

## Evaluation of nutrition and its relationship with BMI in adolescents in Birjand, South East of Iran

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Received: 23 Feb 2017

Accepted: 24 June 2017

### Abstract

**Background and Objectives:** The prevalence of overweight and obesity as a major risk factor for several chronic diseases is increasing rapidly worldwide. Several studies pointed a correlation between obesity and nutrition pattern in children and adults. However, there are still some controversial aspects about this association. The aim of this study was to investigate the relationship between body mass index and nutritional pattern in adolescents.

**Methods:** This is a case-control study including 204 7th -12th grades high school children elected through multiple cluster-sampling in Birjand city. A questionnaire consisted of nutritional patterns was used. Data were analyzed using SPSS v.15. The statistical tests used were Chi square and t-test at  $\alpha=0.05$ .

**Results:** There was no significant difference in age, gender and grade of school between overweight/obese and normal weight subjects. Although there was higher calorie intake in obese/overweight group, but there was no significant difference discovered. There was lower consumption of breakfast in the obese/overweight group ( $p=0.04$ ). The average number of meals during one week was significantly more in obese adolescents than normal ones ( $p<0.001$ ). However, the number of days with breakfast consumption was significantly more in normal students (5.79 vs 5.1 or  $p=0.03$ ).

**Conclusion:** The amount of calorie consumption was not different between case and control in this study, thus, other factors including physical inactivity and genetic factors should be investigated in further studies.

**Keywords:** Obesity-overweightness, Body Mass Index, Nutrition

### Introduction

In recent decades, noncontagious diseases have a major role in mortalities in human communities. One of these noncontagious diseases is obesity (1). Since 1950 prevalence of obesity in the world has had a progressive increase such that now 300 million people in the world suffer from obesity. In 2002, 5.2 million people in different countries have died because of obesity. In recent years as obesity and overweightness has increased dramatically and has become the main cause of some health problems. Obesity is one of the diseases caused by unhealthy lifestyle. It seems that the origin of obesity as a threat for health should be

searched through adolescence, because this point of human life is a critical time for spread of obesity and other noncontagious diseases of adulthood. Considering the spread of urbanization, industrialization of communities, increase in industrial development and market globalization, rapid changes in regimen patterns and lifestyle has emerged (2).

Recent theories of nutrition epidemiologists are based on paying attention to regimen patterns and different food groups in the diets of people and communities instead of merely taking micronutrients into consideration. Fast foods are full of calories so that a small amount of them can provide

the needs of body. Diets depended only on fast and ready foods along with sedentary lifestyle increase the risk of obesity. People who have regime consisted of valueless but high calorie foods are in danger of obesity 40% more than people with regimens consisted of vegetables, fruits, milk and low fat high fiber stuffs (3).

World Health Organization (WHO) has warned about increase in noncontagious diseases in different countries including obesity. Studies in east Mediterranean countries have showed that obesity has led to an alarm point amongst children and adults (4). Adolescence obesity is the most prevalent health problem amongst teenagers of developed countries aged 12-17.

Today at least 27% of children and 21% of adolescents are obese and this fact shows an increased rate of 54% in children obesity and 39% in adolescence in the last two decades.

Today, in the United States of America 25% of children suffer from obesity and overweightness and according to the national statistics (NHANES), obesity in adolescents has increased from 15% in the period of 1976-1980 to 21% in the period of 1988-1991. These numbers show the importance of special attention to this fatal issue and its leading causes (5).

The 17% prevalence of obesity amongst Iran's elementary school children is equal to the world's statistics including developed countries (6). This tendency is an alarm for increase in metabolic syndrome in Iranian adult population (7).

Studies are also accomplished in developing countries including one that showed a 19% prevalence of obesity and overweightness in 10 to 19 year old boys of eastern Tehran, and another one reported by the national institute of nutrition studies, showed 26% and 31% prevalence amongst Tehran's boys and girls respectively. It is reported to be 21% amongst middle school girls living in Tabriz (5).

Nutrition has an important role in fitness and prevention of obesity. Proper nutrition means to act on the two principles of balance and diversity. Balance is consumption of enough and proper amount of materials needed for health, and diversity is using different foodstuff from the four main categories. The best way to assurance about balance and diversity in a diet is to consume foods from all the four categories that are bread and cereals, fruits and vegetables, milk and milk prod-

ucts, lean meat and alternatives (8).

Studies about students are very few and some of them are analytical descriptive studies (5,6,2,9). This study was performed to investigate nutrition in obese and overweight adolescents and comparing them to normal ones.

### Methods

This study is case-control and the statistical population included the students of first and second course middle school of Birjand city. Sample size was determined by the average comparison formula:

$$n = \frac{(z_{1-\alpha} + z_{1-\beta})^2 (s_1^2 + s_2^2)}{d^2}$$

based on the study by Shahidi et al (11) with  $S_1=13.6$ ,  $S_2=12.1$ ,  $\alpha=0.05$ ,  $X_1=65.78$ ,  $X_2=59.34$ , and  $d=6.44$  were estimated in each group. For an increase in study power and based on the researchers' opinion 102 people were considered for each group. Randomized multistep sampling was used for selections. For this method, first, Birjand city was divided into 4 geographical regions, north, south, east and west (which are compatible with the socioeconomic classes to a large extent); then, the list of middle schools in each region was considered a cluster. Then we chose one girl middle school and one boy middle school from each cluster through simple randomization and from each grade, one normal student was chosen for each obese student for inclusion in the study.

For determination of the status in each group, first each student was weighed with German SE-CA scales with minimum clothing and 50 gram precision. Then heights were determined by a meter with 0.5 centimeter precision while standing without shoes, legs sticking together and knees, pelvic, shoulders and head in one alignment and the head kept straight. After weighing every 10 people, the scale was calibrated by a standard weight. Body mass index was calculated as weight (in kilogram) over height squared (in meter). For determining overweightness and obesity definition, percentiles from the disease control center were used. The 85 to 95 percentiles for age and gender were considered overweight and more than 95 was considered obese. The obese, overweight and normal students were chosen from one class and this led to similarity in age and gender.

Table 1. Demographic data of both groups

Variables	Groups	Normal Weight Frequency (%)	Obese/overweight Frequency (%)	Chi square test
Gender	Girl	87 (85.3)	86 (84.3)	$X^2=2.01$ P=0.8
	Boy	15 (14.7)	16 (15.7)	
Academic level	7 <sup>th</sup>	21 (20.6)	20 (19.6)	$X^2=2.5$ P=0.3
	8 <sup>th</sup>	27 (26.5)	28 (27.5)	
	9 <sup>th</sup>	28 (27.5)	17 (16.7)	
	10 <sup>th</sup>	13 (12.7)	14 (13.7)	
	11 <sup>th</sup>	8 (7.8)	16 (15.7)	
	12 <sup>th</sup>	5 (4.9)	7 (6.9)	
		Mean±SD	Mean±SD	
Age (year)		14.3±1.6	14.6±1.7	P=0.2, T=1.28
Family members (number)		4.95±1.4	4.65±1.3	P=0.1, T=1.61

Table 2. The mean caloric intake from different food groups in 24 hours in both groups

Variables	Groups	Normal Weight Mean±SD	Obese/overweight Mean±SD	Mann Whitney test
bread and cereals		820.8±430.7	926.1±587.1	P=0.3, Z=0.9
Milk and dairy		431.3±312.8	523.1±380.2	P=0.04*, Z=2.1
Meat and legumes		467.1±77.9	831.9±785.4	P=0.08, Z=1.7
Fruits and vegetables		293.5±256	282.5±248.4	P=0.7, Z=0.3
Miscellaneous		214.2±223.5	229.1±195	P=0.3, Z=0.9
Total calories received from 5 food groups		2723.9±1366.1	279.8±153.9	P=0.8, Z=0.1

For determining foodstuff related to obesity, a questionnaire was provided by the researchers consistent of 92 phrases and has 2 parts, the first part was personal profile and the second part included a list of food and edibles consumed in 24 hours. According to the 4 groups of foodstuff, it was divided into 4 columns; first was the name of the stuff and the standard consumption unit; second, whether it was consumed in the last 24 hours; third amount of consumption according to the standard consumption unit in the last 24 hours; and the fourth, number of snacks during the last week. Besides that, the number of hours spent watching TV and working with computer was included in the questionnaire. Content justifiability was approved by 5 faculty members of Birjand University which are expert in nutrition science. For determining the calories taken from each foodstuff group, the amount of consumption was multiplied to its unit calories and the results for stuff in each group were summed.

The data driven from this study were transferred to SPSS-15 and analyzed with Chi square, Man-Whitney test, and independent sample t-test in  $\alpha=0.05$ .

## Results

This study was performed on 102 obese/overweight adolescents with BMI average of  $27.9 \pm 4.1$  and 102 normal adolescent with BMI average of  $19.9 \pm 3.2$ . Comparison of demograph-

ic findings is shown in Table 1. According to this table, there is not a meaningful difference in personal information (profile) of different groups. In addition, there is no meaningful difference in the parents' level of education or the mothers' job in the two groups of normal and obese people. ( $p=1.2$  and  $p=0.38$ ) the average in age, household dimension, birth order, gender and education grade was equal in the two groups. There was no meaningful difference in average calories consumed from the groups: bread/cereals, fruits and vegetables, lean meat, alternatives and the summation of all 5 groups. Only in the group of milk and milk products, there was a significant more calorie assumption in obese and overweight adolescents. (1.523 vs 3.431 or  $p=0.04$ ) (Table 2). The average number of meals during one weak was significantly more in obese adolescents than normal ones. (6.6 vs 1.3 or  $p<0.001$ ) Nevertheless, the number of days with breakfast consumption was meaningfully more in normal students. (5.79 vs 5.1 or  $p=0.03$ ) (Table 3). The average of hours spent watching TV or working with computer was meaningfully more in obese students than normal ones (Table 4). However, there was not a meaningful difference in the amount of eating carbonated drinks, chips and ice-cream in the two groups.

## Discussion

Obesity and overweightness are some of the main risk factors of many diseases, and its

Table 3. The mean Number of daily snacks and breakfast days per week in both groups

Variables	Normal weight Mean±SD	Obese/overweight Mean±SD	t-test
Number of daily snacks per week	3.1±2.9	6.6±3.8	P=0.001*, t=7.26
Number of breakfast days per week	5.7±2.2	5.1±2.4	P=0.03*, t=2.19

Table 4. The mean hours of watching TV and computer use per week in both groups

Variables	Normal weight Mean±SD	Obese/overweight Mean±SD	t-test
Hours of watching TV per week	1.17±0.74	1.41±0.65	P=0.01*, t=2.4
Hours of computer use per week	0.81±0.54	1.15±0.58	P=0.001*, t=4.4

negative consequences threaten not only the body's health, but also the person's psychological health. That is why this study was accomplished on 204 obese, overweight and normal adolescents. The average for age, gender, school grade, household dimension and birth order was equal in the two groups of normal and overweight/obese students and there was no meaningful difference in the parents' level of education or the parents' job in the two groups.

Discussing the relation between obesity and the calorie amount consumed, although the calorie consumption was more in obese students than the normal ones, but there was no meaningful difference driven from the study. The results from our study was the same as Zarei et al (2) and Zalila, Khor, Mirmalini, Norimah and Any in Malaysia (10) and Iberly et al(2) in those studies also there was not a meaningful difference in calorie intake between the two groups of case and control. This is while in some studies there was a positive and meaningful difference in this item. In the study of Shahidi et al (11) in 14 to 16 year old students of Tabriz and the one by Gomez et al (12) in 12 to 16 year old students of the united states, the amount of calorie consumption was meaningfully more in the obese group. Although high calorie intake is considered one of the main causes of obesity in adults and adolescents; but its accordance in children and adolescents is not easily defined. One reason is the difficulty in estimating calorie assumption because of problems in methodology and under-reporting. Besides that, sometimes other manners like less physical activity causes positive energy balance while calorie intake is not more, because inactivity causes accumulation of fat tissue. Although the factor of physical activity was not included in this study, but many investigations show that nowadays, adolescents have less activity compared to their peers in past decades. One reason is watching TV and playing computer games. (13)

Alborzimanesh et al (6) and Shakeri et al (14) showed that the time of watching TV and playing computer games was more in obese people. In our study, there was a significant more time of watching TV and playing computer games among obese students than the control group (p=0.014). In our study there was more consumption of milk and its products in the case group compared to the control ones, although in some studies it was less (e.g. the study of 12-13 year old Japanese children or the study by Tanasesko et al (15)). One reason might be more milk intake to control food consumption by the obese people of our study. In our study, the number of breakfasts in one week was significantly less in obese group. Many other studies including Vanelli in Italy (16) and Berki (17) and the study of 9 to 14 year old adolescents of the United States are similar to ours'. Nevertheless, some studies have found no relation between taking breakfast and weight status, one of them is the study by Azizzadeh et al. (18). Some studies have shown less appetite in obese people for taking breakfast (16). Eliminating breakfast may lead to more consumption of fast foods. In other words, elimination of breakfast not only is not a way of weight control, but also may lead to more weight gain (19). Therefore, there seems a need for educating people for other ways like lifestyle and sports. Despite that, there is a need for more investigations in this field. Education about weight control and lifestyle can affect our students' health.

### Conclusion

Considering that the amount of calorie consumption was not different between case and control in this study, other factors including physical inactivity and genetic factors should be investigated in further studies.

### Acknowledgment

We appreciate the help and cooperation kindly given by education department officials and the

students of Birjand high schools.

*Conflicts of interest:* None declared.

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