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Original Article

A Nutritional Study on Weight Status among Urban Male High School Students and Its Related Determinants in Urmia, IRAN

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ABSTRACT

Background and Objectives: Several studies have so far been carried out to determine the prevalence of overweight and obesity among Iranian children but few studies have investigated the relationship between eating habits, socio-demographic differentials and obesity in these children. So, this study tried to assess the body weight status among the urban high school boy students of Urmia, Iran.

Materials and Methods: In this cross-sectional study, we measured weight, height and BMI of 1026 boy students with an age range of 15 to 19 years by multi-stage sampling. Then a questionnaire was completed based on their dietary habits and behaviors related to their physical activity. Overweight and obesity were defined based upon the World Health Organization's growth charts. Statistical analysis was fulfilled by estimating absolute and relative frequencies.

Results: Underweight prevalence in the studied population was 9.84% (95% CI: 8.49%-10.72%). The prevalence of overweight and obesity among the studied students was 12.77% (95% CI: 11.89%-13.3%), and 5.07% (95% CI: 4.5%-5.9%), respectively. Factors significantly correlated with the participants' body weight were the frequency of energy dense foods intake during a week ($P<0.001$), duration of computer use per day ($P<0.01$), and the kind of their schools ($P<0.05$). No significant association was found between other studied dietary variables (such as the time spent for eating over 24-hours, and breakfast eating times per week) and overweight/obesity.

Conclusions: In the present study, we found that two changeable parameters (i.e. the number of times for intake of energy dense foods during a week, and working with computers) could influence the 15-19 years old school boys' body weight in the study region.

Keywords: Prevalence, Underweight, Overweight, Obesity, High school boys

Introduction

Adolescent obesity is associated with many adverse health problems, including hypertension, dyslipidemia, left ventricular hypertrophy, atherosclerosis, metabolic syndrome, type 2 diabetes, sleep apnea, and non-alcoholic fatty liver disease, as well as psychological effects such as depression and emotional trauma (1).

Obesity is defined as a condition of abnormal or excessive fat accumulation in the adipose tissue to the extent that health is impaired (2, 3). In spite of institutional prevention efforts even in the developing countries, the prevalence of obesity has increased worldwide dramatically in the last few decades (1). Obesity has been identified as an independent risk factor for cardiovascular diseases (CVDs); it is associated with reduced life expectancy due to an increased risk of mortality and morbidity.

Healthy eating behavior during adolescence is a fundamental prerequisite for physical growth, psychosocial development and cognitive

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performance, as well as for prevention of diet-related chronic diseases in adulthood. It has been shown that adult overweight is associated with CVDs, hypertension, type 2 diabetes, atherosclerosis, gout, arthritis and some of the malignancies (4- 6).

Furthermore, many of the studies detected that childhood and adolescence obesity is correlated with adulthood mortality (4, 6, 7). In addition, psychological disorders such as depression occur with an increased frequency in obese children (8).

The last two decades of the previous century have affirmed impressive rise in health care costs because of obesity and related issues among children and adolescents (9). It has been estimated that the prevalence of obesity and overweight in the 2000s among Iranian children and adolescents was 5.1% and 10.8%, respectively (10). In a more recent national study, it was indicated that 17.3% of the students at the age range of 10-19 years (17.3% of girls and 17.5% of boys) were underweight, and 17.7% (15.5% of girls and 19.9% of boys) were overweight or obese (11). Obesity in adults is not easy to be treated; it is often correlated with obesity during childhood (1, 4).

Prevalence rates and trends in thinness and overweight/obesity among children and adolescents at national and sub-national levels are also most important issues, especially to nutrition policy-makers (12).

The main aim of the present study is to provide baseline information on the prevalence of thinness and overweight in Urmia's children and adolescents. Also, for the first time, their predictors are calculated for geographical comparisons and descriptions of time trends.

Materials and Methods

In this descriptive cross-sectional study, we selected 17 secondary schools from the 102 existing schools of Urmia City, Iran. This city has been divided into two educational regions by the Ministry of Education. The city possesses governmental and private high schools in each region. According to the official statistics, the city composes 44 governmental and 58 private males' schools. Totally, 17 schools were selected from both regions, and altogether 1026 students were chosen with an age range of 15-19 years by multi-stage sampling.

At the first phase, a pilot study with 45 students at the same age range was conducted to test the field actions, and to improve the validity and reliability of the questionnaire. The field research was started in October 2006 and completed at the end of 2006 by trained field workers who were weighing the students, measuring their stature and filling the questionnaires.

To weigh the students, we used a digital scale made by TEFAL Company (with 100 gram accuracy). We asked the students to take off their overcoat and to stand on scale with no movement; then we read and recorded their weight on the questionnaire. A BMI over 85th centile of BMI curve indicated overweight and over 95th centile of BMI curve was considered as obesity. BMI through the 5th to 85th centile was taken into account as normal (6, 13). As the same way, BMI less than the 5th centile were defined as underweight (14).

To measure the students' height, we applied a tailor's tape installed vertically on the wall of the classroom. The students took off their shoes, and stood in front of the tape with heels together and toes apart; then we set their head position on Frankfort horizontal plane, measured their length by a square, and recorded them on the questionnaire (with 1 millimeter accuracy).

The trained field workers were three persons. The first person was weighing the students, the second one was measuring their length, and the third one was interviewing face-to-face and filling the questionnaires. The interviewer explained each of the questions to the students, and then ticked the question. The students were asked about some variables possibly affecting their body weights including nutrition in the first year of life, the educational level of their parents, their birth time, the occupational status of their parents, weight status of the father and mother, weekly meals fed as fast foods, breakfast eating habits, and finally, being active or inactive in a usual day (including reading duration, sleep duration, daily duration of computer use, TV watching duration, class time, sedentary games and walking duration).The studied dietary variables included the time spent for eating over 24-hours, and the frequency of eating a battery of energy dense foods including potato chips, fried fast foods, pizza, butter, nuts and seeds over a given week. The students were allowed to call their mothers and answer the questions when they did not know any of the questions.

Ethical considerations were met according to the Nutrition and Food Sciences Research Journal policy. Data were analyzed by the SPSS software (version 16.0, SPSS Inc., Chicago, IL, USA). Quantitative variables are expressed as mean ± standard deviation (SD) and categorical data as percentage. Pearson's Chi-square test was applied to do the statistical analysis (with 95% confidence intervals). We applied

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Student's t-test to examine the equality of the means. We calculated the crude odds ratio (OR) by using logistic regression test to find the degree of association between various risk factors and obesity. All variables within the univariate analysis were presented to the multiple model by using stepwise method. The results of logistic regression analysis are presented by OR and 95% confidence interval. A Pvalue<0.1 was considered as statistically significant.

Results

The total number of the students was 1026 boys; of which 529 students belonged to Region 1, and 497 students to Region 2 of Urmia City with the age range of 14-19 years. The mean of BMI for all of the participants was 21.46±2.03 (95% CI: 19.23-22.89). This study revealed that the prevalence of overweight and obesity among the studied students was 141 (12.77%, 95% CI: 11.46%-14.02%), and 52 (5.07%, 95% CI: 4.12%-5.91%), respectively. The prevalence of underweight was 108 (9.84%, 95% CI: 8.49%-10.72%) (Figure1). The remind participants (n=742) were at the normal range of BMI curve (72.32%, 95% CI: 71.03-73.86).

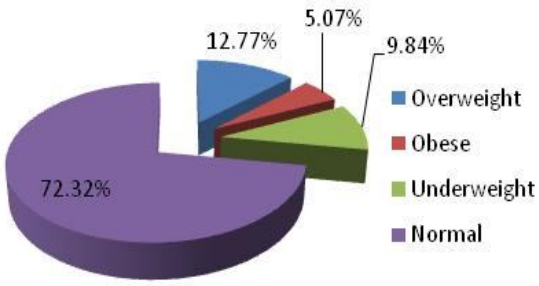

Figure 1. Prevalence of underweight, overweight and obesity among Urmia urban high school boys (n=1026); Iran

Factors that were significantly associated with the participants' body weight included duration of computer use per day (P<0.001) (Table 1), the number of intake of calorie dense foods per week (P<0.01) (Table 2), family size (P<0.01), and the kind of their schools (P<0.05). As a result, obese plus overweight (OB+OW) students have smaller family size compared to non-OB+OW students (i.e. 2.26±1.12 vs. 3.83±1.63).

Table 1. Absolute and relative frequency of the participants' weight status concerning duration of computer use per day, Urmia, Iran

Weight status	Duration of computer use per day (hrs.)*									
	< 1		1- < 2		2- < 3		≥ 3		Total	
	n	%	n	%	n	%	n	%	n	%
Under weight	19	18.81	42	41.59	29	28.71	11	10.89	101	100
Over weight	15	11.45	14	10.69	43	32.82	59	45.04	131	100
Obese	6	11.54	7	13.46	21	40.38	18	34.62	52	100
Normal	104	14.02	118	15.90	312	42.05	208	28.03	742	100

* Chi square test (P<0.001)

Table 2. Absolute and relative frequency of the subjects' weight status concerning times for intake of energy dense foods per week, Urmia, Iran

Weight status	Frequency of intake of energy dense foods per week *											
	< 2		2- < 3		3-< 4		4-< 5		≥ 5		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Underweight	17	16.83	32	31.68	19	18.81	21	20.79	12	11.89	101	100
Overweight	8	6.11	14	10.69	38	29.01	48	36.64	23	17.55	131	100
Obese	2	3.85	6	11.54	20	38.46	18	34.61	6	11.54	52	100
Normal	28	3.78	89	11.99	309	41.64	249	33.56	67	9.03	742	100

* Chi square test (0.01)

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The M±SD of duration of computer use per day for obese and overweight (OB+OW) and underweight students was 3.46±1.17 and 1.46±0.82, respectively (P<0.001).

The association analysis (Tables 3 & 4) revealed that the mothers' educational level and the kind of schools the students studied there are the most important determinants for becoming overweight and/or obese.

We could not detect a statistically significant difference between OB+OW students and the others for the factors of time spent for eating over 24-hours, educational status of their mothers, feeding pattern in the infancy (breastfed or non-breastfed) and breakfast eating times per week.

Table 3. Association between independent factors and obesity plus overweight in univariate logistic regression model, Urmia, Iran

Independent factors	OB+OW§ (n = 183)	Normal (n = 742)	Crude OR	95% CI
BMI (kg/m^2) *	26.62±2.96	22.34±2.12	1.00	1.00-1.00
Computer using duration hrs/day *	2.12±0.45	0.92±0.34	2.24	1.66-3.69
TV watching duration hrs/day *	2.34±0.48	2.16±0.39	0.93	0.89-1.12
Reading duration hrs/day *	2.68±1.02	2.87±0.79	0.99	0.91-1.09
Physical games & walking duration hrs/day *	0.89±0.34	1.32±0.49	0.69	0.56-0.82
Sleep duration hrs/day *	7.54±1.22	7.64±1.92	0.93	0.88-1.16
Family size **				
≤ 4	118(64.48)	414(55.79)	Ref	
5 - 6	46(25.14)	217(29.24)	0.89	0.82-1.09
≥ 7	19(10.38)	111(14.98)	0.77	0.69-1.14
Kind of school **				
Governmental	78(42.63)	516(69.54)	Ref	
Non-governmental	105(57.37)	226(30.46)	3.89	1.26-6.67
Mother's educational level **				
Primary	12(6.56)	293(39.49)	Ref	
Secondary	65(35.52)	254(34.23)	2.34	1.79-4.98
University degrees	106(57.92)	195(26.28)	12.69	8.45-21.23
Breastfeeding until 12 months **				
Yes	86(49.99)	389(52.43)	Ref	
No	97(53.01)	353(47.57)	0.89	0.69-1.32
Breakfast eating times/week **				
≤ 3	32(17.49)	103(13.88)	Ref	
4-5	86(46.99)	572(77.09)	0.68	0.57-0.92
≥ 6	65(35.52)	67(9.03)	1.45	1.22-2.98
Fast foods eating times /week **				
≤ 3	125(68.31)	534(71.96)	Ref	
4-6	38(20.76)	141(19.01)	0.94	0.84-1.87
≥ 6	20(10.93)	67(9.03)	0.98	0.89-1.49
Eating energy dense foods times/week **				
< 2	10(5.46)	28(3.77)	Ref	
2-4	78(42.62)	398(53.63)	0.58	0.48-0.88
> 4	95(51.92)	316(42.58)	1.98	1.34-3.54

* Quantitative factors explained as mean±SD; ** Qualitative factors explained as N (%); § Obesity and overweight

Table 4. Association between independent variables and obesity in multiple logistic regression model after adjustment of effective variables, Urmia, Iran

Variables	Adjusted OR	95% CI *
Mother's educational level **		
Primary	Ref	
Secondary	1.98	1.56-3-44
University degrees	4.89	2.76-7.98
Kind of school **		
Governmental	Ref	
Non-governmental	2.34	1.75-4.64

* Adjusted for breakfast eating times/week; eating energy dense foods times/week; computer using duration

Discussion

The findings represented here indicated that the percent of overweight and obesity was 12.77 and 5.07, respectively (17.84% in total). This shows a high prevalence of OB+OW in the study population so that around one sixth to one fifth of the students were suffering from the overweight and/or obesity adverse outcomes.

In a recent comprehensive study (CASPIAN study), data of 5528 students (2726 girls, 69.37% urban, mean age 14.7 ± 2.4 years) were completed

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and reported. Overall, 17.3% (17.3% of girls and 17.5% of boys) were underweight, and 17.7% (15.5% of girls and 19.9% of boys) were overweight or obese (11).

In a study conducted in high-school boys aged 14–18 years in Sistan and Baluchistan Province, Islamic Republic of Iran, it was shown that the prevalence of underweight, overweight and obesity was 16.2%, 8.6% and 1.5%, respectively (15). The incidence of underweight prevalence is higher than that of our study but the prevalence of obesity and overweight is lower than that of ours. The criteria used in the study were the same as ours. It is to be noted that Sistan and Baluchistan Province is one of the most deprived provinces in Iran mostly due to its warm, dry and droughty climate. The authors of the study had been mentioned that their findings regarding the underweight prevalence were higher than those of other parts of Iran. Our study revealed that the kind of the schools was correlated with the participants' weight status significantly. The kind of schools could be taken into account as one of the indices for socioeconomic status of the households (16). Then these different figures in our study and the mentioned study may be due to the different socioeconomic status of the study populations.

In another research (in Hamedan City, Iran), the above figures were 2.55% and 3.5%, respectively (totally 6.65%) (17). The cut-off points used to define the overweight and obesity in Hamedan study were not the same as ours. Also the population of the mentioned study included both the boy and boy students (n=2000).

The results of a meta-analysis study regarding the prevalence of obesity (and not overweight) in Iran (18) showed that overall prevalence was 5.5% for under 18 years old population. The obesity prevalence in boys under 18 years of age was 4.58%. This study included 62 provincial studies with two studies in East Azerbaijan, the nearest province to Urmia as the largest city in West Azerbaijan. On the other hand, ethnic differences were not taken into account.

In Canadian boys aged 12 to 19 years, the prevalence of overweight and obesity was estimated s 3% and 10%, respectively (19). The defined cut-offs in this study were also not identical with our study.

In the current study, the time of eating energy dense foods per week was associated with the weight status of the children (P<0.01). As a result, the more frequent the students had intake of energy dense foods per week, the more chance they had to be obese. In a case-control study conducted on 114 students aged 6-12 years, the authors confirmed the role of an unhealthy diet, notably calorie-dense snacks, in childhood obesity (20).

In a cross-sectional study on boys and girls aged 6-18 years conducted in Bahrain, it was revealed that high sugar consumption, low intake of dietary fiber and energy dense foods rich in fats and dietary cholesterol by many Bahraini children are the two likely factors in increasing their risk of obesity and cardiovascular diseases in later life (21).

In a study conducted in the United States, it was found that boys who had average weight and viewed themselves as either very underweight or overweight reported significantly higher levels of depressive symptoms compared to boys who accurately viewed their weight as average (n=2,139). This effect remained constant over the 13-year study period (22). This finding demonstrates that distortions in body image, particularly extreme distortions, are risk factors for elevated depressive symptoms among adolescent boys, and persist into early adulthood.

Working with computer is another variable affecting the weight status in our study. A study conducted in Iran (23) detected that the time spent on watching TV was associated with an increased risk of obesity and overweight. Tremblay et al. suggested that both organized and unorganized sport and physical activities are negatively associated with being overweight (10-24% reduced risk) or obese (23-43% reduced risk), while TV watching and computer use are risk factors for being overweight (17-44% increased risk) or obese (10-61% increased risk) (19). They concluded that first physical activity and sedentary behaviors partially account for the association of high socioeconomic status, and secondly two-parent family structure increases the likelihood of being overweight or obese.

Wake and coworkers in Australia found that child mean BMI z-score was significantly related to TV watching (P<0.001), but not video game/computer time (P=0.09), and that they account for only 1 and 0.2% of total BMI variance, respectively (24). When parental BMI, parental education, number of sibling, food intake, organized exercise and general activity level were included, TV watching ceased to be significantly related to child BMI independently (25). They concluded that a small proportion of variance in child BMI was related to TV watching, but not video/game/computer time. In conclusion, our findings revealed two changeable parameters (i.e. the number of times for eating energy dense foods during a week, and working with computers)

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influence the high school boys' body weight in the study region.

It is worth accentuating that our study was designed by using a questionnaire based upon the long term memory of the subjects, which may not be an accurate way to achieve our purposes regarding some of the quantitative variables.

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