Prevalence and awareness of obesity and its risk factors among adolescents in two schools in a northeast Indian city

Prasanta Kumar Bhattacharya[1], Nirmali Gogoi[2], Aakash Roy[1]

[1]Department of General Medicine, North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences, Shillong, Meghalaya, India.
[2]Department of Child Health Nursing, SM College of Nursing, Assam Down Town University, Guwahati, Assam, India.
Correspondence to: Prasanta Kumar Bhattacharya, E-mail: pkbdr78@gmail.com

Abstract

Background: Obesity is a major public health problem leading to 2.6 million deaths worldwide every year. In developing countries, obesity in children and adolescents is emerging as a major health problem.

Objective: To assess the prevalence and awareness of obesity and its risk factors among adolescents.

Materials and Methods: This community-based, cross-sectional study was carried out in schools of Guwahati city. Sixty adolescent school students, aged 10–19 years, were randomly selected, 30 each from a private and government urban school, to assess the prevalence of obesity using the WHO body mass index (BMI) and Agarwal BMI growth chart. Pretested, structured questionnaires were used to assess their physical activity, eating habits, awareness of obesity, and lifestyle risk factors. Statistical analysis was done using χ^2-test to compare proportions; p value < 0.05 was considered significant.

Result: Prevalences of overweight and obesity were 13.3% and 1.7%, respectively, using the WHO criteria and 6.7% and 10%, respectively, using Agarwal BMI growth chart. Prevalence of obesity using waist–hip ratio was 10%. Obesity was higher in private school, in boys, in nuclear families, in those consuming junk foods regularly, and in those who did not do regular exercise. About 35% of participants did not exhibit adequate knowledge about the impact of physical activity on healthy weight.

Conclusion: Prevalence and lack of awareness of obesity and its risk factors are major problems in adolescents in urban community. Hence, community-based lifestyle interventions programs should incorporate adolescents to improve their awareness about healthy lifestyle behavior to prevent obesity and its complications.

KEY WORDS: Adolescents, obesity, body mass index, risk factors, urban community

Introduction

Obesity has now emerged as a major health issue in developing countries, especially in India, which is presently facing a swift epidemiological changeover.[1] Overweight and obesity are chief elements of health resulting in undesirable metabolic changes and elevate the risk of noncommunicable diseases.[2] It is reported that the 2.2 billion adults were overweight in the world in 2013.[3] Urbanization, modernization, sedentary lifestyle, consumption of oily and junk foods, and other lifestyle changes have contributed to overweight and obesity. Obesity is associated with metabolic risks including high blood pressure, hyperlipidemia, and insulin resistance in both old and young people. Obesity has reached epidemic proportions in India in the twenty-first century, with morbid obesity [body mass index (BMI) ≥35 kg/m²] with one or more comorbid conditions][4] affecting 5% of the country's population.[5] It has been found that South Asians, including Indians, are genetically susceptible to weight accumulation, especially around the waist.[1] Increased accessibility of unhealthy, processed

Access this article online	
Website: http://www.ijmsph.com	Quick Response Code:
DOI: 10.5455/ijmsph.2016.18092015168	

food owing to continued integration into the global food markets, rapid urbanization, and lack of concurrent health education are the major contributory factors for the epidemic rise in obesity.

Leaving aside the adult community, today, more and more children and adolescents are being diagnosed with diabetes, hypertension, and other comorbid conditions that are associated with obesity.[2] In children and adolescents, obesity is slowly emerging as a main public health issue in many developing countries, including India. Childhood obesity is not simply a cosmetic problem. Childhood and adolescence are pivotal periods of life, where major physiological and psychological changes take place, which would transform into adult behavior and health status. The prevalence of overweight from studies around the world has been variably reported as ranging from 11.7% to 16.5%.[6] On the other hand, the prevalence of obesity among adolescents has been reported to be 18.1% in one study.[7]

There are a few studies reporting prevalence of childhood and adolescent obesity and overweight from different parts of India, which ranges from 3% to 29% and indicate that the prevalence is higher in urban than in rural areas.[2] In one study, the prevalence of overweight was 9.9% and obesity 4.8%.[8] Another multicentric study from India reported an overall prevalence of overweight/obesity as 18.2%.[9] A meta-analysis on childhood obesity in India has shown the prevalence of overweight as 12.6% and obesity as 3.4%.[10] However, there is no published literature on the prevalence and awareness about obesity and its risk factors among adolescents from the northeast region of the country.

In view of these contexts, this study was undertaken to study the prevalence and awareness of obesity and its risk factors among adolescents in educational institutions in an urban area from the northeast region of India.

Materials and Methods

A cross-sectional study was undertaken to study the prevalence and awareness of obesity and its risk factors among students aged 10–19 years, selected randomly from two randomly selected schools, one government and one private, from Guwahati, the largest city of the northeast of India, during the period from January to March 2015.

The sample size was estimated for infinite population by using the formula $4pq/d^2$, where prevalence was taken as 10%. The required precision of the estimate "d" was set as 20%. Using the abovementioned formula, the sample size was estimated to be 600. This, being a pilot study, was conducted on 10% of total sample size; hence, the sample size of this study was 60. Sample was selected by stratified and multistage random sampling procedure. The schools were selected by stratified random sampling from a list of all schools obtained from the district education office. During the first stage, the schools were divided into two groups: one group comprising the government schools and the other group comprising the private schools. At the second stage,

one school was selected from each group of government and private schools by simple random sampling to get the two target schools. Probability proportional to the size sampling technique was used to select 30 samples (participants) from each school, thus comprising a total sample size of 60.

After reaching the concerned school, the classes from which the students would be recruited for the study were selected by using simple random technique. At least two classes were selected from each school. Because each class had three to four sections, one class section was randomly selected from each selected class, and the participants were then selected from the particular class section by simple random technique using the students register, till the desired sample (15 numbers) from each section was met. In this way, a total of 60 adolescent participants were selected for the study from the two target schools, with 30 participants from each school, who were willing to participate voluntarily after meeting the selection criteria (aged 10–19 years) and gave their consent/assent for the study [Figure 1]. Ethical clearance was obtained from the institutional ethical committee. After obtaining verbal consent from the school authorities and ascent from the students, the willing participants were enrolled into the study. Standardized anthropometrical measurements of the participants were carried out in each participant. Weight was measured in the upright position without shoe to the nearest 0.1 kg using a calibrated electronic weighing machine. Height was measured without shoes to the nearest 0.1 cm using calibrated stadiometer. BMI was defined as the ratio of body weight to body height square, expressed as kilograms per square meter. Overweight and obesity were assessed by the WHO BMI classification[11] and Agarwal BMI chart.[12]

Complete data were collected from each participant using a predesigned, pretested questionnaire. Questionnaire schedule was designed on the basis of demographic variables, physical activities, and diet. Demographic variables such as age, sex, number of siblings, educational level, type of family, family income, and occupational status of the parents; and physical activities that included time spent in watching TV, outdoor game, indoor game, sleeping, and exercise/swimming/jogging were also noted. Diet preferences for junk food, chocolate, fried food, milk and milk products, fish and meat, typical family meal pattern, regular habit of breakfast, and respondent's opinion about impact of physical activities and diet on healthy lifestyle were documented. The socioeconomic status (SES) was assessed based on the modified Kuppuswamy classification.[13] Statistical analyses were done using Statistical Package for Social Survey (SPSS) for Windows, version 18.0. The χ^2-test was used to determine levels of significance between appropriate parameters; "p" values <0.05 were considered statistically significant. The results were tabulated and graphically represented using Microsoft Office for Windows 2008.

Result

The general demographic distribution of the participants is shown in Table 1. The total number of participants enrolled in
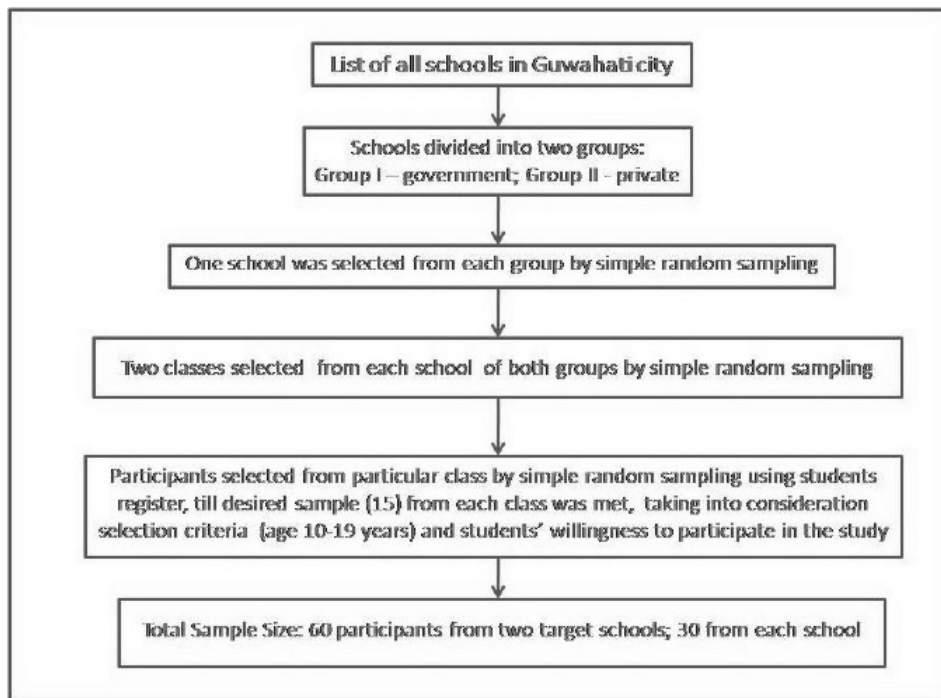
Figure 1: Flow chart showing process of selecting of samples for the study.

the study was 60, of which there were 36 boys and 24 girls. About 50% of the participants belonged to a government school, while the rest 50% belonged to a private school. Both the schools were coeducational in nature. The most common age group was 14 years (31.7%), and most belonged to the second birth order (58.3%). Majority of the participants belonged to Hindu religion (88.3%) and general caste (68.3%). Furthermore, 68.3% of the participants belonged to a nuclear family.

Educational qualification of the mother was high in majority of the study population. While 40% of the mothers were either graduates or postgraduates, only 6.7% was illiterate, and 71.7% of the mothers were housewives by profession. Similarly, 45% of the fathers were either graduates or postgraduates, and none were illiterate. About 36.7% were in government service. On the economic front, the monthly income-wise distribution showed that majority (68.3%) belonged to the high-income family group. Background health-related problems (diabetes, hypertension, and thyroid) were present in 23.3% of the parents. There were health problems in only one (1.7%) participant, with the remaining 59 (98.3 %) without any history of comorbid conditions [Table 2].

The overall prevalence of overweight and obesity was 13.3% and 1.7%, respectively, by the WHO classification and 6.7% and 10%, respectively, by the Agarwal classification. Prevalence of obesity was 10% according to waist–hip ratio [Table 3]. The prevalence of obesity was higher in private school than government school (8.3% vs. 1.7%).

On analyzing the association of obesity with selected demographic variables, it was found that there was no significant association between the prevalence of obesity among adolescents with selected demographic variables except for mother's occupation, which was found to be significant ($p = 0.049$) [Table 4]. Prevalence of obesity was higher in subjects from nuclear family when compared with those belonging to joint family (13.9% vs. 5.5%), although this difference was not statistically significant. Similarly, the prevalence of obesity among the subjects was higher in those whose mothers were professionals or were college educated (graduates or higher) when compared with those whose mothers' education was lower (high school or less; 19.2% vs. 3.6%), although this was not statistically significant.

Our study failed to show any significant association between the prevalence of obesity and consumption of junk food, or food items with higher glycemic index in the participants. However, although there was lack of such a definite association, the prevalence of such unhealthy food habits was found to be higher in those who were obese [Table 5].

In our study, we found a significant association between certain aspects of physical activities and lifestyle-related issues with the prevalence of obesity of the participants [Table 6]. There is a significant association between the prevalence of obesity with sedentary habits such as television watching and playing video or computer games when compared with active lifestyle habits such as exercise, swimming, and jogging.

Table 1: Showing distribution of participants according to different baseline demographic parameters

Parameters	Respondents	
	Frequency	Percentage
Type of school		
Government	30	50.0
Private	30	50.0
Category of school		
Coeducation	60	100.0
Medium of instruction		
English	30	50.0
Local vernacular (Assamese)	30	50.0
Class in which studying		
VII	15	25.0
VIII	15	25.0
X	15	25.0
XI	15	25.0
Age (years)		
11	1	1.7
12	7	11.7
13	8	13.3
14	19	31.7
15	16	26.7
16	9	15.0
Sex		
Male	36	60.0
Female	24	40.0
Birth order		
First child	35	58.3
Second child	18	30.0
Third child	6	10.0
≥Fourth child	1	1.7
Religion		
Hindu	53	88.3
Muslim	5	8.3
Christian	1	1.7
Others (Jain)	1	1.7
Category		
General category	41	68.3
Reserved category	19	31.7
Type of family		
Nuclear	41	68.3
Joint	15	25.0
Extended	4	6.7
Size of family (no. of members)		
3	15	25.0
4	21	35.0
5	10	16.7
>5	14	23.3

Table 2: Showing distribution of participants by socioeconomic, dietary, and family health parameters

Parameters	Respondents	
	Frequency	Percentage
Parental educational qualification		
Mother		
Illiterate	4	6.7
Primary school literate	6	10.0
Middle school certificate	2	3.3
High school certificate	13	21.7
Intermediate or posthigh school diploma	4	6.7
Graduate or postgraduate	24	40.0
Professional	7	11.7
Father		
Primary school literate	2	3.3
Middle school certificate	3	5.0
High school certificate	12	20.0
Intermediate or posthigh school diploma	6	10.0
Graduate or postgraduate	27	45.0
Professional	10	16.7
Parental occupation		
Mother		
Housewife	43	71.7
Worker	1	1.7
Private employee	4	6.7
Government employee	8	13.3
Business	4	6.7
Father		
Unemployed	1	1.7
Worker	10	16.7
Private employee	19	31.7
Government employee	22	36.7
Business	6	10.0
Professional	2	3.3
Total family income (INR per month)		
Poor (1,590–4,726)	1	1.7
Lower middle (7,878–11,816)	1	1.7
Upper middle (11,817–15,753)	17	28.3
High (15,754–31,506)	41	68.3
Dietary pattern		
Vegetarian	10	16.0
Nonvegetarian	50	83.3
Associated health problems		
Participant		
Hypertension and/or diabetes	1	1.7
None	59	98.3
Mother		
Hypertension	3	5.0
Diabetes mellitus	3	5.0
Thyroid problem	8	13.3
None	46	76.7
Father		
Hypertension	8	13.3
Diabetes mellitus	5	8.3
Thyroid problem	1	1.7
None	46	76.7

Table 3: Showing prevalence of obesity among participants according to different classifications

Weight category	No. of participants by different classifications		
	WHO classification, *n* (%)	Agarwal classification, *n* (%)	Waist–hip ratio, *n* (%)
Normal	51 (85)	50 (83.3)	–
Overweight	8 (13.3)	4 (6.7)	–
Obese	1 (1.7)	6 (10)	6 (10)

Table 4: Showing the association between prevalence of obesity with selected demographic variables in the participants

Demographic variables of the participants/parents	Weight category of participants			χ^2	*p*
	Nonobese	Obese	Total		
Type of school					
Government	29	1	30	2.963	0.085
Private	25	5	30		
Medium of instruction					
English	25	5	30	2.963	0.085
Assamese	29	1	30		
Class in which studying					
VII	12	3	15		
VIII	14	1	15	3.704	0.295
X	13	2	15		
XI	15	0	15		
Age of participants (years)					
11	1	0	1		
12	7	0	7		
13	6	2	8	3.157	0.676
14	17	2	19		
15	15	1	16		
16	8	1	9		
Sex of participants					
Male	29	7	36	0.781	0.385
Female	22	2	24		
Birth order of participants					
First child	30	5	35		
Secondchild	18	0	18	3.122	0.373
Third child	5	1	6		
Fourth child	1	0	1		
Religion					
Hindu	49	4	53		
Muslim	3	2	5	5.577	0.134
Christian	1	0	1		
Others	1	0	1		
Caste					
General	35	6	41	3.089	0.213
Reserved	19	0	19		
Type of family					
Nuclear	36	5	41		
Joint	14	1	15	0.849	0.654
Extended	4	0	4		

Table 4: Cont'd					
Size of family (no. of members)					
3	13	2	15		
4	19	2	21	1.587	0.662
5	10	0	10		
>5	12	2	14		
Education					
Mother					
Illiterate	4	0	4	3.183	0.786
Primary school	6	0	6		
Middle school	2	0	2		
High school	12	1	13		
Intermediate/diploma	4	0	4		
Graduate and above	20	4	24		
Professional	6	1	7		
Father					
Illiterate	2	0	2	2.202	0.821
Primary school	3	0	3		
Middle school	11	1	12		
High school	5	1	6		
Intermediate/diploma	25	2	27		
Graduate and above	8	2	10		
Occupation					
Mother					
Housewife	40	3	43	9.548	0.049
Manual worker	1	0	1		
Private employee	3	1	4		
Government employee	8	0	8		
Self-employed	2	2	4		
Father					
Professional	–	–	–	0.656	0.985
Unemployed	1	0	1		
Manual worker	9	1	10		
Private employee	17	2	19		
Government employee	20	2	22		
Self-employed	5	1	6		
Professional	2	0	2		
Total family income (INR/month)					
Poor (1,590–4,726)	1	0	1	0.284	0.963
Lower middle (7,878–11,816	1	0	1		
Upper middle (11,817–15,753)	15	2	17		
High (15,754–31,506)	37	4	41		
Dietary pattern					
Vegetarian	9	1	10	0 .000	0.990
Nonvegetarian	45	5	50		

Table 5: Showing association between prevalence of obesity and its risks factors

Risk Factors for obesity		Weight category of participants			χ^2	p
Parameters	Risk factors	Nonobese	Obese	Total		
Health problems in participants	Hypertension and/or diabetes mellitus	0	1	1	9.153	0.002
	None	54	5	59		
Health problems in mother	Hypertension	2	1	3	14.207	0.003
	Diabetes mellitus	1	2	3		
	Thyroid problem	7	1	8		
	None	44	2	46		
Health problems in father	Hypertension	5	3	6	1.744	0.783
	Diabetes mellitus	4	1	5		
	Thyroid problem	1	0	1		
	None	46	2	48		
History of junk food intake	No	5	0	5	0.606	0.436
	Yes	49	6	55		
History of taking aerated beverages	No	7	0	7	0.881	0.348
	Yes	47	6	53		
How often eating outside (restaurant, dhaba, and eateries)	Daily	2	0	2	1.744	0.783
	Never	5	0	5		
	Rarely	15	1	16		
	Sometimes	32	5	37		

Table 6: Showing association between prevalence of obesity and its risks factors related to physical activity

Characteristics of physical activity/inactivity		Weight category of participants			χ^2	p
Type	Parameter	Nonobesity	Obesity	Total		
Time spent in watching television (hours/day)	0–2	42	3	43	18.632	<0.001
	>5	12	1	13		
	3–4	0	2	2		
Time spent in computer/video games (hours/day)	0–2	44	2	46	9.855	0.020
	3–4	7	3	10		
	>5	1	1	2		
	Nil	2	0	2		
Time spent in for outdoor games/activities (hours/week)	10 h	9	1	10	0.904	0.970
	20 h	1	0	1		
	5 h	38	5	43		
	8 h	1	0	1		
	Nil	5	0	5		
Time spent in for indoor games (hours/week)	10 h	7	1	8	9.784	0.134
	15 h	1	0	1		
	20 h	0	1	1		
	5 h	41	4	45		
	6 h	1	0	1		
	Nil	4	0	4		
Duration of sleep(hours/day)	10 h	3	0	3	0.516	0.915
	5 h	1	0	1		
	6 h	10	1	11		
	8 h	40	5	45		

Table 7: Showing participants' response to questionnaire on awareness of obesity and related risk factors

What do you think/how do you feel about your weight?	Frequency	Percentage
No response	20	33.33
A bit low	1	1.67
According to my physician, I have got heavier bones, and, so, I have a weight of 6.2 kg.	1	1.67
Feel good	1	1.67
Great. I do not think I am underweight but some people do think so.	1	1.67
I think that I am overweight and should control my weight.	1	1.67
I am happy and satisfied with my weight.	1	1.67
I am happy with it.	2	3.33
I am overweight.	1	1.67
I do not know my weight is normal.	1	1.67
I do not think about my weight.	1	1.67
I feel I am overweight.	1	1.67
I feel I should lose some weight. My family has tendency of getting obese; so keeping this thing in my mind, I would lose some weight.	1	1.67
I feel low weight	1	1.67
I feel my weight is good	1	1.67
I feel my weight is normal	3	5.00
I feel normal	2	3.33
I feel okay about my weight	1	1.67
I feel that I have to lose 5 kg; then, I would say that my weight is okay.	1	1.67
I feel that my weight is perfect as per my height.	1	1.67
I think I am overweight, and I need to lose some weight.	1	1.67
I think I am underweight.	1	1.67
I think indeed try be a little bit thin and taller.	1	1.67
I think it is okay.	1	1.67
I think it is okay. I am fine with my weight.	1	1.67
I think my weight is normal when compared with my age.	2	3.33
I think, my weight is normal, but, as I look thin, I do not get satisfied about my physic as I should be healthier and eat healthy diet.	1	1.67
Low	1	1.67
My weight is normal.	2	3.33
My weight is quite normal.	2	3.33
Normal	3	5.00
Overweight; I have started workout last 14 days.	1	1.67

On enquiring the participants about their perception about their own weight and awareness about lifestyle activities with regard to obesity, it was found that majority of participants (30%) thought/felt that were of normal weight, 15% of overweight, and 15% of underweight, and 33.33% were not aware about their weight [Table 7]. Responses of the participants with regard to means of adopting a healthy lifestyle showed that 18 (30%) subjects tried to maintain healthy weight by regular exercise, jogging, playing, cycling, swimming, yoga, good diet, etc., while 22 (36.66%) participants responded that they did not do anything to maintain healthy weight. One (1.67%) participant used to take lot of food to maintain healthy weight, and 19 (31.67%) participants showed no response [Table 8].

On enquiring the participants about what they think about the impact of physical activity on healthy weight, our study showed that about 65% of participants revealed good knowledge about the impact of physical activity on healthy weight, and 35% showed no knowledge about any such association between body weight and healthy lifestyles [Table 9].

Discussion

This study was aimed to assess the prevalence of obesity and its risk factors among adolescents in urban educational institutions. The overall prevalence rate of overweight and

Table 8: Showing participants' response to the questionnaire on healthy lifestyle behavior

Have you tried to do anything to get a healthier weight?	Frequency	Percentage
No response	19	31.67
Eat lots of food	1	1.67
Exercise	1	1.67
I do regular exercise to maintain a good health.	1	1.67
Jogging	1	1.67
Nil	22	36.66
Very rarely	1	1.67
Yes	1	1.67
Yes. Now, every morning I wake up from the bed and start my regular exercise.	1	1.67
Yes, exercise	2	3.33
Yes, I do go for regular morning walk and try to consume less oily food as much as possible.	1	1.67
Yes, I go for swimming in my summer vacation.	1	1.67
Yes, I have tried a lot to get a healthier weight by doing exercises and all.	1	1.67
Yes, I have tried many times to get a nice healthy body. I tried to eat more and more food to become healthy and not thin as I am. Now, lot to get a healthier weight by doing exercises and all.	1	1.67
Yes, I try to maintain a good diet and eat less oily food.	1	1.67
Yes, playing	1	1.67
Yes, such as doing exercise, cycling, and taking nutritional supplements.	1	1.67
Yes, walking	1	1.67
Yoga	2	3.33

obesity was 13.3% and 1.7%, respectively, according to the WHO classification. According to the Agarwal classification, the prevalence of overweight and obesity was 6.7% and 10%, respectively, while the prevalence of obesity was 10% according to waist–hip ratio. Several prior studies done in India showed a comparatively higher prevalence of overweight and obesity among adolescents when compared with our study.[8,14–18]. In a study from Kolkata, the overall prevalence rates of overweight and obesity were 28.5% and 4.2%, respectively.[19] Another previous study that included only girls had shown that overweight and obesity among school girls were 17.63% and 5.1%, respectively.[20] A study from Delhi has, however, showed a comparatively lower rate of overweight at 7.4%.[21] An important finding of this study is an ever burgeoning prevalence of obesity among the adolescents, which is in similar trends to various other studies in India. This study has shown figures that could suggest an obesity epidemic in the twenty-first century. The reason for high prevalence of obesity among adolescents may be owing to selection of subjects from very affluent societies and different schools. The WHO has described obesity as one of today's most neglected public health problems. Following the increase in adult obesity trends, the proportion of children and adolescents who are overweight and obese are also been increasing.[19]

Among the selected demographic variables, the prevalence of obesity is higher in private school than government school (8.3% vs. 1.7%). A study done by Patnaik et al.[22] showed that the prevalence of overweight and obesity was 14.1% and 14.53%, respectively, in private school. Another study revealed that the prevalence of obesity was found to be higher in private school and in those staying in nuclear family.[18] In another study among schoolgoing children, a higher prevalence (9.7%) of obesity was found among English-medium schools when compared with other schools (3.7%).[19] This finding suggests that students in these school settings may be less involved in physical activities. The students may be reluctant about being involved in physical activities in their daily life patterns, such as playing outdoor games and practicing yoga. Besides food intake habits, these exercise factors may also have an influence on overweight and obesity.

The prevalence of obesity is higher in male subjects (6.6%), firstborn child (8.3%), Hindu religion (6.6%), general caste (10%), and nuclear family (8.3%). Several previous studies in India showed that the prevalence of obesity is higher in male than female subjects.[21–26] The graduate and postgraduate level of mothers education (6.6%) was shown to identify adolescents with a higher likelihood of obesity. The prevalence of obesity was higher (8.3%) in families with higher monthly income (Rs. 15,754–31,506). Previous studies have shown that the subjects belonging to high SES score significantly higher on BMI than the subjects from low SES group.[1]

Among the risk factors, the prevalence of obesity was higher among adolescents of parents who were showing health problems such as hypertension, diabetes mellitus, and thyroid. Prevalence of obesity was also found to be higher in those who were consumers of junk food (10%), aerated commercial beverages (10%), or revealed prolonged television viewing (>5 h, 3.3%). The prevalence of obesity was higher among adolescents who played video or computer

Table 9: Showing participants' response to questionnaire on impact of physical activity on body weight

What do you think about the physical activity on impact of body weight?	Frequency	Percentage
No response	21	35.00
Good impact	4	6.67
I think about the activities on impact of healthy weight that should be good and helpful.	1	1.67
I think it maintains our weight and makes us healthy.	1	1.67
I think only healthy diet is not enough to keep a healthy weight. Physical activity is equally important.	1	1.67
I walk with my mother mostly everyday but no impact.	1	1.67
It has a good impact.	1	1.67
It has positive effect.	1	1.67
It has very good impact.	1	1.67
It helps us away from many kinds of diseases and keeps us fit and active to have a healthy weight.	1	1.67
It helps us to have a healthy weight.	1	1.67
It helps in healthy body.	1	1.67
It is extremely necessary to maintain a good weight. The physical activities help to cut down all the calorie levels.	1	1.67
It is good for healthy weight.	1	1.67
It is necessary for maintaining a good health.	2	3.33
It is very effective.	1	1.67
It makes healthy.	2	3.33
It will reduce all our diseases, and we will not suffer any major problem such as diabetes, high blood pressure, or heart disease.	1	1.67
Jogging	1	1.67
Physical activity for health	3	5.00
No idea as much	1	1.67
Physical activity can help to maintain a healthy weight; it helps us away from various diseases.	1	1.67
Physical activity help in keeping us fit.	1	1.67
Physical activity help in keeping us fit. With healthy diet, we also need to exercise.	1	1.67
Physical activity is good for maintaining good health.	1	1.67
Physical activity is indeed an important factor to keep healthy weight as it energizes our body for many activities.	1	1.67
Physical activity is the best way of becoming healthy and getting a healthy weight. I just do not do exercise at all, which makes me unhealthy or unfit as I am already.	1	1.67
Physical activity is very important factor to maintain a healthy weight. Physical activity help us to burn our calories.	1	1.67
Physical activities keep us healthy and fit. It helps us away from various diseases.	1	1.67
Physical activity has impact of healthy weight	1	1.67
Very good effect	1	1.67
When we do physical activity, our blood circulation goes in proper order, which prevents us from health problem.	1	1.67
Yoga and activities are needed.	1	1.67

games each day for 3–4 h (5%), in those who played outdoor games and indoor games for only 5 h per week (8.3%), and in those who were not doing exercise/swimming/jogging (8.3%). One of the major reasons for childhood obesity is watching television and using computers for long durations instead of outdoor games. Physical activity during leisure period either at school or at home is found to be related inversely to overweight and obesity.[8] Children with outdoor game activity in association with good eating habits are found to be healthy and protected from obesity and overweight.[8] As reported by Moazeri et al.,[27] the association between BMI and physical activity in children shows that, as the amount of physical activity increases, the prevalence of overweight and obesity decreases.

This study revealed that a majority (30%) of adolescents perceived that they were of normal weight. From the study,

it was found that 30% of adolescents tried to maintain healthy weight by regular physical activity and a healthy diet. While 65% of the participants showed knowledge about the impact of physical activity on body weight, the remaining 35% of the subjects did not reveal knowledge about the impact of physical activity on healthy weight. Thus, from this study, it is evident that factors such as family history, diet pattern, lack of physical activity, and sedentary lifestyles have led to overweight and obesity, and it is time to think of strategies to curb this epidemic at the earliest, lest it should run out of control. Therefore, interventions on lifestyle changes should be planned in such a way so as to give equal priority to the younger population of the community as well. Intervention should start in the adolescent age when they are also most receptive for such lifestyle interventions.

Conclusion

This study was aimed to assess the prevalence of obesity and its risk factors among adolescents in urban educational institutions. The study showed that adolescent obesity is a major public health problem along with a general lack of awareness about the risk factors for obesity. Schools should play a pivotal role in maintaining healthy behaviors in the form of eating habits and promoting physical activities. Periodic screening for overweight among adolescents should be done in schools, followed by counseling of parents of overweight adolescents on lifestyle modification. The importance of living a healthy lifestyle should be emphasized at the family level, and parents need to be role models by living a healthy lifestyle themselves.

References

1. Jain G, Bharadwaj SK, Joglekar AR. To study the prevalence of overweight and obesity among school children (13–17 yrs) in relation to their socioeconomic status and eating habits. Int J Scientific Res Publications 2012;2(6):1–4.
2. Brahmbhatt KR, Oza UN. Obesity among adolescents of Ahmadabad city, Gujarat, India-a community based cross-sectional study. Int J Biol Med Res 2012;3(2):1554–7.
3. Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet 2014;384(9945):766–81.
4. North American Association for the Study of Obesity, National Heart, Blood Institute, National Institutes of Health (US), & NHLBI Obesity Education Initiative. (2000). *The Practical Guide: Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. National Institutes of Health, National Heart, Lung, and Blood Institute, NHLBI Obesity Education Initiative, North American Association for the Study of Obesity.* Available at: https://www.nhlbi.nih.gov/files/docs/guidelines/prctgd_c.pdf (Last accessed on September 01, 2015).
5. Gothankar JS. Prevalence of obesity and its associated comorbidities amongst adults. Natl J Community Med 2011;2(2):211–24.
6. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. BMJ 2000;320:1240–3.
7. National Center for Health Statistics. *Health, United States, 2004 with Chartbook on Trends in the Health of Americans Hyattsville, MD; 2004.* Available at : http://www.vrp.com/detoxification/safeguard-yourfamily (Last accessed on September 01, 2015).
8. Kotian MS, Kumar SG, Kotian SS. Prevalence and determinants of overweight and obesity among adolescent school children of South Karnataka, India. Indian J Community Med 2010;35: 176–8.
9. Khadilkar VV, Khadilkar AV, Cole TJ, Chiplonkar SA, Pandit D. Overweight and obesity prevalence and body mass index trends in Indian children. Int J Pediatr Obes 2011;6(2-2):216–24.
10. Midha T, Nath B, Kumari R, Rao YK, Pandey U. Childhood obesity in India: a meta-analysis. Indian J Pediatr 2012;79: 945–8.
11. World Health Organization. *BMI Classification. Global Database on Body Mass Index.* Geneva: WHO, 2006.
12. Agarwal KN, Upadhyay SK, Mittal R, Prakash R, Rai S. Physical and sexual growth pattern of affluent Indian children from 5–18 years of age. Indian Pediatr 1992;29:1203–82.
13. Sharma R. Kuppuswamy's socioeconomic status scale—revision for 2011 and formula for real-time updating. Indian J Pediatr 2012; 79(7):961–2.
14. Ramachandran A, Snehalatha C, Vinitha R, Thayyil M, Kumar CK, Sheeba L, et al. Prevalence of overweight in urban Indian adolescent school children. Diabetes Res Clin Pract 2002;57(3):185–190.
15. Chatterjee P. India sees parallel rise in malnutrition and obesity. Lancet 2002;360(9349):1948.
16. Kaur S, Kapil U, Singh P. Pattern of chronic diseases amongst adolescent obese children in developing countries. Curr Sci 2005;88(7):1052–6.
17. Marwah P, Marwah A, Kaur P. To assess the prevalence of obesity among affluent school children in Patiala, Punjab and identify its associated risk factors. Pediatr Oncall J 2012;9(4):93–5.
18. Khadilkar VV, Khadilkar AV. Prevalence of obesity in affluent school boys in Pune. Indian Pediatr 2004;41(8):857–8.
19. Mandal A, Mandal GC. Prevalence of overweight and obesity among the urban adolescent English Medium School girls of Kolkata, India. Italian J Public Health 2012;9(3):1–5.
20. Bose K, Bisai S, Mukhopadhyay A, Bhadra M. Overweight and obesity among affluent Bengalee schoolgirls of Lake Town, Kolkata, India. Matern Child Nutr 2007;3(2):141–5.
21. Kapil U, Singh P, Pathak P, Dwivedi SN, Bhasin S. Prevalence of obesity amongst affluent adolescent school children in Delhi. Indian Pediatr 2002;39(5):449–52.
22. Patnaik S, Patnaik L, Patnaik S, Hussain M. Prevalence of overweight and obesity in a private school of Orissa, India. Internet J Epidemiol 2010;10(1):1–4.
23. Keerthan Kumar M, Prashanth K, Shetty M, Navya N, Kavya CP, et al. Prevalence of obesity among high school children in Dakshina Kannada and Udupi districts. Nitte Univ J Health Sci 2011;1(4):16–20.
24. Chaitali G, Mangala S, Hemalatha AJ, Pradeep C, Subrahmanyam G. Childhood and adolescent overweight and obesity—a public health challenge in India. Int J Sci Stud 2014;2(4):17–9.
25. Wang L, Slawson DL, Relyea G, Southerland JL, Wang Y, Prevalence of and risk factors for adolescent obesity in Southern Appalachia, 2012. Prev Chronic Dis 2014;11:1403–48.

26. Aggarwal T, Bhatia RC, Singh D, Sobti PC. Prevalence of obesity and overweight in affluent adolescents from Ludhiana, Punjab. Indian Pediatr 2008;45(6):500–2.
27. Moayeri H, Bidad K, Zadhoush S, Gholami N, Anari S. Increasing prevalence of iron deficiency in overweight and obese children and adolescents (Tehran Adolescent Obesity Study). Eur J Pediatr 2006;165(11):813–4.