of overweight and obesity among adolescents (18.3% in Kerala and 17.5% in Delhi). The study in Delhi was done in a private school and in the study in Kerala, a greater proportion of students were from private schools and therefore, clearly, a higher prevalence of overweight and obesity were reported due to the greater purchasing power and higher standard of living of those students.

The present study showed that the prevalence of overweight/obesity was significantly higher among adolescents in the 12- to 14-year-old age group than among adolescents in the age group of 15 to 18 years, as has been observed in other studies [23,29]. This is because of increased adipose tissue and overall body weight in adolescents during puberty [27] than during the post-pubertal period at age 15 years and above. The greater prevalence of obesity in girls than boys observed in this study is similar to the observations of Ramachandran et al. [30] and Agarwal et al. [31].

The present study showed a significant positive association between a higher level of paternal and maternal education and overweight/obesity among the students. A possible reason is that better education is functioning as a proxy measure for higher socioeconomic status, contributing to differences in dietary practices and physical activity patterns. Similar findings were reported from a study in the city of Wardha in central India [32]. The higher prevalence of overweight and obesity among adolescents studying in private schools in this study could also be attributed to their higher socioeconomic status.

Previous intervention studies in school-aged children have supported television and video viewing as causes of childhood obesity [12,33]. However, in the present study, the prevalence of overweight/obesity was not significantly associated with television viewing, computer use, or time spent in outdoor games. This finding is similar to the longitudinal study done among adolescent girls in the United States [34], which did not find associations between hours of after-school TV viewing and BMI and physical activity. The reason for the lack of an association in the present study could be that nearly 70% of the obese adolescents were aware of their weight and would have modified their sedentary lifestyle and spent more time in outdoor games. That would explain why none of the modifiable risk factors were correlated with overweight/obesity but the non-modifiable risk factors such age, sex, and socioeconomic status (assessed through parental education and type of school) were significantly related.

Regarding consumption of fast food, it was found that adolescents who were overweight or obese were actually consuming fast food at a lesser frequency, which can best be explained on the basis of better awareness about their body weight and necessary dietary modifications they had initiated for weight reduction. These findings are in conformity with those of the study from Delhi [14]. In the present study, the mode of transport of the students was one of the determining factors for overweight or obesity. Transportation to school by either walking or cycling reduces the prevalence of overweight or obesity by providing the opportunity for increased physical activity.

The strengths of this study are its random method of selection of schools and students and that both government and private schools were included. A large sample was selected to represent the entire population of high and higher secondary school students in Chennai. An almost equal proportion of boys (48.6%) and girls (51.4%) were included in this study.

Data on dietary practices were collected using a set of questions from the age-appropriate GSHS questionnaire modified for India. The data on physical activity levels were measured using the validated International Physical Activity Questionnaire. Hence, the study findings are valid and representative of urban school-going adolescents in Chennai and can be extrapolated to other cities in India.

The main limitation of the study is that objective assessment of physical activity was not done, as it would be difficult to perform in a field situation. Although the individual socioeconomic status of each child was not assessed separately, information on paternal education was obtained as a proxy measure.

The findings of the present study highlight that fewer students had regular intake of fruits and vegetables than the proportion who ate fast food items frequently. This finding implies the importance of spending regular class hours on teaching healthy food habits and the nutritive values of different food items. A low proportion of the students had HEPA levels. Therefore, it is important that the norms for physical education class be strictly followed in schools, and parents should encourage adolescents, irrespective of gender, to actively participate in outdoor games and sports. This study's findings show that a large proportion of overweight and obese adolescents had an accurate perception of their body weight and they were making efforts to modify obesity risk factors such as television viewing, computer use, and unhealthy food consumption.

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CONFLICT OF INTEREST

The authors have no conflicts of interest with the material presented in this paper.

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