

Physical activity a determinant to control adolescent obesity

Abstract

Objective

Lack of physical activity, unbalanced diet and unhealthy lifestyles have led to lifelong obesity. Obesity in Pakistani children and adolescents has also becoming an important public health problem due to changes in life style and other factors. Our aim is to determine relationship between physical activity and obesity in urban youth.

Methods

A Cross-sectional study was conducted from 01 June 2013 to 30 December 2013 in Hyderabad Pakistan. A total of 504 male and female students of class six to ten were selected through simple random sampling. They were interviewed by trained data collectors through obesity and physical activity questionnaire. Anthropometric measurements were done with calibrated instruments using the age and sex specific BMI cut off points according to WHO growth reference.

Results

The prevalence of overweight (>85th Percentile) and obesity (>95th percentile) was 23% and 15% among the boys respectively whereas in girls the prevalence of overweight and obesity was 16% and 8% respectively. A significant proportion of girls (86%) and boys (85%) had abnormal waist to hip ratios. Mean of moderate physical activity 6.2hours SD 5.9 and mean of hard physical activity 5.3hours SD 5.2.

Conclusion

Promoting physical activity has become a priority because of its role in preventing childhood obesity and chronic disease. The determinants of the obesity lie within the home and school environment and the overall socio-cultural phenomena. Children are spending an alarmingly large part of their daily time on sedentary activities and having minimal physical activity.

Keywords: body mass index, prevalence, adolescent, waist circumference, physical activity

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Abbreviations: PA, physical activity; WC, waist circumference; SPSS, statistical package for social sciences; WHR, waist to hip ratios; BMI, body mass index

Introduction

According to world health organization approximately 1.6billion adults (age 15+) were overweight, and at least 400million adults were obese in 2005, at least 20million children under the age of 5years were overweight globally in year 2005.^{1,2} During last three decades the prevalence of overweight and obesity in children and adolescents has been tripled. Physical inactivity, unbalanced diet, and unhealthy lifestyles may have caused this lifelong obesity.³

According to the last census, 32.5% population of Pakistan was living in urban areas.⁴ Lack development and jobs in rural areas lead to mass scale migration towards cities. Pakistan has only 22% physically active adult population.^{4,5} which is due to urbanization and modernization of society along with changes in life styles. Promoting

physical activity among children can help to prevent childhood obesity and related conditions.

Studies have shown that children who are physically fit perform better in school and on tasks requiring concentration. Obesity driven burden of disease is induced by inappropriate diets and widespread physical inactivity which can be addressed by increasing Physical Activity (PA). A study done in Australia mentions decline in fitness level between childhood and adulthood was associated with increased obesity and insulin resistance. Programs aimed at maintaining high childhood physical activity levels into adulthood may have potential for reducing the burden of obesity and type II diabetes in adults.⁶ Pakistan is among the countries which have high prevalence of obesity among boys and girls.⁷ Pakistan is facing the double burden of diseases and obesity which is a major risk factor for a number of Non communicable diseases.⁸

The modern world makes it very easy to out-eat exercise, and nearly impossible to out-exercise excessive eating.⁹ But simply

advocating for more physical activity is unrealistic so substantial changes in urban planning and diet are needed to counter menus of obesity. Despite an appreciation that physical activity is essential for the normal growth and development of children and can prevent obesity and obesity-related health problems, too few children are physically active.

A concurrent problem is that today's young people spending more time in sedentary pursuits, including watching television and engaging in screen-based games. Active behavior has been displaced by these inactive recreational choices, which has contributed to reductions in activity-related energy expenditure.¹⁰ Walking to school provides a convenient opportunity for children to be physically active.¹¹ This study was conducted in order to determine relationship between physical activity and obesity in urban high school students¹² thus it can guide decision makers to formulate recommendations for preventing the growing epidemic of obesity in local setting.

Methods

A Cross-sectional study was conducted from 01 June 2013 to 30 December 2013 in urban city Hyderabad Pakistan.¹³ A total of 504 students, 255 male and 246 female students selected through simple random sampling. The sample size of 504 was divided among the government and private schools according to the probability proportional to size of students in private and government schools in the city. Finally the students were selected from the list of the students from the classes through Simple Random Sampling. They were interviewed by trained data collectors through physical activity and diet questionnaires. Questionnaire was based on the variables on the socio-demographic factors, the variables on the physical activity and school and home environments conducive for physical activity. The physical activity questionnaire was further consolidated and adapted by using the questions from the Youth Physical Activity Survey questionnaire of "The School Health Action, Planning and Evaluation System-SHAPES" study of the University of the Waterloo Canada.

Anthropometric measurements were done with calibrated instruments using the age and sex specific BMI cut off points given by W.H.O. Obesity among the school children was the outcome/dependent variable. Cut off points given by the World Health Organization for the measurement of Obesity were used. In the new WHO growth reference for the school age children and adolescents, more than 85th percentile (BMI Kg/height²) is equivalent to overweight and more than 95th percentile (BMI Kg/height²) is equivalent to obesity.¹⁵

Waist Circumference (WC) is also an important measurement especially of truncal obesity. Although there is no consensus about how to define obesity among children using waist measurement, for clinical use the 98th percentiles is the suggested cut-off for obesity and the 91st percentile is the cut-off for overweight (NICE.UK).¹⁴

Six data collectors were hired and trained in workshop for preparation of the field work, to liaison with the school administration and gathering of the lists of the schools and children, signing up of assent forms by the parents, pretesting and final questionnaire administration and anthropometric measurements.¹⁶

For the calculation of the sample size to keep the secondary objective in consideration we calculated sample size for two population proportions through using Epi info version 6. For associated factors 31% prevalence of mothers of the non obese school children with low education, 23.76% prevalence of non obese children in upper socioeconomic status and 17% prevalence of non obese children of working mothers (expected frequency of disease among non diseased)

was considered.¹⁷

The final sample size was given by the variable mother's education because it gave the largest sample of all the independent variables. To see the association of mothers education with the obesity in children we took a confidence level of 95%, power of 80%, the ratio of exposed children (whose mothers are illiterate) to unexposed children (children whose mothers have at least five years of education) and the prevalence of obesity among children of educated mothers of 31% the sample size came to be 336 with 114 in unexposed arm and 228 among exposed arm. Using a design effect of 1.5 the final sample size came out to be 504 (336*1.5).

Data was analyzed in the Statistical Package for Social Sciences (SPSS) version 16.0. Descriptive analysis was conducted for calculating mean and standard deviations for continuous variables and proportions were calculated for categorical variables such as level of education of parents, gender and type of school. In inferential analysis, at a 5% level of significance (α), t-test was used. Multiple logistic regression analysis was used for adjusting the confounders. Any potential bias in the study was minimized through calibrated height and weight measurement tools.

Analysis of the results is presented in descriptive variables, univariate logistic regression analysis and multivariate logistic regression analysis. Each of these groups are again subdivided and ordered into most understandable categories namely overweight and obesity descriptive variables, variables on the school environment for physical activity of the students and finally the parental/home factors promoting obesity among children.

Results

Results were available for 501 subjects out of the 504 subjects. Three forms were not eligible for the analysis due to the incompleteness of the data. The prevalence of overweight (>85th Percentile) and obesity (>95th percentile) was 23% and 15% among the boys respectively whereas in girls the prevalence of overweight and obesity was 16% and 8% respectively. The Waist to Hip Ratios (WHR) is another measure of central obesity along with BMI. A significant proportion of girls (86%) and boys (85%) had abnormal WHR. Use of transport by students was the most common mode (60%) to reach school will likely to be obese than those who reach school by physical activity i.e. walking and cycling. Mean time to reach school by physical activity is 9.66hours SD 6.7. Mean of moderate physical activity 6.2hours SD 5.9 and mean of hard physical activity hours 5.3 SD 5.2. Obese children in our sample were attempting or trying to lose weight explaining that they were conscious of their weight status and the consequences.

Time to reach school by activity (by foot or by cycle) P value= 0.339, OR 1.2 (CI 95-0.98-1.08). Moderate Physical activity (hrs per week) P value= 0.320, OR 1.02(CI 5- 0.98-1.06) and Hard Physical activity (hrs per week) OR .97 (CI 95- 0.92-1.01). Parental support in physical activity OR 1 and unsupportive parents for physical activity P value=0.988. OR 1.00 CI for OR 0.61-0.62.

Multivariate analysis contained other independent variables including; school gives awards in non-competitive sports (p value=0.123). Males showed a higher risk of obesity as compared to females. Specifically the females were 67% less likely to be obese than males, (OR.0.33). This gender relationship with the outcome improved from 35% in the univariate to 65% in the multivariate analysis. Those who rated themselves poor in athletic ability were OR 5.50 (P value=0.001) more likely to be obese (Table 1-5).

Table 1 Description of overweight and obesity by sex in students

Variables	Boy's		Girl's	
Overweight	N	%	N	%
Yes (>85 th Percentile)	59	23%	39	16%
No (<85 th Percentile)	196	77%	207	84%
Obesity				
Yes (>95 th Percentile)	38 (15%)		20 (8%)	
No (<95 th Percentile)	217(85%)		226 (92%)	
Waist To Hip Ratio (WHR)				
WHR Less than 0.8	NA		35	14%
WHR More than 0.8	NA		211	86%
WHR Less than 0.9	177	69%	NA	
WHR More than 0.9	78	11%	NA	
Waist Circumference				
Mean	75.5		72.23	
SD	10.46		8.52	
Hip Circumference				
Mean	86.03		85.24	
SD	10.09		8.95	

Table 2 Descriptive characteristics related to Physical Activity

Variables	Frequency*	Percent
Mode of travel to school (n=501)		
Actively (walk, cycle)	197	39.3
Inactively (car, bus etc)	304	60.7
Typical week of Moderate exercise		
Yes	374	75
No, less active in last 7Days	127	25
Typical week of hard exercise		
Yes	338	67
No, I was less active in last 7Days	163	33
Anything prevented exercise last week? (n=500)		
Yes	150	30
No	350	70
Exercise for the flexibility of muscles? (n=501)		
less than 4Days in a week	423	84
More than 4Days a week	76	15
Exercise for the strength of the muscles? (n=500)		
less than 4Days in a week	436	87
More than 4Days a week	64	13
3-4Days in a week	61	12.2
More than 5Days a week	64	12.8

Table Continued....

Variables	Frequency*	Percent
Individual exercises after school (n=501)		
Yes	310	62
No	191	38
What are you trying for your weight (n=501)		
Lose Weight	190	38
Gain Weight	78	16
Stay with the same Weight	147	29
Not doing anything about Weight	86	17
Participate in games outside school (e.g. in neighborhoods) (n=501)		
Yes	296	59
No	204	41
	Mean**	SD
Time to reach school by activity (hours)	9.66	6.7
Time spent on Media (hrs per week)	20	12.9
Mean hrs of moderate physical activity	6.2	5.9
Mean hrs of hard physical activity	5.3	5.2

*frequency and percentage is given for the categorical variable

**mean and standard deviation is given for the continuous variables

Table 3 Univariate analysis: factors related to physical activity of students

Variable	P value	OR	95 % CI
Time spent on Media per week			
Weekly	0.528	101%	(0.99-1.02)
Mode of travel to school			
Actively (walk, cycle)		1	
Inactively (car, bus etc)	0.348	1.25	(0.79-1.97)
Time to reach school by activity (by foot or by cycle)			
Hour per week	0.339	1.02	(0.98-1.08)
Moderate Physical activity			
Hours per week	0.32	102%	(0.98-1.06)
Typical week of Moderate exercise			
Yes		1	
No, less active	0.076	1.54	(0.96-2.49)
Hard Physical activity			
Hours per week		0.97	(0.92-1.01)
Typical week of hard exercise			
Yes		1	
No, less active	0.167	1.38	(0.87-2.18)
Exercise for the flexibility of muscles?			
Less than 4 days a week	0.981	1.01	(0.55-1.86)
More than 4 days a week		1	

Table Continued....

Variable	P value	OR	95 % CI
Exercise for the strength of the muscles?			
Less than 4 days a week	0.656	0.86	(0.46-1.64)
More than 4 days a week		I	
Physically active students do better in school			
Agree		I	
Disagree	0.691	1.11	(0.66-1.88)
Participate in games outside school (e.g. in neighborhoods)			
Yes		I	
No	0.552	1.14	(0.73-1.79)

Table 4 Univariate analysis: Factors related to “school physical activity environment” of students

Variables	P value	OR	CI for OR
School emphasis on participation competitive sports			
None	0.135	I	
A Little		2.02	(1.06-3.86)
Some		1.17	(0.62-2.21)
A Lot		1.18	(0.59-2.32)
School emphasis on participation non-competitive sports			
None	0.92		
A Little		104%	(0.57-1.89)
Some		93%	(0.53-1.63)
A Lot		0.82	(0.42-1.61)
School emphasis on developing positive attitudes about physical activity			
None	0.332		
A Little		0.48	(0.21-1.10)
Some		1.09	(0.63-1.91)
A Lot		0.59	(0.31-1.10)
School emphasis on informing opportunities to stay physically active			
None	0.317	I	
A Little		0.9	(0.46-1.78)
Some		1.1	(0.64-1.90)
A Lot		0.63	(0.33-1.19)
Involving students in planning of sports events			
None	0.156	I	
A Little		0.93	(0.49-1.75)
Some		1.24	(0.73-2.11)
A Lot		0.54	(0.26-1.11)
School emphasis on school Staff Physically active in school			
None	0.258	I	
A Little		1.77	(0.91-3.43)
Some		0.83	(0.42-1.62)
A Lot		0.71	(0.27-1.91)

Table 5 Multivariate Logistic Regression Analysis

	Crude OR (95% CI)	Adjusted OR (95% C.I.)	P-value (MVA)
Gender			
Males	1	1	
Females	0.65 (0.41-1.01)	0.33 (0.16-68)	0.002
Athletic ability			
Excellent	1	1	0.001
Good	1.14 (0.64-2.03)	1.20 (0.53-2.70)	
Fair	0.62 (0.29-1.31)	0.48 (0.16-1.44)	
Poor	4.61 (2.21-9.61)	5.50 (1.81-16.68)	
Socioeconomic Status			
Lower tertile	1	1	0.004
Middle tertile	2.22 (1.14-4.33)	3.43 (1.49-7.93)	
Upper tertile	1.62 (0.81-3.22)	0.12 (0.01-1.00)	

Obesity and Overweight vs Normal Weight with Physical Activity of students (n=501)

Discussion

A high prevalence of overweight and obesity among the sampled population was the main finding of our study. A cross-sectional study showed varieties of factors are potential determinants of physical activity behaviors in children and adolescents. Physiologic, environmental, and psychosocial /socio demographic factors play a role in influencing physical activity behaviors for children and adolescents. In all likelihood, these factors interact in various forms to potentially “cause” a physical activity behavior in children and adolescents²⁶ which endorse our study.

Our finding is the middle socioeconomic tertile were 3.43 times more likely to be obese than those in the lower tertile. Physical activity opportunity during school hours is one of the major determinants of childhood obesity. Our study showed that almost half of the schools were not meeting the children’s needs of the physical activity. The youth who participated in games outside schools were also found to be protected against obesity (P value=0.552). A study showed large proportion of the children in urban Nigeria who participate in physical activity the prevalence of overweight and obesity is low¹⁷ which are consistent with our findings. A study done in USA showed that the lack of physical inactivity, poor diet, and excessive television produce obese children. Lack of regular physical exercise contributes to a child’s likelihood to be obese, while a program of exercise can reverse an unhealthy lifestyle. Weight loss and/or gain can be simply represented by the laws of thermodynamics and serve as the basis for understanding the role of physical activity and exercise interventions¹⁸ which supports our finding. In our study use of transport was the most common mode (60%) to reach school these students are likely to be obese than those who reach school by physical activity i.e. walking and cycling. Mean time to reach school by physical activity is 9.66 hours SD 6.7. A study showed walking to and from school is considered an additional time spent on moderate to vigorous physical activity and the studies conclude that this in fact helps children maintain an optimum weight and remain physically active.^{19,20} Another study, in particular, showed that active way of commuting to and from school was associated with about extra 24minutes of physical activity among children²¹ both of these studies endorse our study. Apart from genetic

risk factors for obesity that are transferred to a child from his parents evidence is in favor that other parental factors also play a major role in the obesity among children.^{19,21,23} Our study also showed that parental factors were also important determinants for the childhood obesity. Results of our study endorse Australian and American studies concluding that a decline in fitness from childhood to adulthood due to decline in physical activity is associated with obesity²⁴ and vigorous physical activity may reduce the risk of obesity or overweight among male adolescents.²⁵

A longitudinal study adds strong support for the hypothesis that higher levels of physical activity during childhood lead to the acquisition of less body fat by the time of early adolescence [26]. Results of our study also showed similar trends, for instance; children who rated themselves as poor athletes were 5.5 times more likely to be obese than those who rated themselves excellent athletes.

Conclusion

There is increasingly high burden of overweight and obesity among the urban adolescent. Prevalence of obesity is highest in the middle income families. The determinants of the obesity lie within the home and school environment and the overall socio-cultural phenomena. Children are spending a considerable part of their daily routine on sedentary activities and having minimal physical activity opportunities both at school and home and easier access to energy rich fast foods were found to be the major determinants of obesity in our study.

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Conflict of interest

The author declares no conflict of interest.

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