RESEARCH ARTICLE

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Prevalence and Predictors of Overweight and Obesity in Adolescents

Aziz Kamran[a], Mohammad Taghi Savadpoor[b], Aliakbar Shekarchi[a], Sohrab Iranpour[c], Gholamreza Sharifirad[d]*, Abdollah Dargahi[e]

[a] Public Health Department, Khalkhal Faculty of Medical Sciences, Ardabil University of Medical Sciences, Ardabil, Iran
[b] Nursing Department, Khalkhal Faculty of Medical Sciences, Ardabil University of Medical Sciences, Ardabil, Iran
[c] Public Health Department, School of Health, Ardabil University of Medical Sciences, Ardabil, Iran
[d] Public Health Department, School of Health, Qom University of Medical Sciences, Qom, Iran
[e] Enviromental Health Department, Khalkhal Faculty of Medical Sciences, Ardabil University of Medical Sciences, Ardabil, Iran
[*]**Correspondence** should be addressed to Prof. Gholamreza Sharifirad; **Email**: dr.sharifirad@gmail.com

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Background & Aims of the Study: Adolescent overweight and obesity are worldwide public health problems which play important roles in well-being. The aim of this study was to determine the prevalence of overweight and obesity among adolescents aged 14-19 years old. This study was conducted to determine the prevalence and predictors of adolescent overweight and obesity among Iranian adolescents.

Materials & Methods: A cross sectional study was conducted among 430 adolescents aged 14-19 years old from urban schools of Ardabil, Iran in 2014. The collected data were analyzed by binary logistic regression analysis using SPSS-18;A *P-value* of <0.05 was considered statistically significant.

Results: A total of 99 subjects (23.1%) were undernourished, 43 (10 %) were overweight while 30 (7.3%) were obese. Frequent fast food consumption was found to increase the odds of malnutrition (OR=1.4) while adequate daily physical activity (OR=0.7) and frequent fruit intake (OR=0.6) were inversely correlated.

Conclusions: Overweight and obesity are highly prevalent among adolescents, and health promotion strategies to change adolescents' life style such as controlling the growth of fast food eating culture, promoting frequent fruit and vegetable intakes, and encouraging them to do adequate amount of daily physical activity are required.

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Background

Rapid developmental changes occur in adolescence. Failure to consume an adequate balanced diet and indulge in regular adequate physical activities into their daily schedule can disrupt their normal growth and development (1, 2), inasmuch as obesity continues to be a major concern of public health efforts around the world (3). Obese adolescents may be at risk of short-term health consequences (2) and long-term tracking of obesity to adulthood (4). Overweight and obese adolescents are at risk of developing non communicable diseases' factors like cardiovascular disease, diabetes, and also psychological problems such as stigmatization and poor self-esteem (5, 6).

The recent trends of increasing urbanization and changing dietary patterns and lifestyles have contributed to a rapid rise in overweight and obesity. Studies estimating the costs of malnutrition and its potential predictors among

adolescents are currently limited in Iran. Kelishadi (2014) showed that the overall prevalence of obesity and overweight are estimated to be about 5.1% and 10.8%, respectively, also the meta regression analysis showed that the prevalence of obesity and overweight did not significantly vary with respect to the sex and age of study subjects. Girls had a lower prevalence of obesity and higher prevalence of overweight than boys (7). But in Kazemi's study (2009), the overall prevalence rates of overweight and obesity were 4.8% and 1.8%, respectively; overweight prevalence varied by age from 1.6% to 9.1%in girls and 0.5% to 7.8%in boys, and obesity rate varied from 0.8% to 2.5% in girls and 0.5% to 3.7% in boys (8).

Aims of the study: In order to collect data on this emerging threat, considering the fact that limited research has been carried on Ardabil (Northwest of Iran) adolescents' obesity, the present study aimed to determine the prevalence of overweight and obesity among adolescents aged 14-19 years old, compare the prevalence of overweight and obesity in males and females between the age groups, determine lifestyle factors, estimate the prevalence of underweight, overweight, and obesity amongst adolescent school children, and to understand the lifestyle practices associated with them.

Materials & Methods

This cross-sectional study was conducted among adolescent schoolchildren of both gender groups, aged 14-19 years old and sampled from six randomly selected schools of Ardabil, Iran. The sample size was estimated based on $n = Z^2 * pq/d^2$ formula, and the value of 'p' was determined 50%, absolute error 5%, confidence level at 95%, and a non response rate at 20%. The sample size worked out to be 468 school adolescents; 430 participants completed the study (response rate 91.8%). Stratified cluster sampling was applied to draw the representative students out of six randomly selected schools in the study area.

Information was obtained via a semi-structured questionnaire which elicited relevant socio-demographic characteristics such as age, gender, physical activity, and dietary practices by a trained interviewer' contribution . Weight was measured using an electronic weighing scale to the nearest 0.1 kg. For measuring height, each subject was asked to stand against a calibrated vertical bar with a horizontal headboard. Height was recorded to the nearest 0.5 cm. Body Mass Index (BMI) was calculated via BMI = Wt (kg) /Ht (m) formula (2). Age and sex-specific BMI percentiles were computed based on Health Statistics growth curves of National Disease Control Centre. Study subjects were classified as underweight, normal weight, overweight, and obese.
"Adequate physically active adolescent" is defined as one who is currently doing moderate to vigorous intensity physical activity (which increases heart rate and breathing) for at least 60 minutes per day and leastwise three days a week, or walks for at least 10 minutes to go to school every day. A "frequent vegetable intake" was defined as taking vegetables for at least five or more days in a week. A "frequent fruit intake" was defined as taking fruits for at least five or more days in a week. A "frequent fast food intake" was defined as taking fast food (such as samosa, burger chips, or any other packed oily snacks) more than three days a week.
Data analysis: The data were analyzed by SPSS software, version-18. Chi-square test was performed to establish the association between categorical variables like age group and gender. Binary logistic regression analysis was done to determine the independent variables that were significant predictors of overweight and obesity in the study. P-value of <0.05 was considered statistically significant.

Results

A total of 99 subjects (23.1%) were undernourished, 43 (10%) overweight, and 30 (7.3%) obese. The mean age of the students was 15.5± 1.4 years old [mean ± standard deviation (SD). The mean weight of the students was 47.3 ± 8.2 kg (range 28.3 - 82.0 kg). Mean height was 157.3 ± 9.4 cm (range 128 - 187 cm).

Among the study subjects, more females (25.1%) were undernourished than males (20.9%). The reverse trend was evident for overweight and obesity; the prevalence was more in males (19.5%) as compared to females (14.4%). As the age increased, the level of undernourishment decreased. In a contradictory manner, an increasing trend was evident for overweight and obesity wherein the prevalence deceased. 74.9 % of the adolescents consumed extra salt in their diet (Table 1).

Table 1: Demographic characteristics of the study participants screened for Hypertension (N=354)

	Underweight N=99	Normal weight N=258	Overweight/obesity N=73	P_value
Gender				
Male(n=215)	45(20.9)	128(59.5)	42(19.5)	P= 0.28
Female(n=215)	54(25.1)	130(60.5)	31(14.4)	
Age				
14 years(n=144)	37(25.7)	86(59.7)	21(14.6)	
15 years(n=86)	19(22.1)	54(62.8)	13(15.1)	
16 years(n=60)	11(16.7)	23(63.3)	12(20.0)	P= 0.9
17 years(n=40)	11(27.5)	23(57.5)	6(15.0)	
18 years(n=45)	9(20.0)	26(57.8)	10(22.2)	
19 years(n=55)	12(21.8)	32(58.2)	11(20.0)	
Excessive salt intake				
No(n=108)	29(26.9)	71(65.7)	8(7.4)	P = 0.009
Yes(n=322)	70(21.7)	187(58.1)	65(20.2)	
Vegetable intake				
Frequent(n=144)	33(22.9)	101(70.1)	10(6.9)	P< 0.001
Less frequent(n=286)	66(23.1)	157(54.9)	63(22.0)	
Fruit intake				
Frequent(n=144)	36(25.0)	104(72.2)	4(2.8)	P< 0.001
Less frequent(n=286)	63(22.0)	154(53.8)	69(24.1)	
Fast food consumption				
Frequent(n=280)	29(10.4)	181(64.6)	70(25.0)	P <0.001
Less frequent(n=150)	70(46.7)	77(51.3)	3(2.0)	
Watching TV				
>3 hours(n=262)	39(14.9)	155(59.2)	68(8.2)	P <0.001
<3 hours(n=168)	60(35.7)	103(61.3)	5(3.0)	
Physical activity				
Adequate(n=125)	38(30.4)	79(63.2)	8(6.4)	P <0.001
Inadequate(n=305)	61(20.0)	179(58.7)	65(21.3)	

The results of BP screening showed that the distribution of newly diagnosed cases of hypertension, those having pre-hypertension and those having normal BP were 18.6% (66/354), 39.3 % (139/354) and 42.1% (149/354) respectively. Most of the

normotensive, pre hypertensive and hypertensive patients also belonged to the same age group (Table 2).

Table 2: Logistic regression model of predictors of malnutrition among adolescents (N=430)

	OR	95% Confidence interval	P_value
Excessive salt intake			
yes	1.58	1.1 - 2.2	0.01
No	R		
Vegetable intake			
adequate	1.46	1.0 -2.0	0.02
Less frequent	R		
Fruit intake			
adequate	1.8	1.3 -2.6	<0.001
Less frequent	R		
Fast food consumption			
frequent	0.15	0.10 – 0.24	<0.001
Less frequent	R		
TV watching			
Watching TV > 3 hours	0.29	0.2 – 0.4	<0.001
Watching TV < 3 hours	R		
Physical activity			
Less active	1.9	1.3 -2.7	<0.001
active	R		

Logistic regression model was adjusted for age and gender
*** = Significant at p<0.05***

Majority of the study participants who were normotensive, pre hypertensive or hypertensives on screening were females. Near the one fifth of all participants were currently using tobacco and majority of the participants with current tobacco most of were hypertensive, whereas most of the normotensive and pre hypertensive participants were not smoker and significant differences was found in blood pressure between current tobacco status, BMI and Waist circumstance groups (P<0.001). Central obesity was present in 71.2% and 54.0% of hypertensive and pre-hypertensive participants respectively and 24.8 of normotensive participants had central obesity.

Discussion

In our study, 17% of the adolescents were overweight and obese that is consistent with similar studies in Iran. In Mohamadpour's (2012) study, the prevalence of obesity, overweight, and underweight were 7.1, 14.5, and 2.9 %, respectively (9). In another study from Iran, prevalence of obesity and overweight was 18.6 and 5.9 %, respectively (10), and Bazhn (2009) reported 14.8 and 5.3 % of adolescents who were overweight and obese, respectively(11).

In this study, no significant difference was observed in the weight status of men and women and their age groups; however, significant associations were found for variables of higher salt intake, fast food, and TV watching period (more than three hours a day). Also, there was a significant correlation between the consumption of fruit and vegetables and overweight and obesity. This means that fruit and vegetable intake in subjects with normal weight was higher than overweight and obese adolescents, instead excessive salt use and frequent fast food intake was higher among the overweight and obese subjects than the normal adolescents.

Physical activity among participants with normal weight was higher than overweight and obese adolescents; this is in consistence with other similar studies in Canada, American, and Iran (12-14). Similarly, in Mohamadpour's (2012) study, obesity and overweight were significantly correlated with education, parents' jobs, and girls' physical activities. In the obese girls, 58.3% of the subjects had an activity rate of less than 30 minutes per day; 25% had TV watching more than four hours a day, 50 % consumed snacks twice a day, and 38.9 % reported obesity in their first-degree relatives (9).

Based on the Global School-based Student Health Survey (GSSHS), India reported that 12.9% of adolescents were overweight and

obese (15). A study conducted by Ramesh (16) recorded 18.3% prevalence. Another study by Kapil (17) reported prevalence of obesity to be 30%. Ramachandran et al in their study reported prevalence of overweight as 17.8% for boys and 15.8% for girls aged 13-18 years old (18). Deshmukh reported prevalence of overweight/obesity to be 2.2 % (19). The reason for low prevalence of overweight and obesity in this study can be due to the geographical conditions of the study area.

This research identified a significant relationship between frequent fast food consumption and malnutrition; studies done by researchers around the world have reported the same association (20-21). Moreover, a positive correlation was observed between inadequate physical activity and malnutrition; this has been similarly highlighted in various studies carried out worldwide (22-24). Although statistically insignificant, adolescents spending more time watching television programs had slightly higher odds of malnutrition. Similar association was noted in a study done by Hancox et al in New Zealand (25). Braithwaite et al in their multicentric worldwide study reported that increased television viewing hours was positively associated with BMI of the adolescents (26).

Conclusion

According to the results of the present study, school managers and health policy makers should develop and implement health promotion programs to educate all parents, including older ones, about the need to provide adequate number of fruits and vegetables each day for their adolescents, also they should work on the development and provision of alternative healthy foods for their children. It is crucial for public health practitioners to address overweight/obesity in school children through primary prevention strategies to reduce these rates in adults. School management should promote fresh food sale and purchase in school cafeteria and create healthy food zones around schools. Furthermore, efforts should be made to promote supportive environment in society where adolescents indulge in regular physical activities.

Regular physical educational activities such as celebration of sports' day in schools should be encouraged.

Footnotes

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Conflict of Interest:
The authors declared no conflict of interest.

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