Overweight and Obesity in the Iranian Schoolchildren

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Background: The prevalence of childhood obesity is increasing worldwide and is one of the most serious public health challenges of the 21st century. Obesity during childhood can be harmful to the body.

Objectives: This study aimed to determine the prevalence of overweight and obesity among schoolchildren in Semnan Province, Iran.

Patients and Methods: In this cross-sectional study, 2195 schoolchildren (1102 girls, 1093 boys) aged 6-12 years were selected through random multistage sampling. Data were collected using a questionnaire consisted of items including weight, height, gender, age, residential area, parents' education, housing status and access to computer. Body mass index (BMI) was calculated by dividing weight (Kg) by the square of height (m). Overweight was defined as a BMI $\geq$ 85th percentile and lower than the 95th percentile for children of the same age and sex. Obesity was defined as a BMI $\geq$ 95th percentile for children of the same age and sex.

Results: Results showed that 8.2% of schoolchildren were obese and 11.5% were overweight. The prevalence of overweight and obesity among girls were 11.9% and 8.0% and among boys were 11.1% and 8.3%, respectively. There was a significant relationship between obesity/overweight and housing status (OR = 1.53, 95%CI: 1.19-1.97, P = 0.001) and access to computer (OR = 1.49, 95%CI: 1.20-1.85, P < 0.001).

Conclusions: Findings report a relatively high prevalence of obesity and overweight in schoolchildren of Semnan Province in Iran. More interventions are suggested to increase physical activity and limit the time children spend on personal computer games.

Keywords: Overweight; Obesity; Weight Gain; Students

1. Background

Childhood obesity is one of the most serious public health challenges of the 21st century (1). The prevalence of childhood obesity is increasing worldwide (2-4). This is also observed in developing countries as well as in Western countries (3).

According to the study by European Association, overweight children when getting older are more vulnerable to suffer chronic diseases. Cardiovascular disease, diabetes and liver disease are common in obese children. Therefore, effective measures are required to deal with the increased risks related to overweight children (5).

Childhood obesity is related to many adverse health effects, such as metabolic abnormalities and hypertension (6, 7). Moreover, childhood obesity is also a predictive factor for obesity in adulthood (8). Adults who were overweight in childhood are at increased risk for coronary heart disease compared with adults who were thin as children (9, 10). The review of obesity and cardio metabolic syndrome in children offers basis for additional assessments to determine cardio metabolic risk in overweight and recommendations for treatment (11). Significant changes in body mass index (BMI) with age in childhood are observed. At birth the median is 13 kg/

m^2, it then increases to 17 kg/m^2 at age 1, later at age 6 it decreases to 15.5 kg/m^2 and again increases to 21 kg/m^2 at age 20. A cut-off point related to age is necessary for determination of child obesity, considering the relationship between BMI and age, for example, using reference centiles (2).

Intensive behavioral treatment is recommend to children with BMI > 85th percentile by the US Preventive Service Task Force. A group program could indicate an encouraging strategy dealing with pediatric obesity (12). Preventing obesity in a child's earliest years is very important and beneficial. The clear issue is that losing the excess weight for an obese person is quite difficult, at any age (1).

It has been observed that childhood obesity has more than doubled in children and quadrupled in adolescents in the past three decades and the percentage of obese children aged 6-11 years increased (from 7% in 1980 to about 18% in 2012) in the United States (13). The prevalence of obesity in Iran has been differently reported. In total, it was suggested that the prevalence of obesity in Iran is less than that in developed countries. Kelishadi et al. predicted that the prevalence of obesity and overweight

among 7-11-year-old Iranian children in 2005-2010 was 7.78% and 9.71%, respectively (14). Findings of a systematic review and meta-analysis study in Iran indicated that 5.5% of children (< 18 y) were obese (15).

In addition, Saker et al. showed that both biological and environmental factors have been related to school-children obesity (16). Because of the importance of overweight and obesity during childhood, the prevalence and trends of such problems should be monitored (2). Knowing the prevalence of overweight and obesity in different regions including urban or rural areas provides the opportunity to establish and modify interventional or nutritional education programs. Therefore, we decided to establish this study, although we had studied the prevalence of obesity among students in Semnan Province in 2008, the population of that study was urban population of only the Semnan City (Center of Semnan Province) (17), but the present study carried out in both urban and rural areas of Semnan Province, Iran.

2. Objectives

The aim of this study was to determine the prevalence of overweight and obesity and some related factors among schoolchildren in Semnan Province (Center of Iran).

3. Patients and Methods

This study was a cross-sectional study with research population being all the students of Semnan Province, both in urban and rural regions. All primary school children (1st to 5th grades) aged 6-12 years were participated in this study between November 2012 and March 2013. Sampling procedure was multistage, composed of stratified, cluster and systematic methods. This study encompassed 2195 students, apparently healthy children that were divided within every township in proportion to the number of students. Schools have been selected according to distribution in different regions, north, south, east, west and center of the city. In the rural regions they have been selected based on the number of schools and the distribution of the villages in different geographical areas. Ultimately, students were randomly selected. Data were collected using a questionnaire consisted of items such as weight, height (to determine BMI), gender, age, residential area, parents' education, housing status and access to computer.

Data were collected through interviews with the student and his or her mother by trained persons, as well as by referring to student records . Measuring the weight and height was performed with minimal clothing, without shoes, while the hips, shoulders, and head came in contact with the wall. Measurement of height and weight was performed using a nonflexible tape measure and Beurer, German digital scale with 100 g precision, respectively.

Considering ethical issues, if student's family satisfied to participate in the study, they received and completed

the questionnaire, and also name of the student was kept confidential.

The standard Centers for Disease Control (CDC) growth charts 2000 were used. Besides, overweight was defined as a BMI ≥ 85th percentile and lower than the 95th percentile for children of the same age and sex. Obesity was defined as a BMI ≥ 95th percentile for children of the same age and sex. Body mass index was calculated the weight (Kg) divided by height (m) squared (18).

3.1. Data Analysis

Statistical analyses were performed using chi-square test for univariate analysis. We applied logistic regression analysis to estimate adjusted odds ratio of obesity/overweight for different levels of risk factors. All statistical analyses were performed using SPSS (USA) 16.00. A p-value less than 0.05 were considered statistically significant.

4. Results

Of all children, 8.2% (95% CI: 7.1-9.3) were obese and 11.5% (95% CI: 10.2-12.8) were overweight. The prevalence rates of obesity among girls and boys were 8.0% and 8.3%, respectively. In univariate analysis, no significant relationship was found between obesity and gender, age, mothers' education level and residential area; however, there was a significant relationship between obesity/overweight and fathers' education level (P = 0.008), housing status (P < 0.001) and access to computer (P < 0.001) (Table 1).

In a multivariate analysis, we used stepwise logistic regression analysis assigning BMI (obese or overweight = 1, otherwise = 0) as the dependent variable and the rest of variables as independent ones. The fathers' education level was omitted from the model, access to computer (P < 0.001) and housing status (P = 0.001) of children were significantly associated with obesity/overweight (Table 2).

5. Discussion

Findings showed that 8.2% (95% CI: 7.1-9.3) of schoolchildren living in Semnan Province were obese and 11.5% (95% CI: 10.2-12.8) were overweight. Findings of the similar study (2008) in Semnan City have been showed that 14.3% and 18.8% of school children were obese and overweight, respectively (17), that is significantly higher than the present results. It seems during this period, possibility of changing in life style such as increasing exercise activities and application of other approaches to control obesity such as nutrition could help reduction of cases with overweight and obesity. However differences in statistical population could resulted to a such trend.

Hajian-Tilaki et al. (2013) study among preschool children in Babol in the north of Iran, indicates overweight and obesity are the public health matters, it confirms that Babol preschool children also suffer from overweight and obesity and thus the prevalence rate of overweight and obesity were 11.8% and 15%, respectively (19).

Table 1. Prevalence (%) of Obesity, Overweight With Respect to Gender, Age, Residential Area, Mothers' and Fathers' Educational Level, Housing Status and Access to Computer

Characteristic	Number	Obesity [a]		P Value
		Overweight	Obese	
Gender				0.814
Female	1102	11.9 (10.0,13.8)	8.0 (6.4,9.6)	
Male	1093	11.1 (9.2,13.0)	8.3 (6.7,9.9)	
Age, y				0.095
< 8	646	9.9 (7.6, 12.2)	7.6 (5.6,9.6)	
8-9	873	10.7 (8.6,12.8)	9.0 (7.1,10.9)	
≥ 10	204	14.1 (9.3,18.9)	7.2 (3.7,10.7)	
Residential area				0.352
City	1660	11.3 (9.8,12.8)	8.6 (7.3,9.9)	
Rural	535	12.1 (9.3,14.9)	6.7 (4.6,8.8)	
Mothers' education level				0.131
Uneducated	86	7.0 (1.6,12.4)	3.5 (0.0,7.4)	
Primary	556	11.5 (8.8,14.2)	6.1 (4.1,8.1)	
Secondary School	399	12.0 (8.8,15.2)	8.3 (5.6,11.0)	
High School	826	10.9 (8.8,13.0)	9.2 (7.2,11.2)	
Academic	328	13.4 (9.7,17.1)	10.1 (6.8,13.4)	
Fathers' education level				0.008
Uneducated	78	5.1 (0.2,10.0)	5.1 (0.2,10.0)	
Primary	463	8. 2(5.7,10.7)	7.1 (4.8,9.4)	
Secondary School	573	12.7 (10.0,15.4)	6.5 (4.5,8.5)	
High School	685	13.6 (11.0,16.2)	9.2 (7.0,11.4)	
Academic	396	11.1 (8.0,14.2)	10.6 (7.6,13.6)	
Housing status				<0.001
Private	1535	12.6 (10.9,14.3)	9.2 (7.8,10.6)	
Leased	660	8.8 (6.6,11.0)	5.8 (4.0,7.6)	
Access to computer				<0.001
Yes	1022	13.3 (11.2,15.4)	10.2 (8.3,12.1)	
No	1173	9.9 (8.2,11.6)	6.4 (5.0,7.8)	

[a] Data are presented as, % (95% CI); CI, confidence interval.

Table 2. Obesity Risk-Assessment Model Among Schoolchildren in Iran [a]

Characteristic	β Coefficient	SE (β)	P Value	OR	95% Confidence Interval for OR
Housing status					
Leased	-	-	-	1.00	-
Private	0.43	0.13	0.001	1.53	1.19-1.97
Access to computer			0.044		
Yes	0.40	0.11	<0.001	1.49	1.20-1.85
No	-	-	-	1.00	-
Constant	-1.92	0.12	<0.001	-	

[a] Abbreviations: SE, standard error; OR, odds ratio.

Study of the prevalence of overweight and obesity among Iranian school children in different ethnicities suggest that 9.27% of children were overweight and 3.22% of them were obese. The same study indicated a significant ethnic differences in BMI (20). On the other hand, Ayatollahi et al. (2007) has shown that 6.8% and 3.3% of boys and 3.8% and 6.1% of girls aged between 6.5 and 11.5 years old in Shiraz (southern Iran) were overweight and obese, respectively (21).

During 2009-2010, in the United States, approximately 17% of children and adolescents were obese (22). Despite the higher rates of obesity in adults, in relative terms U.S., Brazil, China, and other countries have seen the problem escalate more rapidly in children than in adults (1).

In France, among 7-11 year-old children, prevalence of overweight and obesity was recorded as 15.6% and 2.9%, respectively (23). Pirincci et al (2010) in Elazig City, Eastern Turkey, reported that the prevalence of overweight and obesity in children aged 6-11 years were 13.2 and 1.6, respectively (24). Saker et al. (2011) showed that 6.5% of schoolchildren aged 6-8 years in Algeria were obese (16).

In the present study, 11.9% of girls and 11.1% of boys in Semnan Province were overweight, while 8.0% of girls and 8.3% of boys were obese, respectively. The difference is not significant. Saker et al. (2011) have shown similar results (16). But some previous studies have shown a significant relationship between gender and obesity (17, 21, 23). It is probable that different life styles among girls and boys in various regions may cause the different results that needs more study.

Fathers' education level of children was not significantly associated with obesity, in contrast with some studies (16, 24, 25). Fathers' education level and housing status perhaps reflects the socio-economic status of families. We also expected to observe a significant association between overweight/obesity and fathers' education level. It seems that there are similar knowledge and practice related to prevention of the risk factors of overweight/ obesity among families with different education level. It needs more studies.

In our study, a significant association was observed between access to computer and childhood obesity. In a study by Sigmundova et al. (2014) there was a significant association between more than 2 hours spent watching TV and playing personal computer (PC) games (4). Excess working hours with PC in children resulted in reduced physical activity and increased risk of obesity. We did not study the effects of physical activity level and working hours with a computer; however, we hypothesize that access to computer first, reflects higher social and economic status of a student and second, results in a lower level of physical activity and less frequent engagement in games that involve mobility.

It seems that life style of Iranian children such as dietary habits, "nutrition transition", physical activities, urbanization, indeed probable tendency of parents especially mothers to weight gain in children (as an indicator of well-being) are possible factors of prevalence of overweight and obesity in children (26). That needs more studies to discuss about the influence of any mentioned parameters in Semnan Province. Some limitations of this study include lack of measuring the physical activity level and working hours with computer.

Findings show that an increased rate of obesity and overweight in children living in Semnan, center of Iran. To prevent the childhood obesity and consequently to reduce the probability of chronic diseases and public health problems, more interventions are suggested to increase physical activity and limit the time children spend on PC games, especially in those living in private houses.

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Authors' Contributions

Batool Karimi: study conception, design and writing of the article, Raheb Ghorbani: design, data analysis and writing of the article.

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