Original Article

Prevalence of Overweight, Obesity and Central Obesity among Elementary School Children in Birjand, East of Iran, 2012

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ARTICLE INFORMATION

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ABSTRACT

Background: Prevalence of obesity in children has been increasing during recent decades all over the world. Obesity, particularly central obesity, is associated with metabolic syndrome and cardiovascular diseases. The present study aimed to assess obesity and central obesity in 6-11 year old Birjand elementary school children, East of Iran.

Methods: This cross-sectional study was conducted on 1541 elementary school children, i.e. 851girls and 690 boys, selected from Birjand elementary schools through multiple-cluster sampling in 2012. In order to determine overweight and obesity the percentile of CDC was used, so that, 85-95th percentile were taken as overweight and >95th percentile was defined as obese with respect to age and sex. For determination of central obesity, waist circumference and the ≥90th percentile were used regarding age and sex. The obtained data was analyzed by means of SPSS software (V: 15) using *t* and chi-square statistical tests at the 0.05 significant level.

Results: Out of the studied children, 9.6% (11% of boys and 8.3% of girls) were overweight and 9.2% of children (i.e. 10.9% of boys and 7.9% of girls) were obese. About 15.7% of children (i.e. 20.3% of boys and 12% of girls) had central obesity.

Conclusions: Regarding high prevalence of obesity, central obesity, and overweight in Birjand elementary school children, it is recommended that families should be provided with necessary information with respect to correcting life-style and preventing obesity in children.

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Introduction

Obesity is a serious health problem in the last century whereas the prevalence of obesity and overweight is growing progressively [1]. Obesity and overweight in children have been on the move during recent decades so as to become more than three fold since 1960 [2]. Obesity in children is one of the principal health problems both in the developed and in developing countries [3-6]. According to WHO's estimation, non-communicable diseases will cause three-fourth of mortalities in developing countries. Obesity is a principal risk-factor to chronic diseases. Obesity in children is associated with an increased metabolic syndrome risk, hypertension, and diabetes I and II during childhood and adolescence. Obesity, particularly central obesity, has a decisive role in the development of metabolic syndrome. Moreover, childhood obesity increases the proneness to obesity in adulthood and is associated with cardiovascular complications, diabetes, hypertension, mortality, and morbidity of adulthood[7-8]. Anthropometry is a simple tool for assessing nutritional status such as underweight, overweight and obesity, in individuals and communities[9].

In Iran, like many of other developing countries, prevalence of obesity in children has been moving on[10-12].The present study aimed at assessing the prevalence of

overweight, obesity, and central obesity in Birjand elementary school children in 2012.

Methods

The present cross-sectional study was carried out on 1541 elementary students aged 6-11 years (851 girls and 690 boys) in Birjand, eastern Iran from November to February 2012. Subjects were selected through multiple-cluster sampling. Considering the distribution of elementary schools in different districts of the city, at first 10 girls' elementary schools and 10 boys' elementary schools were selected. Then, accounting to the population of each school and its ratio to the total population of elementary school students, a subsample was selected from each class.

In this step, 1700 students were selected and a questionnaire as well as an informed consent form was sent to each student's parents. The parents were requested to fill out the demographic and consent forms and return them to school if they agreed with their kid's participation in the plan. The exclusion criteria were: (a) not having any chronic disease or endocrine disorder such as diabetes; (b) not being on treatment of corticosteroids.

Finally, 1590 questionnaires were filled out and returned to school. In the next step, after getting the permission of the education office and ensuring coordination with it, two trained nurses referred to the elementary schools and recorded the weight, height, and waist circumference of the participated students in a standard way and recorded the data in the data collection form. At the end, a few of the subjects were excluded because of defects in the information offered 1541 subjects remained foe analysis.

Weighing of the students was done, while they had light clothes on and they were bare-footed, by means of German Seca digital scale allowing for an error of 100 gr. The height of each student was also measured in standard manner; allowing for an error of 0.5 centimeter. The waist circumference of each individual was measured, while the person was standing and exhaling, by wrapping a measuring strip midway between the 10th rib and the iliac crest.

Then, each student's body mass index (BMI) was measured. In order to determine overweight and obesity the percentages of Center for Diseases Control and Prevention (CDC) were used. Thus, 85-95th percentiles were considered as overweight with respect to age and sex; and ≥95th percentile as obese. In order to pinpoint central obesity the ≥90th percentile regarding age and sex was taken as a measure.

Statistical analysis was done using SPSS software. Comparing qualitative variables was performed using t and chi-square test at the 0.05 significant level.

Results

In this study 1541 elementary students including 851 girls and 690 boys were assessed. Mean age of the students was 9.4 [95% CI: 7.8, 11.0] years. Mean BMI of the girls was 16.3: [95% CI: 13.1, 19.5] and that of the boys was 16.9 [95% CI: 13.7, 20.2]. Out of the studied children, 9.6% (11% of boys and 8.3% of girls) were overweight and 9.2% of children (i.e. 10.9% of boys and 7.9% of girls) were obese.

Comparison of overweight and obesity prevalence in primary school children by sex and age is shown in Table 1. Accordingly the prevalence of overweight and obesity in male was significantly higher (P=0.001). Relationship between age and prevalence of overweight and obesity was significant in both sexes. Mean waist circumference of the students was 58.4 [95% CI: 49.8, 67.0] centimeters, ranging between 39 and 99 centimeters. Mean waist circumference of the girls was 57.7 [95% CI: 49.8, 65.6] and that of the boys was 59.1 [95% CI: 49.8, 68.4] centimeters; the difference of which was significant (P=0.001).

Table 1: Distribution of normal weight, overweight and obesity in primary school children, Birjand, Iran using chi-square test

Age (yr)	Male (N=690; 44.8%)						Female (N=851; 55.2%)					
	Normal weight		Over weight		Obesity		Normal weight		Over weight		Obesity	
	N	%	N	%	N	%	N	%	N	%	N	%
6	52	92.9	2	3.6	2	3.6	68	93.2	1	1.4	4	5.5
7	105	78.9	13	9.8	15	11.3	112	84.8	9	6.8	11	8.3
8	102	82.7	12	9.0	11	8.3	117	87.6	18	8.9	7	3.5
9	107	74.3	16	11.1	21	14.6	141	79.7	18	10.2	18	10.2
10	113	72.0	28	17.0	16	10.9	152	81.7	19	10.2	15	8.1
11	52	77.6	5	7.5	10	14.9	63	77.8	6	7.4	12	14.7
Total	539	78.1	76	11.0	75	10.9	713	83.8	71	8.3	67	7.9
P value	0.026						0.030					

The prevalence of central obesity in the subjects was 15.7% (i.e. 20.3% in males and 12% in females); the difference was significant (P=0.001). Table 2 illustrates relative and absolute frequencies of central obesity by age and sex. As shown, the relationship between age and central obesity was significant in both sexes. Central obesity had a direct and significant relationship with BMI, so that children with normal BMI, 85-95 percentage, and >95 percentage had central obesity of 9%, 75.4%, 88.5% respectively (P=0.001).

Table 2: Distribution of central obesity in primary school children in Birjand, Iran using chi-square test

Age (yr)	Male (N=690; 44.8%)				Female (N=851; 55.2%)			
	Normal		Central obesity		Normal		Central obesity	
	N	%	N	%	N	%	N	%
6	53	94.6	3	5.4	70	95.9	3	4.1
7	106	79.1	28	20.9	124	94.1	8	5.9
8	114	85.1	20	14.9	187	92.6	15	7.4
9	80	76.9	33	23.1	147	83.1	30	16.9
10	120	76.4	37	23.6	160	86.0	26	14.0
11	47	71.2	19	28.8	60	74.4	21	25.6
Total	550	79.8	140	20.2	713	88.0	140	12.0
P value	0.010				0.001			

Discussion

The findings indicate that prevalence of overweight, obesity, and central obesity in Birjand elementary students was 9.6%, 9.2%, and 15.7%, respectively. Another study on Birjand elementary students in 2002 reported that overweight and obesity were 2.2% and 1.2%, respectively [13]. Other study carried out on 11-15 and 15-18 years old adolescents reported that overweight was 5.2% and 6.1%, respectively; and obesity was 2.1% [14,]. The prevalence of overweight and obesity in Birjand pre-schoolchildren in 2008 was 10.6% and 7.6% respectively [15]. Comparison between the findings of the present study and the previous elementary study in 2002 indicates that prevalence of obesity in Birjand students has been severely growing[13].

There are other studies reporting the increasing trend of obesity in Iranian children. According to a study in Tehran on 10-19 years olds adolescents, 15% were overweight, 4.2% had medium overweight, and 4.6% were acutely overweight [16]. In elementary students of Babol, the prevalence of overweight and obesity were 12.3% and 5%-8% respectively [17]. Overweight and obesity in Rafsanjan elementary students was 20.9%, but central obesity was 6.4% [18].

The prevalence of obesity in the children of other Asian countries has been studied in various researches. In the children of Daka in Bangladesh, the prevalence of obesity in 6-9 and 10-13 years old children was reported to be 27.7% and 10.7% respectively [19]. In 7-14 years old Chinese elementary students, the prevalence of overweight and obesity were 11.1% and 7.2% respectively [20]. In 9-12 years old Kuala Lumpur elementary students the prevalence of overweight and obesity was 17.9% and 16% respectively [21]. In the children and adolescents of Saudi Arabia, the prevalence of overweight, obesity, and severe obesity were reported to be 23.1%, 9.3%, and 2% respectively [22].

In some American countries such as Argentina, the prevalence of overweight and obesity among 7-11 years olds children was 15.3% and 17.4% respectively [23]. In Mexico, 28.9% of elementary students were overweight and 10.8% of whom were obese [24]. Furthermore, central obesity, based on the present study, was 15.7%. It was 6.4% in elementary students of Rafsanjan (another city in Iran). In Chinese children, it was 23.4 % [18,20].

The critical prevalence of overweight and obesity in Birjand compared to other studies on the same city is diagnosed which can be due to changes in life-style, nutritional transferal, using fast foods, having high calorie foods, and insufficient activity because of computer games and watching TV instead of games requiring physical activity[13,14].

One of the limitations of the present study was that about 7% of the subjects, due to lack of their parents' consent, were excluded from the study. Another limitation was that, because of obesity of children, their parents were more willing to take part in the project. Therefore, the prevalence of overweight and obesity recorded might be a bit overestimated.

The present study confirms that prevalence of overweight, obesity, and central obesity is more in boys that in girls. This is in accord with the situation in similar studies in Iran and other parts of the world; such as Babol (north of Iran), Bangladesh, China, and Poland[17,19,20].

Pinpointing the reason for the difference in the prevalence of these disorders in the two genders requires more studies. Perhaps, in some urban areas and in developing ones, like Birjand, boys are more prone to changing life-style including consuming fast foods instead of local ones, and computerized games; due to social-cultural condition for this sex.

High and growing prevalence of obesity in children in developing countries has been reported. In Mexico, it was 41.8%, in Brazil 22.1%, in India 22%, and in Argentina 19.3%. Obesity in children in Brazil increased from 4.1% to 13.9% between 1974 and 1997; in Thailand, it increased from 12.2% to 15.6% between 1991 and 1993; in India it increased from 9.8% to 11.7% between 2006 and 2009 [2].

In Canadian children, it was 28%[25], in Portuguese boys and girls it was 26.9% and 35.7%, respectively [26]. In Polish boys and girls, obesity was 18.7% and 14.1% respectively [27].

The prevalence of obesity in children in developed countries which had a growing trend since 1960s, now has a slow rise or even declining trend in some articles.

In American children and adolescents, it was found that between 2009 and 2010, 31.8% of them suffered overweight and obesity, 16.9% of whom were obese (15% of girls, 18.6% of boys). Since 2007 down through 2009-2010 the situation has not changed. Another study on New Yorker children indicates that obesity in them decreased between 2006-2007 and 2010-2011, so that it dropped from 21.9% to 20.7% [28].

Conclusion

Overweight and obesity in children has had a critical increase compared to previous years. It is necessary that specific health policies would be pursued to prevent obesity in children through proper intervening measures, raising the awareness of families and children about predisposing factors behind obesity, its complications and early dangers, in addition to its mortality and morbidity, inclusion of suitable educational programs in students' curriculum and correcting of life-style.

Due to high prevalence of obesity, central obesity, and overweight in Birjand elementary school children, it is recommended that other studies should be done to assess the causes of this increasing trend, besides and; periodic assessments must be performed in order to examine the prevalence of obesity in children during future.

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Conflict of interest statement

The authors declare that they have no competing interests.

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