PREVALENCE OF OVERWEIGHT AND OBESITY IN ADOLESCENTS IN BIRJAND

F Taheri MD[(1)], T Kazemi MD[(2)]

Abstract

INTRODUCTION: This population-based study was conducted to assess the prevalence of overweight and obesity in high schools in the city of Birjand in Khorasan Province, Eastern Iran.

METHODS: In this descriptive study, we attempted to determine the prevalence of overweight and obesity in Iranian adolescents attending high school in Birjand in 2005. A sample of 2230 high school students (1115 boys and 1115 girls) aged 15-18 years was selected via stepwise random sampling in four districts of Birjand. Overweight and obesity were defined based on the 85th and 95th percentiles of BMI for age, respectively, as proposed by the Center for Disease Control (CDC) in 2000.

RESULTS: The overall prevalence rates of overweight and obesity were 6.1% and 2.3%, respectively. The prevalence of overweight was 5% in boys and 7.1% in high school girls. The prevalence of obesity was 2.8% and 1.8% in high school boys and girls, respectively.

CONCLUSIONS: The prevalence of overweight and obesity in high schools in the city of Birjand is lower than figures reported by other studies conducted in Iran and in other countries.

Key Words: Prevalence, overweight, obesity, adolescents.

ARYA Journal 2006; 2(1): 27-30

Introduction

Obesity has become a growing concern due to its high prevalence and association with morbidity.[1-3]

Childhood and adolescent obesity have been identified as risk factors for obesity in adulthood, and are linked to increased adult morbidity through predisposing to a variety of conditions such as insulin resistance, lipoprotein abnormalities, diabetes mellitus type II, cardiovascular disease, deep vein thrombosis, and elevated blood pressure.[4-6]

Serdula found a risk for adult obesity at least twice as high in obese children as in non-obese ones; approximately one-third of preschool children and 50% of school-age children become obese adults.[7]

In contrast to studies involving children and adults, relatively little information is available about the effect of racial differences on weight in adolescents.[8]

However, it has recently been shown that the prevalence of adolescent obesity is increasing not only in developed countries, but also in some developing countries in which malnutrition used to be the major nutritional disorder.[9-12] Obesity may be defined as excessive accumulation of adipose tissue in the body. Several methods have been developed to measure body fat, including densitometry, ultrasonography, computed tomography, magnetic resonance, assessment of body potassium content, levels of creatinine, and total body water content. These methods are usually expensive, time-consuming, require qualified personnel, and are not widely available. BMI is the preferred method of expressing body fat percentile of groups in childhood and adolescence.

BMI between the 85th and 95th percentiles is widely accepted as the definition of overweight, and BMI greater than the 95th percentile, as obesity.[13,14]

The present study aimed to determine the prevalence of overweight and obesity in adolescents, and compare the prevalence of overweight and obesity between males and females and between the age groups.

Materials and methods

This study was carried out in high schools of Birjand. A total of 2250 students (1115 boys and 1115 girls) aged 15-18 years were studied.

The participants were selected with the systematic sampling technique, using a list based on which the students were categorized into grades and each grade was organized in alphabetical order.

(1) Fatemeh Taheri MD, Fatemeh Taheri MD, Assistant Professor, Pediatrician, Birjand University of Medical Sciences, School of Medicine

(2) Toba Kazemi MD, Assistant Professor, Cardiologist, Birjand University of Medical Sciences, School of Medicine, Department of Internal Medicine, email address: med_847@yahoo.com

Corresponding author: Toba Kazemi

Date of submission: June 23, 2006

Date of acceptance: July 30, 2006

Whenever an individual refused to participate in the study, the subsequent student on the list was called. The measurements of body height and weight were carried out by two trained medical students in the morning. Body weight (in kilograms) was measured to the nearest 0.1 kg with an electronic scale (Seca, Germany). Body height was measured to the nearest 0.5 cm as the adolescents stood erect against a vertical wall-mounted scale with heels, buttocks, and occiput in the Frankfort plane with anthropometric square. The adolescents were dressed in light underclothing and no shoes throughout the measurements.

BMI was calculated as the ratio of body weight in kilograms to the square of body height in meters (kg/m^2). Data were processed and analyzed with EPSS software version 11.5.

Descriptive statistical analysis of BMI, weight and height was performed. Estimations of the prevalence of overweight and obesity were based on definitions of the Center for Disease Control (CDC) in 2000 (in excess of the 85th and 95th percentiles, respectively).

Chi square test with a significance level of 5% ($P<0.05$) was used to compare the prevalence rates, taking into consideration gender and age group.

Results

The sample, representing adolescents aged between 15 and 18 years, consisted of 2230 subjects (1115 girls and 1115 boys). The prevalence of overweight and obesity in relation to the age of adolescents is shown in Table 1. Table 2 shows the prevalence of overweight and obesity in relation to sex. The prevalence of overweight and obesity was found to be 7.1% and 1.8%, respectively in adolescent girls, and 5% and 2.8%, respectively in adolescent boys.

Discussion

The purpose of this study was to provide data on the prevalence of overweight and obesity in adolescents in Birjand. The results demonstrated the overall prevalence of overweight and obesity to be 6.1% and 2.1%, respectively.

Moayeri reported the prevalence of overweight and obesity in students in Tehran to be 21.1% and 7.8%, respectively.[15] In the city of Tabriz, Western Iran, the prevalence of overweight and obesity in high school girls was 11.1% and 3.6%, respectively.[16]

In the city of Shiraz, Central Iran, the prevalence of overweight and obesity in adolescents (13-18 years old) was 11.3% and 2.9%, respectively.[17]

The reason for the lower prevalence of overweight and obesity in Birjand adolescents is largely unknown, but diet and undernutrition generally linked to low socioeconomic status in Eastern Iran may be held to account.

The prevalence of obesity in children and adolescents in Europe increased gradually when traced towards east and south. Dutch, Belgium and Swedish adolescents are slimmer than Middle and Eastern European adolescent populations.[18,19] On the other hand, a higher prevalence of overweight and obesity is seen in Hungarian, Austrian, and Croatian adolescents.[19-21] Bellizzi et al.[22] compared the prevalence of overweight and obesity in 15-year-old boys and girls in different Asian and European countries.

TABLE 1. The prevalence of overweight and obesity in subjects by age (using CDC BMI reference criteria)

Normal	Obese	Overweight	Age (years)
637 (91.5%)	14 (2%)	45 (6.5%)	15, N=696
586 (91.4%)	14 (2.2%)	41 (6.4%)	16, N=641
532 (91.6%)	14 (2.4%)	35 (6%)	17, N=581
289 (92.6%)	9 (2.9%)	14 (4.5%)	18, N=312
2044 (91.6%)	51 (2.3%)	135 (6.1%)	All, N=2230

TABLE 2. The prevalence of overweight and obesity in subject by gender

Sex	Overweight	Obese	Normal weight
girl	79 (7.1%)	31 (1.8%)	1016 (91.1%)
boy	56 (5%)	20 (2.8%)	1028 (92.9%)
total	135 (6.1%)	51 (2.3%)	2044 (91.6%)
$\chi^2=6.36$	df=2	P=0.04	

Among these populations, the total prevalence of overweight (obesity and overweight) in boys ranged from 5.8% (in the Netherlands) to 30.5% (in Taiwan), and in girls from 6.3% (in Hong Kong) to 21.1% (in Taiwan). In Asia, a higher prevalence of obesity was found in Taipei and Saudi Arabian adolescents.[23,24]

Some countries showed significant gender differences in the prevalence of overweight and obesity in adolescents. In particular, most of the studies performed in Asia and Europe (Taiwan, Finland and Austria) showed higher prevalence rates in adolescent boys than girls.[19,20,23] Saudi Arabian and Brazilian adolescents demonstrated an opposite trend.[22,25] In our study, higher rates of overweight were observed in adolescent girls but the rates of obesity were higher in boys.

The obesity epidemic in adolescents is troubling, not because of cosmetic issues, but because of tremendous public health implications.

Roughly 60% of overweight 5-10-year-olds are reported to have one associated biochemical or clinical cardiovascular risk factor such as elevated blood pressure, hyperlipidemia, and increased insulin levels; 25% have two or more risk factors.[26] Research findings suggest that the risk factors observed in childhood often become chronic diseases in adulthood. Approximately 80% of obese adults have diabetes, hypertension, coronary artery disease, gallbladder disease, osteoarthritis, high blood cholesterol, or obesity-related cancers.[26]

Although it is commonly assumed that high-fat diets and overeating are the primary causes of obesity, recent findings demonstrate that mean energy intake and fat consumption in industrialized countries have declined substantially, while obesity rates have increased.[27] Changes in the amount of daily physical activity may account, at least in part, for this apparent discrepancy.

Indeed, many attribute the epidemic rise in obesity prevalence to increasingly sedentary lifestyles.

For many children, leisure time activities are more sedentary, with television watching, video games, and internet browsing. Furthermore, less energy is spent in activities of daily living and at work.[27] In Iran, Kelishadi et al. evaluated the physical activity of the children and adolescents of Isfahan in 1994 and 2001. They reported that physical activity levels showed no significant improvement during the previous seven years (1994-2001). The rate of regular morning exercise was declining in high schools. During these years, some parents had agreed to their children's participation in sports activities outside school hours, but disagreement to such activities showed an increasing trend. About 60% of students watched television more than 4 hours daily and only 10% of parents showed any objection to this behavior.[27]

The health status of children and adolescents in Iran has improved in many areas, as evidenced by lower rates of communicable diseases and declines in nutrient deficiency diseases of the past; however, rapid westernization and lifestyle changes have made them prone to chronic diseases later in life.

Achieving better health through improved diet and increased physical activity is bound to decrease the prevalence of chronic diseases.[29]

Acknowledgements

This study was supported by a grant from Birjand University of Medical Sciences. We would like to thank all the students who participated in this study. Many thanks go to Dr Taghizadeh. We also thank Dr Najibi for assistance in collecting the data.

References

1. Drewnowski A, Popkin BM. The nutrition transition: new trends in the global diet. Nutr Rev. 1997;55(2):31-43.
2. Bandini LG. Natural history of obesity. Nestle Nutrition Workshop Series Pediatric Program 2001;49:20-2.
3. Must A, Strauss RS. Risk and consequences of childhood and adolescent obesity. Int J Obes 1999;23(2): S2-11.
4. Bao W, Threefoot SA, Srinivasan SR, Berenson GS. Essential hypertension predicted by tracking of elevated blood pressure from childhood to adulthood: the Bogalusa Heart Study. Am J Hypertens 1995;8:657-65.
5. Kelishadi R, Hashemipour M, Faghih Imani S. Survey of some metabolic disorders in obese children and adolescents. The Journal of Qazvin University of Medical Sciences and Health Services. 1382;26:90-85.
6. Balaban G, Silva GA. Overweight and obesity prevalence in children and adolescents from a private school in Recife. J Pediatr (Rio J). 2001; Mar-Apr;77(2): 96-100.
7. Serdula MK, Ivery D, Coates RJ, Freedman DS, Williamson DF, Byers T. Do obese children become obese adults? - A review of the literature. Prev Med 1993;22: 167-77.
8. Oner N, Vatansever U, Sari A, Ekuklu E, Guzel A, Karasalihoglu S, Boris NW. Swiss Med Wkly. Prevalence of underweight, overweight and obesity in Turkish adolescents.2004;134(35-36):529-33.
9. Kelishadi R, Pour MH, Sarraf-Zadegan N, Sadry GH, Ansari R, Alikhassy H, Bashardoust N. Obesity and associated modifiable environmental factors in Iranian adolescents: Isfahan Health Heart Program - Heart Health Promotion from Childhood. Pediatrics International 2003;45:435-42.

10. Del Rio-Navarro BE, Velazquez-Monroy O, Sanchez-Castillo CP, Lara-Esqueda A, Berber A, Fanghanel G, Violante R. The high prevalence of overweight and obesity in Mexican children. Obes Res. 2004 Feb;12(2):215-23.
11. Rashidi A, Mohammadpour-Ahranjani B, Vafa MR, Karandish M. Prevalence of obesity in Iran. Obes Rev. 2005 Aug;6(3):191-2.
12 . El-Hazmi MA, Warsy AS. J Trop Pediatr. A comparative study of prevalence of overweight and obesity in children in different provinces of Saudi Arabia.2002;48(3):172-7.
13. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. BMJ 2000;320:1270-3.
14. Dietz WH, Bellizzi MC. Introduction: the use of body mass index to assess obesity in children. Am J Clin Nutr 1999;70:123S-125S.
15. Moayeri H, Bidad K, Aghamohammadi A, Rabbani A, Anari S, Nazemi L, Gholami N, Zadhoush S, Hatmi ZN. Overweight and obesity and their associated factors in adolescents in Tehran, Iran, 2004-2005. Eur J Pediatr. 2006;65(7):489-93.
16. Gargari BP, Behzad MH, Ghassabpour S, Ayat A. Food Nutr Bull. Prevalence of overweight and obesity among high-school girls in Tabriz, Iran, in 2001. 2004;25(3): 288-91.
17. Mostafavi H, Dabagh Manesh MH, Zare N. Prevalence of obesity and over weight in adolescents and adult population in Shiraz: Irn J Endcorinol Metab 2005;7(1): (SN 25).
18.Wabitsch M. Overweight and obesity in the European Children and adolescents, Eur J Pediatr 2000;159(Suppl 1):S5-7.
19. Livingstone B. Epidemiology of childhood obesity in Europe. Eur J Pediatr 2000;159(Suppl 1): S14-34.
20. Elmadfa I, Godina-Zarfl B, Konig J, Dichtl M, Faist V. Prevalence of overweight and plasma lipids in 7-18 year old Austrian children and adolescents. Int J Obes Relat Metab Disord 1993;17(Suppl 2):35.
21. Prebeg Z, Juresa V, Kujundzig M. Secular growth changes in Zagreb schoolchildren over four decades, 1951-91. Ann Hum Biol 1995;22:99-110.
22. Bellizzi MC, Horgan GW, Guillaume M, Dietz WH. Prevalence of childhood and adolescent overweight and obesity in Asian and European countries. Nestle Nutrition Workshop Series Pediatric Program Volume 2001;49:4-6.
23. Al-Nuaim AR, Al-Rubeaan, Al-Mazrou, Al-Attas O, Al-Gaghari N, Khoja T. High prevalence of overweight and obesity in Saudi Arabia. Int J Obes Relat Metab Disord 1996;20:547-52.
24. Chu NF. Prevalence and trends of obesity among children in Taiwan - the Taipei Children Heart Study. Int J Obes Relat Metab Disord 2001;25:170-6.
25. Neutzling MB, Taddei JA, Rodrigues EM, Sigulem DM. Overweight and obesity in Brazilian adolescents. Int J Obes Relat Metab Disord 2000;24:869-74.
26. Koplan J, Dietz WH. Caloric imbalance and public health policy. J Amer Med Assoc 1999;282(16): 1579.
27. Pi-Sunyer FX. Fattening of America [editorial].J A mer Med Assoc 1994;272: 238-239.
28. Kelishadi R, Hashemipoor M, Ansari R, Rouhafza HR, Sarraf Zadegan N, Bashardoost N. Comparison of physical activity level among adolescents of Isfahan in 1994 and 2001. J RESEAR MED SCIEN 1381;2(7):117-112.
29. Kelishadi R. Preventive pediatric cardiology. ARYA Journal. 2005;1(3):157-158.