Trends of overweight and obesity among 14-18 years old urban adolescent girls among senior high schools, Ahvaz, Iran

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Abstract

Background: Over the past century, most nutrition research and policy concerning the developing world focused on poverty and under-nutrition. Now, there is a growing evidence of a major shift toward overweight and obesity in these societies. The aim of this study was to assess changes in prevalence of obesity among 14-18 years old adolescent girls in Ahvaz between years 1997 and 2006.
Methods: Two cross-sectional studies were separately carried out. In 1997, 398 adolescent girls aged 14-18 year, and in 2006, 420 girls were selected from Ahvaz senior high schools, by stratified sampling. Socio-economic questionnaires were completed, weight and height were measured, and then BMI was calculated.
Results: We observed a statistical significant difference in BMI and weight when participants of two studies were compared, revealed a tremendous trend toward over-weight and obesity. Results reveal a 3-fold increase in the prevalence of obesity and over-weight between 1997 and 2006 (OR= 2.87, 95%CI: 1.83-4.49; $P<0.001$). The data shows that there is a significant relation between BMI and food habits including number of meals ($P< 0.001$) and missing the breakfast ($P< 0.05$).
Conclusion: Results of this study are eloquent of the fact that prevalence of obesity is increasing among adolescent girl students in Ahvaz. Regarding the harmful ramifications of obesity, it is critical to encourage healthy eating patterns and increase physical activity among adolescent girls.

Keywords: Over-weight, Obesity, Adolescent

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Introduction

Over the past century, most nutrition research as and policy concerning the developing world focused on poverty and under nutrition. Now there is growing evidence of a major shift toward overweight and obesity in these societies [1]. Obesity has been recognized as a major public health problem [2, 3] and its prevalence has increased both in industrialized and developing countries [2, 4]. Childhood and adolescent overweight and obesity have increased substantially in the past 2 decades, raising concerns about the physical and psychosocial consequences of obesity in these age groups [5,6]. Obesity in adolescence is a strong precursor of obesity and related morbidity in adulthood, with 50% to 80% of obese teenagers becoming obese as adults [3].

During adolescence, overweight and obesity are often a burden that results in psychosocial problems, and a reduced capacity for physical activity [3, 5, and 7]. The marked increase in prevalence of obesity indicates that other than biological factors, psychological and behavioral elements are responsible for this [8, 9].

Adolescence is a critical period for the onset of obesity and for obesity-associated morbidity in later life. Therefore, from a public health perspective, it is important to monitor overweight in adolescence [3, 10]. In the assessment of obesity causes, several factors which affect body fat should be considered. Results of epidemiologic studies revealed a negative association between number of meals and body fat. Besides high calorie meals and binge eating are some causes of obesity [4]. Other than mentioned factors, obesity risk is associated to socio-economic status [11].

In spite of mentioned issues, there is no study on trends of adolescent obesity in Iran. So we carried out this study to compare the prevalence of obesity among 14-18 years old urban adolescent girls in Ahvaz senior high schools between years 1997 and 2006.

Methods

We conducted two cross-sectional studies in 1997 and 2006. In 1997, 398 adolescent year and in 2006 420 girls all girls aged 14-18 were selected from Ahvaz senior governmental and nongovernmental high schools via stratified sampling. We considered the whole high schools as 4 separate districts according to education ministry stratification. In each district, number of samples and schools were estimated in proportion to the number of students and schools within it. Then participants were selected randomly in each school. Food habits and socio-economic questionnaires were completed, weight and height were measured, and then BMI was calculated.

The following variables were assessed in the questionnaire: parents' education, parent's job, family size, family income, and food habits such as number of meals, breakfast consumption, and kind of snacks.

Weight was measured in light clothing by nearly 0.5 kg estimate using a seca scale. Height was measured without shoes by nearly 0.1 cm estimate using a stadiometer.

In this study overweight was defined as 85 ≤ BMI <95 percentile and obesity as BMI ≥95 percentile.

Data were analyzed using the statistical software SPSS version 11.5. Means of BMI, weight and height were compared between 2 groups using independent samples T-test. Logistic regression was used to compare the prevalence of overweight and obesity between 2 groups. In order to find the relation between food habits and BMI we used ANOVA and type 1 error was set at 0.05, P-values two-tailed.

Results

Mean ± SD of height(cm), weight(kg), and body mass index(kg/m²) were 159.82 ± 5.55 vs. 159.77 ± 15.69(P=0.95), 52.17± 8.67 vs.55.64 ± 13.66 (P<0.001), and 20.41 ± 3.18 vs. 21.57 ± 3.94(P<0.001) in 1997 and 2006, respectively. Mean ± SD of

weight and BMI of the participants, are shown in tables 1 and 2.

Table 1 shows that mean weight of 14-18 years old adolescent girls in all groups increased significantly from 1997 to 2006, except for 17 years old group.

According to table 2 mean BMI in all age groups increased in 2006 comparing to 1997. Results of this study showed that prevalence of obesity and overweight in 1997 were 6% and 1.5 %, respectively which increased to 13.5% and 5.4% in 2006.

Comparison of the prevalence of overweight plus obesity between 1997 and 2006 showed that it increased in 2006 significantly. Logistic regression indicated that the odds of being obese or overweight in 2006 was 2.87 fold of 1997(P=0.001, OR=2.87, 95%CI: 1.83-4.49)

Table 3 shows that prevalence of overweight and obesity in all age groups, except for 16 year old group increased significantly between 1997 and 2006.

In this study there was a correlation between BMI and consumption of breakfast. BMI of the girls who consumed breakfast frequently was significantly less than who ate breakfast occasionally or skipped it (P< 0.05). Also we found a correlation between BMI and the number of meals (P< 0.001). Results of posthoc showed that the participants who consume 2 or less meals had higher BMI than who consume 4 or 5 meals (P< 0.001).

Results of logistic regression showed that the odds of being overweight or obese in the participants whose family size were equal or less than 4 persons was 1.9 fold, compare to subjects with more than 4 members (P=0.029, OR=1.88, CI 95%: 1.06-3.31).

There was no correlation between prevalence of obesity and parents' job, parents' education status and family income.

Table 1. Mean and standard deviation of the weight of 14-18 years old urban adolescent girls in senior high schools 1997 and 2006, Ahvaz, Iran

age(year)	1997			2006			† 1997-2006
	n	mean	SD	n	mean	SD	
14	43	51.60	7.88	48	57.58	11.56	**
15	90	50.59	8.16	122	54.17	10.75	**
16	94	52.21	8.69	105	57.70	17.76	*
17	85	52.56	7.77	90	54.07	10.34	§ NS
18	86	53.70	10.14	41	59.27	10.71	*

† Difference between 1997 and 2006: ** *P* < 0.01, * *P* < 0.05
§ Not Significant(P>0.05)

Table 2. Mean and standard deviation of the BMI of 14-18 years old urban adolescent girls in senior high schools 1997 and 2006, Ahvaz, Iran

age(year)	1997			2006			† 1997-2006
	n	mean	SD	n	mean	SD	
14	43	20.49	3.32	48	22.26	4.97	*
15	90	19.92	2.97	122	21.64	3.88	**
16	94	20.40	3.22	105	21.30	3.47	*
17	85	20.23	2.52	90	21.26	3.83	*
18	86	21.08	3.78	41	23.31	4.38	*

† Difference between 1997 and 2006: ** *P* < 0.01, * *P* < 0.05

Table 3.Percent of overweight and obesity among 14-18 years old urban adolescent girls in senior high schools 1997 and 2006, Ahvaz, Iran

	Overweight (%)	Obese (%)	Normal (%)	Over weight + obese (%)	Odds ratio(95% CI) for overweight + obesity
age14y					
1997(n=43)	0	4.7	95.3	4.7	1.00
2006(n=48)	20.4	14.3	65.3	34.7	11.24(2.41-52.31)**
age15y					
1997(n=90)	11.1	0	88.9	11.1	1.00
2006(n=48)	18.9	5.7	75.4	24.6	2.6(1.20-5.66)*
age16y					
1997(n=96)	11.7	0	88.3	11.7	1.00
2006(n=105)	9.2	2.8	88.0	12.0	1.08(0.48-2.44)
age17y					
1997(n=85)	2.4	0	97.6	2.4	1.00
2006(n=90)	7.8	3.3	88.9	11.1	5.18(1.10-24.41)*
age18y					
1997(n=86)	1.2	4.7	94.1	5.9	1.00
2006(n=41)	18.2	9.1	72.7	27.3	6.07(1.22-30.32)*

*P< 0.05
**P< 0.01

Conclusion

There is an increasing trend of obesity and its complication in developing countries [12]. Results of this study generally is eloquent of the fact that in the last decade, prevalence of overweight and obesity increased significantly among adolescent girls in Ahvaz city, Iran. During this period prevalence of overweight and obesity became 2 fold and 3 fold, respectively. During last 10 years the subjects' weight and BMI increased about 1.5-6 kg and 1-2 kg/m² in different age groups, respectively.

Numerous published studies indicate the increase of obesity among adolescents during last years [13-18] but considering that in most of them criteria other than CDC/NCSH were used to assess the prevalence of obesity and overweight, it is not easy and accurate to compare the result of this study to them [18].

Among these studies, results of NHANES study showed that based on CDC/NCSH criteria, 9.7% of 12-19 years old adolescent girls during 1994 to 1988 were obese ,which increased to 15.5% during 1999-2000(P=0.002)[19]. Trembley and Williams also reported that prevalence of overweight among Canadian 7-13 years old girls increased from 15% to 23.6% between 1981 and 1996. Prevalence of obesity doubled during this time period [20]. In Australia, Booth et al. found that prevalence of obesity and overweight among adolescent girls of 8th and 10th grade in 1985, 1997 and 2004 were 8.3, 17.9 and 19.8 percent, respectively [14].

In spite of different prevalence reports of obesity in different studies, there is an increasing trend of obesity in all of them. Results of Tehran Lipid and Glucose study (TLGS) showed that between 1998 and 2001 according to CDC-2000 criteria, trend of obesity among 12-19 years old girls increased from 4.9±0.5 to 6.9±0.9 percent(P=0.03) [21].

Despite the importance of this issue, it seems that other than TLGS, there is no study on trends of obesity among adolescents in Iran. Results of this study and TLGS are eloquent of the fact that as most of the other countries [13-18], trends of overweight and obesity are increasing in Iran. However its exact reason is not recognized, over eating and sedentary life style is common all over the world and adolescents are surrounded with lots of opportunities which lead to consume high

calorie and high fat processed foods [22]. It seems that different factors are associated to obesity. Although excess weight is the result of imbalance between intake and expenditure of energy in the body, factors like socio-economic status, emotional and environmental conditions, and genetic characteristics are of importance [23].

We found a correlation between BMI and consumption of breakfast. BMI of the girls who consumed breakfast frequently was significantly less than who ate breakfast occasionally or skipped it (P< 0.05). Alahverdian et al. showed that the percent of energy provided by breakfast and BMI were negatively correlated in adolescents (P< 0.01, r = -0.18) [24]. Vanelli and coworkers found that prevalence of overweight in children who skipped breakfast (27.5%) was significantly more than who consumed breakfast (9.1%) (P=0.01). Prevalence of obesity in children who skipped and who ate breakfast were 9.6 and 4.5 percent, respectively (P= 0.04). [25]

Lots of studies showed that since 1980, skipping the meals specially breakfast has increased [26]. The correlation breakfast skipping and BMI is seen among children [27] and adolescents [28].Obese people usually skip the breakfast and compensate it in other meals like dinner [28], in addition persons who do not eat breakfast have more high calorie and fatty foods. It seems that breakfast eating inhibits binge eating and fat intake [25].

In this study we found that there was a correlation between number of meals and BMI (P< 0.001), and persons who ate 2 meals or less had higher BMI than who had 4 or 5 meals. Thirty years ago a negative relation between number of meals and BMI was reported by Forslund. He found that consuming 3 or fewer meals compared to having 5 or more meals resulted in higher prevalence of obesity, hyperinsolinemia and glucose intolerance [28]. Timlin and Pereira also reported a negative correlation between BMI and number of meals [29] which is consistent with our results.

There was a correlation between prevalence of overweight plus obesity and family size in our study. The likelihood of being overweight or obese in families with 4 members or less were 1.9 folds of families who had more than 4 members. Shi and colleagues found that overweight and obesity were less prevalent among adolescent girls of families who have 3 members or fewer (9% and4.2%) than who have more than 3 members (3.9% and 1%) (P= 0.015) [30].

Generally it is concluded that like other countries, prevalence of overweight and obesity is increasing in Iran and this trend is correlated with food habits.

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