ASSOCIATION OF BMI AND LIFE STYLE: A COMPARATIVE STUDY ON SCHOOL GOING CHILDREN (AGED 6-16 YEARS) OF LAHORE

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Abstract

Objective: To find an association between life style and overweight/ obesity in different socio-income groups of school going children in Lahore

Method: A cross sectional study design was conducted to assess frequency of overweight and obesity in school children aged 6- 16 years. A sample of 370 students was selected from six schools in Lahore. Random sampling technique was use to select 10 students from each grade. Data was analyzed using SPSS version 17, and associations were made using chi-square test.

Results: A total of n=370 students were included in the study. The students comprised of males (n=194)52.4% and females (n= 176) 47.6%. The number of students from government school was (n=176) 47.6% and private school was (n=194) 52.4%. A total of 18.4% (n=68) were found to be underweight, 46.5 %(n=172) had normal BMI and 35.1% (n=130) were overweight. Strong positive association was found between upper and lower socio- income schools and BMI, 49.5% (n=96) students from upper income were overweight and 19.3% (n=34) students were overweight from lower income school (p value <0.000). Thirty eight percent (n=66) Females were overweight as compared to thirty percent (n=64) males (p value < 0.000).

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Conclusion: The high prevalence of overweight indicates that intensive intervention is required to tackle this emerging problem. Thus, it is necessary to formulate preventive strategies that involve physical activity and nutritious food. Advice about diet should include guidance about avoiding the over-consumption of energy dense food and food low in fiber. Health education in school should incorporate all the above-mentioned points in an understandable way in order to maximize its impact on society.

INTRODUCTION

Historically, a fat child meant a healthier child and the concept "BIGGER IS BETTER" was widely accepted by parents and healthcare workers. Unfortunately this perception has not changed as a recent global analysis with more than one survey has shown a rising trend in obesity and overweight in 16 out of 38 countries.[1] According to statistic by CDC, childhood obesity has tripled in the last thirty years.[2] The prevalence of obesity among children aged 6 to 11 years increased from 6.5% in 1980 to 19.6% in 2008. The prevalence of obesity among adolescents aged 12 to 19 years increased from 5.0% to 18.1%. [2] Globally, IASO/IOFT, estimates that 200 million children are either overweight or obese, of those 40-50 million are obese.[3]

According to the latest statistical figures of World Health Organization, in 2010, around 43 million children under five were overweight[4]. Once considered a high-income country problem; overweight and obesity are now on the rise in low- and middle-income countries, particularly in urban settings. Close to 35 million overweight children are living in developing countries and 8 million in developed countries.[4]

Overweight and obesity are linked to more deaths worldwide than underweight. For example, 65% of the world's population live in countries where overweight and obesity kill more people than underweight (this includes all high-income and most middle-income countries).[4]

Due to lack of published studies on obesity in Pakistan, the exact picture of the impact on economics and health cannot be reflected. The only available source of information is National Health Survey[5] which has revealed that (a) obesity and overweight are common in females than male for all ages (b) levels of obesity tend to increase in all age groups peaking in 45 and 46 and then decreasing. This dip in BMI is called as 'adiposity rebound'. Children whose adiposity rebound begins at younger age are likely to have increase BMI as an adult (c) Obesity increases with economic classes; affecting

15% males of low socioeconomic class to 40% of those of high socioeconomic class.

Pakistan where over 43% of population is composed of children[6] it has been observed that children are adopting a sedentary lifestyle. Study done by Khwaja etal found that majority (58%) of school children had at least one modifiable risk for obesity and CVD; like physical inactivity, unhealthy dietary habits and overweight and obesity.[7]

The numerous psychological, physical and economic consequences of obesity are well known. Childhood obesity affects self esteem and has negative consequences on social development.[8,9,] Condition such as diabetes type 2 diabetes mellitus, hypertension, hypercholesterolemia which were common in adult are becoming common in children with the increase in the prevalence of obesity.[10]

The main cause of obesity and overweight is the imbalance between calories consumed and calories expended.[11, 12.] Food intake is also associated with obesity not only in terms of volume of food ingested but also in term of quality and composition of diet.[13]

Obesity is defined using the age and sex specific charts for BMI released by Center for Disease Control (CDC).[14] The CDC defines normal weight for height as a BMI greater than 5th percentile but less than 85th percentile. A BMI between 85th and 95th percentiles is called at risk for overweight and a BMI greater than 95th percentile is usually specific for increased body fat and is called obesity.[15] According to World Health Organization, overweight and obesity are defined as abnormal or excessive fat.[4] Obesity is an emerging problem in Pakistan.[16] As a developing nation, it is important to create awareness in order to decrease the burden of this disease on our society. According to one study done in school of Karachi; out of 398 students, 24 (6%) were above 95th percentile (obese) while 77(19.35%) were between 85-95th percentile (at risk of overweight) and approximately 85% of students when asked about their daily schedule were leading a predominant sedentary lifestyle due to tuitions, television, internet surfing, or in door games.

Considering the above staggering figures of obesity and overweight in children and adolescent, this study is being conducted to find an association between life style and overweight/ obesity and also to compare prevalence of overweight/obesity in different socio-income groups of school going children in Lahore.

METHODS

STUDY DESIGN:

A cross sectional study design was conducted to assess frequency of overweight and obesity in school children aged 6- 16 years.

SETTING:

Six schools were selected from Lahore on a spectrum determined by their fee structure. Out of six schools, two refused due to ongoing vacations. Of the four schools visited, two were subsidized government schools and two were private schools. Permission was taken from school administration for conducting the survey.

SAMPLE SIZE:

Keeping Confidence Interval 95%, anticipated population proportion of overweight at 15% and absolute error at+/-5%, estimated sample size was 245. However to avoid dropout due to non response sample size was increased to 370.

SAMPLING TECHNIQUE:

Random sampling technique; A total of 370 students took part in the study. Ten Male and Female students from grades 1 to 10 of each school were randomly selected in the study.

DATA COLLECTION METHOD:

- *Anthropometric Measurements*

Height and Weight of each student was measured using calibrated scales. Height was measured in erect position without shoes with a measuring tape to the nearest 0.1 cm. Body Weight was measured to the nearest 0.1 kg with a weighing scale. The formula utilized during data collection procedure was Body mass index (BMI) =weight (kg)/height (m) 2.

- *Self Administered Questionnaire*

Children of grades 1 to 3 were assisted by their teachers to fill in the questionnaires. Students of Grade 4 onwards were able to fill the questionnaire. It was optional for the children to write their name on the form. Questionnaire was based on three parts consisting of demography, anthropometric measurements and awareness and practices regarding nutritional diet and physical activity.

DATA ANALYSIS:

The data was entered and analyzed on the SPSS version 17, statistical analysis program. For the categorical variables frequencies and percentages were taken out and mean and standard deviation for numerical variables. Chi Square was applied for finding association between categorical variables and P value less than 0.05 was taken as significant.

RESULTS

A total of n=370 students were included in the study. The students comprised of males (n=194)52.4% and females (n= 176) 47.6%. The number of students from government school was (n=176) 47.6% and private school was (n=194) 52.4%. On enquiring about the educational status of parents, majority of the parents both mother (n= 173) 46.8% and father (n=114) 30.8% were graduates, postgraduate qualification was however more common in fathers

(n=100) 27%. On enquiring about parental health status, number of students whose parents were overweight (n=135)36.5% and number of students whose parents were not overweight 63.5 %(n=235).

The anthropometric measurements of the students revealed a mean height of 143.42$\pm$ 17.3 and a mean weight of 40.74 $\pm$16.2. The mean BMI was found to be 19.6$\pm$ 6.1. A total of 18.4% (n=68) were found to be underweight, 46.5 %(n=172) had normal BMI and 35.1% (n=130) were overweight. Strong positive association was found between upper and lower socio- income schools and BMI, 49.5% (n=96) students from upper income were overweight and 19.3% (n=34) students were overweight from lower income school (p value <0.000). Thirty eight percent (n=66) Females were overweight as compared to thirty percent (n=64) males (p value < 0.000).

The physical activity of the students were assessed through number of hours watching TV and playing games both in school and out of school. The number of hours watching TV was classified as less than two hours or more. Sixty four percent (n=237) of the students watch TV less than 2 hours while 36% (n=133) watch TV for more than two hours. Association between BMI groups and physical activity revealed that majority in the overweight group (48.9%) watch TV for more than 2 hours (P value less than 0.000) Table 1. Similarly highly significant association was found between watching TV for more than 2 hours and upper and lower socioeconomic schools(p value less than 0.000) Table 2.

Physical activity and playing games in school revealed 22% students (n= 81) not indulging in any sports whereas 45.4% (n=168) played for less than 30- minutes and 32.7% (n=121) played for greater than 30 minutes. Similarly majority of the students 44% (n=161) do not play sports after school. Whereas only 23% (n=84) played greater than 30 minutes. Significant association was found between playing more than 30 minutes both during and after school hours and overweight group (P value 0.003 and 0.016). Table 1

Association between government/private schools and number of hours playing games and sports was significant where majority of the private school students 74.4% and 85.7% respectively played greater than 30 minutes (P value less than 0.003 and 000.0) Table 2. Majority of the students 35% (n=128) were fond of playing cricket.

On assessing the dietary intake71 %(n=263) had breakfast regularly and 29 %(n=106) do not have breakfast regularly. Majority of the students 64 %(n =235) take three meals daily. Fifty nine percent (n=217) of the students were taking snacks between meals. On inquiring about the intake of fruit and vegetables 57 %(n=209) ate daily; whereas 43 %(n=161) ate occasionally. Regarding intake of milk 68 %(n=253) students were consuming up to two glasses of milk daily. On assessing the intake of dairy products; 94 %(n=346) students consume it daily. From the carbohydrate group, significant association was found between intake of potatoes and overweight group. (P value less than 0.001). Similarly, significant association was found between consumption of bread and overweight group. (P value less than 0.001).39% (n=143) and 38% (n=139) of the students respectively were consuming chapatti and rice daily.29% (n=108) of the students were drinking soft drinks daily. Strong association was found between consumption of more than one beverage daily and overweight groups. (P value 0.0001). Strong association was also found between socioeconomic schools and beverages where 71% (n=77) of the private schools were drinking more than one drink dally (P value 0.000).

A strong association was observed between overweight groups and dines out where 50% of the overweight students at least dine out once a week. Similarly association was found between LSES/USES and dine out where 75.7% of private school students dine out once a week. (P value less than 0.000). When students were enquired about whether they have their meals while watching TV or other activities, 73% students from private schools (USES) said they watch TV during meal times (p value 0.000).

DISCUSSION

The study participants comprised of government and private school going children from age group 6- 16 years. Of our total population (370 students), 35.1% of children were overweight and 18.4% of children were underweight. This finding is consistent with the view that childhood overweight and obesity is an emerging problem for developing and developed countries. A research done in Saudi Arabia has proven that the highest rate of childhood overweight and obesity is found in developing countries, as one in every six child is obese.[17]High prevalence can also be seen in Middle Eastern, Central and Eastern Europe countries.[18] Females 37.5% have found to be more overweight than boys 33.0% in our study. This is consistent with the results of a research done in New South Wales where 21.6% females were overweight and males were 16.8%[19]Similarly, according to a research done by Hedley has indicated that prevalence of obesity has increased in the last two decades in USA. Among children6-19 years in 1999-2002, 31% are at risk of overweight or obese.[20]

Parental health status has proved to be a reliable indicator which is directly linked to BMI. Wand et al 2002 has shown in its study that parental overweight

or obesity is an independent factor for childhood obesity. This fact coincides with our study that shows statistically significant association between parental health status and BMI.

According to WHO, global increase in overweight and obesity are attributable to a number of factors including a change in dietary habits have and current diet including mostly: low fruits, green vegetables and milk; increase snacks, sweets and soft drinks; and skipping breakfast; all of these habits have led to increase in adiposity in children.[13]

Eating breakfast is beneficial for both the body and the mind in several ways. Breakfast is the first meal of the day and is the most important because it supplies the body and brain with the necessary nutrients after a night's sleep. Data from USA has shown that children and adults who eat breakfast have healthier weights than children who skip breakfast.[21] This is supported by a study done in Finland on sixteen years old children and their parents, breakfast skipping among adolescents and adults, and was associated with having a high Body Mass Index (BMI).[22] However, our study shows that there is no positive association between Body Mass Index and intake of breakfast.

Snack food including French fries, fried foods, packet chips and biscuits has a low nutritional value. Our study showed that snack food is not an important determinant of weight gain and obesity in children as no association has been established between the two factors. This fact is consistent with results of a research done in USA where intake of snack foods did not predict weight gain among children and adolescent.[23]

A Greek study showed positive association between childhood obesity and increased frequency of meals (>3 per day).[24] Our study failed to establish a positive association between the above-mentioned variables. Researchers have also shown that children who sit down with their parents at least three times a week were 12% less likely to be overweight, 20% less likely to eat junk food, 35% less likely to have eating problems like skipping meals.[25] Our study shows that neither skipping meals nor family meals have a positive association with BMI. However, positive association was found between skipping meals and upper and lower socioeconomic schools.

The rise in obesity in children has a direct association with consumption of soft drinks and decrease intake of milk. In a study on children from grade 3 to grade 8, Lytle et al found [20] that the proportion of children consuming soft drinks daily have almost tripled and milk consumption decreased by 10%. This change may have serious health implications, because milk is a good source of several nutrients, such as protein, calcium, and vitamins B-2, B-12, and D, some of which are not easily available from other food groups and thus may not be consumed at all when the replacement of milk in the diet occurs as a result of increased consumption of high-sugar beverages. This finding is consistent with our results that show children with normal BMI consuming milk more than children at both ends of the malnutrition spectrum. Strong positive association is observed between increase consumption of soft drinks and increasing BMI.

Watching TV for hours is one of the modifiable risk factors for obesity. This has been exclusively been studied and reducing sedentary activity is necessary to control the growing prevalence of overweight and obesity. Our study shows strong association between watching Television greater than 2 hour and BMI.A recent study published in The American Journal of Clinical Nutrition found that the more hours spent watching television, the more likely children were to be both fatter and less physically active.[26]

Globally there has been a decrease in physical activity due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanization.[13] Physical activities have reduced with decrease in middle and high school physical education activity. Children don't play as they used to play before (Burdette & Whitaker, 2005).[23] Our study shows that children in the overweight group prefer playing indoor rather than outdoor games. American guidelines recommend that children should engage in 30-60 min of physical activity on most or all days of the week.[28] Negating this fact, our study shows that children in the overweight group are engaged in physical activity greater than 30 minutes.

CONCLUSION

The results of our study have shown large proportion of students who are overweight. The high prevalence of overweight indicates that intensive intervention is required to tackle this emerging problem. Thus, it is necessary to formulate preventive strategies that involve physical activity and nutritious food. Emphasis should be done on promoting low intensity, long duration of physical activity that should be incorporated into daily life. Advice about diet should include guidance about avoiding the over-consumption of energy dense food and food low in fiber. Health education in school should incorporate all the above-mentioned points in an understandable way in order to maximize its impact on society.
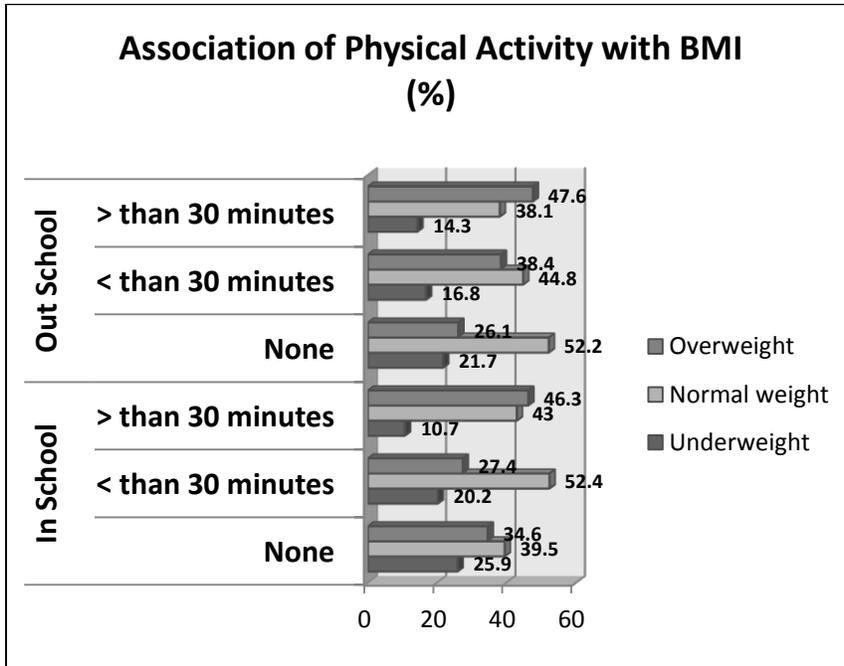
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Graph 1: Association of Physical Activity with number of hours spent on Physical Activity

Graph 2: Association of Physical Activity with number of hours spent on Physical Activity
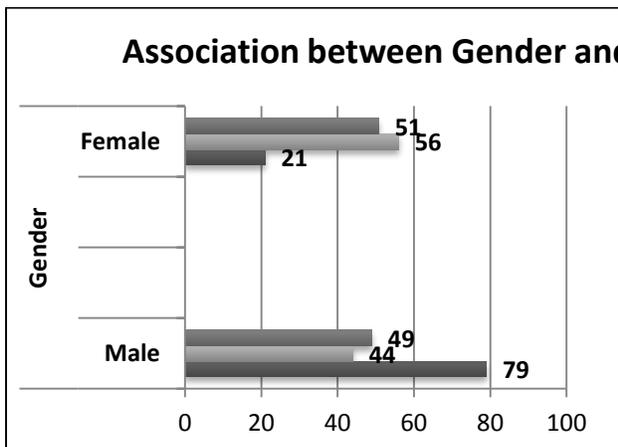
TABLE 1: ASSOCIATION BETWEEN RISK FACTORS AND BMI:

	Underweight (n=68)		Normal (n=172)		Overweight (n=130)		P Value
	n	%	n	%	n	%	
Parents Health Status							**< 0.007**
Yes	15	11.1	62	45.9	58	43.0	
No	53	22.6	110	46.8	72	30.6	
Watching TV							**< 0.000**
< 2 hours	46	19.4	126	53.2	65	27.4	
> 2 hours	22	16.5	46	34.6	65	48.9	
Physical Activity in School							**<0.003**
None	21	25.9	32	39.5	28	34.6	
< 30 minutes	34	20.2	88	52.4	46	27.4	
> 30 minutes	13	10.7	52	43.0	56	46.3	
Physical Activity out of School							**<0.016**
None	35	21.7	84	52.2	42	26.1	
< 30 minutes	21	16.8	56	44.8	48	38.4	
> 30 minutes	12	14.3	32	38.1	40	47.6	
Place of Playing							**<0.012**
Indoor	24	12.6	97	51.1	69	36.3	
Outdoor	44	24.4	75	41.7	61	33.9	
Nutritional Habits							
Breakfast							<0.142
Yes	54	20.5	123	46.8	86	32.7	
No	14	13.2	48	45.3	44	41.5	
Number of Meals							<0.200
≤ 3 Meals	68	100	165	95.9	109	83.8	
> 3 Meals	0	0	7	4.1	21	16.2	
No .of beverages							**0.001**
one	20	20.2	35	35.4	44	44.4	
more than one	16	14.8	44	40.7	48	44.4	
occasionally	32	19.6	93	57.1	38	23.3	
Fast food							**<0.000**
once a week	21	19.6	33	30.8	53	49.5	
once a month	6	8.1	38	51.4	30	40.5	
occasionally	41	21.7	101	53.4	47	24.9	
Meal intake							0.0721
alone	9	14.8	30	49.2	22	36.1	
family	59	19.1	142	46	108	35	
Activity while eating							0.301
watching TV	30	21.6	55	39.6	54	38.8	
playing games	13	15.5	41	48.8	30	35.7	
none	25	17	76	51.7	46	31.3	

TABLE 2: ASSOCATION BETWEEN LSES/USES AND RISK FACTORS:

	GOVERNMENT (LSES) n=176		PRIVATE (USES) n=194		P Value
	n	%	n	%	
Parents Health Status					**0.003**
Yes	78	57.8	57	42.2	
No	98	41.7	137	58.3	
Watching TV					**<0.000**
More 2 hours	40	30.1	93	69.9	
less 2 hours	136	57.4	101	42.6	
Physical Activity in School					**0.003**
None	45	55.6	36	44.4	
> 30 minutes	31	25.6	90	74.4	
< 30 minutes	100	59.5	68	40.5	
Physical Activity out of School					**<0.000**
None	118	73.3	43	26.7	
> 30 minutes	12	14.3	72	85.7	
<30 minutes	46	36.8	79	63.2	
Place of Playing					**0.016**
Indoor	102	53.7	88	46.3	
Outdoor	74	41.1	106	58.9	
Nutritional Habits					
Breakfast					0.39
Yes	121	46	142	54	
No	54	50.9	52	49.1	
Number of Meals					**0.014**
≤ 3 Meals	169	96	173	92	
> 3 Meals	7	4	21	8	
No .of beverages					**<0.000**
one	36	36.4	63	63.6	
more than one	31	28.7	77	71.3	
occasionally	109	66.9	54	33.1	
Fast food					**<0.000**
once a week	26	24.3	81	75.7	
once a month	36	48.6	38	51.4	
occasionally	114	60.3	75	39.7	
Meal intake					0.162
alone	34	55.7	27	44.3	
family	142	46.0	167	54.0	
Activity while eating					**<0.000**
watching TV	38	27.3	101	72.7	
playing games	56	66.7	28	33.3	
none	82	55.8	65	44.2	