

T.C.
YEDİTEPE UNIVERSITY
INSTITUTE OF HEALTH SCIENCE
DEPARTMENT OF NUTRITION AND DIETETICS

**EFFECT OF NUTRITION EDUCATION ON
HEALTHY EATING INDEX 2015 SCORES OF
FEMALE HIGH SCHOOL STUDENTS WHO STAY
IN THE STUDENT DORMITORY IN ALANYA**

MASTER OF NUTRITION AND DIETETICS THESIS

İREM COŞKUNKAN

İstanbul-2021

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İstanbul-2021

APPROVAL

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APPROVAL

This thesis has been deemed by the jury in accordance with the relevant articles of Yeditepe University Graduate Education and Examinations Regulation and has been approved by Administrative Board of Institute with decision dated 21.06.2021 and numbered 18897253/302.04.

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Director of Institute of Health Sciences

DECLARATION

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree except where due acknowledgment has been made in the text.

İrem COŞKUNKAN
05.07.2021



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I wrote this thesis to keep my last promise for my father. I know that he is not here anymore, but I always feel his presence. I am thankful to be his daughter. I hope that he rest in peace.

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LIST OF SYMBOLS AND ABBREVIATIONS

BMI	Body Mass Index
Cm	Centimeter
DGA	Dietary Guideline for Americans
ESPEN	The European Society for Clinical Nutrition and Metabolism
HEI-2015	Healthy Eating Index-2015
Kg	Kilogram
LMICs	Low- And Middle- Income Countries
NCDs	Non-communicable Diseases
n	Frequency
SNAP	Supplemental Nutrition Assistance Program
USDA	United States Department of Agriculture
WHO	World Health Organization
%	Percentile

ABSTRACT

Coşkunkan İ., Effect of Nutrition Education on Healthy Eating Index Scores of Female High School Students Who Staying in the Student Dormitory in Alanya. Yeditepe University Institute of Health Sciences, Nutrition and Dietetics Department, Master of Science Thesis, İstanbul, 2021.

In this thesis, the effect of nutrition education on the Healthy Eating Index 2015 (HEI-2015) scores of female adolescents who stay in the girls' dormitory was investigated. This research was conducted among 40 female high school students. The height and body weight of the adolescents were measured, and their body mass index (BMI) was calculated. BMI was classified according to the World Health Organization (WHO) reference ranges. 24-hour Recall questionnaire was recorded from the adolescents by using the "Food and Food Photo Catalogue" book. Afterwards, a nutrition education based on the components of the Healthy Eating Index 2015 calculated. 15 days after this nutrition education, 24-hour Recall questionnaire was recorded from each participant using the "Food and Food Photo Catalogue" book. HEI-2015 scores were measured by using 24-hour recall records of the participants before and after the nutrition education. The mean scores of the HEI-2015 before and after the nutrition education were compared as both the 13 nutrients that are consisted of HEI-2015, and the total score. In addition, the HEI-2015 scores before and after nutrition education were compared according to the BMI groups, both as a total score and as 13 nutrients.

There was not a statistically significant difference between the means of the total HEI-2015 scores before and after the nutrition education ($p=0.744>0.05$). However, a statistically significant increase was found in the means of the green and beans scores ($p = 0.001<0.05$), the dairy scores ($p = 0.023<0.05$), and the seafood and plant proteins scores ($p = 0.000<0.05$), added sugar scores ($p= 0.027<0.05$). Also, there were statistically significant decreases in the means of total vegetables scores ($p=0.003<0.05$) and fatty acids scores ($p=0.001<0.05$). Although nutrition education did not have a statistically significant differences on the total HEI-2015 score, nutrition education can be used to improve diet quality because it has a statistically significant effect on some of the components of HEI-2015.

Key words: healthy eating index, diet quality, adolescents

ÖZET

Coşkunkan İ., Alanya’da Bir Kız Öğrenci Yurdunda Kalan Lise Öğrencilerinde Beslenme Eğitiminin Sağlıklı Yeme İndeksi Skorlarına Etkisi. Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü, Beslenme ve Diyetetik Anabilim Dalı Yüksek Lisans Tezi, İstanbul, 2021.

Bu tez çalışmasında bir kız öğrenci yurdunda kayıtlı olan adölesan kadın öğrencilere verilecek beslenme eğitiminin Sağlıklı Yeme İndeksi 2015 (Healthy Eating Index-2015) skorlarına etkisini araştırılmıştır. Bu araştırma 40 kadın öğrenci arasında yürütülmüştür. Öğrencilerin boy ve kiloları ölçülmüş ve beden kütle indeksleri (BKI) hesaplanmıştır. BKİ Dünya Sağlık Örgütü referans aralıklarına göre sınıflandırılmıştır. Öğrencilerden 24 saatlik geriye dönük besin tüketim kaydı ‘Yemek ve Besin Fotoğraf Kataloğu’ kitabı kullanılarak alınmıştır. Ardından Sağlıklı Yeme İndeksi 2015 bileşenlerini temel alan bir beslenme eğitimi gerçekleştirilmiştir. Bu beslenme eğitiminden 15 gün sonra, tekrar her bireyden 24 saatlik geriye dönük besin tüketim kaydı ‘Yemek ve Besin Fotoğraf Kataloğu’ kitabı kullanılarak kaydedilmiştir.

Katılımcıların beslenme eğitimi öncesi ve sonrası 24 saatlik geriye dönük beslenme kayıtları kullanılarak Sağlıklı Yeme İndeksi 2015 skorları hesaplanmıştır. Beslenme eğitimi öncesi ve sonrası Sağlıklı Yeme İndeksi 2015 skor ortalamaları hem Sağlıklı Yemek İndeksi 2015’i oluşturan 13 besin öğeleri hem de toplam skor olarak karşılaştırılmıştır. Ayrıca beslenme eğitimi ve öncesi Sağlıklı Yemek İndeksi 2015 skorları BKİ gruplarına göre hem toplam skor olarak hem de besin öğeleri olarak karşılaştırılmış.

Eğitim öncesi ve sonrası total Sağlıklı Yemek İndeksi 2015 skorları ortalaması arasında istatistiksel olarak anlamlı bir fark bulunamamıştır ($p=0.744>0.05$). Fakat koyu yeşil yapraklı sebzeler ve bakliyatlar ($p = 0.001<0.05$), süt ve süt ürünleri ($p = 0.023<0.05$), deniz ürünleri ve bitkisel kaynaklı proteinler ($p = 0.000<0.05$) ve eklenti şeker ($p=0.027<0.05$) skor ortalamaları arasında istatistiksel olarak anlamlı bir artış bulunmuştur. Ayrıca toplam sebze ($p=0.003<0.05$) ve yağ asitleri ($p=0.001<0.5$) skor ortalamaları arasında istatistiksel olarak anlamlı bir azalma bulunmuştur. Beslenme eğitiminin total HEI-2015 skora istatistiksel olarak anlamlı bir değişimi olmamışsa da HEI-2015’i oluşturan bileşenlerin bir kısmına istatistiksel olarak anlamlı bir etkisi olduğu için beslenme eğitimi diyet kalitesini geliştirmek için kullanılabilir.

Anahtar Kelimeler: sağlıklı yeme indeksi, diyet kalitesi, adölesan

1. INTRODUCTION AND PURPOSE

World Health Organization (WHO) defines health as “a state of complete physical, mental and social well-being and not merely the absence of diseases or infirmity¹.

Inheritance and environmental conditions are the main factors affecting the health of people and society. Inheritance means the characteristics received from parents through the genes. Nutrition, physical environment, education, shelter, and cultural opportunities are the main environmental factors².

Nutrition is the process of taking food and using it for growth, metabolism, and repair. It is the most crucial requirement to being alive. Health is affected by nutrition directly. An adequate and balanced diet is defined as a healthy diet^{3,4}. An adequate and balanced diet is one that fulfills all of a person's nutrition needs⁴. An adequate and balanced diet helps people maintain healthy, reduce their risk of diet-related non-communicable diseases (NCDs) and be within healthy weight range⁵.

Adolescence is the transition phase between childhood and adulthood. The World Health Organization (WHO) defines an adolescent as individuals between ages 10-19. Also, WHO defines a young people as any person between ages 10-24^{3,6}.

Worldwide, there are 1,8 billion people between the ages of 10-24^{3,6}. This number represents a quarter of the entire population⁶. Close the 90 percent of them live in low- and middle- income countries (LMICs)⁷. In Europe, Turkey has the youngest population³. In Turkey, 41,1 percent of all population is children and youth³.

The aim of this thesis is to determine the impact of nutrition education on Healthy Eating Index 2015 scores for female adolescents aged 10-19 who are registered in a non-governmental organization sorority and live at a low socioeconomic level.

This thesis should provide healthy food choices after nutrition education in female adolescents living in low socioeconomic situations.

HEI is a nutritional quality measurement based on dietary recommendations of the Dietary Guideline of American (DGA)⁸⁻¹⁰. The updated version of HEI is HEI-2015 which is based on DGA 2015-2020^{8,11}.

HEI-2015 contains 13 food components to measure the quality of an individual's diet⁹. The 9 components of Hei-2015 which are total fruits, whole fruits, total vegetables,

greens and beans, whole grains, dairy, total protein foods, seafood, and plant proteins, and fatty acids increase the total score due to an increase in consumption^{8,9}.

Because of their positive health outcomes, recommendations of consumption of these components are promoted by HEI-2015. In this study, the score should not change in this group due to low socioeconomic levels. However, the decrease in consumption of the last 4 components found in HEI-2015 which are refined grains, sodium, added sugars, and saturated fats should increase the score after nutrition education.

Adolescence is the most important period of people's life. Young people are the most important population for the development of a healthy generation¹².

Adolescence- based nutritional studies contribute to the development of the country, the formation of a healthy generation, and the decrease in the incidence of nutrition-related diseases by pioneering projects related to adequate healthy eating and nutrition education for adolescents and young individuals.

2. LITERATURE REVIEW

2.1. Adolescence

Adolescence is a transition phase in which the growth and development of the body is fastest between childhood and adult. Characteristics of this period are rapid physical growth, sexual development, and psychosocial maturation. There is a significant increase in the size of the internal organs and glands, bone, fat, and muscle along with general growth in this phase. Growth in the reproductive system occurs rapidly during this period, along with sexual maturation. In contrast, there is a decline in lymphoid tissues (thymus, tonsils, adenoids). During this period, it increases growth hormone secretion with the secretion of sufficient sex steroids. During a growth attack, the height increase rate reaches its maximum, and this is called the height elongation rate peak. It is observed in female two years before than male. Furthermore, an average of half of the weight in adult life is gained during a growth attack in adolescents¹².

World Health Organization (WHO) defines any people age of 10-19 as an adolescent, age of 20-24 as a youth, and age of 10-24 as young people¹. Students between the ages of 14 and 17 in Turkey who are educated in high school are also considered adolescence according to this classification¹³.

Globally young people population is over 1.8 billion today³. This number replaces quarter of all people population¹⁴. In addition, %90 of young people live in LMICs¹⁴. In Europe, Turkey has the youngest population³.

Although there is an age limit for adolescents, it is difficult to separate this period with an exact age. Because people can be entered to adolescence phases at an earlier or later age due to many factors that change beginning of puberty¹².

Young people are the most important population for the development of a healthy generation.

2.2. Nutrition and Adolescence

Nutrition is the process of taking food and using it for growth, metabolism, and repair¹⁵. It is the most significant requirement to being alive. People should consume consciously the right amount of nutrients at the right time to protect and improve their health¹⁶.

The rapid growth and development in adolescence affect the nutritional needs in this period. Due to the acceleration of metabolism and the increase in socialization and activities in adolescence, the daily need for total calories and nutrients also increase¹⁷. The daily total calorie requirements of the Turkish Ministry of Health for adolescents are shown in Table 2.1¹².

Table 2.1.: Daily Calorie Requirements of Adolescents¹²

Age	Energy requirements (kcal/ kg/ day)	
7-10	67-78	
Age	Male	Female
10-12	36,5 x weight x 1.75*	33.0 x weight x 1.64*
12-14	32,5 x weight x 1.75*	25.5 x weight x 1.55*
14-16	29,5 x weight x 1.75*	26.5 x weight x 1.55*
16-18	27,5 weight x 1.75*	25.5 x weight x 1.53*

*Standard energy values for physical activity

Adolescence periods are the riskiest period in terms of physiological, psychological, and social development for people, behaviors that can continue throughout life, are most suitable for getting information and getting habitual, and for the development of adulthood diseases⁴. Dietary behavior that is physiological in childhood turns into a learned and consciously controllable behavior during adolescence¹⁸. Sudden and rapid physical and psychological development, increasing energy expenditure and stepping into social life play a role in determining the nutritional habits of adolescents¹⁷.

Children or adolescents who are malnourished can be vulnerable to have a health problem in their adult life¹⁹. Type 2 diabetes mellitus, cancer, hypertension, and cardiovascular diseases are associated with unhealthy eating patterns which are low in proteins, healthy fats, micronutrients, and fiber and high in saturated and trans fats, sodium, and added sugar²⁰. Also, unhealthy, and poor dietary patterns are a key reason for overweight and obesity²¹.

Adolescence is an important stage of growth development in which individuals gain about 15% of their total height in adulthood and 50% of their total body weight. In the process of growth and development at this stage, there are serious changes in the number of hormones in the body and important body compartments, such as the amount of fat. Therefore, a significant amount of nutrients and energy are needed for growth and development in this process^{22,23}. However, the consumption of healthy eating patterns

which include fruits, vegetables, whole grain bread, legumes, milk and dairy products, fish, and meat is lower than recommended in adolescents²⁴. The fruit, vegetable, and milk consumption decrease in adolescents especially in the post- elementary school period. In contrast to milk, beverages which are sugary consumption increases²⁵. Also, consumption of salty foods, high fat content foods, ready-to-consume and fast-food foods, sweet foods with high sugar content, and sugary drinks is higher than recommended levels in adolescents^{7,26}. Besides, final research has shown that the valence of child and adolescent overweight and obesity has significantly high in high-income countries as well as LMICs²¹.

The increase in energy needs during adolescence causes an increase in appetite and the desire to consume snacks usually¹⁶. In recent years, since a high amount of daily energy intake in adolescent nutrition is met from snacks and beverages, it has been observed that adolescents are vulnerable to mineral and vitamin insufficiency²⁵. Also, it has been observed that adolescents consume excessive amounts of added sugar, sodium, and saturated fats²⁷.

The most common wrong dietary features of adolescence are skipping some meals, especially breakfast, eating junk foods and fast foods regularly, beginning of alcohol consumption, interest in sugary and carbonated drinks, consuming foods containing caffeine frequently, tendency to choose meals, excessive energy intake, insufficient consumption of some nutrients, practicing random diet¹².

An adequate and balanced diet during adolescence ensures healthy completion of growth and is resistant to diseases. Until school age, children create nutritional habits from their families as a guide. When they are students, their diet behaviors can be changed. Because of the new social environments, they can be duplicate new dietary behaviors from their new society (e.g., other students, teachers.). The adequate and balanced nutrition in adolescence affects school success and can also cause diseases such as diabetes, iron deficiency anemia, retardation in growth and development, and obesity¹⁶.

Adolescents' proper eating habits are not only important for their own health, but also for being the right role model for their friends. Also, adolescent nutrition is an important issue for improvements to future generation health including chronic diseases, malnutrition, fertility, and poverty¹⁹. For this reason, health-enhancing practices targeting adolescents are considered an important way to prevent existing health problems as well as health problems in future generations²⁸.

The nutritional status of adolescents is affected by many factors that are physical characteristics, age, gender, economic status, and socioeconomic status¹⁶.

2.3. Malnutrition

The European Society for Clinical Nutrition and Metabolism (ESPEN) defines malnutrition as excessive, inadequate, or unbalanced intake of energy, protein, and other nutrients as a malnutrition disorder with side effects on body structure, functions, and clinical outcomes. The main purpose of this definition is to emphasize that malnutrition is a disease that not only causes changes in body shape and appearance but also has side effects on body structure and functions²⁹.

A healthy and balanced diet can help people to promote health and reduce the risk of chronic disease development. Malnutrition is an imbalanced intake of energy and/or macronutrients (carbohydrates, proteins, and fats) and/or micronutrients (vitamins and minerals) to promote good health. Besides, malnutrition can be developed by being over or under malnourished³⁰.

Poor dietary behavior contributes to health problems. A poor and unbalanced diet is associated with NCDs including hypertension, type 2 diabetes mellitus, coronary heart disease, stroke, cancer, elevated cholesterol, osteoarthritis, obesity hypoventilation syndrome, metabolic disorder, and menstrual abnormalities^{19,31}.

Low consumption of fruits, vegetables, whole grains, nuts, seeds, and seafood has positively associated with chronic disease prevalence²¹. Final research has shown that more than half of female adolescents in LMICs do not consume dairy, meat, vegetables, and fruits in their daily lives³². The rise of obesity and NCDs prevalence is highest in LMICs^{32,33}. Furthermore, female adolescents who consume vegetables and fruits in their daily lives do not consume the recommended amount of WHO dietary guidelines³². There is a shift from whole grain and fiber consumption to refined sugar, animal fats, refined grains, and protein-rich food consumption in adolescence phases³¹. This shift can be cause malnutrition.

2.4. Determination of Nutritional Status

Unhealthy and poor eating habits of adolescents are a major public health problem. A good quality diet contributes to being healthy. Therefore, their nutritional status should be evaluated³⁴

Methods that determine nutritional status are the determination of food consumption, anthropometric methods, biochemical and functional tests, clinical symptoms, and history of health^{35,36}. The selection of method is determined by economic conditions, time, and trained personnel. For example, there is not possible to determine the state of food consumption, and to measure anthropometric measurements without a dietitian, or to determine the clinical symptoms without a doctor³⁵.

Nutritional status is used to determine how the body is affected by diet. Anthropometric methods are one of the commonly used methods in the evaluation of nutritional status. Bodyweight, height, gender, and age are used to evaluating anthropometric measurements for adolescents³⁵.

Achieving a balance between nutrient intake and requirement is important for optimal health. Nutritional statuses are affected by climate, cultural structure, appetite, and various diseases, emotional state, eating habits, economic situation.

The aim of determining the nutritional status of the individual and society is to find solutions if there is negativity and to evaluate the effect if the nutritional intervention has been applied³⁵.

Evaluation of nutritional status should be carried out in cases of the disease, but also for the protection of health^{15,35}.

2.5. Adolescents and Diet Quality

A quality diet in adolescents is a protective factor to contribute to good health. As the quality of the diet increases, the health-related quality of life also increases. For this reason, public health also increases³⁷. However, healthy eating habits and diet quality tend to decrease with age from childhood³⁸.

Considering that the risk of chronic disease and NCDs increase as diet quality decreases, improving diet quality is important for maintaining a healthy life³⁸.

Some studies show that the proportion of adolescents with moderate and low diet quality is high, while the proportion of those with good diet quality is quite low³⁹.

2.6. Nutrition Education

The adequate and balanced nutritional intake in adolescence is very important in terms of growth and development, the establishment of long-term healthy eating habits, and future disease risks. In this period, the needs for energy and nutrients of the body are

much higher than in other periods of life. For this reason, it is necessary to provide nutrition education to families, teachers, and children especially in childhood and adolescence⁴⁰.

Dietary behavior is defined by multiple complex factors and nutrition education is only one of them²¹. Knowledge of a healthy balanced diet is one of the most important influencers of healthy dietary behaviors²¹. Also, low nutritional awareness reduces the effective use of food even if it has access to food⁴. Final studies showed that healthy eating behaviors increase as nutritional knowledge increases⁴¹.

The aim of nutrition education is to adopt healthy eating behaviors for individuals, thus creating permanent behavioral changes. Therefore, nutrition education that has achieved its goal improves the health of individuals^{40,42}.

Nutrition education should be focused on improving health and decrease nutrition-related chronic disease prevalence²¹.

High school-level schools have been identified by WHO as an ideal environment for teaching adolescents healthy eating habits, helping them make healthy food choices⁴³. Besides, school-based nutrition programs have also been shown to be an effective method of improving healthy eating habits and dietary quality in adolescents who are disadvantaged in terms of socioeconomic status⁴⁴. Although adolescents who are especially overweight are more interested in nutrition-related issues, their ability to convert nutritional information into habits is limited⁴⁵.

LMICs' socioeconomical status is shown that people have low educational access⁴⁶. It has been noted that nutritional knowledge is high in adolescents who live in high socioeconomic status and have parents that are educated^{45,47}.

Significant physical, sexual, cognitive, social, and spiritual changes occur in adolescents. The biggest challenge for those trying to influence adolescents is that not all these changes are simultaneous. For example, although an adolescent's puberty begins at an earlier age, her/his physical and sexual development is almost complete, she/he still behaves like a child. On the contrary, an adolescent whose puberty begins at a later age may be more mature, while his sexual development may have just begun. Therefore, not all adolescents of the same age are at the same developmental stages. For this reason, occupational groups and families working with adolescents should be aware of such individual differences¹².

Nutrition education should be planned considering that nutrition education should affect the total. In addition to these, health services provided to adolescents should be

appropriate for the age and developmental level. The educator should be sensitive to socio-cultural differences of them¹².

The aim of nutrition education should be to teach adolescents to adjust their daily energy consumption and to develop an ideal healthy eating model¹².

Nutrition Education should be an effective intervention for people choosing a healthy diet in their life. However, nutrition education is an important tool in gaining healthy eating habits in adolescents, nutritional knowledge gained through nutrition education is not the only factor for healthy eating in adolescents²¹.

2.7. Socioeconomic Status

Income and education are the most important indicators of individual socioeconomic status. Income determines safe and healthy food access. Increasing socioeconomic status contributes to people consuming safe and healthy foods. Therefore, decreased socioeconomic status leads to poor dietary habits³¹.

A healthy diet is achieved by consuming enough nutrients for the body². Even if the individual's healthy nutrition knowledge is complete, the individual's conditions such as an insufficient economic situation, harmful eating habits can be preventing a healthy diet¹⁶.

The economic situation is the first indicator reflected in nutritional behavior in a society. A healthy diet ensures the continuity of a healthy life. There are nutrients that need to be taken in this process. The change in economic situations is reflected in people's food preferences and nutritional behavior. As the economic level increases, people are more focused on purified foods with high energy and low nutritional value¹⁵.

There is a strong link between individual socioeconomic status and dietary patterns³¹. In addition, the study that investigated nutritional knowledge in adolescents found that most adolescents did not know the contents of food⁴⁵. The low socioeconomic level has been shown as the cause of this condition⁴⁵.

Low socioeconomic level, skipping breakfast and lunch, lack of eating and activity habits with the family are factors that reduce diet quality. Therefore, low socioeconomic status causes adolescents to experience more unhealthy eating habits that reduce the quality of their diet, such as high energy, fat, saturated, and trans fats consumption^{44,48,49}.

Food price and individual income are the two most significant determinants leading to nutrition behavior change in LMICs³¹. People who live in LMIC consume more

unhealthy foods which are energy-dense, processed, salty, sugary, and fatty than in high-income countries because unhealthy food is cheaper than healthy food which are fresh vegetables and fruits, whole grain, lean protein, nuts, etc.⁴⁶. Regular consumption of these types of unhealthy food increase the risk of chronic diseases like diabetes, hypertension, cardiovascular diseases development⁴⁶.

The double burden of malnutrition is the coexistence of malnutrition (micro or/and macronutrient deficiency) with obesity, overweight, or NCDs^{33,50}. Especially in LMICs, a double burden of malnutrition which includes both overweight and undernutrition is a major problem⁵⁰. Because low-income determinates food choices and healthy eating patterns⁵¹. Generally, women who live in poor countries are live in the poor area are less to eat healthy dietary patterns that are fruits, vegetables, lean meats, fish, nuts, whole grains, and dairy products⁵¹. Besides, obesity is higher in women compared with men in the poorest area⁵¹.

2.8. Nutrition and Development

People with adequate nutrition are more productive for their community. These people can create opportunities to develop their countries and break the cycles of poverty. Nutrition is essential for maintaining health and sustaining the life cycle¹⁵.

An adequate and balanced diet is the most basic element to raise healthy adolescents who increase the level of welfare in the country. Because adolescents are the critical participants of the workfare and the socioeconomic determiner of the countries³³.

For a healthy society, people need to increase their awareness of healthy eating. Therefore, the economic and social development of the country depends on the increase in public health⁴.

Providing healthy eating habits and awareness to individuals during adolescence is important in terms of both improving the individual's future health and improving social health⁴. Adolescent population health also determines the future of population mobility, global communication, economic development, and ecosystem sustainability⁵².

Young people are the link between today and the future. Therefore, they should be strengthened in many aspects. Nutrition education should be one of them. The future healthy generation is going to become today's young people so if they have healthy diet behavior.

3. MATERIALS AND METHODS

3.1. Place, Time, and Sample Selection in Research

This study conducted among female adolescent who stayed at Alanya Kır Çiçekleri Kız Öğrenci Yurdu and Alanya Oba Kız Öğrenci Yurdu. This study was carried out between 05.04.2021- 19.04.2021 with 40 volunteer female students registered at Alanya Kır Çiçekleri Kız Öğrenci Yurdu and Alanya Oba Kız Öğrenci Yurdu in Alanya district of Antalya province.

3.2. Inclusion and Exclusion Criteria

Inclusion Criteria

- Being registered at Alanya Kır Çiçekleri Kız Öğrenci Yurdu and Alanya Oba Kız Öğrenci Yurdu
- Participant age of between 10-19
- Not having a disease that requires dietary restrictions (e.g., diabetes)
- Volunteer to participate in the study
- Declare verbal and written consent to participate in the research by participants or legal parents

Exclusion Criteria

- Being not registered at Alanya Kır Çiçekleri Kız Öğrenci Yurdu and Alanya Oba Kız Öğrenci Yurdu
- Participant not the age of between 10-19
- Having a disease that requires dietary restrictions (e.g., diabetes)
- Not volunteer to participate in the study
- Not declare verbal and written consent to participate in the research by participants or legal parents

3.3. General Plan of the Research

Currently, young people face many biological and psychological health problems. At the beginning of the most important problems comes unhealthy and unbalanced eating habits.

In this research, female adolescents were educated about healthy diet components that are in HEI-2015. Then, their dietary quality was evaluated by HEI-2015, and the effectiveness of nutrition education on nutritional behavior was evaluated by statistical methods.

This study is a cross-sectional and descriptive study.

This study was carried out between 05.04.2021- 19.04.2021 with 40 volunteer female students registered at Alanya Kır Çiçekleri Kız Öğrenci Yurdu and Alanya Oba Kız Öğrenci Yurdu in Alanya district of Antalya province. It was also noted that the participants in the study did not have a disease (e.g., diabetes, hypertension) that required dietary restrictions. Since the age group of the interviewees is under 18 years of age, the legal parents of the participants have been informed and the voluntary form has been signed.

After the participants over the age of 18 signed the informed voluntary form, which is presented to the legal parents of participants under the age of 18, their weight (kg) and height (cm) were measured by the researcher in accordance with its technique. Portable stadiometer and digital weight scales were used as part of the study.

The data from adolescent's body weight and height measurements were calculated to BMI by using the WHO AnthroPlus Software.

Then, participants were recorded the questionnaire by using the 24-hour recall methods. The 24-hour recall was applied using the book which is 'Yemek ve Besin Fotoğraf Kataloğu'⁵³.

Participants were educated by PowerPoint presentation which includes 13 components of HEI-2015.

After 2 weeks, a 24-hour recall questionnaire was recorded from the participants again by using the 'Yemek ve Besin Fotoğraf Kataloğu'⁵³.

Finally, the mean HEI-2015 scores which is measured before and after the nutrition education were compared statically.

3.4. Healthy Eating Index-2015

HEI is a nutritional quality measurement based on dietary recommendations of the Dietary Guideline of American (DGA) ^{54,55}. HEI was first developed by the United States Department of Agriculture in 1995⁸. Then, HEI is updated every 5 years according to updated DGA⁸. The final version of HEI is HEI-2015. HEI is used to evaluate the total diet quality of individuals aged 2 years and older⁵⁴.

HEI-2015 reflects the structure of the dietary dimension. Also, HEI-2015 is associated with dietary quality rather than dietary quantity⁵⁶.

HEI has been updated with the release of the 2015-2020 DGA. HEI-2015 is the latest one contains more dimensions of a healthy diet than the oldest ones. HEI-2015 contains 13 dietary patterns which are total fruits, whole fruits, total vegetables, greens and beans, whole grains, dairy, total protein foods, seafood and plant proteins, fatty acids, refined grains, sodium, added sugars, and saturated fats⁵⁴.

Since some food groups are represented by 2 components, the highest score in the components of those groups is 5. The highest score for other components is 10. The high score represents high uptake in the components for which high intake is required, while the high score represents low uptake in the components for which low intake is required⁵⁴.

HEI is a tool to measure diet quality⁹. Thus, increasing the HEI-2015 score is related to higher diet quality⁵⁶.

The full score of HEI-2015 is 100. If the HEI-2015 score is above 80, it is defined as "good diet quality". If the HEI-2015 score is between 51-80, it is defined as "diet quality that needs to be improved". If the HEI-2015 score is below 51, it is defined as "poor diet quality"⁹.

HEI is used to examine the relationship between nutrition and health outcome in both prospective and cross-sectional studies^{8,9}.

3.5. Healthy Eating Index-2015 Components

HEI-2015 contains 13 dietary patterns which are total fruits, whole fruits, total vegetables, greens and beans, whole grains, dairy, total protein foods, seafood and plant proteins, fatty acids, refined grains, sodium, added sugars, and saturated fats⁵⁴.

3.5.1. Total Fruits

Total Fruits includes whole fruits and 100% fruit juice. The recommendation of total fruit consumption is 2 cups- equivalents per day in 2,000- calorie level⁹.

3.5.2. Whole Fruits

Whole fruits (e.g., fresh, frozen, canned, or dried) are loaded with fiber, antioxidants, and other important nutrients (e.g., potassium and vitamins)¹⁰. Consuming

healthy dietary fiber from whole fruits improves gut health, lowers elevated LDL-cholesterol, and reduces the risk of cardiovascular diseases (CVD), coronary heart diseases (CHD), cancers, and type 2 diabetes⁵⁷. Thus, at least half of 2 cups- equivalents for 2,000-calorie level should be whole fruits⁵⁷.

3.5.3. Total Vegetables

There are 5 vegetable subgroups includes in the 2015 DGA. These are dark-green vegetables, red& orange vegetables, legumes (beans and peas), starchy vegetables, and other vegetables¹⁰.

Vegetables play a role in improving, and health preventing body weight gain because of their low energy content¹⁰.

Vegetable consumption is lower than recommendations for female adolescents ages 14-18. This consumption slightly higher in the adult period, but it is still lower than recommendations for them⁴.

At least 5 portions of vegetables and fruits should be consumed every day. Three portions of all five portions should be vegetables which one of these should green vegetables¹⁰.

3.5.4. Greens and Beans

Among the 5 vegetable groups in DGA, dark-green vegetables and legumes intakes are lower from the recommended level than other vegetable subgroups⁴.

Legumes are important sources of protein, dietary fiber, and nutrients¹⁰.

3.5.5. Whole Grains

Whole grains include all kernels including endosperm, bran, and germ. Because of the lack of refined processes, they are a source of important nutrients, such as iron, zinc, manganese, folate, copper, magnesium, thiamin, niacin, selenium, phosphorus, riboflavin, vitamin B6, vitamin A, and dietary fiber. Therefore, whole grains contain more dietary fiber than refined grains^{4,10}.

It is recommended that at least 6 ounces- equivalents of grains per week in the 2000-calorie diet. At least 3 ounce- equivalents should be whole grains (e.g., whole wheat flour, oats)¹⁰.

3.5.6. Dairy

Dairy products include milk, yogurt, cheese, or soymilk, but other plant-based milk products are not included as part of dairy because their nutritional content is not like milk, milk products, and soymilk ¹⁰.

The dairy group is an important source of many nutrients especially quality protein, calcium, phosphorus, zinc, choline, magnesium, selenium, vitamin B, vitamin B12, and vitamin A. In addition, lactose- free dairy products should be preferred by individuals who are lactose intolerant ¹⁰.

The amount of milk recommended being consumed varies according to age, gender, and special conditions such as growth period, pregnancy, and lactation^{4,10}.

The recommendation of dairy products consumption for adolescents is 3 cups equivalents per day⁴.

3.5.7. Total Protein Foods

Total protein foods include both animal and plant products include meats, seafood, poultry, eggs, nuts, seeds, soy products, legumes, and dairy ¹⁰.

It is recommended that 10-20 percent of the energy in the daily diet comes from total proteins¹⁰. The recommendation for total proteins in DGA is 5 ½ ounce-equivalents of protein foods at the 2000-calorie diet per day⁴.

3.5.8. Seafood and Plant Proteins

It is recommended that at least 8 ounces- equivalents of seafood per week in 2000-calorie diet ¹⁰.

The consumption of 8 ounces- equivalents of seafood per week provides consumption of 250 mg per day eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) ¹⁰.

3.5.9. Fatty Acids

Dietary fatty acids include polyunsaturated fatty acids, monounsaturated fatty acids, saturated fatty acids, and trans fatty acids¹⁰.

It is recommended that the ratio of poly- and mono-unsaturated fatty acids (PUFAs and MUFAs) to saturated fatty acids (SFAs) should not lower than 1.2 ¹⁰.

3.5.10. Refined Grains

In contrast to whole grains, refined grains are milled, a process that strips out both the bran and germ to give them a soft texture. Because of this process, they are rich in starch and poor in dietary fiber. Most refined grains, lack of important nutrients, but they are enriched that adds iron, thiamin, riboflavin, niacin, and folic acid^{8,9}.

It is important that products made with refined grains (e.g., cakes, cookies, junk foods) are high in added sugars, saturated fats, and sodium¹⁰

It is recommended that at most 3 ounces- equivalents of refined grains per week in 200- calorie diet ¹⁵.

3.5.11. Sodium

Daily salt consumption should be less than 5 g¹⁰. Approximately 40 percent of table salt is sodium^{4,58}. Total 5 g salt contains 2000 mg sodium^{4,58}. The average intake of sodium is 3440 mg per day ^{4,58}.

The average intake of sodium is higher than the recommended maximum level in both gender ¹⁰.

Excessive sodium consumption can cause cardiovascular diseases, kidney diseases, hypertension, stroke, osteoporosis, and some type of cancer¹⁰.

Daily salt consumption should not exceed 5 g. In addition, the salt consumed should be iodized^{4,58}.

3.5.12. Added Sugars

The amount of total sugar consumed by the daily diet is naturally present in food structure and added during the processing of food⁴.

An important source of added sugar is sweet, snacks and beverages which includes grain-based desserts, dairy- based desserts, sugars, candies, jams, syrups, sweet toppings, soft drinks, fruit drinks, energy drinks, sweetened coffee and tea, alcohol ^{4,10,15}.

Added sugar consumption is high in children, adolescence, and youth ^{4,10}.

The energy from sugar should not exceed 10 percent of the daily energy and it should be preferred to be below 5 percent¹⁰.

3.5.13. Saturated Fats

Current studies have shown that averages intakes of saturated fats are 11 percent of calories ⁴.

Snacks and sweets, protein foods, solid fats, dairy products, and mixed dishes which contain meat, dairy, and cheese are the major sources of saturated fats in diet ¹⁰.

The ratio of dietary energy from fats should 20-35 percent and less than 10 percent of the energy taken from saturated fats and less than 1 percent from trans fats^{4,10,15}.

Consumption of large amounts of saturated fats in the diet causes nutrition-related NCDs like cardiovascular diseases ⁴.

3.6. 24-Hour Recall Questionnaire Method

A 24-hour recall is a structured interview intended to capture detailed information about all foods and beverages consumed by the respondent in the past 24 hours by a nutritionist or dietitian who has been trained in this technique⁴. Usually, the time frame is the previous 24 hours^{35,36}.

The 24-hour recall method is a frequently used method in nutritional related studies. The energy and nutrients of each consumed food in the 24-hour recall questionnaire are calculated using nutrient composition charts or a nutritional information system (BEBIS).

3.7. The Nutrition Education and Topics of The Education

The duration of the education in this study is between 2 and 3 hours. The education process was supported by brochures and a PowerPoint presentation. Students were encouraged to ask questions about the subject at the end and during the nutrition education. Therefore, education has been presented in an interactive way. While preparing the PowerPoint presentation and brochures, the information contained in the DGA, and HEI-2015 components were used. Also, 13 components of HEI-2015 were found equally in the presentation.

3 content of nutrition education:

1. Adequate and Balanced Nutrition:

Adequate and balanced nutrition is defined in this section of the presentation. The importance of healthy nutrition is mentioned. Also, the

results of unhealthy dietary patterns are explained. Healthy main and snacks are explained.

2. Food Groups which are components of HEI-2015:

The 13 dietary patterns of HEI-2015 are total fruits, whole fruits, total vegetables, greens and beans, whole grains, dairy, total protein foods, seafood and plant proteins, fatty acids, refined grains, sodium, added sugars, and saturated fats are explained.

3. Nutrition Labels:

Nutrition labels are one of the indicators of food safety, as they provide consumers with information about products, protect them from false information and enable them to make informed choices. Labels are a great value for consumers to make healthy and suitable food choices. Therefore, students were taught to read calories and nutrients according to package weight. Ingredients that need attention on the label (e.g., types of added sugar, saturated fat, and sodium) are underlined.

3.8. Anthropometric Measurement

Supervision of physical growth and development in adolescents should include assessment of nutritional status and provision of prospective guidance. Determining the nutritional status of adolescents provides important information about adolescent health and the development of various chronic diseases and plays a key role in breaking the cycle of malnutrition. Nutritional status in adolescents is often assessed using measurements of body weight for age and height for age³⁵.

The weight (kg) and height (cm) of the participants were measured by the researcher in accordance with its technique. Portable stadiometer and digital weight scales were used in the study. The data from adolescent's body weight and height measurements were calculated to BMI by using the WHO AnthroPlus Software.

3.8.1. WHO AnthroPlus Software

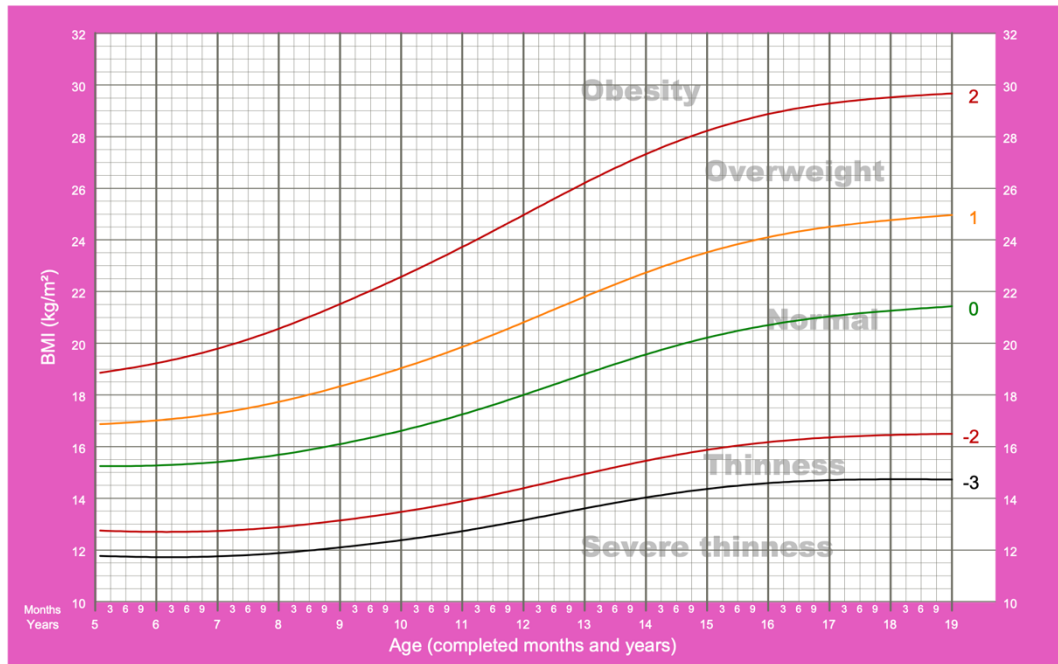
WHO AnthroPlus is a software for the global application of the WHO Reference 2007 for 5-19 years to assess the growth of children and adolescents. WHO AnthroPlus consists anthropometric calculator, individual assessment, and nutritional survey³⁵.

Who Reference 2007 for 5-19 years to children and adolescence are shown in Figure 3.1. and 3.2.⁵⁹.



BMI-for-age GIRLS

5 to 19 years (z-scores)

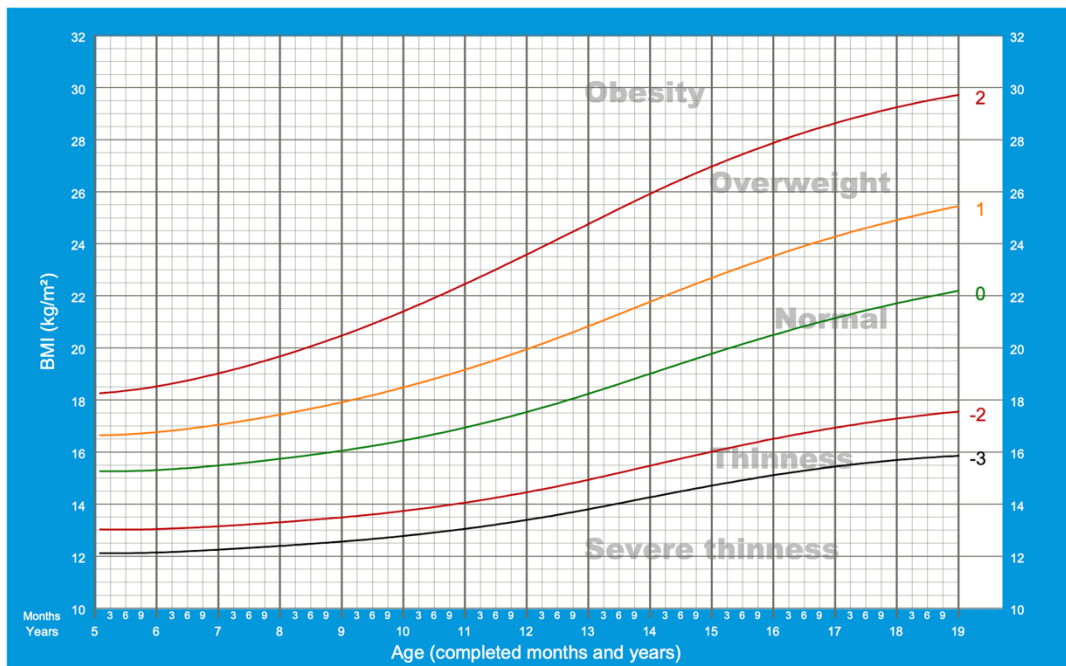


2007 WHO Reference

Figure 3.1. BMI-for-age Girls of the WHO Reference 2007⁵⁹.

BMI-for-age BOYS

5 to 19 years (z-scores)



2007 WHO Reference

Figure 3.2. BMI-for-age Boys of the WHO Reference 2007⁵⁹.

3.9. Statistical Method

In this study, Microsoft Excel, and SPSS 23.0 (Statistical Package for the Social Sciences) were used.

For all tests, the critical decision value was considered $p \leq 0.05$. Descriptive statistical methods for determining values; percentage, min., maximum., averaging $\bar{X}$. As a descriptive statistic, Wilcoxon marked order to test for nonparametric tests according to the result obtained using the Shapiro-Wilk normality test before starting the analyses, student t - test analyses were used in parametric ones. It was evaluated with a degree of materiality of 0.05.



4. RESULTS

4.1. HEI-2015 Score Before and After Nutrition Education

Table 4.1. Comparison of HEI-2015 Scores Before and After Nutrition Education

(n=40)

HEI – 2015 Scores	Pre-test Mean	Post-test Mean	Significance
Total Fruits Score	1.27	2.06	Z=-1.410* p=0.159
Whole Fruits Score	1.38	2.23	Z=-1.634* p=0.102
Total Vegetables Score	3.35	2.14	Z=-2.979* p=0.003
Greens and Beans Score	0.75	2.63	Z=-3.273* P= 0.001
Whole Grains Score	0.73	0.00	Z=-1.633* p=0.102
Dairy Score	6.20	7.84	Z=-2.275* p=0.023
Total Protein Foods Score	1.76	1.11	Z=-1.286* p=0.198
Seafood and Plants Proteins Score	0.13	2.06	Z=-3.939* p= 0.000
Fatty Acids Score	4.51	1.94	Z=-3.179* p=0.001
Refined Grains Score	0.39	0.00	Z=-1.604* p=0.109
Sodium Score	3.96	3.24	Z=-0.655* p=0.513
Added Sugars Score	5.34	6.45	t=-230.413** p= 0.027
Saturated Fats Score	4.35	3.29	Z=-1.359* p=0.174
Total Score	34.11	34.97	t=-0.32848** p=0.744

* Wilcoxon Signed Ranks,

** Paired Samples Test

Preliminary and final test results for the mean total fruits score are the Wilcoxon signed Ranks test, $z=-1.410$ $p=0.159>0.05$. There are not statistically significant differences of the mean total fruits score.

Preliminary and final test results for the mean whole fruits score are the Wilcoxon signed Ranks test, $z=-1.634$ $p=0.102>0.05$. There are not statistically significant differences in the nutrition education of the mean whole fruits score.

Preliminary and final test results for the mean total vegetable score are the Wilcoxon signed Ranks test, $z=-2.979$ $p=0.003<0.05$. There are statistically significant decreases in the nutrition education of the mean total vegetable score.

Preliminary and final test results for the mean greens and beans score are the Wilcoxon signed Ranks test, $z=-3.273$ $p=0.001<0.05$. There are statistically significant increases in nutrition education of the mean greens and beans Score.

Preliminary and final test results for the mean whole grains score are the Wilcoxon signed Ranks test, $z=-1.633$ $p=0.102>0.05$. There are not statistically significant differences in the nutrition education of the mean whole grains score.

Preliminary and final test results for the mean dairy score are the Wilcoxon signed Ranks test, $z=-2.275$ $p=0.023<0.05$. There are statistically significant increases in nutrition education of the mean dairy score.

Preliminary and final test results for the mean total protein score are the Wilcoxon signed Ranks test, $z=-1.286$ $p=0.198>0.05$. There are not statistically significant differences of the mean total protein score.

Preliminary and final test results for the mean seafood and plants proteins score are the Wilcoxon signed Ranks test, $z=-3.939$ $p=0.000<0.05$. There are statistically significant increases in nutrition education of the mean seafood and plants protein score.

Preliminary and final test results for the mean fatty acids score are the Wilcoxon signed Ranks test, $z=-3.179$ $p=0.001<0.05$. There are statistically significant decreases in the nutrition education of the mean fatty acids score.

Preliminary and final test results for the mean refined grains score are the Wilcoxon signed Ranks test, $z=-1.604$ $p=0.109>0.05$. There are not statistically significant differences in the nutrition education of the mean refined grains score.

Preliminary and final test results for the mean sodium score are the Wilcoxon signed Ranks test, $z=-0.655$ $p=0.513>0.05$. There are not statistically significant differences in nutrition education of the mean sodium score.

Since the added sugars in the normality test related to the preliminary test is $p=0.200>0.05$, the data is normally distributed with 95% confidence. For this reason, the test result is $p=0.027<0.05$. There are statistically significant increases between the added sugars score averages of before and after nutrition education.

Preliminary and final test results for the mean saturated fat score are the Wilcoxon signed Ranks test, $z=-1.359$ $p=0.174>0.05$. There are not statistically significant differences in the nutrition education in the saturated fat score.

Since the total HEI-2015 score in the normality test related to the preliminary test is $p=0.200>0.05$, the data is normally distributed with 95% confidence. For this reason, the Paired Samples test result is $p=0.744>0.05$. There are not statistically significant differences between the HEI-2015 score averages of before and after nutrition education.

Table 4.2. Descriptive Statistics of HEI-2015 (n=40)

Descriptive Statistics		
	Mean	Standard Deviation
Total Fruits Score	1.668	2.265
Whole Fruits Score	1.800	2.405
Total Vegetables Score	2.744	2.116
Greens and Beans Score	1.688	2.379
Whole Grains Score	0.363	1.850
Dairy Score	7.018	3.488
Total Protein Foods Score	1.436	1.660
Seafood and Plants Proteins Score	1.094	1.851
Fatty Acids Score	3.221	3.750
Refined Grains Score	0.194	1.223
Sodium Score	3.600	3.948
Added Sugars Score	5.897	2.895
Saturated Fats Score	3.819	3.671
Total Score	34.539	14.673
Energy (kilocalorie)	1453.116	322.119

Diet Added Sugar (gram)	44.924	25.057
Diet Unsaturated Fatty Acids (gram)	29.179	10.931
Diet Saturated Fatty Acids (gram)	24.996	10.715
Diet Sodium (milligram)	2738.393	1041.059
BMI	23.273	2.900

Table 4.3. BMI distribution of the participants

	Frequency (n)	Percent (%)
Normal	28	70.0
Overweight	10	25.0
Obese I	2	5.0
Total	40	100.0

According to the BMI index, 5.0% of participants (n:4) are obese I, 25.0% (n:20) are overweight and 70% (n:56) are normal weight.

Table 4.4. Description of HEI-2015 Before and After Nutrition Education

	Frequency (n)		Percent (%)	
	Pre-test	Post-test	Pre-test	Post-test
Good diet quality	0	0	0	0
Diet quality that needs to be improved	7	7	17.5	17.5
Poor diet quality	33	33	82.5	82.5

Total	40	40	100	100
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According to the Table 4.5., there was not observed any differences between the description of HEI-2015 before and after nutrition education. None of the participants were scored "good diet quality" in HEI-2015 before and after the nutrition education. In addition, 17.5 percent of participants were scored “diet quality that needs to be improved” in HEI-2015. However, 82.5 percent of participants were scored "poor diet quality" in HEI-2015.



5. DISCUSSION AND CONCLUSION

The aim of the study is to compare HEI-2015 before and after nutrition education in female adolescents who stay in the dormitory. Also, this study was conducted on female adolescents with low socioeconomic status.

The HEI-2015 was selected for this research because it reflects the dimension of a healthy diet. HEI-2015 contains 13 diet components which are high or low recommendation in DGA. HEI is prevalently used in evaluating diet quality. Most studies have been used HEI for adults, but data in adolescents is limited⁶⁰.

The nutrition education in this study was planned with the information of 13 diet components of HEI-2015 equally. The education process was supported by brochures and a PowerPoint presentation. Students were encouraged to ask questions about the subject during the nutrition education, so education has been presented in an interactive way. Nutrition education is of great importance in providing healthy, adequate, and balanced nutritional behavior⁵⁹.

As a result of this study, there was not statistically significant difference between the means HEI-2015 scores before and after nutrition education ($p=0.479>0.05$). The hypothesis of the thesis was refuted by a result of this study. Because there was not statistically significant increase in the scores of the last 4 components which are refined grains, sodium, added sugars and saturated fats of HEI-2015. There was a statistically significant increase only in the means of added sugar scores ($p=0.027<0.05$). However, there were not statistically significant differences in the mean of refined grains, sodium, and saturated fats scores. In addition, there were statistically significant increases in the means of the green and beans scores ($p=0.001<0.05$), the dairy scores ($p=0.023<0.05$), and the seafood and plant proteins scores ($p=0.000<0.05$). Also, there were statistically significant decreases in the means of total vegetables scores ($p=0.003<0.05$) and fatty acids scores ($p=0.001<0.05$).

Although nutrition education did not have a statistically significant differences in the total HEI-2015 score, nutrition education can be used to improve diet quality. Because there were statistically significant increases in some of the components of HEI-2015.

While there was an increase in the mean score of total fruits from 1.27 to 2.06 after the nutrition education, there was not statistically difference between the averages of total fruits scores ($p=0.159>0.05$). Besides, although there was no significant difference between pre- and post- whole fruits scores ($p=0.102>0.05$), there was an

increase in the mean score from 1.38 to 2.23. The reason for this can be that the dormitory officials offer fruit options instead of dessert for the main meals and snacks.

According to TUBER, 2 portions of fruits should be consumed daily, but the daily fruit consumption was less than 2 servings per day in this study⁴.

A statistically significant decrease was found in total vegetables score ($p=0.003<0.05$), but this can be due to the absence of a vegetable meal for dinner in the last 24-hour recall record and therefore, participants may not have consumed any vegetables during the day.

Since the participants do not cook their own dinner, they either consume cheap and easily accessible meals or eat dormitory meals.

After the nutritional education, seafood and plants proteins score averages increased from 0,13 to 2,06. There were statistically significant increases in total seafood and plants proteins score ($p=0.000<0.05$). Although the consumption of seafood among participants has not been recorded in the last 24-hours Recall questionnaires, the reason for this increase can be related to consuming chickpeas for dinner at the dorms and nuts such as hazelnuts and peanuts for snacks.

Greens and beans score averages increased from 0.75 to 2.63. There were statistically significant increases in total greens and beans score ($p=0.001<0.05$). The reason for this can be the presence of a chickpea meal at the dinner which is recorded in the second 24-hours recall questionnaire. Therefore, it can be recommended to add legumes to the dormitory menus frequently. Also, it was observed in the last 24 hours recall questionnaires that the students generally consume the whole chickpea meal.

Legumes which are an important source of protein, and dietary fiber are of great importance in solving the nutritional problems of the developing countries⁶¹. Because legumes are cheaper and easier to access than other protein foods⁶². Another advantage of legumes over other protein foods is that legumes do not contain saturated fat⁶². In addition, the agriculture of legumes is widespread in Turkey, so people can easily access them^{2,15}. Legumes constitute an average 8.3% of the agricultural area in Turkey⁶³. Legumes are also second place in agricultural products in Turkey⁶³.

An increase was observed in dairy score averages from 6.2 to 7.84 after the nutrition education. There were statistically significant increases between the means of dairy scores ($p=0.023<0.05$). The reason for the increase in the mean of the statistically significant scores can be that the dormitory authorities have added a milk option as a snack and that a yogurt or an ayran or a cacik option has been added to every meal.

The reason for the lack of change in means of whole grains ($p=0.102>0.05$) and refined grains($p=0.109>0.05$) scores can be that there was not a whole grain bread option in dormitory meals. Another reason for this situation can be that pasta and rice are served alongside the main course at dinners generally.

There were not statistically significant differences between the main of total protein foods score ($p=0.198>0.05$). Due to the high cost of protein foods, protein foods have not preferred by dormitory officials and students regularly.

There were statistically significant decreases between the main of fatty acids score ($p=0.001<0.05$). The reason of the decreases can be the increase in mean of saturated fats score.

There was an increase in the mean scores of added sugars from 5.34 to 6.45. Also, there were statistically significant increases between the added sugars score averages before and after the nutritional education($p=0.200>0.05$). Since consumption of sugar containing foods and beverages has been suggested to increase the risk of NCDs, overweight, and obesity in adolescents⁶², the increase in mean scores of added sugar can be helpful in promoting health. There was a statistically significant increases in only the means of added sugars score between last 4 components of HEI-2015.

There were not statistically significant differences between the main of sodium score ($p=0.513>0.05$). Because it has been recorded that participants still consumed fast foods, junk foods, and beverages which include sodium in second 24-hour recall questionnaire.

There are not statistically significant differences in the nutrition education in the saturated fats score ($p = 0.174>0.05$). However, there was a decrease in the mean scores of saturated fats from 4.35 to 3.29. The reason for the decrease in the mean score of saturated fats can be the increase in the mean dairy scores from 6.2 to 7.84. Because dairy products are rich in saturated fatty acids⁶⁴. Also, dairy products are rich in many nutrients which promote being healthy⁶⁵.

If dairy consumption is the reason of the increase in the mean saturated fats score, there is also a healthy side effect which the consumption of healthy nutrients that are containing in dairy products.

Consumption of low-fat dairy products can be recommended but it should be considered that the cost of these products is more expensive than normal ones. Since income is one of the most important factors in food selection, the recommended low-fat dairy products may not be preferred.

As a result of the study, the total HEI-2015 score averages increased from 34.72 to 35.65 in the normal weight group, decreased from 35.95 to 32.87 in the overweight group, and increased from 25.44 to 39.23 in the obese 1 group.

The low number of people in the obese 1 group can be the reason for the higher increase compared to the other groups. However, many studies have been shown that the nutritional knowledge of obese adolescents is lower than other adolescents^{15,65}.

Considering the total HEI-2015 score averages there was clear that the nutrition education was understood correctly especially by participants with normal and obese I BMI.

There are not any differences between pre- and post- test of diet quality. None of the participants were scored "good diet quality" in HEI-2015 pre- and post- test. In addition, 17.5 percent of participants were scored "diet quality that needs to be improved" in HEI-2015. However, 82.5 percent of participants were scored "poor diet quality" in HEI-2015. The high percent of "poor diet quality" indicates that participants need nutritional intervention. There can be more studies in female adolescents to improve their diet quality, and thus create a healthy society in developing countries.

Despite the increase from 34.1 to 34.97 in the HEI-2015 total score, there were not statistically significant differences between the mean of before and after nutrition education ($p=0.744>0.05$). In addition, the HEI-2015 total score average means still "poor diet quality". As a result of all these data, most adolescents do not eat healthy.

Most research on HEI has reached similar conclusions⁴⁵. Also, in a study conducted with adolescents in Gaziantep, the average HEI-2010 score was found to be 46.2 in boys and 48.7 in female adolescents which means "poor diet quality"⁶⁰.

In a study of 11-16-year-old adolescents with low socioeconomic levels, they found a Healthy Eating Index score of 64.4 in female adolescents and 61.5 in male adolescents⁶⁰.

In a study conducted by 1104 adolescents in Ankara to evaluate the quality of diet, they found an average Healthy Eating Index score of 51.5, noting that it did not differ by gender²⁰.

Another result of the study in Turkey was found that many of the students (male= 72.6%, female= 85.8%) according to the HEI score were at a level that needed to be improved, but the average diet quality was insufficient⁶⁶.

Participants have at least 1 meal (especially dinner) with dormitory meals. Therefore, dinners may affect the HEI-2015 score depending on the menu. If low-cost

healthy foods such as more fruits, vegetables, dairy, and plant proteins in the dormitory menu, this may increase the diet quality of the participants.

The addition of fruit and milk preferences by the dormitory staff for the snack time caused an increase in the HEI-2015 score after the nutrition education. However, it was observed that the adolescence used their food choices from cheap priced products abroad the dorm. In this case, it shows that the socioeconomic situation is one of the most important factors in diet behavior.

Other recent studies have been shown that socioeconomic status is the most critical factor in healthy food access, diet behavior, and healthy food consumption⁶⁷. In the study investigating the relationship between socioeconomic status and diet quality, there was found that low socioeconomic status was associated with lower HEI-2015 scores in young adults^{32,68,69}.

Based on the hypothesis, this study could not reach the desired result. It has been observed that participants have no effect on their choice of fast foods, junk foods, and beverages which include more sugar, saturated fat, sodium, and refined grains statistically.

Considering that the healthy dietary habits of adolescents are an important factor in the development of their country, adolescents, their families, and teachers should be educated about the healthy diet.

The first of the School Health and Nutrition-Friendly School Symposium was held in 2016, and the second in 2018, in which the Nutrition-Friendly Schools Program studies of 81 provinces and nutrition and physical activity practices in schools took place in Turkey⁷⁰. It can be suggested that the School Health and Nutrition Friendly School Symposium be held regularly every year.

The article "Adequate and Balanced Nutrition and Regular Physical Activity Habit in Combating Obesity in Schools" are included under the "Studies for the Prevention of Obesity" section of the Turkey Healthy Nutrition and Active Life Program published on 29.09.2010. In this direction, students, parents, educational activities are carried out in order for teachers and all school staff to acquire healthy living behaviors such as adequate and balanced nutrition and regular physical activity⁷¹.

Developing countries need to develop projects for healthy adolescents. For example, in the School Milk Program implemented between 06.02.2017 and 09.06.2017 in the second semester of the 2016-2017 academic year in Turkey, 200 ml, fat-free (3% - 3.5) plain UHT milk was delivered to 33 308 schools, 6 032 056 students, 3 times a week.

289 538 688 boxes of milk were distributed on Monday, Wednesday, and Friday, 48 days in total⁷². Children and adolescents can be consuming milk regularly to improve their diet quality by making the School Milk Program permanent.

The WIC Farmers Market Nutrition Program was carried out by the United States Department of Agriculture (USDA) in the USA; WIC coupons have been regularly distributed to eligible participants with low socioeconomic status. In exchange for these coupons, participants can buy food from farmers, markets, and stands that accept the Farmers Market Nutrition Program coupons from the government. In this way, participants can access and consume healthy foods regularly⁷³.

Implementation of a program like the WIC Farmers Market Nutrition Program in Turkey can be preventing the disadvantage of the economic situation in the development of healthy generations. Implementation of a program like the WIC Farmers Market Nutrition Program in Turkey may increase public health and develop the economy of agriculture. Because of the widespread agriculture area in Turkey, there can be a double advantage of these coupons.

The Supplemental Nutrition Assistance Program (SNAP) that carried out by USDA is a program that supports food budgets to families with low income to buy their food requirements. Eligible families have a monthly SNAP budget from the government. Eligible families can purchase foods such as fruit, vegetables, meat poultry, fish, dairy products, breads and cereals, other foods (e.g., healthy snack foods and non-alcoholic beverages), seeds, and plants from SNAP markets. In addition, these SNAP families have been educated about healthy eating patterns and healthy cooking technique⁷⁴.

In Turkey, developing SNAP like program that is regular monthly nutrient budgeting for individuals with low socioeconomic status, can contribute to the development of healthy generations and the development of the country's economy in the long term.

Especially, considering that socioeconomic status affects healthy nutrition, developing countries can be preparing monthly packages containing healthy foods for adolescents. Also, adolescents, their families, and their teachers should be constantly informed about healthy eating patterns.

Determining the nutritional status of adolescents and regulating their dietary habits are important to preventing disorders that can be caused by inadequate and unbalanced nutrition.

Diet quality indices can be used to determine the adequate and balanced nutritional status of adolescents. Therefore, more studies and projects should be carried out for adolescents. In addition, the development of a diet quality index specific to the food consumption and nutritional habits of Turkey may be more effective in showing diet quality and the factors affecting it. In this way, healthy nutrition programs which are designed by Turkey can be solved more nutrition-related problems. In addition, target-oriented studies can be carried out in adolescents.

Since nutrition affects physical and mental health especially in childhood and adolescence, the education, and practices on healthy nutrition at school can be beneficial for the developing health of future generations.

Since healthy generations contribute to the economy, workforce, development, and public health, studies on nutrition targeting adolescents should be carried out.

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7. APPENDİCES

7.1. Appendix 1. Ethical Approval

YEDİTEPE ÜNİVERSİTESİ



Sayı : 37068608-6100-15- 1829
Konu: Klinik Araştırmalar
Etik kurul Başvurusu hk.

05/03/2020

İlgili Makama (İrem Coşkun)

Yeditepe Üniversitesi Beslenme ve Diyetetik Bölümü Dr. Öğr. Üyesi Binnur Okan Bakır'ın sorumlu araştırmacı olduğu "Alanya'da Bir Kız Öğrenci Yurdunda Kalan Öğrencilerde Beslenme Eğitiminin Sağlıklı Yeme İndeksi Skoruna Etkisi" isimli araştırma projesine ait Klinik Araştırmalar Etik Kurulu (KAEK) Başvuru Dosyası (1812) kayıt Numaralı KAEK Başvuru Dosyası, Yeditepe Üniversitesi Klinik Araştırmalar Etik Kurulu tarafından 04.03.2020 tarihli toplantıda incelenmiştir.

Kurul tarafından yapılan inceleme sonucu, yukarıdaki isimi belirtilen çalışmanın yapılmasının etik ve bilimsel açıdan uygun olduğuna karar verilmiştir (KAEK Karar No: 1170).

Prof. Dr. Turgay ÇELİK
Yeditepe Üniversitesi
Klinik Araştırmalar Etik Kurulu Başkanı

7.2. Appendix 2. Informed Consent

Sayın Katılımcı ve Yasal ebeveyni,

Aşağıda detayları verilen çalışmaya katılmayı kabul ettiğiniz takdirde kabul ettiğinize dair imzalayarak lütfen ekteki anketi doldurup teslim ediniz.

İrem

Coşkun

Araştırmanın adı:

Araştırmanın Konusu: Ergen kadınlarda beslenme eğitiminin besin tercihlerine etkisi

Araştırmanın kapsamı: Ergenlik hayat döngüsünde kritik bir önem taşır. Bu dönemde bireylere sağlıklı beslenme alışkanlığı ve bilinci kazandırılması hem bireyin ileriki dönem sağlığını geliştirmek hem de toplumsal sağlığı geliştirmek açısından önemlidir. Birçok düşük ve orta gelirli ülkede ergen kızlarda kötü beslenme yaygındır ve bu durum hem kendi sağlıklarını hem de ileriki nesillerin sağlığını tehdit eder.

Araştırma yöntemi: Bu araştırma adolesan kadınların beslenme eğitimi öncesi ve sonrası besin tercihlerinin değerlendirilmesini sağlayan bir anket çalışmasıdır. Çalışma yüzyüze görüşerek soru sorma, kendi kendine cevaplanacak anket ve boy, kilo ölçümlerinden oluşmaktadır. Hiç bir girişimsel işlem içermemektedir. İsim bilgisi alınmayacak olup elde edilen bilgiler bilimsel paylaşım dışında hiç bir koşulda kullanılmayacaktır.

Araştırma Süresince 24 Saat Ulaşılabilecek Kişi Adı / Soyadı / Telefonu:

Bilgilendirilmiş Gönüllü Olur Formundaki tüm açıklamaları okudum. Söz konusu araştırmaya, hiçbir baskı ve zorlama olmaksızın kendi rızamla oğlumun/kızımın katılmasını kabul ediyorum.

Adı / Soyadı / İmzası / Tarih

Açıklamaları Yapan Kişinin Adı / Soyadı / İmzası / Tarih

Gerekliyse Olur İşlemine Tanık Olan Kişinin Adı / Soyadı / İmzası / Tarih

7.3. Appendix 3. HEI-2015

HEI-2015¹ Components and Scoring Standards

Component	Maximum points	Standard for maximum score	Standard for minimum score of zero
Adequacy:			
Total Fruits ²	5	□□□□□ Equivalent per 1,000 kcal	No Fruit
Whole Fruits ³	5	□□□□□ Equivalent per 1,000 kcal	No Whole Fruit
Total Vegetables ⁴	5	□□□□□ Equivalent per 1,000 kcal	No Vegetables
Greens and Beans ⁴	5	□□□□□ Equivalent per 1,000 kcal	No Dark-Green Vegetables or Legumes
Whole Grains	10	□□□□□□□□ Equivalent per 1,000 kcal	No Whole Grains
Dairy ⁵	10	□□□□□ Equivalent per 1,000 kcal	No Dairy
Total Protein Foods ⁴	5	□□□□□ Equivalent per 1,000 kcal	No Protein Foods
Seafood and Plant Proteins ^{4,6}	5	□□□□□ Equivalent per 1,000 kcal	No Seafood or Plant Proteins
Fatty Acids ⁷	10	(PUFAs + MUFAs) / SFAs □2.5	(PUFAs + MUFAs)/SFAs □1.2
Moderation:			
Refined Grains	10	□□□□□□□□ Equivalent per 1,000 kcal	□□□□□□□□ Equivalent per 1,000 kcal
Sodium	10	□□□□□□□□ per 1,000 kcal	□2.0 grams per 1,000 kcal
Added Sugars	10	□6.5% of energy	□26% of energy
Saturated Fats	10	□8% of energy	□16% of energy

¹ Intakes between the minimum and maximum standards are scored proportionately.

² Includes 100% fruit juice.

³ Includes all forms except juice.

⁴ Includes legumes (beans and peas).

⁵ Includes all milk products, such as fluid milk, yogurt, and cheese, and fortified soy beverages.

⁶ Includes seafood; nuts, seeds, soy products (other than beverages), and legumes (beans and peas).

⁷ Ratio of poly- and mono-unsaturated fatty acids (PUFAs and MUFAs) to saturated fatty acids (SFAs).

7.4. Appendix 24-hour Recall Questionnaire Method

ÖĞÜNLER	BESİNLER	MİKTAR	İÇİNDEKİLER
SABAHA Saat:			
ARA Saat:			
ÖĞLE Saat:			
ARA Saat:			
AKŞAM Saat:			
ARA Saat:			

Tüketilen su miktarı:..... su bardağı