

A Study of Food Consumption Patterns of and Obesity in Female Adolescents in Khorramshahr High Schools

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Abstract

Background: One consequence of an industrial age is overweight and obesity. The accelerating rate of obesity, especially in adolescent girls, has led to growing concern regarding the health of this generation.

Objectives: The objective of this study was to examine the food consumption patterns of and obesity in female adolescents in Khorramshahr high schools.

Materials and Methods: This cross-sectional study involved 200 high school girls from Khorramshahr. The study sample was selected via multistage random sampling. Body weight and height were measured and the body mass index (BMI) values were calculated. Underweight, overweight, and obesity were defined as the 5th, 85th, and 95th percentiles, respectively, using the centers for disease control and prevention (CDC) BMI-for-age growth charts for girls. More data were collected by using the Food frequency questionnaire. Analysis was done using the SPSS software, Kruskal-Wallis test, and median measures.

Results: Findings showed that according to their BMI, 3% of the students were underweight, 82% had normal weight, 11% were overweight, and 4% were obese. There were significant relationships between the consumption of bread, dough, and sugar cubes and the BMI ($P < 0.05$). The highest bread consumption was among overweight students (min 90, max 360, mean 180 palms per month). In addition, students with normal weight had the highest consumption of rice and sugar cubes (160 plates and 360 cubes per month, respectively).

Conclusions: The findings of this study offer information regarding the current dietary patterns among adolescent girls that can be used to design educational programs to promote healthy eating in this group.

Keywords: Food Frequency, Obesity, Adolescent Girls, Food Patterns

1. Background

One of the important health complications and challenges in today's world is overweight and obesity (1). Improvements and changes in the human lifestyle have led to changes in food patterns (2). These patterns usually start at adolescence and continue into adulthood (3). Changes during adolescence, such as an increasing sense of independence and autonomy (4) and accelerating rate of growth, are some of the risk factors related to the development of inappropriate food patterns and consequently overweight and obesity (5).

Obesity has many consequences including: increased rate of growth and development, early puberty, intolerance of physical activity (6), sleep apnea, eating disorders (7-10), glucose metabolism disorder (11), insulin resistance, glucose intolerance, increased level of insulin in the blood, type 2 diabetes, musculoskeletal problems (12), neurolog-

ical diseases, lung disorders, digestive diseases (13), increased level of triglyceride in the blood, and cardiovascular disease (14). Moreover, obesity, especially in adolescent girls, can lead to the disturbance of menstruation and affect ovulation and fertility (15).

Existing evidence shows the growing rate of obesity among adolescents. In the past 30 years, obesity has tripled in children and quadrupled in adolescents. For example, according to the national health and nutrition survey conducted in 2012, the prevalence of obese children aged 6 - 11 increased from 7% in 1980 to 18% in 2012. In addition, the prevalence of obese adolescents aged 12 - 19 increased from 5% to 21% during the same period of time. Furthermore, according to this survey, 17.2% of American female adolescents are obese and 14.5% are overweight, which suggests high growth (16). In Iran, findings of a survey that was conducted on 2,321 students with the aim of determining the prevalence of overweight and obesity in Tehran students

showed that 23.1% of the girls were overweight (17). Another study that was carried out on 210 female adolescents in the northern and southern areas of Tehran showed that 15.2% and 26.7% of female adolescents, respectively to the regions, were overweight or obese (18).

Most studies conducted in our country have shown that little attention is being given to a healthy diet. A study conducted by Alizade et al. showed that teenage girls follow a western food pattern (16.6%), an Asian food pattern (4.6%), or a traditional Iranian food pattern (3.8%). This study also showed that teenage girls eat sweetened foods (5.6%), salty foods (4.4%), and low-protein, high soda, and fatty foods (4%) (19). The results given by Amini et al. showed low fruit and vegetable consumption among adolescents; 39.9% consumed fruits only once a week, 16.7% did not eat fruits at all, and only 7% of them consumed fruits more than three times a day. In addition, 6.8% of the adolescents did not eat vegetables at all. Moreover, the girls' consumption of fruits, vegetables, meat and meat products was less than the boys' consumption (20).

2. Objectives

Although awareness of food pattern changes over time in the adolescence period is very important, it has only been assessed in adults and there is a lack of knowledge regarding this issue, especially in adolescent girls of Khorramshahr, a southwest city of Iran (21). Consequently, the authors decided to conduct a study with the aim of determining the food consumption patterns and obesity rates among female adolescents in Khorramshahr.

3. Materials and Methods

This cross-sectional study was carried out from November 2014 to February 2015 and involved 200 high school girls in Khorramshahr. The study sample was selected via multistage random sampling. In the first stage, all of the girls high schools in Khorramshahr were divided into 25 clusters. In the next stage, 4 schools were chosen randomly. Finally, from each school 50 students were selected randomly based on a table of random numbers.

Data were collected by using the food frequency questionnaire and analyzed by the SPSS software, the Kruskal-Wallis test, and median measures. Although the Food frequency questionnaire is a standard questionnaire, its content validity was confirmed by five specialists and to determine its reliability a test-retest method was applied so that the questionnaires were distributed between twenty students in a two-week interval and the Pearson correlation was calculated ($r = 0.92$). The questionnaire contained 16 items of food products related to the five food

groups of grains, fruits and vegetables, dairy products, meat, and general food. If the participant answered according to daily or weekly consumption, the researcher adjusted them to monthly frequency. Furthermore, the questionnaire contained a demographic section that collected the student's age and grade, the educational level of their parents, their parents' occupational status, and their family's socioeconomic status. Weight was measured using an analogue SECA scale with a maximum error of one-tenth without wearing shoes and with light clothing, and height was measured with a stadiometer with a maximum error of half a centimeter. The body mass index (BMI) was calculated as kg/m^2 . In this study, the centers for disease control and prevention (CDC) BMI-for-age growth charts for girls were used (Table 1). Finally, the data was analyzed by the SPSS software, Kruskal-Wallis test, and median measures.

Table 1. The CDC BMI-for-Age Growth Charts for Girls

Weight Status Category	Percentile Range
Underweight	Less than the 5th percentile
Healthy weight	5th percentile to less than the 85th percentile
Overweight	85th to less than the 95th percentile
Obese	Equal to or greater than the 95th percentile

3.1. Inclusion Criteria

- 1) Studying in one of the high schools in Khorramshahr;
- 2) Student's and parental agreement to participate in the study;
- 3) Not suffering from diseases which require a specific food diet.

3.2. Exclusion Criteria

- 1) Incompletely answering the questions.

3.3. Ethical Considerations

We received ethics approval for this study from the ethics committee affiliated with Ahvaz Jundishapur University of Medical Sciences (ethics code: U 93150). All students and their parents were informed about the aim of the study, and written consent was obtained. Moreover, the right of voluntary participation was followed.

4. Results

The study data revealed that 24% of the studied sample was in the first grade of high school, 27% was in the second grade, 30.5% was in the third grade, and 18.5% was in

the fourth grade. About 30% of the students' fathers had an academic degree, but only 4% of the mothers had such degrees. Furthermore, the results showed that according to the BMI-for-age charts, 3% of the students were underweight, 82% had a healthy weight, 11% were overweight, and 4% were obese (Table 2).

Regarding food consumption, the results showed that the most common foods consumed by the sample were bread and rice (Table 3). The Kruskal-Wallis test analysis revealed significant relationships between the BMI and the consumption of bread, dough, and sugar cubes ($P < 0.05$), but there were no significant relationships between the consumption of other food items and the BMI. The highest consumption of bread was among overweight students (min 90, max 360, median 180 hand palms per month). In addition, students with a normal weight had the highest consumption of rice and sugar cubes (160 plates and 360 cubes of sugar per month, respectively). Obese students had the lowest consumption of fruits (min 1, max 90, median 40 servings of fruit per month) and the lowest consumption of milk (min 0, max 90, median 2 cups per month). In general, the consumption of meat was very low among the girls. Nonetheless, the obese girls had the lowest consumption of meat (min 0, max 30, median 2.5 medium pieces per month).

5. Discussion

Our study showed that female adolescents, regardless of their BMI, exhibit some inappropriate food patterns including low consumption of fruits, vegetables, and milk as well as high consumption of high calorie foods. In addition, the consumption of meat was very low among adolescent girls. In this study, the adolescents with normal weight consumed a mean of 30 units of vegetables, 18 units of fruits, and 8 medium pieces of meat per month. However, the recommended amount of vegetables and fruits for adolescents is 3 to 5 units per day, or 90 to 150 units per month (each unit of vegetables is equal to one cup and each unit of fruits is equal to one medium size fruit). In addition, the recommended amount of milk is 3 to 5 units per day, or 90 to 120 units per month (each unit is equal to 1 cup). Furthermore, to prevent anemia, adolescent girls need to eat 2 to 3 servings of meat or meat substitutes per day, or 60 to 90 servings per month (a serving is equal to 60 - 90 grams) (16).

In our study, the consumption of sugar cubes among obese adolescents was very high (180 cubes per month). In line with our findings, studies conducted by Kouchakpour et al. and Alizade et al. showed that adolescents consume too much sugar (19, 21) and sweet foods formed the second

dominant dietary pattern among students (19). These studies also showed the high consumption of high calorie food by adolescents (19, 21).

In addition, most of the food consumed by the students with their friends, especially in schools, contains too much sugar. Since the recommended amount of daily sugar consumption is not more than 50 grams (16), the findings of the mentioned studies show that the food patterns of students need considerable attention.

Our findings showed that bread and rice are the most frequent foods consumed by the study sample. These results were in agreement with the results of a study conducted by Abedi et al. (22). Bread and rice are in the grain category, which is another type of sugar, and can be added to the sugar consumed by the students. Consequently, it is clear that the study's sample consumes a large amount of calories. However, to reduce the side effects of sweet food, it is recommended that the consumption of simple sugar be decreased instead of the consumption of grains.

In our study, the foods most consumed by obese students were bread, sugar, sugar cubes, and rice. In regard to the consumption of bread and sugar cubes, these results were in agreement with the results of Abedi et al. (22). However, the results were not consistent in regard to the consumption of sugar.

Although the study of Abedi et al. revealed that dough in the dairy category was the most consumed item by underweight adolescents, in our study the consumption of yogurt was the highest among underweight adolescents (22). It can be concluded that the type of chosen dairy does not affect body weight.

Generally, there were no significant relationships between the consumption of most food categories and BMI. The study conducted by Al-Muammar et al. assessing the relationship between food behavior and BMI in adolescent high school girls in Saudi Arabia also showed no significant relationships (23). These findings, however, might be caused by measurement errors of height and weight, non-accurate reports of food frequency, or the small size of the sample.

In conclusion, unhealthy food patterns, which are prevalent among adolescents if not managed properly, may result in long-term habits as well as overweight and obesity that threaten the health of the adolescents and the community in general.

The results of this study showed no significant relationship between the consumption of most food categories and BMI. Consequently, more research is needed to reduce the growing rate of obesity among this generation.

Furthermore, findings show that the food patterns and BMI in high school female adolescents are generally inappropriate. Developing continuous and well-managed ed-

Table 2. Demographic Characteristics of the Study Sample

Variables	No. (%)
Father's education	
Master's degree or higher	3 (1.5)
Bachelor's degree	10 (5)
Associate's degree	17 (8.5)
High school diploma	61 (30.5)
Below high school diploma	80 (40)
Illiterate	26 (13)
Mother's Education	
Master's degree or higher	1 (0.5)
Bachelor's degree	3 (1.5)
Associate's degree	61 (30.5)
High school diploma	96 (48)
Below high school diploma	38 (19)
Illiterate	1 (0.5)
Father's employment status (occupation)	
Employed	32 (16)
Worker	23 (11.5)
Retired	24 (12)
Self-employed	90 (45)
Unemployed	27 (13.5)
Mother's employment status (occupation)	
Employed	4 (2)
Worker	1 (0.5)
Self-employed	14 (7)
Housewife	181 (90.5)
Economic status of family	
Very good	17 (8.5)
Good	52 (26)
Average	116 (58)
Bad	11 (5.5)
Very bad	4 (2)
Student's education level in high school	
First grade	48 (24)
Second grade	54 (27)
Third grade	61 (30.5)
Fourth grade	37 (18.5)
Student's body mass index (BMI)	
Underweight	6 (3)
Normal (healthy weight)	164 (82)
Overweight	22 (11)
Obese	8 (4)

educational programs to change female adolescents' eating behaviors is essential to improve adolescents' health as well as their community's health.

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Table 3. Median, Minimum, and Maximum of Food Frequency per Month According to BMI

Food Category	Under-weight Median (Min, Max)	Healthy Weight Median (Min, Max)	Over-weight Median (Min, Max)	Obese Median (Min, Max)	P Value
Grains					
Bread	110 (60 - 180)	180 (55 - 750)	180 (90 - 360)	165 (60 - 210)	0.025
Rice	30 (20-45)	30 (16-160)	30 (20 - 80)	40 (20 - 60)	0.579
Pasta	6 (0 - 8)	5 (0 - 16)	6.5 (0 - 23)	7 (2 - 12)	0.630
Fruit/Vegetables					
Fruit	12 (4 - 60)	30 (0 - 150)	25 (0 - 150)	4 (1 - 90)	0.705
Vegetables	10 (0 - 30)	18 (0 - 120)	30 (0 - 60)	16 (0 - 60)	0.785
Yogurt	10 (4 - 30)	12 (0 - 90)	10 (0 - 90)	21 (1 - 90)	0.601
Dairy					
Cheese	30 (4 - 30)	22 (0 - 120)	21 (2 - 60)	30 (1 - 60)	0.978
Milk	6 (0 - 60)	6 (0 - 60)	4 (0 - 60)	2 (0 - 90)	0.607
Dough	4 (0 - 12)	7 (0 - 60)	3 (0 - 60)	25 (1 - 60)	0.038
Chicken	4.5 (1 - 8)	8 (0 - 120)	12 (0 - 90)	12 (3 - 24)	0.113
Protein (Meat and Meat Products)					
Meat	10.5 (1 - 18)	8 (0 - 50)	8 (0 - 60)	2.5 (0 - 30)	0.674
Fish	6 (1 - 12)	6 (0 - 30)	5 (0 - 24)	4 (1 - 12)	0.732
Legumes/Beans	10 (0 - 25)	12 (0 - 60)	12 (1 - 90)	13 (8 - 25)	0.875
Solid Oil	15 (0 - 120)	12 (0 - 270)	12 (0 - 270)	21 (0 - 120)	0.989
Other Foods					
Sugar Cube	2 (0 - 90)	10 (0 - 360)	30 (0 - 150)	60 (30 - 90)	0.046
Sugar	105 (60 - 210)	90 (60 - 270)	105 (4 - 190)	105 (0 - 180)	0.901

Footnotes

Authors' Contribution: Amineh Asadinasab, Mahin Gheibizadeh, Malek Fereidoonimoghadam and Parvin Abedi were responsible for the study conception and design, performing data analysis, and drafting the manuscript. Data collection was conducted by Amineh Asadinasab. Amal Saki Malehi was responsible for the statistical analysis. All of the authors approved the final manuscript.

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