



Adherence to the Mediterranean Diet and Factors Affecting Obesity in High School Students

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ABSTRACT

The prevalence of overweight and obese among children and adolescents increases gradually in the world and became an epidemic in both developing and developed countries. Overweight and obesity in the adolescent period are the main risk factors contributing to the development of cardiovascular diseases in the adulthood period. This study was planned to reveal the prevalence of obesity and association of healthy lifestyle behaviors with obesity in adolescents. **Methods:** This research was carried out with 859 students studying at Istanbul Hezarfen High School between the dates 1 February to 31 March 2017. The general dietary habits and night eating statuses were determined using the Mediterranean Diet Quality Index (KIDMED) and Night Eating Questionnaire (NEQ) and anthropometric parameters such as height and body weight were measured. **Results:** The mean age of the students was 15.9 ± 1.3 years. Of the students, 19.2% had overweight, 13.7% had obese BMI values. In this study, 32.4% of all students had low and 13% of them had optimal nutritional quality. The difference between two genders was statistically significant ($p < 0.05$). The Night Eating Syndrome was not present in 78.9% of all students whereas it was detected in 21.1% of them. **Conclusions:** In our study, there was no statistically significant relationship between obesity, adherence to Mediterranean Diet and Night Eating Syndrome.

Keywords: Adolescent, Obesity, Mediterranean diet, Night eating syndrome, Nutrition

INTRODUCTION

For a healthy life in the adulthood, nutrition in the adolescence period can be considered a window. That is because the foundation of many nutritional problems is laid in early life periods. Adolescents are at the stage of undertaking responsibility for many of their health-related behaviors, including eating habits. Therefore, this period is an appropriate time for promoting a healthy life and nutrition for the relationship between chronic diseases and behaviors such as obesity and cardiovascular diseases [1].

Many results suggestive of this notion were obtained in the studies conducted recently. The dietary habits of the children were examined, and the unhealthy diet patterns were found to be associated with different cardiovascular risk factors such as obesity, blood pressure, cholesterol and type-2 diabetes [2-5]. In adolescence, the majority of young people are at risk of excessive weight gain since they eat unhealthy and unbalanced diet. Psychological and cognitive developmental imbalances and malnutrition, especially in young people aged 15-17 years, lead to serious health problems such as excessive weight gain and obesity [6]. Also, the time of food intake and nutritional profile were associated with metabolic problems [7]. The studies conducted determined that nutritional consumption at night increases the risks of having independently higher body mass index (BMI) and obesity in addition to the poor quality of diet in children [8], adolescents [9], and adults [10].

The prevalence of being overweight and obese among children and adolescents increases each day gradually throughout the world and became an epidemic in both developing and developed countries [11]. Also, being overweight and obese in the adolescent period are the main risk factors contributing to the development of cardiovascular diseases in the adulthood period. Obesity prevalence in the adolescence period increased four times over the last 30 years and

became one of the today's most important public health problem [12]. Therefore, it is important to make lifestyle changes adopting the diet models preventing this increase and the development of cardiovascular disease [13]. The aim of the nutritional research conducted recently was to investigate not only the effects of each nutrient on health but also the effect of whole diet model on health [14]. Especially, in this kind of studies, the beneficial effects of the Mediterranean diet on a number of health problems were demonstrated [15]. There are also the studies suggesting that the Mediterranean diet (MD) has a positive impact on the quality of healthy life, cardiovascular diseases, and metabolic syndrome and in addition to that, it is associated with obesity although the findings are not evident yet [16-18].

Although there are international differences, the Mediterranean diet recommends the following: (I) more consumption of fruits, vegetables, legumes and whole grains which are the main sources of fiber and antioxidant compounds; (ii) moderate consumption of fish, nuts and olive oil which are the main sources of fats (primarily monounsaturated and polyunsaturated fatty acids [MUFA and PUFA]); (iii) lesser consumption of red meat and desserts which are the main sources of trans and saturated fatty acids; (iv) moderate consumption of wine (mostly red wine) including polyphenols [19]. However, unfortunately, it is seen that the traditional Mediterranean diet has been replaced by the diets with higher content of saturated fat in the Mediterranean countries [20]. This change was also found to be more pronounced among young population [21]. Therefore, the promotion of the Mediterranean diet among adolescents can contribute to the preference of healthy nutrients [22]. This study was planned to reveal the prevalence of obesity and association of healthy lifestyle behaviors with obesity in adolescents.

METHODS

This research was carried out on all students (n=859) studying at Istanbul Hezarfen Vocational and Technical Anatolian High School in the second semester (1 February to 31 March 2017) of the academic year of 2016-2017. The research was conducted with the aim of evaluating dietary habits of the students and determining the relationship between nutritional status and obesity. Face-to-face interviews were conducted with the students who agreed to participate in the study, and anthropometric parameters such as height and body weight were measured, and BMI values were calculated. The general characteristics of the participants, their nutrition-related practices, and dietary habits were determined using the Mediterranean Diet Quality Index (KIDMED) and Night Eating Questionnaire (NEQ) inquiring their night eating statuses. Anthropometric measurements (height, body weight) was taken by the researcher. Mesitas branded height meter was used for the measurement of height and Tanita branded digital scales was used for the measurement of body weight.

Each participant was informed about the research, and we had those who wanted to participate, and their parents read and sign the voluntary participation (consent) form. The KIDMED index administered to measure the dietary habits is an index which contains a total of 16 questions including the characteristics of the Mediterranean diet and which is developed by Serra-Majem, et al. [21]. Of the questions included by the KIDMED index, 12 are positive, and 4 are negative. Those who answer yes to the positive questions get +1 points while those who answer no to the negative questions get -1 points and with the summation of these points, the points ranging between 0-12 are obtained at the end of the assessment. And then these points are divided into three groups as follows (1) ≥ 8 points; optimal Mediterranean diet (good), (2) points between 4-7 points; compliance to the Mediterranean diet should be improved (medium), (3) ≤ 3 points; very low nutritional quality (low).

NEQ is a screening questionnaire consisting of 14 questions and developed by Allison, et al. The questionnaire includes the questions about morning appetite and the first food intake of the date, night and evening eating, the rate of food intake after dinner, cravings, control over the night eating behavior, difficulty in falling asleep, waking up at night and eating frequency, mood, and awareness during night eating. The total score may range between 0-52 points. In the original study, the cutoff score of NEQ for screening research is recommended as 25 [23]. The Turkish validity and reliability study was conducted by Atasoy, et al. [24].

The data obtained in the present study were evaluated using SPSS (version 22.0) program. Difference between groups were assessed with ANOVA, Chi-square test and regression analysis. In all cases, $p < 0.05$ was considered significant. This study was deemed to be ethical by the decision of Okan University Ethics Committee dated 01 February 2017, meeting numbered 79 and numbered 3.

RESULTS

Out of 859 students in total who participated in the study, 81.4% were male, and 18.6% were female. The mean age of the students was 15.9 ± 1.3 years; mean body weight was 66.6 ± 14.1 kg, mean height was 1.6 ± 0.1 cm and mean BMI was 23.3 ± 4.2 kg/m². Of the students, 19.2% had overweight (85-95 percentile), 13.7% had obese (>95th percentile) and 60.8% had normal (15-85 percentile) BMI values.

Three main meals were consumed by 46% of the female students and 51% of the male students whereas one main meal was consumed by 14% of the girls and 14% of the boys. There was no statistically significant difference between the number of consumed main meals and genders ($p > 0.05$). Among all students, the rate of the students who always skipped meals was 35.7% while the rate of those skipped occasionally was 56%. The rate of skipping meals was found to be more common among the girls compared to the boys ($p < 0.05$). Considering the skipped meals, breakfast and lunch were skipped almost equally among the male students while breakfast was the most commonly skipped meal among the female students ($p < 0.05$). The girls had breakfast at most twice a week whereas the majority of the boys had breakfast every day ($p < 0.05$). Twenty-four-point one percent of the male students had a regular physical activity while this rate was 2.1% for the female students ($p < 0.05$) (Table 1).

Table 1 Distribution of students according to their genders according to their eating habits and physical activity status

| Variables | Man | | Women | | Total | | p |
|----------------------------|-----|------|-------|------|-------|------|-------|
| | n | % | n | % | n | % | |
| Main Meal | | | | | | | |
| 1 | 64 | 9.2 | 23 | 14.4 | 87 | 10.1 | 0.00* |
| 2 | 281 | 40.2 | 93 | 58.1 | 374 | 43.5 | |
| 3 | 354 | 50.6 | 44 | 27.5 | 398 | 46.3 | |
| Total | 699 | 100 | 160 | 100 | 859 | 100 | |
| Snack | | | | | | | |
| < 3 | 584 | 68 | 134 | 15.6 | 718 | 83.6 | 0.82 |
| ≥ 3 | 115 | 13.4 | 26 | 3 | 141 | 16.2 | |
| Total | 699 | 81.4 | 160 | 18.6 | 859 | 100 | |
| Meal skipping | | | | | | | |
| Yes | 220 | 25.6 | 87 | 10.1 | 307 | 35.7 | 0.00* |
| Sometimes skip | 412 | 48 | 69 | 8 | 481 | 56 | |
| Never skip | 67 | 7.8 | 4 | 0.5 | 71 | 8.3 | |
| Total | 699 | 81.4 | 160 | 18.6 | 859 | 100 | |
| Meal skipping | | | | | | | |
| Breakfast | 281 | 35.6 | 93 | 11.8 | 374 | 47.6 | 0.00* |
| Launch | 283 | 36.5 | 48 | 6.1 | 331 | 42.2 | |
| Dinner | 67 | 8.3 | 13 | 1.7 | 80 | 10.2 | |
| Total | 631 | 80.4 | 154 | 19.6 | 785 | 100 | |
| Breakfast frequency | | | | | | | |
| Everyday | 330 | 38.4 | 41 | 4.8 | 371 | 43.2 | 0.00* |
| 5-6 times per a week | 68 | 7.9 | 8 | 0.9 | 76 | 8.8 | |
| 3-4 times per a week | 111 | 12.9 | 17 | 2 | 128 | 14.9 | |
| 2 times per a week | 124 | 14.4 | 52 | 6.1 | 176 | 20.5 | |
| Never | 66 | 7.7 | 42 | 4.9 | 108 | 12.6 | |
| Total | 699 | 81.3 | 160 | 18.7 | 859 | 100 | |
| Physical activity | | | | | | | |
| Yes | 207 | 24.1 | 18 | 2.1 | 225 | 26.2 | 0.00* |
| No | 492 | 57.3 | 142 | 16.5 | 634 | 73.8 | |
| Total | 699 | 81.4 | 160 | 18.6 | 859 | 100 | |

* $p > 0.05$ significant

When the KIDMED scores of the students were examined according to the gender of the students and the status of having breakfast, 46.9% of the boys and 64.2% of the girls had low nutritional score among those who had breakfast very rarely/never. Among the students who had breakfast every day, the rate of having moderate nutritional score was

90.2% for the boys and 9.8% for the girls. When the KIDMED scores were examined according to the frequency of breakfast, a statistical difference was determined among the male students ($p < 0.05$) while no statistical significance was found among the female students ($p > 0.05$).

In this study, 32.4% of all students had low nutritional quality (27.6% male, 53.1% female), 54.6% of them had moderate nutritional quality (57.7% male, 41.3% female) and 13% of them had optimal nutritional quality (14.7% male, 5.6% female). The difference between two genders was statistically significant ($p < 0.05$) (Figure 1).

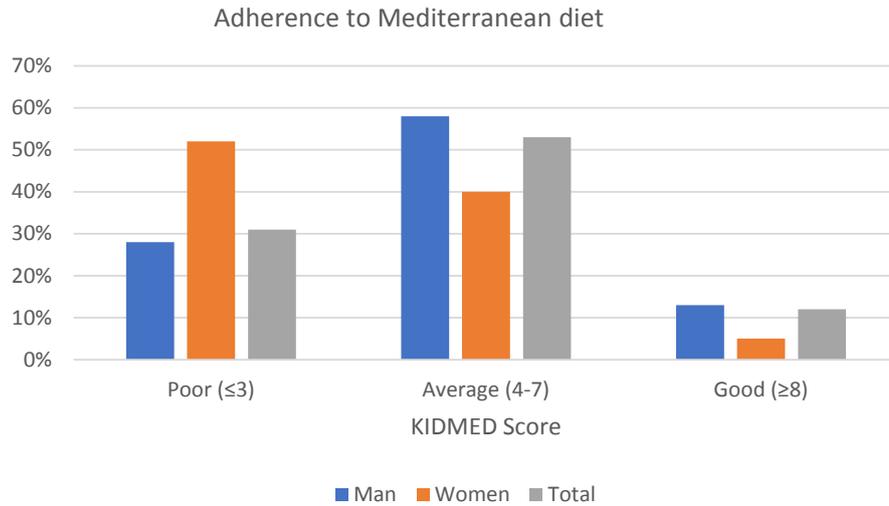


Figure 1 Comparison of students' compliance rates to Mediterranean diet ($X^2=40,8$ $p=0.00$; $p < 0.05$ significant)

The Night Eating Syndrome was not present in 78.9% of all students whereas it was detected in 21.1% of them. When we examined at whether the students had Night Eating Syndrome according to their percentile values or not, 76% of those who had the night eating syndrome were male, and 66.6% of them were in the normal percentile range. Only 9.9% of all students were found to have 95 and above percentile. The night eating syndrome score was not statistically significant between genders according to the BMI values ($p > 0.05$) (Table 2). However, when all students were evaluated according to their night eating score; the girls were found to be more likely than men to have a night eating syndrome ($X^2= 3.98$, $p=0.046$). Regardless of gender, there was no significant relationship between the BMI percentile of the students and their night eating score ($p > 0.05$).

When the KIDMED scores were evaluated according to the BMI values of the students, 32.4% of all students were found to have low nutritional quality (≤ 3). It was detected that 62.6% of those with low-quality nutrition index had a BMI between 15-85 percentile and 11.8% had a BMI above the 95th percentile. Of the students, 54.6% had moderate nutritional quality (4-7) and 60.3% of these students were in the percentile range of 15-85. It was determined that only 13% of the total number of students had optimal nutritional quality and the vast majority of those (58%) were in the percentile range of 15-85 and 15.2% of them were above the 95th percentile. According to the KIDMED scores, there was no statistically significant relationship between the percentile values and genders ($p > 0.05$) (Table 2).

Table 2 Distribution of night eating syndrome and KIDMED scores according to percentile values of students

| Night eating syndrome | | Percentile Value | | | | | | | | | | Total Ratio (n=859) | | | |
|--------------------------------------|-------|------------------|------|-------|------|-------|------|-------|-----|----|-----|---------------------|------|-------|--|
| | | >95 | | 85-95 | | 15-85 | | 05-15 | | <5 | | | | Total | |
| | | n | % | n | % | n | % | n | % | n | % | n | % | | |
| None | Man | 77 | 11.4 | 122 | 18 | 326 | 48.1 | 31 | 4.6 | 5 | 0.7 | 561 | 82.7 | 78.9 | |
| | Woman | 23 | 3.4 | 14 | 2.1 | 72 | 10.6 | 8 | 1.2 | 0 | 0 | 117 | 17.3 | | |
| | Total | 100 | 14.7 | 136 | 20.1 | 398 | 58.7 | 39 | 5.8 | 5 | 0.7 | 678 | 100 | | |
| $X^2=8.45a$; $p=0.076$; $p > 0.05$ | | | | | | | | | | | | | | | |
| Exists | Man | 16 | 8.8 | 22 | 12.2 | 92 | 50.8 | 7 | 3.9 | 1 | 0.6 | 138 | 76 | 21.1 | |
| | Woman | 2 | 1.1 | 7 | 3.9 | 32 | 17.7 | 2 | 1.1 | 0 | 0 | 43 | 24 | | |
| | Total | 18 | 9.9 | 29 | 16 | 124 | 68.5 | 9 | 5 | 1 | 0.6 | 181 | 100 | | |

| X ² =2.20a; p=0.069; p>0.05 | | | | | | | | | | | | | | |
|--|-------|----|------|----|------|-----|------|----|-----|---|-----|-----|------|---------------------|
| KIDMED Score | | n | % | n | % | n | % | n | % | n | % | n | % | Total Ratio (n=859) |
| Poor (≤3) | Man | 23 | 8.3 | 38 | 13.7 | 120 | 43.2 | 11 | 4 | 1 | 0.4 | 193 | 69.4 | 32.4 |
| | Woman | 10 | 3.6 | 15 | 5.4 | 54 | 19.4 | 6 | 2.2 | 0 | 0 | 85 | 30.6 | |
| | Total | 33 | 11.9 | 53 | 19.1 | 174 | 62.6 | 17 | 6.1 | 1 | 0.4 | 278 | 100 | |
| X ² =0.76a; p=0.094; p>0.05 | | | | | | | | | | | | | | |
| Average (4-7) | Man | 57 | 12.2 | 86 | 18.3 | 237 | 50.5 | 21 | 4.5 | 2 | 0.4 | 403 | 85.9 | 54.6 |
| | Woman | 11 | 2.3 | 5 | 1.1 | 46 | 9.8 | 4 | 0.9 | 0 | 0 | 66 | 41.1 | |
| | Total | 68 | 14.5 | 91 | 19.4 | 283 | 60.3 | 25 | 5.3 | 2 | 0.4 | 469 | 100 | |
| X ² =8.11b; p=0.079; p>0.05 | | | | | | | | | | | | | | |
| Good (≥8) | Man | 13 | 11.6 | 20 | 17.9 | 61 | 54.5 | 6 | 5.4 | 3 | 2.7 | 103 | 92 | 13 |
| | Woman | 4 | 3.6 | 1 | 0.9 | 4 | 3.6 | 0 | 0 | 0 | 0 | 9 | 8 | |
| | Total | 17 | 15.2 | 21 | 18.8 | 65 | 58 | 6 | 5.4 | 3 | 2.7 | 112 | 100 | |

X²=5.02b; p=0.023; p>0.05; a: Pearson chi square; b: Fisher exact test; p>0.05 significant

DISCUSSION

The adaptation of healthy behavior patterns in the transition period from adolescence to young adulthood is important for the future and the dietary habits of individuals in this critical period need to be examined. In this study, the dietary habits of adolescents were assessed according to the Mediterranean Diet Quality Index (KIDMED) score, which is one of the healthy nutrition scales, and the relationship with obesity was identified by examining night eating status. Of 859 students participating in our study (15.96 ± 1.35 years), 60.8% were normal weighted and 13.7% were obese. Being overweight or obese is one of the most important health problems of the 21st century, which is an ever-increasing problem affecting every age group in both developed and developing countries [25]. Seeing this situation in the children and adolescents which will create the individuals of the future is extremely worrisome. The most recent national research conducted in our country in 2010 found that 23.8% of the children in the age range of 9-11 years, as well as 12-14 years and 21.6% of the children in the age range of 15-18 years, were above their normal weight [26]. These rates indicate nearly one person for every 4-5 people. In our study, the rate of those who were above normal weight was 32.9%. The results were reported to be very alarming in similar studies carried out in other countries, especially in the Mediterranean countries [27-30]. Obesity has a very complex etiology. The modern living conditions of today provide a great contribution to obesity by affecting food preferences as well as eating times and also offering a pathway in which consumed energy is less than received energy. In this case, we suggest that developing and adopting a healthy eating pattern and healthy lifestyle is quite important. Today, the Mediterranean diet is considered to be the healthiest diet model [21]. This diet is mainly a model including the nutrients such as olive oil, bread, grain products, fresh vegetables and fruits, oilseeds like hazelnuts, nuts, walnuts, almonds, wine, cheese, yogurt and fish in combination with an active lifestyle [31]. However, nowadays, this nutritional pattern has been replaced by a diet model including the nutrients with low nutrient element intensity and high content of fat and sugar. Especially children and young people have become a part of this nutrition and lifestyle [32].

The mean KIDMED score of all students participating in this study was determined to be 4.65 ± 4.65, and a statistically significant difference was found regarding gender (p<0.05). The KIDMED score of the girls was observed to be lower than that of the boys (Figure 1). Female gender is known to be a risk factor in the etiology of obesity. Women are known to be more obese or overweight in the advanced age or adulthood than men. Also, this is the case in our country. The rate of obesity in adult women is 41.0% whereas it was found to be 20.5% in men. As a developing country, women are known to be more sedentary in our country from the economic, environmental, lifestyle as well as cultural points of view [26]. In that case, it is extremely important for girls not to carry their extra weight to their adulthood. In our study, 24.1% of the male students were found to do regular physical activity while only 2.1% of the female students did a regular physical activity (p<0.05) (Table 1). Gender factor may have positive and negative effects on health promotion behavior depending on the cultural and social roles. In such a manner that is supporting the results of this study, the literature stated that the engagement of girl students in exercise and sports activity was lower than adolescent boys [33,34]. In the study by Giulliano, et al. [35] in Brazil, they determined that the physical activity of the adolescent girls was lower than the adolescent boys whereas their watching TV rates were higher than the boys. Especially with the adolescent period, as a reflection of social gender roles, girls spend more time at home. Also, the inadequacy of sporting facilities, cultural misconceptions about various sports activities in the society may cause girls to participate less in sports activities and to live a more sedentary life compared to boys.

In a study by Mariscal, et al. evaluating the Mediterranean diet, they determined that 48.6% of the children (n:3190, 8-16 years) had good KIDMED scores, 49.5% had moderate scores, and 1.6% had low scores [29]. Another study conducted in Greece found that only 8.3% of the adolescents and only 11.3% of the children had optimal KIDMED scores [30]. A similar study conducted in Turkey identified that the KIDMED score was very low in the age group of 7-18 years (268 boys, 356 girls), very low in 15.1% of the children, moderate in 59.3% of them and good in 25.6% of them and that there was no statistical difference between two genders ($p>0.05$) [36]. Also, another study found that the quality of diet was very low in 21.3% of 225 subjects aged between 12-18 years, moderate in 61.8% of them and at an optimal level in 16.9% of them [37]. Although results vary among countries, the rate of those who have optimal diet quality is generally observed to be much lower.

Except for the assessment of the Mediterranean Diet Quality Index score, the assessment of nutritional preferences is of great importance regarding healthy nutrition and obesity development. For example, the daily consumption of vegetables which is one of the biggest food groups of the balanced diet was found to be low in all adolescents. This condition is especially more evident in girls. The rate of consuming one fruit per day is 69.8% in the general population, the consumption rate of the second fruit per day was found to drop (45.1%), and it is little if any in girls (6%) ($p<0.05$) (Table 2). A similar study found that only 30% of the young adults consumed a second fruit and vegetable per day [27]. In the study by Meyinsse, et al., they demonstrated that only 13% of the students consumed fruit and vegetable at least twice a day and that 50% of them consumed no fruit daily and 52% of them consumed no vegetable daily [38]. A similar study conducted on 198 adolescents found that only 5% of the subjects had five portions of fruit and vegetable as recommended [39]. Another finding in our study was that 29.4% of the students went to fast-food restaurants once a week. Avram and Oravitan [40] found this ratio as 25% in their study conducted on 435 college students. Eating fast-food is associated with the high intake of saturated fat, and this is a risk factor for obesity and cardiovascular diseases.

There are many studies evaluating the dietary habits of adolescents and the number and time of meals. In the study by Onay [41], he found that the majority of the students (62%) ate two meals per day and again the majority of them (55%) skipped the breakfast. Whereas Ünalán et al. found that [42] 60.2% of the students consume three meals per day and 62.9% of them skipped the breakfast. Mazicioglu and Ozturk [43] determined that 48.9% of the subjects ate three meals per day, 24.8% ate less than three meals, and 65.6% of them rarely had breakfast or never had breakfast in their research. In the study by Turk, et al. [44], 81% of students were found to skip meals, and the breakfast was determined to be the most frequently skipped meal with 45.6%. In this study, it was determined that 47.6% of the students skipped the breakfast, 46.3% of them had three meals per day, and 43.5% of them had two meals per day (Table 1).

Not having breakfast or eating too little at breakfast, increased appetite at night and taking at least 25% of calorie taken daily after dinner are among the diagnostic criteria of night eating [45]. The Night Eating Syndrome (NES) is a disorder characterized by resistant obesity against weight loss, lack of appetite in the morning whereas hyperphagia at night and insomnia [46]. Although it has not come to light yet whether the NES is the cause of obesity or obesity is the cause of the NES, the NES is considered to cause obesity in general view. In a study conducted, the individuals with the NES who were not obese were found to be younger than those who were obese and but did not have NES [47]. In our study, the NES was detected in 21.1% of the students, 26% of those had BMI over the 85th percentile whereas the majority (68.5%) of them had BMI within the normal percentile range. However, if this situation continues in the future, the BMI value is likely to increase.

In the study by Vassigh [48], it was shown that the rate of the girls who consumed milk and yogurt daily (28.3%) was higher than the boys (25.5%) and that the daily consumption of cheese by the girls (50.2%) was determined to be higher than that of the boys (35.7%). In the study conducted on the Cypriot students [27], the milk-yogurt consumption rate of the children (76.2%) was the same as the result of our study. Our high result shows that the students meet at least two portions of the recommended amount of daily dairy products. In recent years, the consumption of dairy products was observed to decrease among young population in the literature [49]. That is why this finding of ours is promising. However, in our study, the daily consumption of sugar/sweet was quite high (61.7%) (Table 2). This is important regarding providing a serious contribution to both unhealthy nutrition and obesity development. In this respect, youth should be encouraged to promote healthy behaviors.

CONCLUSION

In our study, the compliance with the Mediterranean diet was found to be moderate in general. At the same time, the obesity rate was not found to be very high. However, the facts that girls have higher BMI compared to boys, they skip more meals, this skipped meal is the breakfast in particular, and they do not do regular physical activity are important risk factors for obesity. Low education level, inadequate physical activity, and number of pregnancies are important determinants of obesity in adult women in our country. Therefore, adopting healthier dietary habits and lifestyle in younger ages is especially important for boys and also for girls in adolescence, and this will provide to have the appropriate weight. For this, each country should contribute its own children. Governments, educators, and families in the first place should do whatever necessary in respect to the subject of adopting healthy eating patterns and lifestyles.

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