

Prevalence of overweight and obesity among adolescents (13-15 years) in Jorhat town

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■ **ABSTRACT** : The prime objective of the study was to assess the prevalence of overweight and obesity and thereby correlate it with life style factors of adolescents of Jorhat town, Assam. Body Mass Index [BMI] criteria was used to screen out the overweight and obese samples from 1007 adolescents belonging to seven High Schools of the town area. Standard techniques and structured, pre-tested schedules were used to elicit information on different parameters of the screened samples. The survey revealed the prevalence of overweight and obesity to be 4 per cent and 0.4 per cent, respectively. Percentage distribution of overweight and obesity according to gender showed 1.6 per cent and 0 per cent among boys and 2.6 per cent and 0.4 per cent among girls. Majority of overweight and obese were from the 15 years age group, the prime cause being physical inactivity. Positive association between BMI and fast food consumption was obtained for both boys ($r=0.5422$) and girls ($r=0.0097$). Boys spent an average of 17.5-19.5 hours in sedentary activities while girls spent more hours in sedentary activities (18-20 hours). Mean physical efficiency index (PEI) of boys ranged from 38.10-47.28 and that of girls ranged from 37.49-41.08 for different age groups, exhibiting a very poor physical efficiency. Correlation between BMI of screened samples and affluency also showed a positive association both for boys ($r=0.2748$) and girls ($r=0.1758$). Increasing prevalence of obesity in a population, particularly among children and adolescents is an early indicator of emerging health burden due to non-communicable diseases which needs to be addressed. Formulation of need based govt. and non-govt. programmes could help to provide appropriate measures to combat the menace along with school and college campaign focusing on allied aspects of overweight and obesity.

■ **KEY WORDS**: Overweight, Obesity, Prevalence, BMI, Life style factors

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Obesity is a public health problem of increasing concern in the developed world and in populations undergoing cultural transitions. Overweight and obesity are widely prevalent in several developing countries, particularly in areas of rapid transition and is affecting both children and adults. Adolescence is the transitional stage in the life cycle linking childhood with adulthood – a crucial period of life. The most important physiological group deserves attention of the health and nutritional status particularly in terms of overweight and obesity. The problem has become almost an epidemic and obesity has become globesity. Researchers have

expressed concern over the increase in the sedentary habits of children in the developing countries. Morbid obesity in children and adolescents can be associated with musculo-skeletal problems as well as unusual cardio-pulmonary compliance, such as respiration failure and pulmonary hypertension. The hypoactive child becomes indifferent to play and exercise resulting in greater degrees of obesity, in turn increasing the sedentary lifestyle. BMI is the most commonly used measure of overall obesity, while waist circumferences and skin folds are measures of central obesity (WHO, 2000).

While this global epidemic is well described in the adult population, not much data are available regarding the prevalence of overweight/ obesity in children or adolescents among developing countries. In India, the problem of obesity has been scantily explored in the affluent population groups (Asthana *et al.*, 1998).

Therefore, with a view to explore the prevalence of overweight and obesity among adolescents in Jorhat town, this study was undertaken, with the following objectives:

- To screen out the overweight and obese adolescents using Body Mass Index (BMI).
- To correlate the prevalence of overweight and obesity with different life style factors.

■ RESEARCH METHODS

The study was undertaken on selected samples from seven High Schools, both English and Assamese medium situated in Jorhat district of Assam. Permission to conduct the study in these schools were obtained from the Head Master/ mistress/ principal of the respective schools. Written consent from the parents/ guardians was also obtained prior to commencement of the study.

The sample population consisted of adolescent boys and girls in the age group of 13-15 years studying in class VIII – IX. Overweight and obese adolescents were screened out for detail investigation using BMI criteria, for the basic frame of 1007 samples. A pre- tested questionnaire was administered to each and every subject to collect data on their life-style factors.

Anthropometric assessment for weight and height to calculate the BMI were done using standard techniques (Rao and Vijayaraghavan, 1996). Weight was measured with krups

platform balance, with a sensitivity of 0.10 kg and height was measured with a rod with a sensitivity of 0.1mm. WHR was also assessed to calculate the degree of abdominal adiposity. Skinfold thickness was measured to determine the percentage of fat using a Herpenden skinfold calliper with a sensitivity of 0.2mm. The sites for skinfold measurement were tricep skinfold, subscapular skinfold and supraillac skinfold.

Apart from this, different parameters like dietary practices, life-style factors and physical endurance test were also studied. To elicit information on the life style factors of pre-tested semi-structured questionnaire was administered among the subjects, wherein in the aspects of socio-economic profile, family background and parental particulars, dietary pattern and activity patterns were recorded.

■ RESEARCH FINDINGS AND DISCUSSION

A total of 1007 school children were included in the study out of which 44 children were screened out as overweight and obese adolescents.

Overall prevalence of overweight and obesity in the total population was found to be 4 per cent and 0.4 per cent, respectively. Prevalence of obesity being very nominal was contributed by only 0.3 per cent class I and 0.1 per cent class II obese sample. The result is presented in Table 1.

Since the study population consisted of both boys and girls, the prevalence of overweight and obesity was further classified according to sex and the results of which are presented in Table 2.

From Table 2, it is apparent that none of the boys was obese and only 1.6 per cent of them were overweight. On the other hand, prevalence of overweight and obesity was prominent in girls with 2.4 per cent and 0.4 per cent,

Table 1 : Percentage prevalence of overweight and obesity among total samples

Age	Total samples	Overweight	Percentage	Obese	Percentage
13-15	1007	40	4	4	0.4

Table 2 : Distribution of overweight and obesity among total samples according to sex

Sex	Overweight	Percentage	Obese	Percentage	Total prevalence
Boys	16	1.6	0	0	1.6
Girls	24	2.4	4	0.4	2.8
Total		4.0		0.4	4.4

Table 3 : Distribution of overweight and obesity among total samples according to age and sex

Sex	Age group (years)	Overweight	Obese	Total
Boys (n = 16)	13 (n=2)	2	0	2
	14 (n=3)	3	0	3
	15 (n=11)	11	0	11
Girls (n = 28)	13 (n=6)	6	0	6
	14 (n=7)	5	2	7
	15 (n=15)	13	2	15

respectively. Thus, girls were outnumbered boys in the prevalence rate of overweight and obesity.

The overweight and obese adolescents were selected from three age groups *i.e.* 13, 14 and 15 years and therefore, they were also distributed according to age and sex as presented in Table 3.

It is observed from Table 3 that, a total of 16 boys and 28 girls were overweight and obese, respectively. Among the boys none were obese, but out of 28 girls 4 were found to be obese. Among all the age groups, more numbers of overweight and obese adolescent girls and boys were found in the 15 year age group.

Prevalence of overweight and obesity in the total population was found to be 4 per cent and 0.4 per cent, respectively. In a study conducted by Sidhu *et al.* (2005), it was found the prevalence of overweight and obesity among boys and girls to be 9.91 per cent and 4.95 per cent, respectively among 640 affluent school children in Amritsar. This study too observed the large number of girls being obese than boys, however, prevalence study was comparatively lower than the study under reference.

Similar findings were reported by Aggarwal *et al.* (2008) for 1000 affluent school children in Ludhiana, where overweight and obesity prevalence were found to be 12.7 per cent and 3.4 per cent, respectively. Subramanyam *et al.* (2003), Ukegbu *et al.* (2007) and Kapil *et al.* (2002) also reported similar results.

In due course of the present investigation, different life style factors were identified which are as follows :

- Dietary practices
- Physical activity levels
- Affluency

These life-style factors were studied with a pre-structured and pre-tested interview schedule. The detailed investigations of these are presented in subsequent tables and figures and the correlations between BMI and life-style factors of the overweight and obese samples were studied individually.

Dietary practices :

The dietary practices of the screened overweight and obese adolescents were studied in terms of consumption frequency of fast foods. More and more people are now-a-days inclined towards, the fast food culture. This emerging trend is influencing the adolescent section of the society at the fastest rate. Thus, results of detailed investigations regarding consumption of fast foods by the adolescent boys and girls are depicted in the following figures.

From Fig. 1(A), it is seen that majority (10) of the boys out of 16 consumed fast foods, 20 days a month, followed by 2 consuming 16 days a month, and 1, 2 and 3 boys consuming 12, 8 and 4 days a month, respectively.

Analysis of fast food consumption frequency by the girls revealed that, 32.14 per cent consumed 20 days a month, 50 per cent consumed 12 days a month followed by 14.28 per cent and 3.57 per cent consuming 12 days and 4 days a month, respectively (Fig. 1B).

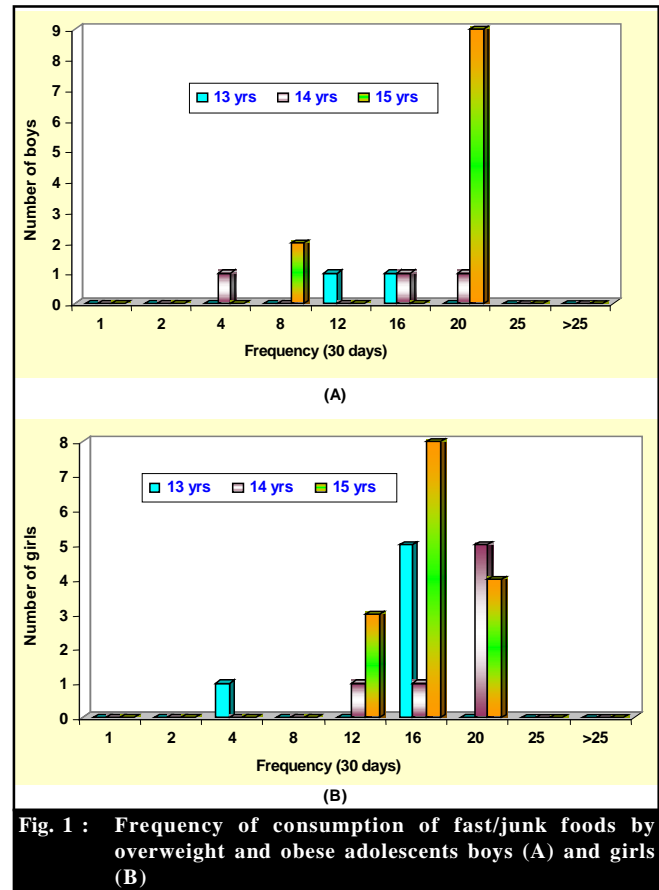


Fig. 1 : Frequency of consumption of fast/junk foods by overweight and obese adolescents boys (A) and girls (B)

Boys consumed fast foods more frequently than girls. The frequency rate of fast food consumption was higher in 15 year old boys and girls in comparison to other age groups. Since boys and girls at the age of 15-16 years move out for their tuitions and coaching classes, they opt to eat some quick foods during evening times thereby leading to higher consumption of fast foods. Moreover, boys specially opted to move about more with friends and peers than girls. Girls do

Table 4 : Correlation between BMI and dietary practices of overweight and obese adolescents (13-15 years)				
Dietary practices	Boys (n=16)		Girls (n=28)	
	r values	t values	r values	t values
Frequency of fast food consumption	0.5422	2.414*	0.0097	0.049

* Significant at 0.05 level of significance

not get much liberty to move about with friends at this age and are therefore confined to their homes or accompanied by parents to tutorials classes. This may be a primary cause of boys consuming fast foods more frequently than girls. Similar observations were reported by Singh and his co-workers in 2006 and Aggarwal *et al.* in 2008.

Correlation between overweight and obesity with lifestyle factors :

The food habits and life-style factors were studied in details under different sections. Thereby, an attempt was made to correlate the occurrence of overweight and obesity in terms of BMI with life-style factors to assess the degree of association between them (Table 4).

When correlation was done between BMI and dietary practices (Table 4) in terms of frequency of consumption of fast foods, a positive association was obtained for both boys ($r= 0.5422$) and girls ($r= 0.0097$). A statistically significant correlation was observed between BMI of boys with frequency of fast food consumption. Thus, it can be rightly opened that consumption of fast foods was a major cause of higher prevalence of overweight and obesity among screened samples.

Physical activity levels :

The amount of physical activity performed by the

overweight and obese adolescents were computed by cross-checking and the data were gathered during home visit and from the maintenance of diary for 3 consecutive days. Some preliminary information regarding time spent on physical activities at school were also obtained from the school authorities.

Table 5 depicts the average time spent on different activities both at home, outside and school. The activities were categorized into sedentary, moderate and heavy activities. The relative energy expenditures were therefore, calculated for both the genders based on individual results.

From the results presented in Table 5, it is evident that boys spent an average of 17.5-19.5 hours on sedentary activities, highest by 14 years and least by 13 years. An average of 2.5 hours was spent on moderate activities by boys of all age groups followed by 2-4 hours on heavy activities. Boys of 13 years spent highest on heavy activities while 15 years boys spent lowest on heavy activities. A similar trend was observed for girls also. It was observed that girls spent more hours in sedentary activities (18-20 hours) when compared with that of boys. The hours spent on heavy activities (45 mins – 1 hour) by girls were considerably less than that of boys.

The mean energy expenditure was calculated separately for boys and girls from the time spent on different activities using BMR factors. Highest energy expenditure on sedentary

Table 5 : Average time spent on different activities with mean energy expenditure by overweight and obese adolescents (13-15 years)

Sex	Age group (years)		Time spent (hrs)			Energy expenditure (Kcal)		
			Sedentary activity	Moderate activity	Heavy activity	Sedentary activity	Moderate activity	Heavy activity
Boys (n=16)	13 (n=2)	Mean	17.500	2.500	4.000	1407.000	435.000	1494.000
	14 (n=3)	Mean	19.500	2.167	2.333	1589.000	394.000	648.000
	15 (n=11)	Mean	19.455	2.500	2.045	1587.818	440.455	700.364
Girls (n=28)	13 (n=6)	Mean	18.833	3.583	1.583	1508.500	643.500	519.000
	14 (n=7)	Mean	19.000	3.286	1.786	1494.429	591.286	565.714
	15 (n=15)	Mean	20.133	3.083	0.783	1616.000	551.800	254.400

Table 6 : Mean physical efficiency index (PEI) scores of overweight and obese adolescents (13-15 years)

	Boys (n=16)			Girls (n=28)		
	13 yrs	14 yrs	15 yrs	13 yrs	14 yrs	15 yrs
Mean	47.285	44.810	38.105	41.085	37.494	38.837
SD	1.209	10.381	5.106	7.325	3.807	8.498
SE	0.855	5.994	1.539	2.990	1.439	2.194

Score	Physical condition
91 and above	Superior
81-90	Excellent
71-80	Good
61-70	Fair
51-60	Poor

Source : Gallagher and Brouha, 1943

activities was seen in boys of 14 years (1589.000 Kcal) and lowest in 13 years (1407 Kcal). Energy expenditure on heavy activities was highest for 13 years (1494 Kcal) and lowest for 15 years (648 Kcal). Very low energy expenditure ranging from 394 Kcal – 435 Kcal was recorded on moderate activities (Table 5).

In case of girls, the energy expenditure on sedentary activities was highest (1616 Kcal) among 15 years and lowest (1508 Kcal) among 13 years age group. In heavy activities, the energy expenditure was highest (565 Kcal) among 14 years and lowest (254 kcal) among 15 year old girls. Girls too spent less energy on moderate activities ranging from 551 Kcal – 643 Kcal for different age group.

Analysis of results revealed that the time spent on sedentary activities were highest among 15 years adolescent boys and girls and more among boys than girls. It may be due to the fact that adolescents at this age are loaded with the burden of academic schedules both at home and school. Adolescents are more involved in their studies and coaching classes. Consequently very less time is left for engagement in outdoor sports and activities.

Home visits and survey on means of transportation to schools and other places revealed that now-a-days children are more dependent on using their parents cars/bikes, hired rickshaws and school buses as a means of communication to school and other places instead of walking or cycling. This is also seen to contribute highly towards decreased physical activity leading to reduced energy expenditure.

Information collected on physical activities at school revealed that all the schools allotted a stipulated time of 2 periods (35-40 minutes each) per week for physical training. A part from this, during lunch break, most of the students failed

to engage themselves in active play or sports, rather they preferred roaming about with their friends and class-mates. This is therefore, a contributing factor towards reduced physical activity. Similar observations were reported by Singh *et al.* (2006), Aggarwal *et al.* (2008) and Sidhu and Prabhjot in 2004 also observed similar results.

Physical endurance :

The physical endurance of the screened overweight and obese adolescents were studied through a Modified Harvard Step Test. The result of the physical endurance test was utilized to compute physical efficiency index (PEI) scores, which are presented in Table 6.

The Physical Efficiency Index (PEI) score of boys ranged from 38.10-47.28 and that of girls ranged from 37.49-41.08 for different age groups. The PEI scores were assessed to study the state of physical efficiency. Since majority of the overweight and obese boys and girls spent a greater proportion of their time on sedentary activities, therefore, the PEI scores exhibited very poor physical efficiency when evaluated using the scale set by Gallagher and Brohua (1943). It was very discouraging to observe that 100 per cent of the overweight and obese adolescents exhibited very poor physical efficiency.

Correlation between BMI and physical activity level of overweight and obese adolescents :

Correlation between BMI of overweight and obese samples with physical activity levels is presented in Table 7.

Correlation between BMI of overweight and obese samples with physical activity levels indicated a positive association (Table 7). Physical inactivity levels were computed

Table 7 : Correlation between BMI and physical activity level of overweight and obese adolescents (13-15 years)

Physical activity	Boys (n=16)		Girls (n=28)	
	r values	t values	r values	t values
Time spent on sedentary activities	0.0248	0.093	0.0929	0.476
Total energy expenditure	-0.0127	0.048	-0.2116	1.104
PEI score	-0.2554	0.988	-0.3677	2.016

Table 8 : Distribution of overweight and obese adolescents (13-15 yrs) according to family income range (13-15 years)

*Income range (Rs.)	Boys (n=16)		Girls (n=28)	
	Overweight	Obese	Overweight	Obese
<5000	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
5000-7000	1 (2.27)	0 (0.00)	1 (2.27)	0 (0.00)
7000-9000	2 (4.54)	0 (0.00)	1 (2.27)	1 (2.27)
>9000	13 (29.54)	0 (0.00)	22 (50.00)	3 (6.81)

Figures in parenthesis indicate percentage of total

Table 9: Correlation between BMI and family income level of overweight and obese adolescents (13-15 years)

Affluency	Boys		Girls	
	r values	t values	r values	t values
Income	0.2748	1.069	0.1758	0.911

in terms of time spent on sedentary activities and total energy expenditure from all activities. Positive 'r' values for boys (0.0248) and for girls (0.0929) indicated that with the increase in time spent on sedentary activities, there was an increase in BMI of the screened samples. On the other hand, ($r=-0.0127$) and ($r=-0.2116$) for boys and girls, respectively for total energy expenditure from different activities suggests that, BMI of the screened sample increases with decrease in total energy expenditure. Thus, these two factors highly contributed towards elevated BMI among the screened samples.

Again 'r' values of -0.2554 and -0.3677 for PEI score for boys and girls, respectively indicated a positive association although the degree of correlation was negative. It was observed that, with the increase in BMI of the overweight and obese adolescents, the PEI score decreased significantly, which is already evident from the poor physical efficiency during earlier investigations.

Affluency :

Affluency is considered as a major contributing factor towards development of overweight and obesity. In the present study, it was observed that 89.28 per cent girls and 81.25 per cent boys belonged to the affluent class of the society with an income exceeding Rs. 9,000/month for each family (Table 8).

Owing to increase in family income, the tendency to purchase income elastic foods is increased. Since these foods are energy dense, children consuming these tend to grow fatter. Moreover, most of the families are now-a-days small with an average of 3-5 members. Thus, in small families with higher income, the individual share of food during intra family food distribution is large. Hence, the proportion of food consumed is increased. Also caretakers, specially mothers prefer to feed a greater share of the food to their children. This in turn leads to adiposity thereby producing more overweight and obese adolescents. It can, therefore be highly justified that children from affluent families tend to grow fatter. Majority of overweight and obese adolescents of the present study also belonged to affluent families.

Similar studies were reported by Sangha *et al.* (2006), Aggarwal *et al.* (2008), Sidhu and Prabhjot (2004) and Kaneria *et al.* (2006).

Correlation between BMI and family income level of overweight and obese adolescents :

The correlation between BMI of screened samples and final life-style factor *i.e.* affluency in terms of family income is presented in Table 9.

The correlation between BMI of screened samples and affluency in terms of family income showed a positive association for boys ($r=0.2748$) and girls ($r=0.1758$), respectively. The data agreed with the universal findings that

income is one of the most influencing factors of nutritional status. With increase in family income, the BMI of screened samples was found to be higher.

Summary and conclusion :

Correlation was done between the BMI of overweight and obese adolescent with dietary practices in terms of fast food consumption. Results obtained documented a positive association between frequency of fast food consumption of boys with increase in BMI ($r=0.5422$).

Correlation was done between the BMI of overweight and obese adolescent with physical activity levels. Result obtained documented a positive association with time spent on sedentary activities for both boys and girls. Negative correlation between total energy expenditure and physical efficiency index score documented a positive association though no statistically significant correlation was obtained.

Affluency, the third life-style factor indicated that 56.81 per cent girls and 29.54 per cent boys who were overweight as well as obese belonged to affluent families. Very few of them were from middle income and low income families.

Correlation was done between the BMI of overweight and obese adolescent with affluency in terms of family income. Result obtained documented a positive association with family income for both boys and girls with no statistically significant correlation.

Correlation was also done between the BMI of overweight and obese samples with life-style factors. Results obtained documented a positive association between the elevated BMI of the overweight and obese adolescents with all the life style factors. A significantly positive association was observed between frequency of fast food consumption of boys with increase in BMI ($r=0.5422$).

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