

Assessment of the Correlation between BMI, Waist Circumference, and the Snacking Pattern and Dairy Consumption among Female Student Residents of Shiraz University Dormitories

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Background: It is suggested that the type and frequency of snacks as well as dairy consumption can influence body weight and composition.

Objectives: This study attempts to assess the correlation of BMI and waist circumference with snacking pattern and dairy consumption among female university students.

Materials and Methods: We randomly selected 112 female students who were residents of Shiraz University dormitories as participants in this cross-sectional study. Weight, height and waist circumference of the participants were measured. Demographic and food frequency questionnaires were completed in face-to-face interviews. Data were analyzed using SPSS version 16.

Results: The results showed that 17% of participants were underweight, 74.1% were normal weight and 8.9% were overweight. Among participants, 95.5% had a normal waist circumference whereas the waist circumference in 4.5% was above normal. There were 63.3% of female students who consumed just one snack per day. Confectionaries (84.1%) were the most popular snacks. Mean \pm SD dairy consumption was 1.78 ± 1.20 servings per day. There were no correlations between body mass index and waist circumference with snacking pattern or dairy intake.

Conclusions: The majority of our subjects had normal weight and waist circumference, thus we did not find any correlation between body mass index and waist circumference to snacking pattern or dairy intake. Similar studies should be conducted that enroll both overweight and normal weight subjects.

Keywords: Body mass index; Waist circumference; Snacking; Dairy

1. Background

Obesity, or accumulation of extra fat in the body (1) is the main risk factor for chronic diseases such as diabetes, certain cancers, hypertension, dyslipidemia, osteoarthritis, cardiovascular diseases and psychosocial abnormalities (2, 3). The World Health Organization (WHO) has reported that the prevalence of obesity doubled globally over the last two decades (4). Currently, obesity is a major public health concern both in developed and developing countries (5-7).

Positive energy balance which is the consequence of excessive energy intake, reduced physical activity or both, is commonly accepted as the main cause for obesity (8, 9). High fat snacks and sugar-rich drinks provide a tremendous amount of energy, thus frequent consumption of unhealthy snacks is mentioned as a potential cause of obesity (10). On the other hand, results of many studies suggest that decreasing milk or dairy consumption may

lead to increased body fat and obesity (11-13).

During the past decade, life style changes, Westernization, television commercials and the lack of nutrition knowledge has led to increasing consumption of unhealthy snacks and fast foods, particularly by young people and university students (14). It has been reported that becoming a university student causes individuals to adopt unhealthy dietary patterns (10, 14).

2. Objectives

This study attempts to assess the correlation of BMI and waist circumference with snacking pattern and dairy consumption among female university students.

3. Materials and Methods

This cross-sectional study was carried out on 112 randomly chosen female students who resided in Shiraz University dormitories. For random selection the student

Implication for health policy/practice/research/medical education:

Results of this study may help nutritionists and policy makers to recognize the non-native university students health implications also to find suitable suggestions to solve them.

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lists which existed in the dormitory office were used. According to the sample size and proportionate to the number of blocks, floors and rooms, participants were systematically chosen.

After explaining the purpose of the study, we obtained written informed consent from all participants. Weight was measured with participants in light clothing to the nearest 100 g using a digital scale (Glamor, China). Height was measured without shoes, to the nearest 0.1 cm by a non-elastic Tape measure. We calculated the body mass index (BMI) by the formula: weight (kg)/height² (m). Waist circumference was measured by a non-elastic Tape measure at the narrowest part of the participant's body located between the breasts and hips (15).

Demographic characteristics such as age, field of study, parents' education and employment were asked in a face-to-face interview. Also all participants completed a Food Frequency Questionnaire (FFQ). Data analysis was done by the Statistical Package for Social Sciences (SPSS) version 16. To assess the desired associations, we used the Pearson correlation and Kruskal-Wallis tests. *P*-values less than 0.05 were considered significant.

4. Results

Participants' mean age was 21.56 ± 1.38 years. There were 17% (*N* = 19) underweight participants, 74.1% (*N* = 83) participants of normal weight and 8.9% (*N* = 10) who were overweight. A normal waist circumference was observed in 4.5% (*N* = 5) of participants (Table 1).

According to Table 2 the most popular snack was sweet food items (84.1%, *N* = 110) followed by fruits (63.3%, *N* = 76). A total of 41.7% (*N* = 50) consumed nuts and 29.2% (*N* = 35) ate salty foods for snacks. The frequency of snacking was reported as once daily for 63.3% (*N* = 76) of participants, twice daily for 16.7% (*N* = 20), three times per day for 14.2% (*N* = 17) and 4.2% (*N* = 5) reported that they consumed no snacks.

As seen in Table 3 46% (*N* = 35) of participants consumed less than three servings per day of fruits, 56% (*N* = 28) consumed less than one serving per day of nuts, 82.9% (*N*

= 29) ate less than one daily serving of salty snacks and 23.7% (*N* = 24) ate less than one serving per day of sweet food items.

The Pearson correlation test showed no linear correlations between any type of snack consumption to BMI or waist circumference. Additionally, there was no linear correlation between dairy consumption to BMI or waist circumference. When we applied the Kruskal-Wallis test, we found no significant association between frequency of snack consumption and BMI or waist circumference.

5. Discussion

We found that among female students in Shiraz University dormitories the prevalence of general obesity was approximately 10% and less than 5% for central obesity. More than half of the participants consumed just one snack daily. The most popular snack was sweet food item. We found no correlation between snacking pattern and general or central obesity. The results of other studies showed no consistency with regards to the correlation between snacking and obesity (16-21).

In agreement with the current study, researches by Hampl et al. (16) and Spanos et al. (10) have shown no association between snacking and obesity. We assumed the main reason for the lack of a correlation was that the majority of our participants were of normal weight. This analysis was supported by Spanos et al. (10). However, unlike our findings, some studies reported either positive or negative correlations between snacking and obesity (17, 18). In Dubai, Zaal et al. found that adolescents who consumed a higher amount of snacks were more obese than others. They suggested that since most snacks were high in calories, frequent snacking could lead to extra energy intake and obesity among adolescents (17). On the other hand, there was an inverse correlation between snacking, and overweight and central obesity among adolescents in the 1999-2004 National Health and Nutrition Examination Survey (NHANES) as reported by Keast et al. (18). They hypothesized that snacks compared to meals contained more carbohydrates and less fat, therefore snacking helped adolescents to consume less fat and maintain weight control.

Table 1. Age and Anthropometric Indices of Female University Students

Variables	Frequency, No. (%)	Mean \pm SD	Range
Age, years		21.56 ± 1.38	19-26
Weight, kg		55.17 ± 8.55	40-81.3
Height, cm		161.15 ± 5.14	145-172
BMI [*] , kg/m ²		21.23 ± 3.16	15.42-27.99
< 18.5	19 (17)		
18.5-24.9	83 (74.1)		
≥ 25	10 (8.9)		
Waist circumference, cm		73.52 ± 7.44	58-95
< 88	107 (95.5)		
≥ 88	5 (4.5)		

* Abbreviation: BMI; body mass index

Table 2. Snack Choices and Frequency of Consumption among Female University Students

Snack	Frequency, No. (%)
Sweet snacks, (Cookies, cake, chocolate, ice cream)	101 (84.1)
Fruits	76 (63.3)
Nuts	50 (41.7)
Salty snacks, (Chips, popcorn, crunchy foods)	35 (29.2)
Frequency of consumption, times/day	
0	5 (4.2)
1	76 (63.3)
2	20 (16.7)
3	17 (14.2)

Table 3. Frequency of Snacks and Dairy Consumption among Female University Students

Food items, (Servings/day)	No. (%)
Fruits	
>3	35 (46.0)
≤3	41 (54.0)
Nuts	
>1	28 (56.0)
≤1	22 (44.0)
Salty snacks	
1	29 (82.9)
≤1	6 (17.1)
Sweet snacks	
1	24 (23.7)
≤1	77 (76.3)
Dairy	
1	21 (18.8)
1-2	36 (32.1)
2	55 (49.1)

Despite the numerous amounts of studies that have shown negative correlations between dairy consumption and obesity, (13, 19, 20) we were unable to find an association between milk intake and BMI or waist circumference. It has been suggested that the calcium content of dairy products can reduce 1,25 dihydroxy vitamin D levels which leads to intracellular calcium reduction, decreased lipogenesis and increased lipolysis in adipocytes (21). Besides, milk contains bioactive peptides which inhibit the angiotensin converting enzyme and thus controls fatty acid synthesis in adipocytes and obesity (22).

We assumed that because approximately 10% of our participants were overweight and there were no obese participants in this study, no correlation was found. Addi-

tionally, there was a low intake of dairy products among participants. In agreement with our results, Murakami et al. found no correlation between intake of dairy products and BMI among relatively thin young Japanese women who consumed low amounts of dairy products (23).

In conclusion, the results of our study indicated no correlation between dairy consumption or snacking pattern and BMI or waist circumference in non-obese female students. We have suggested that this study be repeated with a more diverse population.

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Authors' Contribution

Shiva Faghih has done the data analysis and manuscript writing. Razieh Mohebpoor and Leila Eskandari have prepared the proposal draft and have done the data gathering.

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There is no conflict of interest.

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