

Prevalence of overweight and obesity among children and adolescents of affluent schools in Karachi

Sina Aziz,¹ Wajeeha Noorulain,² Umm-e-Rubab Zaidi,³ Kehkashan Hossain,⁴ Intisar Ahmed Siddiqui⁵

Sarwar Zuberi Liver Centre, Medical Unit 5, Civil Hospital Karachi, Dow University of Health Sciences,¹⁻³

Department of Nutrition, Sindh Institute of Urology & Transplantation,⁴ Medical Education, College of Physicians & Surgeons Karachi, Pakistan⁵

Abstract

Objective: To estimate the prevalence of overweight and obesity among children and adolescents of affluent schools of Karachi.

Method: This descriptive study is part of an ongoing nationwide project funded by Higher Education Commission (HEC) Pakistan, to develop growth centile charts of our children. This survey of three affluent schools of Karachi was done over a period of three months (from Sept to end Nov, 2007) including 398 children. Socio-economic group was decided based on monthly income and items such as computer, fridge, television, car etc. Students from Class 1-10 representing age group 6 to 17 years were included; children were divided into groups A, B, and C representing age of 6-9, 10-13, and 14-17 years respectively. The children included were healthy with no history of chronic infection and immunization up-to-date as per the Expanded Program of Immunization (EPI) schedule of the country. Body weight was measured in minimum clothing to the nearest 0.1 kg using a weight scale with calibration done after every 25 readings. Body height was measured in the erect position without shoes to the nearest 0.1 cm using wall mounted stadiometers. A twenty four hour diet chart was obtained using specially designed questionnaires. The reference definitions used were those given by the Center for Disease Control (CDC) according to which children having their BMI plotted above 95th centile are obese and BMI between 85th-95th centiles were "at risk for overweight."

Results: Data of 398 students belonging to affluent schools is presented. Out of these 398, 24 (6%) were above the 95th centile (obese) while 77 (19.35%) were between 85th-95th centiles on NCHS charts (at risk for overweight). The children in group A (6-9 years) showed daily caloric intake of 2220±816 kcal/day, group B showed caloric intake of 2133±942 kcal/day and group C a caloric intake of 1976±873 kcal/day. Apart from the overall data, children above 95th centile and between 85th to 95th centile showed a daily caloric intake of 1861±849 and 2056±895 kcal per day, respectively. Approximately 85% of the students when asked about their daily schedule were leading a predominantly sedentary life style, due to tuitions, television viewing or internet surfing or indoor games like play stations (not requiring physical activity).

Conclusion: Even with our small sample size the percentage of obese and overweight children were 6% and 19% of the population studied. This study suggests that overweight and obesity among these children maybe due to their sedentary lifestyle and/or lack of intake of proper food (imbalance in the intake of daily calories, carbohydrate, fat and protein) (JPMA 59:35; 2009).

Introduction

Identification of obesity and overweight children and their management is an important aspect of preventive pediatrics and Public Health.¹ The prevalence of child obesity is increasing rapidly worldwide.² A study done by Hedley et al indicates that the prevalence of overweight and obesity has increased markedly in the last two decades in the United States. Among children aged 6 through 19 years in 1999-2002, 31% were at risk of overweight or overweight.³ This childhood obesity is not a disease but rather a symptom complex having a weak association with adult obesity and recognized as a significant risk factor for chronic diseases such as early atherosclerosis,^{4,5} arteriosclerosis, ischaemic heart disease, diabetes, all of

which are major causes of morbidity and mortality.⁶⁻⁹

Obesity is defined using the age and sex specific charts for BMI released by the Center for Disease Control (CDC).^{10,11} The CDC defines normal weight for height as a BMI greater than 5th percentile but less than the 85th percentile. A BMI between the 85-95th percentile is called at risk for overweight and a BMI greater than the 95th percentile is usually specific for increased body fat and is called overweight.^{12,13} These terms overweight and obesity are used interchangeably in paediatric population though obesity can also be referred to as a level of overweight that has accompanying adverse physical or psychological issues.¹⁴

According to the World Health Organization (WHO)

latest projections for the world in 2005 there were approximately 1.6 billion overweight adults (age 15+) and at least 400 million adults were obese. Worldwide, 20 million children under the age of 5 years are overweight. In these 2.5 million children, cause of death is attributed to overweight and obesity.¹⁵

Considering the above staggering figures of obesity and overweight in children and adolescents, this study was conducted to estimate the prevalence of overweight and obesity among children and adolescents of affluent schools of Karachi.

Subjects and Methods

This is a descriptive study done over a period of three months from September to November 2007, in three private sector schools of affluent socio-economic groups in Karachi, Pakistan. The affluent socio-economic group was identified on the basis of monthly income of parents (average > Rs.15,000 per month approximately \$246); school fees of child (average > Rs.1,500 per month approximately \$25) and presence of household items such as computer, refrigerator, washing machine, television and a car.

A visit to the Administration of every school was made to explain the project and to obtain permission for the study. A total of 398 students from classes 1 to 10 (age range 6 to 17 years) were randomly selected. Fifty students were included from each individual school. In order to have a representative number of students of each group, 10 students were randomly chosen from each class to have a total of 50 students from each selected school. Consent was taken from the parents of the children. The students were also interviewed using pre-designed questionnaires. A 24 hours diet recall was obtained from the students. In case of younger children, between six and seven years of age diet recall was confirmed from their parents. For this a food key was developed with the help of dietitians using the United States Department of Agriculture (USDA) approved food exchange¹⁶ and another food list from the website of Allama Iqbal Open University (AIOU) Pakistan.¹⁷ Body weight was measured in minimum clothing to the nearest 0.1 kg using a weight scale with calibration done after every 25 readings. Body height was measured in the erect position without shoes to the nearest 0.1 cm using wall mounted stadiometers. Only those children were included in the study who gave no history of chronic illnesses, repeated hospitalization and had an up-to-date vaccination status according to the Expanded Program of Immunization of Pakistan (which was obtained from the parents by a questionnaire).

Ethical consideration: The study was approved by the Ethical Review Board of HEC. A prior visit to each school principal was done with an explanation and

introduction of the study. Agreement of the concerned principal and consent from parents was obtained before this study was initiated.

Statistical Analysis: The data was entered and analyzed using SPSS version 10.0. Variables like Calories, Carbohydrate CHO, Protein, and Fat were transformed into per kg/day through the SPSS program. The ratio of the aforementioned variables from the weight in kilogram of the children and then the transformed variables were presented by mean±SD.

The prevalence of obese and overweight children was calculated with their 95% confidence intervals. Analysis of variance was applied to compare mean dietary intake among three groups. Chi-square test of K-proportion was applied to compare three proportions, through SPSS non-parametric test.

Comparison of combination of groups (A vs B) etc among the three group averages was done, to determine the significance under alternate hypothesis (for p<0.05). Post-Hoc Scheaffe's test was applied to compare two independent groups.

Results

A total of 398 students were interviewed from three high socio-economic schools. The age of the students, ranged between 6 to 17 years. Majority of them were girls (72.2%; n=287). The prevalence of obese children were found to be 6 percent (95% C.I.: 3.7, 8.4) and of overweight were 19.3 percent (95% C.I.: 15.5, 23.2) respectively. Table 1 shows the total daily intake, and per

Table 1: Carbohydrate, Fat and Protein Percentages per day in obese and overweight children of affluent schools of Karachi.

	Obese n=24	Overweight n=77
Total Calories/day (range)	1861 ± 849* (587 - 4435)	2056 ± 895* (742 - 5207)
Carbohydrate (%)†	57.9	56.7
Fat (%)†	35.4	35.5
Protein (%)†	12.6	12.5

*mean±sd (Insignificant difference of total calories/ day between obese and overweight groups t=0.944, p=0.347).

†percentage

day consumption of the three macronutrients among the obese and overweight children. Forty six percent of the obese children were taking the upper limit of fat content in their diet (35% of the diet) while 29% of the obese children were taking the upper limit of carbohydrates (65% of the diet). In the obese group 42.8% were taking the upper limit of fat (35% of the diet) and 19.48% were taking the upper limit of carbohydrates (65% of the diet).

The average 1861.3±849 kcal per day and by overweight children was 2056.7±895 kcal per day. The per day carbohydrate, protein, and fat consumption in obese children on an average was 57.9%, 12.6% and 35.4% respectively whereas that of overweight children was 56.8%, 12.5% and 35.5%.

Table 2 shows the total calories, carbohydrate, fat

Table 2: Total Calories, Carbohydrate, Fat and Protein intake (mean±sd) in g/day of 398 children of affluent schools of Karachi.

	Age Group (years)			p-value
	Group A (6-9) n=95	Group B (10-13) n=201	Group C (14-17) n=102	
Total Calories/day	2220 ± 816	2133 ± 942	1976 ± 873	0.148
Total CHO+ (g/day)	331 ± 125	306 ± 145	289 ± 142	0.111
Total Fat (g/day)	90 ± 41*	82 ± 41	73 ± 35	0.010
Total Protein (g/day)	73 ± 23**	64 ± 27^	58 ± 25	0.001
Calories (per kg/day)	78 ± 34**	56 ± 32^	39 ± 19	0.001
CHO (per kg/day)	12 ± 5**	8 ± 4^	5 ± 3	0.001
Protein (per kg/day)	3 ± 1**	2 ± 1^	1 ± 0.8	0.001
Fat(per kg/day)	3 ± 1**	2 ± 0.9^	1 ± 0.6	0.001

Key: +CHO, Carbohydrates

*, ** Post-Hoc Scheaffe's test was applied to compare two independent groups.

and protein intake (mean±SD) in g/day of 398 children of affluent schools of Karachi. Group A intake of total calories and consumption of carbohydrate, fat and protein was significantly higher compared to Group B and group C.

Overall, less than 15% were taking fruits in their daily life. About 63 (15.82%) had bed time snacks in the form of burgers, pizzas, french fries, cola drinks, noodles, chocolates and chips. Approximately 85% of the students when asked about their daily schedule showed 6-7 hours of school followed by another 2-3 hours at madressah or tuition, followed by television viewing or internet surfing or playing indoor games like play stations (not requiring physical activity).

Discussion

Obesity in childhood and adolescence is increasing in developing countries around the world.¹⁸ Once considered a problem only in high income countries, overweight and obesity are now dramatically on the rise in low and middle income countries particularly in urban setting.¹⁵ Supporting this statement studies from countries such as India,¹⁹ Srilanka,²⁰ also show the high prevalence of overweight and obesity in their population and more so in urban, affluent settings. The prevalence of obesity (6%) and overweight (19%) in our study is comparable to the data available from other countries like India, Srilanka, Qatar and Iran.¹⁹⁻²² According to WHO these global increases in overweight and obesity are attributable to a number of

factors including a global shift in diet towards intake of energy-dense foods that are high in fat and sugars but low in vitamins, minerals, and other micronutrients and a trend towards decreased physical activity due to sedentary lifestyles.¹⁵

Various papers from the developing world describe the concept of the nutrition transition, which is a sequence of characteristic dietary and nutritional patterns resulting from large shifts in the overall structure of the diet, correlated with changing economic, social, and demographic and health factors. These changes are associated with a high prevalence of obesity, particularly childhood obesity.¹⁸ A study on dietary pattern of children among low socioeconomic group of Karachi also showed obesity and overweight to be 4%.²³ The results of our study also showed that the intake of total calories per day in two of the age groups was above the normal recommended range i.e. in group A mean was 2220 (recommended 1530-1762); group B was 2133 (recommended 1880) whereas for children in group C (adolescents) it was below normal i.e. 1976.6 (recommended 2460)²⁴ but the consumption of carbohydrates, fat and proteins was imbalanced, which is in reverse of what is recommended in the food guide pyramid.¹⁶ The younger children were more regular in their meals, being supervised by the parents. The food, provided by the parents to these younger children was not according to the food pyramid, but comprise of less intake of vegetables and fruits and more of food with high caloric intake and energy-dense foods (high in fat and sugars). It was also low in vitamins, minerals, and other micronutrients. A trend towards decreased physical activity due to sedentary lifestyles is also observed. However, as the child grew older, parental supervision and counseling declined. Meals were taken at random but food utilization was again a reversal of the pyramid.¹⁶ This consumption of snacks was seen increasing with urbanization as well as with affluence plus overall consumption of foods from the vegetable groups decreased with urbanization and affluence.²⁵ This sedentary lifestyle is also a major contributor in childhood obesity in our affluent paediatric population.

Conclusion

The results, though representing a small proportion of our community, constitute a high prevalence of obesity and overweight i.e. 6% and 19% respectively.

Children of affluent schools are taking junk food more compared to a mixed healthy diet, leading to imbalanced dietary intake with majority of them showing sedentary lifestyle because of transitions of our lifestyle due to media, Internet, indoor games (Play station etc) in the last decade or so. The general public, especially parents, should

be made aware about the prevailing situation and involve themselves in the activities of their children. Physical educational activity should be encouraged and made a part of the students' curriculum, only then, can we prevent the untoward effects of this emerging epidemic in our affluent community.

Acknowledgements

We are grateful to the principals and administration of concerned schools, students and their parents for their co-operation and making this study possible. We would also like to thank the staff of Sarwar Zuberi Liver Center, Civil Hospital Karachi, especially Mr. Mohammad Younis for their support and co-operation.

Acknowledgement of Grant

This study is part of a nationwide project funded by the Higher Education Commission (HEC) of Pakistan.

References

- de Onis M, Garza C, Onyango AW, et al. Comparison of the WHO child growth standards and the CDC 2000 growth charts. *J CMAJ Nutr* 2007; 137:144-8.
- Ogden CL, Kuczmarski RJ, Flegal KM, et al. Centers for Disease Control and Prevention 2000 growth charts for the United States: improvements to the 1977 National Center for Health Statistics version. *Pediatrics* 2002; 109:45-60.
- Curran JS, Barness LA. Obesity. In: Nelson Textbook of Pediatrics, ed 16. Philadelphia: W.B. Saunders, 2000; pp 172-6.
- Plotnikoff RC, Lightfoot P, Spinola C, Predy G, Barrett L. A framework for addressing the global obesity epidemic locally: the Child Health Ecological Surveillance System (CHESS). *Prev Chronic Dis*. 2008; 5:A95. Epub 2008.
- Hedley AA, Ogden CL, Jhonson CL, Carrol MD, Curtin LR, Flegal KM. Prevalence of overweight and obesity among US children, adolescent and adults, 1999-2002. *JAMA* 2004; 291: 2847-50.
- Berenson GS, Srinivasan SR, Bao W, Newman WP, Tracy RE, Vattigney WA. Association between multiple cardiovascular risk factors and atherosclerosis in children and young adults. The Bogalusa Heart Study. *New Engl J Med* 1998; 338:1650-6.
- Mahoney LT, Burns TL, Stamford W. Coronary risk factors measured in childhood and young adult life are associated with coronary artery calcification in young adults: the muscaline study. *J Am Coll Cardiol* 1996; 27:277-84.
- Green SM. Obesity: Prevalence, causes, health risks and treatment. *Br J Nurs* 1997; 6:1181-5.
- Abraham S, Collins G, Nordsiek M. Relationship of childhood weight status to morbidity in adults. *Public health Re*. 1971; 86:273-84.
- Nieto FJ, Szklo M, Comstock JW. Childhood weight and growth rate as predictors of adult mortality. *Am J Epidemiol* 1992; 136:201-13
- Lewis CE, Jacobs DR Jr, McCreath H, et al. Weight gain continues in the 1990s: 10 year trends in weight and overweight from the cardia study. *Am J Epidemiol* 2000; 151:1172-81.
- Milliken K. Childhood obesity. The APGNN Clinical Handbook of Pediatric Gastroenterology. The Association of Pediatric Gastroenterology and Nutrition Nurses 2008; pp 171-81.
- Skelton JA, Rudolph CD. Overweight and Obesity. In: Nelson Textbook of Pediatrics, ed 18. Philadelphia: Saunders, 2007; pp 232-42.
- Rehman T, Rizvi Z, Siddiqui U, Ahmad S, Sophie A, Siddiqui M, Saeed O, Kizilbash Q, Shaikh A, Lakhani A, Shakoora A. Obesity and adolescence of Pakistan. *J Pak Med Assoc* 2003; 53: 315-9.
- World Health Organization Fact sheet September 2006. www.who.int/mediacentre/factsheets/fs311/en/index.html. Accessed August 8, 2008.
- United States Department of Agriculture's Food Guide Pyramid Booklet, Food and Nutrition, 1996. www.nal.usda.gov/fnic/fpyr/pyramid.html. Accessed October 2, 2008.
- Allama Iqbal Open University www.aiou.edu.pk/foodsite/fctviewonline.html. Accessed October 2, 2008.
- Kosti RI, Panagiotakos DB. The epidemic of obesity in children and adolescents in the world. *Cent Eur J Public Health*. 2006; 14:151-9.
- Sharma A, Sharma K, Mathur KP. Growth pattern & prevalence of obesity in affluent school children of Delhi. *Public health Nutr* 2007; 10:485-91.
- Wickramasinghe VP, Lamabadusuriya SP, Attapattu N, Sathyadas G, Kuruparanantha S, Karunarathne P. Nutritional status of school children in an urban area of Sri Lanka. *Ceylon Med J* 2004; 49:114-8.
- Bener A, Kamal AA. Growth Patterns of Qatari school children and adolescents aged 6-18 years. *J Health Popul Nutr*. 2005; 23: 250-8.
- Ayatollahi SM, Mostajabi F. Prevalence of obesity among school children in Iran. *Obes Rev*. 2007; 8:289-91.
- Aziz S, Rehan N, Zaidi UR, Hosain K, Siddiqui IH. Dietary intake and its impact on the growth among low socio-economic school children of Karachi. *J Pedr Gastroenterol Nutr* Oct 2001; 45:e22:Abstract#55.
- Glynn J. Parenteral Nutrition. In: Clinical Paediatric Dietetics, ed 2. Abingdon: Blackwell, 2002; pp 46.
- Hakeem R, Thomas J, Badruddin SH. Rural-Urban differences in food and nutrient intake of Pakistani children. *J Pak Med Assoc* 1999; 49:288-94.