



## Food behaviors and youth obesity in Pakistan

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**ABSTRACT.** The epidemic of obesity took off from about 1980 and in almost all countries has been rising inexorably ever since. Only in 1997 did world health organization accept that this was a major public health problem. It is also becoming an important public health problem among Pakistani children due to changes in life style and other factors. The increasing prevalence of childhood obesity and its concomitant health risks justify widespread efforts toward prevention. A Cross-sectional study was conducted to elaborate the various types of foods and change in eating behavior leading to abnormal weight gain among the youth. A total of 504 male and female students of class six to ten were selected through simple random sampling. Anthropometric measurements were done with calibrated instruments using the age and sex specific BMI cut off points according to World Health Organization growth reference. Results showed significant proportion of girls (86%) and boys (85%) had abnormal waist to hip ratio. The determinants of the obesity lie within the rapid changes in food intake behavior and lifestyle patterns which had a clear and significant impact on the prevalence of obesity in youth of Pakistan.

**Keywords:** body mass index, obesity, adolescent, risk factors, food habits, diet.

## Tendências alimentar e a obesidade juventude no Paquistão

**RESUMO.** A epidemia de obesidade decolou de 1980, e em quase todos os países aumentou inexoravelmente o número de obesos desde então. Apenas em 1997, a Organização Mundial da Saúde aceitou que este era um problema de saúde pública. Também está se tornando um importante problema de saúde pública entre crianças paquistanesas pelas mudanças no estilo de vida e outros fatores. O aumento da prevalência da obesidade infantil e seus riscos de saúde concomitante em justificar esforços generalizados para a prevenção. Um estudo transversal foi conduzido para a elaboração dos vários tipos de alimentos e a mudança no comportamento alimentar levando ao ganho de peso anormal entre os jovens. Um total de 504 estudantes do sexo masculino e feminino da classe 6-10 foram selecionados através de amostragem aleatória simples. Medidas antropométricas foram realizadas com instrumentos calibrados usando a idade e o sexo IMC específicos cortado pontos de acordo com Mundial de referência de crescimento Organização Mundial de Saúde. Os resultados mostraram significativa proporção de meninas (86%) e meninos (85%) com cintura anormal ao quadril. Os determinantes da obesidade encontram-se nas rápidas mudanças no comportamento de consumo alimentar e os padrões de estilo de vida que teve um impacto claro e significativo sobre a prevalência de obesidade em jovens do Paquistão.

**Palavras-chave:** índice de massa corporal, obesidade, adolescente, fatores de risco, hábitos alimentares, dieta.

### Introduction

The epidemic of obesity took off from about 1980 and in almost all countries has been rising inexorably ever since. Only in 1997 did World Health Organization accept that this was a major public health problem and, even then, there was no accepted method for monitoring the problem in children. It was soon evident, however, that the optimum population body mass index is about 21 (JAMES, 2008).

The prevalence of obesity and overweight is increasing globally. Frequently coexisting with under-nutrition in developing countries, obesity is a major

contributor to chronic disease, and will become a serious healthcare burden especially in countries with a larger percentage of youthful population (COLLISON et al., 2010).

Globally, six in every 10 deaths are caused by chronic diseases, a proportion expected to rise over the next few decades. Diets high in saturated fat and sugar but low in nutritional value a risk factor for heart disease, diabetes, and some cancers are becoming more popular in many developing countries, which currently account for at least 80% of all deaths from non-infectious causes (KAREN et al, 2008).

The trend is linked with changes in agricultural and trade policy that date from the 1980s, explain the authors. But even though these systems are linked to health by a complex web of interactions, research into the impact of dietary policies has overlooked this piece of the puzzle, creating a 'disconnect' in policies and priorities between agriculture and health sectors (KONTOGIANNI et al., 2010).

Pakistan stands among those countries which have the prevalence of obesity, among boys and girls is 15% to 20 %. Pakistan being a low income country faces the 'double burden of diseases' and obesity is a major risk factor for a number of Non communicable diseases (PAPPAS et al., 2001).

Technology has also contributed to the epidemic of obesity; television watching time has been considered an important determinant of the obesity in children; firstly it leaves children physically inactive secondly television is the most used medium for food advertisements targeting children (CHENG, 2005).

Almost all food companies target children for their products which is basically 'junk food' i.e. providing little nutrition but of high caloric content. Therefore the epidemic of obesity can be explained by the increased intake of diet rich in fat and sugars but low in vitamins, minerals and other micronutrients (CHENG, 2005).

Also television watching is independently associated with the obesity therefore children watching TV are prone to eat energy dense foods regardless of that they could have spent that time on healthier activities (ERIK LANDHUIS et al., 2008; MANIOS et al., 2009).

Obese, physically inactive parents are less likely to support and help their children to stay with a healthy weight. The kind of foods children eat is also determined by the fact that what they are given to eat at home. Therefore parental behavior in this regard is considered one of the major factors for obesity in children (BIRCH, 2006; CLARK et al., 2007).

Iran, like other regional countries, is also facing the rising burden of childhood obesity where it is a concern and in one study it was concluded that not only obese children are at greater hazard of becoming obese adults but they are independently at higher risk to morbidity and mortality in adulthood. In addition to this there is immense lack of awareness among families to tackle with their obese children (MADDAH, 2008).

Studies from these middle income and developing countries suggests that childhood obesity is now become one of the major concern to these countries as well (FIGUEROA-COLON et al., 1997; KING et al., 1998; JAFAR et al., 2008).

It was observed that the higher socioeconomic status is associated with the obesity problem whereas

the lower socioeconomic status with the under nutrition problem (WARRAICH et al., 2009).

Asthma is an increasing global health burden, especially in the western world. Public health interventions are sought to lessen its prevalence or severity, and diet and nutrition have been identified as potential factors (KIM et al., 2009).

Available data suggest a protective effect of ready-to-eat cereal on risk of obesity thus it can reduce the burden of childhood obesity so plant foods should be made affordable and accessible to children of all income levels and also socio-cultural norms that affect their consumption (NEWBY, 2009).

Logically, the burden of disease induced by inappropriate diets and widespread physical inactivity can be addressed by increasing physical activity (PA), but the decades of misdirected food policies which with free market forces have induced our current 'toxic environment'. Counteracting this requires unusual policy initiatives (JAMES, 2008).

The nature of nutritionally-related disease (NRD) in transitional economies is such that deficiency can frequently co-exist with excess. This is most usually represented by the combination of diets of low nutritional quality and decreased levels of physical activity (LUKITO; WAHLQVIST, 2006).

The shifting beverage landscape along with simultaneous lifestyle changes have occurred in the last few decades, creating an imbalance in energy intake and energy expenditure that has led to overweight and obesity. Some have suggested that intake of beverages has had a disproportional impact on obesity (STOREY, 2010).

Pakistan has one of the lowest i.e. 22% prevalence of physically active adult population (CHENG, 2005). This has happened due to changes in life styles with the urbanization and modernization of society which is occurring at a very fast pace in Pakistan.

This study was conducted in order to elaborate the various types of foods and change in eating behavior that could contribute toward an abnormal weight gain among the school going youth.

## Material and methods

A Cross-sectional study was conducted from 01 January 2008 to 30 June 2009 in city of Hyderabad. The Objective this study was to elaborate the various types of foods and change in eating behavior in schools and homes which contribute in abnormal weight gain among the youth. This study was passed by ethical research committee of AKUH No 1006-CHS-ERC-08.

A total of 504 male and female students selected through simple random sampling. They were

interviewed by trained data collectors through diet questionnaires. Questionnaire was based on the variables on the socio-demographic factors, the various types of foods and change in eating behavior in schools and homes.

Anthropometric measurements were done with calibrated instruments using the age and sex specific BMI cut off points given by World Health Organization. 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 World Health Organization growth reference for the school age children and adolescents, more than 85<sup>th</sup> percentile (BMI Kg height<sup>-2</sup>) is equivalent to overweight and more than 95<sup>th</sup> percentile (BMI Kg height<sup>-2</sup>) is equivalent to obesity (WHO, 2007).

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 98<sup>th</sup> percentiles is the suggested cut-off for obesity and the 91<sup>st</sup> percentile is the cut-off for overweight (Nice, UK) (MCCARTHY et al., 2001).

Seven 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.

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. (AL-SAEED et al., 2007)

The final sample size was given by the variable mothers' 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. In inferential analysis, at a 5% level of significance ( $\alpha$ ), 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.

## Results

Results were available for 501 respondents out of the 504 (Table 1). Analysis of the results is presented in descriptive variables, univariate logistic regression analysis and multivariate logistic regression analysis.

**Table 1.** Sociodemographic characteristics of high school youth of Hyderabad.

Variables	Frequency	Percent
Gender (n = 501)		
Boys	255	50.9
Girls	246	49.1
Age (n = 501) Mean (SD)	13.8 years (1.6)	
Socioeconomic Status (n = 370)		
Lower tertile	123	32.8
Middle tertile	124	33.1
Upper tertile	123	34.1

The prevalence of overweight (> 85<sup>th</sup> percentile) and obesity (> 95<sup>th</sup> 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 ratio (Table 2).

**Table 2.** Description of overweight and obesity by sex of high school youth of Hyderabad .

Obesity and overweight	Boys n (%)	Girls n (%)
Overweight		
Yes (> 85 <sup>th</sup> percentile)	59 (23%)	39 (16%)
No (< 85 <sup>th</sup> percentile)	196 (77%)	207 (84%)
Obesity		
Yes (> 95 <sup>th</sup> percentile)	38 (15%)	20 (8%)
No (< 95 <sup>th</sup> 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 (SD)	75.509 (10.46)	72.23 (8.52)
Hip Circumference; Mean (SD)	86.03 (10.09)	85.24 (8.95)

NA: Not Applicable.

The univariate analysis is placed in the same order as is descriptive analysis for the purpose of clarity and coherence. Those variables which had p-value less than 0.25 were eligible entered in the multivariate logistic regression analysis. The univariate analysis was also done for the food frequency. Food frequency was

inquired about 99 foods within the groups of starch foods, dairy, traditional protein/meat curries, nontraditional proteins foods, fruits and vegetables. Initially the variables had 9 categories of frequency but these were merged due to sparse data and for meaningful analysis (Table 3).

Analysis was significant ( $p = < 0.25$ ) for the starch, vegetables, fruit and dairy variables. These along with the other insignificant but biologically plausible variables in the food frequency, were entered in the multivariate analysis. A significant proportion of the participants ate breakfast, lunch and dinner without the presence of their parents on the day before the interview. Also students had visited any of the fast food

restaurants 1.8 times on an average in the last six months. About 83% of the children did not bring any lunch box in school. More than half (56%) ate some meal at a fast food restaurant. Lastly about 31% of the schools promoted fast food companies to open their stalls in the school premises (Table 4).

The results of the multivariable analysis are food frequency variables specifically, dairy foods ( $p = 0.21$ ), starch ( $p = 0.846$ ), vegetables ( $p = 0.095$ ). Finally those who were eating fruit more than 4 times a week were 55% less likely to be obese than those who ate less than 4 times a week ( $p = 0.02$ ).

**Table 3.** Univariate analysis: Factors related to 'food behavior' of high school youth of Hyderabad (n = -501).

	p value	OR	CI for OR
Eat at a fast food place or restaurant last week?			
Never		1.00	
1-3 Times	0.007	1.85	(1.19-2.89)
Brought lunch from home to school last week?			
Never		1.00	
1-3 Times	0.170	0.63	(0.33-1.22)
Ate lunch at home on a school day last week?			
Never		1.00	
1-3 Times	0.705	0.85	(0.38-1.94)
Ate breakfast last week?			
Never		1.00	
1-3 Times	0.609	0.85	(0.46-1.58)
Meals or snacks while watching television last week?			
Never		1.00	
1-3 Times	0.899	0.97	(0.57-1.63)
Breakfast			
With parents		1	
Alone	0.284	1.27	(0.82-1.98)
Lunch			
With parents		1	
Alone	0.702	1.10	(0.68-1.78)
Dinner			
With parents			
Alone	0.797	0.93	(0.55-1.59)
Any fast food company open stall in school in last six months			
Yes		1.00	
No	0.375	0.81	(0.51-1.29)
Does the school arrange trips to fast food			
No		1.00	
Yes	0.695	1.10	(0.66-1.84)
Number of trips to fast food in last six months	0.195	1.12	(0.94-1.33)

OR (odd ratio), CI (confidence interval).

**Table 4.** Descriptive characteristics related to 'food behavior' of high school youth of Hyderabad (n = -501).

	frequency	percent
Any fast food company open stall in school in last six months (n = 499)		
Yes	153	31
No	346	69
Does the school arrange trips to fast food		
Yes	119	24
No	382	76
Average number of times schools arranged trips to fast food outlet in last six months (n = 501) 1.8 SD=0.4)		
Breakfast yesterday		
With parents	262	52
Alone	239	48
Lunch yesterday		
With parents	357	71
Alone	144	29
Dinner yesterday		
With parents	388	77
Alone	112	22

Males showed a higher risk of obesity as compared to females. Specifically the females were 67% less likely to be obese than males. This gender relationship with the outcome improved from 35% in the univariate to 65% in the multivariate analysis. Those in the middle socioeconomic status tertile were 3.43 times more likely to be obese than those in the lower tertile ( $p = 0.004$ ) (Table 5).

**Table 5.** Multivariate logistic regression analysis for obesity and overweight versus normal weight with diet of high school youth of Hyderabad ( $n = -501$ ).

	Crude OR (95% CI)	Adjusted OR (95% CI)	p-value (MVA)
Gender			
Boys <sup>30</sup>	1.00	1.00	
Girls	0.65 (0.41-1.01)	0.33 (0.16-68)	0.002
Socioeconomic Status			
Lower <sup>30</sup>	1.00	1.00	0.004
Middle	2.22 (1.14-4.33)	3.43 (1.49-7.93)	
Upper	1.62 (0.81-3.22)	0.12 (0.01-1.00)	
Fruit <sup>*</sup>			
Less than 4 times a week <sup>30</sup>	1.00	1.00	
More than 4 times a week	2.0 (1.27-3.14)	0.45 (0.22-0.91)	0.02

OR (odd ratio), CI (confidence interval), MVA (multivariate analysis). \*Fruit variable was computed through merging all the data on various types of local seasonal fruits asked in the food frequency.

## Results and discussion

The change in traditional food behavior to high caloric and low nutritional value food has led to obesity which is evident in our study which showed a high prevalence of overweight and obesity among the sampled population. The prevalence of overweight ( $> 85^{\text{th}}$  percentile) and obesity ( $> 95^{\text{th}}$  percentile) was 23% and 15% among boys, whereas in girls the prevalence of overweight and obesity was 16% and 8% respectively. Therefore girls were less overweight and obese than boys; the reason behind girls being less overweight is traditionally our community spent more on boys being bread earner of future so girls have less opportunity to high quality food and dining out. Those who were bringing lunch from home to school were also less prone to be obese ( $p = 0.170$ ). Those who were eating at some fast food outlet rather than at home were more likely to be obese ( $p = 0.007$ ). The students who were eating fruit more than 4 times a week were 55% less likely to be obese (Table 6).

A possible explanation for the occurrence of high prevalence of obesity among middle income group and absence of obesity among the children belonging to lower and upper income class is that the lower income group has minimal purchasing power as far as foods particularly energy dense foods

is concerned on the other hand the upper class is more aware of the role of diet and the physical activity and remaining fit.

**Table 6.** Univariate analyses: Factors related to 'food behavior' of high school youth of Hyderabad ( $n = -501$ ).

	p value	Crude OR	95% CI for OR
Starch <sup>1</sup>			
Less than 4 times a week		1	
More than 4 times a week	0.045	0.63	(0.40-0.98)
Traditional meat \ Protein curries <sup>2</sup>			
Less than 4 times a week		1	
More than 4 times a week	0.42	1.19	(0.77-1.86)
Vegetables <sup>3</sup>			
Less than 4 times a week		1	
More than 4 times a week	0.036	0.62	(0.39-0.97)
Fruit <sup>4</sup>			
Less than 4 times a week		1	
More than 4 times a week	0.003	2.00	(1.27-3.14)
Nontraditional high protein meals <sup>5</sup>			
Less than 4 times a week		1	
More than 4 times a week	0.681	1.10	(0.71-1.71)
Sweets / junk <sup>6</sup>			
Less than 4 times a week		1	
More than 4 times a week	0.28	0.8	(0.5-1.2)
Dairy <sup>7</sup>			
Less than 4 times a week		1	
More than 4 times a week	0.002	0.49	(0.31-0.77)

OR (odd ratio), CI (confidence interval) <sup>1</sup>Starch: variable was computed by merging the chapatti without oil + chapatti with oil + naan + paratha + sheermal + puree + bread + Rusk. <sup>2</sup>Traditional proteins curries: variable was computed by merging the mutton beef + minced meat + kofta + chicken curry + fish fry + fish + any curry + brain + paya + katakut + nihari + haleem + omelet + egg boiled. <sup>3</sup>Vegetables: variable was computed by merging the reddish + beetroot + cucumber + onions + cauliflower + cabbage + egg plant + torai + beetroots + reddish + carrots + turnips + spinach + yam + karalla + okra + beans. <sup>4</sup>Fruit: variable was computed by merging the banana + watermelon + cantaloupe + papaya + plum + apricot + peach + apple + mango + grapes + pomegranate + custard apple + dates + berries + orange + chikoo. <sup>5</sup>Non traditional high protein meals: variable was computed by merging the burger + chicken roast + tikka + pizza + seekh boti. <sup>6</sup>Sweets/junk: variable was computed by merging the mithai + kheer + zarda + kulfi + biscuit + chocolate + honey + samosa + pakora + + nimko + french-fries + soft drink + diet soft drink + packaged juice + sugar syrup. <sup>7</sup>Dairy: variable was computed by merging the whole milk + skimmed milk + yoghurt + lassi + butter.

Parents were found to be indirectly contributing to the high prevalence of obesity among our sampled children. A large number of the children were not being given any food from home for school. Also children frequently eat outside home particularly at chain or fast food restaurants. It is observed that these restaurants tempt children through their marketing and advertisement strategies directed particularly at children. Therefore frequent and high consumption of fast foods by the parents obviously leads to higher consumption of food by their children.

A Greek study suggest a potential inter correlation and protective action of selected eating behaviors, namely eating frequency, breakfast consumption, and adherence to the Mediterranean diet, against overweight and obesity in children and adolescents (KONTOGIANNI et al., 2010) which support our study findings.

A study done in Thailand showed that rapid changes in food intake and lifestyle patterns had clear and significant impact on the pattern of disease

burden. Study showed that Thai staples and side dishes are being replaced by diets containing a higher proportion of fats and animal meat. A shift in the proportion of expenditure on food prepared at home and that on purchased, ready-to-eat food, in both rural and urban settings, gives another reflection of the change in food consumption resulting in high prevalence of overweight and obesity among children and adolescents (KOSULWAT, 2002) which are consistent with finding of our study. A Brazilian study showed students whose mean weekly intake of unhealthy foods was 3.25 times for soft drinks, 2.91 for fried foods and 4.01 for sweets are more obese. The intake of skimmed milk (38.9%) and diet soft drinks (20.9%) was greater among obese children (BARBIERO et al., 2009) these finding are consistent with our study.

A study done provided in schools have significantly changed since 2006 when the beverage industry implemented School Beverage Guidelines i.e. voluntary removal of full-calorie soft drinks from participating schools across the country. This shift to lower-calorie and smaller-portion beverages has led to a significant decrease in total beverage calories in schools which support the public health concept to prevent and treat obesity (STOREY, 2010).

A Greek study disagrees with this concept that a 'high fiber pattern', representing high consumption of whole-grain cereals, legumes, and low intake of sugar-sweetened beverages was negatively correlated with obesity indices (YANNAKOULIA et al., 2010).

## Conclusion

This study draws conclusion on the increasingly high burden of overweight and obesity among the youth, particularly living in the urban setting of Pakistan. Furthermore obesity prevalence was highest among the youth belonging to the middle income families and the determinants of obesity lie within the home and school and in changing food behavior of our nation. The rapid changes in food intake and lifestyle patterns had a clear and significant impact on the prevalence of obesity in youth of Pakistan. These changes should be monitored carefully and must be reversed through appropriate behavior modification and the promotion of appropriate eating practices.

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