

ORIGINAL ARTICLE

FREQUENCY OF AND FACTORS LEADING TO OBESITY AND OVERWEIGHT IN SCHOOL CHILDREN

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Background: Obesity is considered as a global epidemic. Obesity in childhood and adolescent is an issue of concern because it is an important predictor of adult obesity. Identifying individuals who are physically inactive, overweight or obese in school going age is very important. The objective of this study was to determine the frequency and factors leading to obesity in school children. **Methods:** A cross-sectional survey was conducted on children aged 13–16 years. It was a questionnaire based survey with measurement of height and weight. **Results:** Total 431 children were included in the study. Three hundred and nine (71.7%) of the students were in the normal category, i.e., less than 85th centile while 122 (28.3%) had weight greater than 85th centile and were overweight and obese. Positive association was found between eating out and weight categories, eating breakfast, intake of fresh fruits and vegetables and soft drinks, low physical activity, and increased screen time. Frequency of overweight and obese children was high in children from higher socioeconomic status. **Conclusion:** There is strong association between strong determinants of obesity and overweight. Health education of students for known risk factors should be integrated with curriculum of science from elementary classes.

Keywords: Obesity, Children, Determinants of obesity

INTRODUCTION

Obesity is considered as a global epidemic.¹ It is defined as accumulation of abnormal or excessive fat in the body that poses a risk to health.² Obesity in childhood and adolescent is an issue of concern because it is an important predictor of adult obesity.³ It is reported in different studies that about two third of obese children and adolescents grow up as obese adults.⁴ International Obesity Task Force (IOTF) in the year 2000 declared that around ten percent of the youth aged 5–17 years is overweight worldwide.⁵ Childhood obesity has been reported to be the highest in developed countries; however, its prevalence is on a rise in underprivileged societies as well.⁶

Among the developing world, WHO has ranked Iran among the top seven countries with the highest burden of childhood obesity and it is also on rise in Middle East.⁷ The prevalence of obesity among children in Pakistan was reported to be 2.6% which is higher as compared to other South Asian countries like India and Thailand where it is relatively low.³

Obese children are more likely to develop diseases like diabetes, dyslipidemia, hypertension, heart disease, stroke and cancers.⁸ There are also important psychosocial consequences of childhood obesity and being overweight like low self esteem. Hence it is important to identify the high-risk children and consider them for intervention.

Various studies have identified risk factors associated with childhood obesity. Factors contributing towards obesity are increase in screen time, e.g., watching television and playing computer games (48%), consumption of soft drinks (67%)⁹ and fast food (eating

fast food more than twice/week increased the risk of becoming obese by 86%)¹⁰, and decreased physical activity (15% vs 11% in high vs low physical activity groups respectively).¹¹

Despite the grave consequences of obesity and being overweight in childhood and adolescence, little work has been done in our setting. Health related behaviours, e.g., physical activity patterns, dietary habits consolidate during school age and then persist into adulthood. Therefore, identifying individuals who are physically inactive, overweight or obese in school going age is very important. Since our society is westernising rapidly, our young generation, especially the school children are affected by it the most. The objective of this study was to determine the frequency and factors leading to obesity in school children.

MATERIAL AND METHODS

A cross-sectional survey of children aged 13–16 years studying at different educational institutions of Karachi belonging to upper-middle (Fee= PKR 4,000/month) and lower-middle (Fee= PKR 1,000/month) socioeconomic strata were conducted. The sample size was calculated on the basis of lowest prevalence for childhood obesity reported in previous research which was found to be approximately 2.6%.³ The data were obtained from two different urban schools of Karachi by means of non-probability convenience sampling. All children who were present/attending the school at the time of study were approached for data collection. Data from 431 children aged 13–16 years were collected. Age of the children was taken from the school register. Children with a history of Diabetes mellitus,

hypothyroidism, and long term corticosteroids use were excluded from the study.

A written consent was taken from the principals of the schools. Data were collected through a questionnaire adopted from Global School-based Student Health Survey (GSHS) which was modified accordingly.¹³ Height and weight of all the subjects were measured. Weight of the children was measured in school uniform only using bathroom scale to the nearest 0.1 Kg. Height was measured without shoes, on a flat surface to the nearest 0.1 cm using wall mounted stadiometers. The BMI were plotted on gender specific 'BMI for age' growth curves standardised by WHO¹⁴.

Children whose weight was between 85th and 95th percentiles on growth curves were labelled as overweight and those who were above 95th percentile were classified as obese.

After data collection, interactive awareness session was conducted for the students regarding balanced diet, physical activity and adverse health consequences of obesity.

Data were analysed using SPSS-11. Effect modifiers were controlled through stratification of age, maternal education, age and gender of children, overweight and obese status.

RESULTS

A total of 431 students participated in the survey, 268 (62%) belonged to the upper-middle income school (UMIS) and 163 (38%) belonged to lower-middle income school (LMIS). Male students were 247 (57%) and female were 184 (43%). The mean age of the respondents was 13.4±1.59. In response to the number of siblings, 280 (65%) had between 3–5 siblings.

Determinants of obesity and overweight were assessed through different questions focusing on eating habits (Table-1). In response to the question of eating junk food (pizza/burgers) from outside in a week, 234 (87.3%) from the upper middle income and 103 (63.2%) students from lower middle income replied eating out 1–3 times in a week ($p<0.001$). In response to the habit of eating breakfast, 214 (80%) from the upper middle

income school sometime eats breakfast as compared to 112 (69%) from lower middle income school regularly eats breakfast ($p<0.001$).

Two hundred twenty-three (83.3%) students from the upper middle income school eat junk food in school one to three days in a week as compared to 76 (46.6%) from the lower middle income school ($p<0.001$). Intake of fruits per day was limited to 1–2 times by the majority of the students (46% in UMIS and 44% in LMIS). Regarding intake of vegetables majority of the students replied with eating vegetables 1–2 times per day ($p<0.001$).

When asked about the intake of soft drinks, majority of the students responded that they don't consume it daily (55% UMIS and 63% LMIS). 17% (n= 45) Upper middle income school children consume soft drinks more than 3 times daily as compared to only 7% (n=12) students from LMIS.

In response to how much time students watch television or play games on computers, 206 (77%) students from UMIS said up to 2 hours daily compared to 103 (63%) students from LMIS ($p=0.002$). The numbers of hours spend on physical activity like outdoor games were 30 minutes to 2 hours by majority of the students (73% for UMIS and 49 % for LMIS). Surprisingly 67 (41%) students from the LMIS said they don't play any outdoor games ($p<0.001$).

Association between determinants of obesity and weight categories are presented in Table-2. Positive associations were found between eating out and weight categories (odds ratio 1.29), eating breakfast (odds ratio 4.7), intake of fresh fruits and vegetables (1.61 and 4.51 respectively) and soft drinks intake (odds ratio 1.44).

According to the percentile for weight, 309 (71.7%) of the students were in the normal category, i.e., <85 centile, and 122 (28.3%) had weight >85 centile and were overweight and obese. According to the socioeconomic status, 107 (25%) students from the upper income group had weight >85 percentile compared to only 15 (4%) from the lower middle income group ($p<0.001$) Table-3

Table-1: Determinants of obesity in different socio-economic strata

Determinants of Obesity	Upper middle income schools		Lower middle income schools		p-value
	No.	%	No.	%	
Eating fast food (pizza/burger etc.) per week:					
• Don't eat fast foods at all	9	3.4	49	30.1	<0.001
• 1–3 days	234	87.3	103	63.2	
• >3 days	25	9.3	11	6.7	
Eating breakfast :					
• Never	28	10.4	10	6.1	<0.001
• Sometimes	214	79.9	41	25.2	
• Always	26	9.7	112	68.7	
Eating snacks at school (samosa, patties, French fries etc) per week:					
• Don't eat snacks at all	41	15.3	64	39.3	<0.001
• 1–3 days	223	83.2	76	46.6	
• >3 days	4	1.5	23	14.1	
Intake of fruit per day:					
• Don't eat fruit at all	12	4.5	14	8.6	

• ≤ 2 times	211	78.7	122	74.9	0.385
• 3 or more times	45	16.8	27	16.5	
Intake of vegetables per day:					<0.001
• Don't eat vegetables at all	33	12.3	28	17.2	
• ≤ 2 times	224	83.6	101	62	
• 3 or more times	11	4.1	34	20.8	
Intake of soft drinks per day:					0.018
• Not daily	147	54.8	103	63.2	
• 1-2 times	76	28.4	48	29.4	
• 3 or more times	45	16.8	12	7.4	
Screen Time (watching TV/playing computer games) per day:					0.002
• <1 hour	102	38.1	39	23.9	
• 1-2 hours	104	38.8	64	39.3	
• 3-4 hours	43	16.0	35	21.5	
• >4 hours	19	7.1	25	15.3	
No. of hours spent during Physical activity per day:					<0.001
• No physical activity at all	22	8.2	67	41.2	
• 30 min-2 hours	196	73.1	80	49	
• 3 or more hours	50	18.7	16	9.8	

Table-2: Odds of being overweight and obese

Predictor of being Overweight and Obese	Overweight >85 th centile	Normal BMI ≤ 85 th centile	Odds Ratio
Eating fast food (pizza/burger etc.) per week:			1.29
• >3 days/week	12	24	
• ≤3 days/week	110	285	
Eating breakfast :			4.7
• Sometimes	107	186	
• Always	15	123	
Eating snacks at school per week:			0.29
• ≥3 days	3	24	
• <3 days	119	285	
Intake of fruit per day:			1.61
• <3 times	107	252	
• ≥3 times	15	57	
Intake of vegetables per day:			4.51
• <3 times	118	268	
• ≥3 times	4	41	
Intake of soft drinks per day:			1.44
• ≥3 times	20	37	
• <3 times	102	272	
Screen Time (watching TV/playing computer games) per day:			0.97
• ≥3 hours	34	88	
• <3 hours	88	221	
Time spent during physical activity per day:			0.75
• <3 hours	100	265	
• ≥3 hours	22	44	

Table-3: Weight status of school children according to Socio-economic status

Socioeconomic status	Normal 5 th to <85 th centile	Overweight 85 th to 95 th centile	Obese >95 th centile	p-value
Upper middle income schools	161 (37%)	64 (15%)	43 (10%)	<0.001
Lower middle income schools	148 (34%)	11 (3%)	4 (1%)	

DISCUSSION

The study participants comprised of students studying in upper middle and lower middle income schools in the age group of 11-16 years. 28% of the students had weight greater than the 85 centile corresponding to overweight and obesity. There was a higher prevalence in overweight and obesity in boys as compared to girls. Male students were 33% overweight and obese as compared to 22% female students. These results are consistent with a study conducted by Ramesh *et al.* in India where overweight and obesity was 17% in boys as compared to 11% in girls.¹⁷ Overall overweight and obesity was much more prevalent in students studying in UMIS and was estimated at 25% whereas only 4% students in LMIS were found to be in this group. These findings were consistent to a study carried on school

children in Karachi by Haider *et al*¹⁵ as well as several other studies carried all over the world. In a review article by Kosti *et al* it was estimated that overweight and obesity in school children in Africa and Asia is below 10% and in Americas and Europe it is above 20%.¹⁶ The results of the UMIS students from our study postulate trends similar to affluent countries.

Determinants of obesity in this study are focused on eating habits, physical activity and sedentary pursuits like watching TV and playing screen games. Eating junk food or energy dense food more than three times a week is associated with overweight and obesity. These findings are consistent with the study conducted in India by Ramesh *et al.*¹⁷

Breakfast is regarded as the most important meal of the day as it provides the nutrients the people need to start the day. Studies also show a link between

participation in the School Breakfast Program and improved academic performance and psychosocial behaviour. Positive association in this study has been seen with students' not regularly eating breakfast and overweight and obesity. A study performed on Dutch adolescents by Croezen *et al* found positive association with skipping breakfast and overweight.¹⁸ Data Analysis of the third NHANES health survey by Sungsoo Cho *et al* showed similar findings. They not only found significant difference in BMI among skippers and regular breakfast eaters but also the type of breakfast taken. Those eating meat products and eggs had higher BMI as compared to cereal eaters.¹⁹

Eating snacks at schools like French fries, fried foods, packet chips and biscuits have been found to be negatively associated with overweight and obesity in this study. A large many students don't eat from the school canteens every day. Ashlesha *et al.* found out that consumption of competitive foods in schools had no significant effect on BMI.²⁰ In a study conducted on snack food intake on children and adolescents by Field *et al*, conclusion was derived that though snacks may be low in nutritional value yet they were not an important independent determinant of weight gain among children and adolescents.²¹

Most vegetables and fruits are low in energy density because of their high water and low fat content. Consumption of fruits and vegetables is associated with overall decrease in energy density, thereby increasing the amount of food that can be consumed for a given level of calories. This study showed a positive association between increase intake of fruits and vegetables in the diet and normal BMI. However a similar study conducted in the United States by Field *et al.* showed no significant association between BMI and consumption of fruits and vegetables.²²

Previous studies have in depth examined the relationship between soft drinks and BMI. Ludwig *et al.* in his study examined that for consumption of each sweet drink; chances of becoming fat increased by 60%.²³ Our study found positive association between consumption of more than 3 drinks per day and overweight and obesity.

Watching television for more than two hours is another important determinant of weight gain and obesity. This has been extensively studied and reducing sedentary behaviours is important in reducing overweight and obesity. In our study weak association is observed in screen time and overweight and obesity. However similar studies conducted elsewhere showed strong positive association between TV viewing and weight gain²⁴.

The role of physical activity in weight control has been extensively studied. Physical activity up to three hours daily has shown negative association with overweight and obesity in our study, suggesting a

protective role in controlling weight. Similar result was observed in a study carried out by Tremblay *et al.* on Canadian children where both organized and unorganized physical activity was negatively associated with overweight.²⁵

CONCLUSION

There is association between strong determinants of obesity and overweight. It is suggested that health education of students for the known risk factors be integrated with their existing curriculum of science from elementary classes for adoption to healthy lifestyles.

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