

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

**INVESTIGATING THE IMPACT OF NUTRITION
EDUCATION GIVEN TO ADOLESCENTS
EXERCISE REGULARLY IN A PRIVATE SPORTS
CLUB BETWEEN THE AGES OF 10-16 ATHLETES'
NUTRITION KNOWLEDGE**

MASTER THESIS

NORA KUMRAL

ISTANBUL, 2022

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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 and numbered

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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.

NORA KUMRAL



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TABLE OF CONTENTS

THESIS APPROVAL FORM	ii
DECLARATION	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	v
LIST OF TABLES	vii
LIST OF FIGURES	viii
LIST OF SYMBOLS AND ABBREVIATIONS	ix
ABSTRACT	x
ABSTRACT (Turkish)	xi
1. INTRODUCTION	1
2. LITERATURE REVIEW	3
2.1. Adolescence	3
2.2. Metabolic and Physical Changes During Adolescence	6
2.3. Nutrition in Adolescence	8
2.3.1. Nutrient Element Need and Importance in the Adolescence	9
2.3.2. Food Groups Need and Importance in the Adolescence	14
2.3.3. Nutritional Health Disorders in Adolescents	15
2.4. Sport Nutrition in the Adolescence	18
2.4.1. Physical Activity and Importance in the Adolescence	19
2.4.2. Physical Activity and Energy Metabolism	20
2.4.3. Sport Nutrition and Importance in the Adolescence	24
2.4.4. Nutrition Before, During and After Training and Competition	30
2.5. Nutrition Knowledge and Nutrition Education	32
3. MATERIALS AND METHODS	34
3.1. Participants	34
3.2. Data Collection	34
3.2.1. Demographic information form	35

3.2.2. The nutritional knowledge questionnaire for adolescence	35
3.2.3. Food consumption frequency form	36
3.3. Statistical Analysis.....	36
4. RESULTS	37
5. DISCUSSION AND CONCLUSION	47
6. REFERENCES	56
7. APPENDICES	64
7.1. Ethical Approval	64
7.2. Rotary Sports Club Approval.....	65
7.3. Informed Consent Form.....	66
7.4. Questionnaire Form	68
7.5. Questionnaire Approve	72
7.6. Curriculum Vitae	73

LIST OF TABLES

Table 2.1.1. Distribution of population density of adolescent between the ages of 10-19 in Turkey by years according to the WHO	5
Table 2.3.1. Recommended daily energy calculation formulas for the adolescence	10
Table 2.3.2. Energy requirements for adolescents by age, gender and physical activity status	10
Table 2.3.4. Amount of vitamins to be recommended daily in adolescents	13
Table 2.3.5. Amount of minerals to be recommended daily in adolescents	13
Table 2.3.6. Standard Portion Sizes and Amount of Nutrients by Food Groups for Adolescents	15
Table 2.4.1. Amounts of energy spent on some activities	22
Table 2.4.2. Energy system and nutrition recommendations according to sports branches	29
Table 4.1. Demographic Characteristics	38
Table 4.2. Descriptive characteristics of participant for continuous variables	39
Table 4.3. Distribution of question and answers regarding general characteristics	40
Table 4.4. Distribution descriptive statistics of Nutrition Knowledge Score	41
Table 4.5. Distribution categorical frequency of before and after education Nutritional Knowledge Score	41
Table 4.6. The Nutritional Knowledge Questionnaire score at before and after education	42
Table 4.7. Result of paired sample test for Nutrition Knowledge score before and after the education	42
Table 4.8. Correlation of Nutrition Knowledge Score and some descriptive variable	43
Table 4.9. Dairy consumption food groups frequency (%)	45

LIST OF FIGURES

Figure 2.4-1. Energy sources used at different times during the activity	23
Figure 4-1. Daily consumption frequency of food groups	45
Figure 4-2. Daily consumption portion of food groups	46



LIST OF SYMBOLS AND ABBREVIATIONS

AI	Adequate Intake
ATP	Adenozin Trifosfat
BMI	Body Mass Index
DNA	Deoxyribonucleic acid
DRI	Dietary Reference Intake
g	Gram
kcal	Kilocalories
kg	Kilogram
mg	Milligram
PAL	Physical Activity Level
RDA	Recommended Dietary Allowances
RNA	Ribonucleic Acid
TÜBER	Turkey Nutrition Guide (Türkiye Beslenme Rehberi)
WHO	World Health Organization

ABSTRACT

Kumral, N. (2022). Investigating The Impact Of Nutrition Education Given To Adolescents Exercise Regularly In A Private Sports Club Between The Ages Of 10-16 Athletes' on Nutrition Knowledge Level. Yeditepe University Institute of Health Sciences, Nutrition and Dietetics, Master Thesis, Istanbul.

This study was conducted to evaluate impact of healthy nutrition education on adolescent athlete's the nutritional knowledge level and food consumption habits in Rotary 100. Year Anatolian High Schools Sports Club. 161 adolescent athletes (mean age 13.91 ± 1.8 ; Women:80, Men:81) voluntarily participated in the study. Demographic Information Form, Adolescent Nutrition Knowledge Questionnaire and Food Consumption Frequency Form were filled by the participants. The nutrition education was prepared on the basis of the Turkish Nutrition Guide (TÜBER-15) and the Nutrition Education Guide for Educators prepared by T.C. Ministry of Health was given to the athletes with face to face meeting. The same forms and questionnaire were applied to the participants again 2 months after the education. Statistical analyzes were made with the SPSS 22 program. No significant results were obtained between the participants age, BMI value and education level of the parents with nutritional knowledge level ($p > 0.05$). Nutritional knowledge levels of women were obtained to be statistically significantly higher than men both before and after education ($p < 0.05$). A statistically significant increased with the education given was found, between nutritional knowledge levels of the participants before nutrition education (29.49 ± 7.99) and after the education (34.37 ± 5.86) ($p < 0.001$). After the education, statistically significant changes were obtain in the consumption frequencies of the participants for certain food groups ($p < 0.05$). It has been determined that the frequency of consumption of food groups such as dairy products, eggs, vegetables, fruits and oil has increased, and pastry, packaged products, candy, fast-food and carbonated beverages has decreased. In addition, a statistically significant increases in the daily consumption food groups such as dairy products, legumes-nuts, vegetables, bread and cereals after the education ($p < 0.05$). As a result of study that nutrition education has a positive effect on the increase in the nutritional knowledge of adolescent athletes and the frequency and amount of consumption foods that are considered positive to be consumed.

Key Words: Nutrition education, Nutritional knowledge, Food consumption, Adolescent athletes

ABSTRACT (Turkish)

Kumral, N. (2022). Özel Bir Spor Kulübünde Düzenli Spor Yapan 10-16 Yaş Arası Adölesan Sporculara Verilen Beslenme Eğitiminin Beslenme Bilgi Düzeylerine Olan Etkisinin İncelenmesi. Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü, Beslenme ve Diyetetik, Yüksek Lisans Tezi, İstanbul.

Bu çalışma sağlıklı beslenme eğitiminin sporcu adölesanların beslenme bilgi düzeyine ve besin tüketim alışkanlığına olan etkisini incelemek amacıyla Rotary 100. Yıl Anadolu Lisesi Spor Kulübü'nde gerçekleştirilmiştir. Çalışmaya 161 sporcu adölesan (ortalama yaş 13.91 ± 1.8 ; Kız:80, Erkek:81) gönüllü olarak katılmıştır. Demografik Bilgi Formu, Adölesanlarda Beslenme Bilgisi Saptama Ölçeği ve Besin Tüketim Sıklığı Formu katılımcılar tarafından doldurulmuştur. T.C. Sağlık Bakanlığının hazırladığı Türkiye Beslenme Rehberi (TÜBER-15) ve Eğitimciler için Beslenme Eğitimi Rehberi esas alınarak hazırlanan beslenme eğitimleri sporculara yüz yüze toplantılarla verilmiştir. Katılımcılara aynı formlar ve ölçekler eğitimden 2 ay sonra tekrar uygulanmıştır. İstatiksel analizler SPSS 22 programı ile yapılmıştır. Katılımcıların yaşları, BKİ değerleri ve ebeveynlerinin eğitim seviyeleri ile beslenme bilgi düzeyleri arasında anlamlı bir sonuç elde edilmemiştir ($p > 0.05$). Kız sporcuların beslenme bilgi düzeyleri hem eğitim öncesi hem de sonrası erkeklerden istatistiksel olarak anlamlı bir şekilde yüksek bulunmuştur ($p < 0.05$). Tüm katılımcıların eğitim almadan önceki beslenme bilgi düzeyleri (29.49 ± 7.99) verilen eğitim ile istatistiksel olarak anlamlı bir şekilde artmıştır (34.37 ± 5.86) ($p < 0.001$). Eğitim sonrası katılımcıların çeşitli besin grupları için tüketim sıklıklarında istatistiksel olarak anlamlı değişiklikler saptanmıştır ($p < 0.05$). Süt ürünü, yumurta, sebze, meyve ve yağ gibi besin grupları tüketim sıklıklarında artma, hamur işi, paketli ürün, şekerleme, fast-food ve gazlı içecek gibi ürünlerin tüketim sıklıklarında azalma tespit edilmiştir. Ayrıca eğitim sonrası süt ürünü, kurubaklagil-sert kabuklu yemiş, sebze, ekmek ve tahıl gibi besin gruplarının günlük tüketim miktarlarında istatistiksel olarak anlamlı artış saptanmıştır ($p < 0.05$). Sonuç olarak çalışmamızda beslenme eğitiminin adölesan sporcuların beslenme bilgilerinde artışa ve dolayısıyla tüketilmesi olumlu olarak kabul edilen besinlerin tüketim sıklıkları ve tüketim miktarları üzerine olumlu etkiye sahip olduğunu göstermiştir.

Anahtar Kelimeler: Beslenme eğitimi, Beslenme bilgi düzeyi, Besin tüketim alışkanlığı, Sporcu Adölesanlar

1. INTRODUCTION

World Health Organization (WHO) define adolescence includes 10-19 aged person. It is a period of gradual transition from childhood to adulthood. This period are defined as early adolescence between the ages of 10/13-14/15, middle adolescence between the ages of 14/15-17 and late adolescence between the ages of 17-21. ¹ Adolescence is a process in which rapid growth and development are experienced, not only physiologically, but also biochemically, mental and socially. ² Adolescence begins with puberty. Puberty includes a physical development process in which the sex character is formed, the sexual organs develop, fertility is possible and the developmental attack begins. ³

All these changes require a special diet. It expressed to be a critical life period in terms of nutrition. The reason of this is the sudden increase in physical growth and development, socio-cultural factors, lifestyle changes and personality developments. All of these lead to the shaping of eating habits. ⁴ At these ages, which are prepared for adulthood, it is of great importance to meet the nutritional elements that the individual needs in the required amount with an adequate and balanced nutrition plan. Otherwise, it may cause slowdown in linear growth, stunting and delay in menarche, while at the same time it may cause chronic diseases such as diabetes, hypertension, obesity, coronary heart disease and liver diseases that can be experienced in adulthood. ^{5, 6}

Nutrition is particular importance for athletes as it can increase performance as well as maintain health. The energy and nutritional requirements vary of the athletes according to various factors, such as age, gender and the training intensity of the sports branch. Athletes whose requirement are meet and whose provide an adequate and balanced nutrition plan increase their performance, the effectiveness of the training, their attention and concentration reach the highest level, the probability of injury decreases, and the recovery time is shortened. In this way, they are ready for the next competition or training. ⁷ The main goal in sports nutrition; to meet the training demand by getting enough energy, to replenish the glycogen stores in the muscles and liver, to support growth and muscle repair, to provide a healthy immune system and to prevent dehydration with adequate fluid consumption. ⁸

Regular physical activity during adolescence is great importance because it supports growth and development, increases bone mineral density, reduces the risk of chronic diseases in adulthood and creates a more active lifestyle.⁹ While adolescents need more energy due to the highest level of growth and development, adolescent athletes need more energy than their peers. It should not be forgotten that all children and adolescents need a rich nutrition program and habits for their growth and development.¹⁰

Gaining healthy eating habits at an early age can only be achieved through nutrition education. It is best to education the athletes by experts in their work or dietitians.¹¹ Information about healthy food choices, adoption of a healthy life and formation of nutritional awareness are provided by nutritional interventions.¹² Yarar H. et al. (2011) investigated the nutritional knowledge and habits of elite athletes, and 56.5% of the athletes declared that they had sufficient knowledge about sports nutrition. Despite this, it was concluded that their knowledge about athlete nutrition is insufficient, they have partially wrong eating habits and they do not give enough importance to their nutrition even though they are national athletes.¹³

Consciousness of healthy nutrition in adolescent athletes is an important factor for them to become successful adult athletes in the future. The energy and nutrient requirements of adolescents who do sports are higher than those who not do sports and adults. It is very important to increase the nutritional knowledge level of adolescent's athlete with education.

Although studies evaluating the effect in nutrition education on nutritional habits and knowledge levels on school-age children are common, they are not common in adolescent athletes who do regular physical activity. In accordance with this information, in our study was aimed to evaluate the effect of nutrition education given to adolescent aged 10-16, affiliated with a private sports club, on the nutritional knowledge levels and consumption habits of athletes. Therefore, the data to be obtained from this study may contribute to the filling of the literature section on adolescent athlete nutrition. In addition, by revealing the benefits of nutrition education given to athletes at an early age, it is thought that the contribution of athletes to both their health and performance in sports will increase in the later years.

2. LITERATURE REVIEW

2.1. Adolescence

Adolescence is a process in which rapid growth and development occur not only physiologically but also biochemically, spiritually, and socially during the transition from childhood to adulthood.² The growth rate in this period performs the fastest growth spurt except for the first 0-1 year of human life.⁴ It is also characterized by identity development, adapting to physical changes, making plans for the future, and gaining independence. Adolescence begins with puberty. Puberty includes physical development in which gender characters emerge, sexual organs develop, reproduction is possible and the developmental spurt of the adolescent begins. The adolescent period, however, is the whole process in which the individual becomes psychologically mature and can undertake the responsibilities of an adult. In other words, puberty is a stage of the adolescent period.³ Depending on society, the rate of puberty may vary with the effect of various factors. This varies according to various cultural and physical characteristics such as race, genetic factors, climate, geography, and nutrition. Although it varies from country to country, this rate is the lowest in developed countries and the highest in developing countries.^{1, 3, 4}

While the term youth include 10 to 24 years of age, the World Health Organization (WHO) defines adolescence as between 10 to 19 years.¹ In girls, the growth spurt in the adolescent period usually starts with symptoms of growth in the chest and hip at the age of 10 and reaches the highest growth rate at the age of 12. In boys, the adolescent period begins with symptoms of hip shrinkage and muscle prominence around the age of 12, surpasses the girls within a year or two, and reaches its peak at the age of 14.^{2, 4} Although there are differences between societies, the average age of menarche (first menstrual cycle) is 12, that is, about 2-2.5 years after the onset of breast development. Girls who are taller and have a higher Body Mass Index (BMI) tend to be early adolescent and menarche, and this causes an increase in height below normal during adolescence. On the other hand, girls who are short in childhood tend to enter puberty late and experience menarche later.⁶

These physical, psychological, and social development processes, which show heterogeneity, are examined in 3 stages. Who groups Early Adolescents between the

ages of 10/13-14/15; Middle Adolescents between the ages of 14/15-17; Late Adolescents between the ages of 17-21. ¹

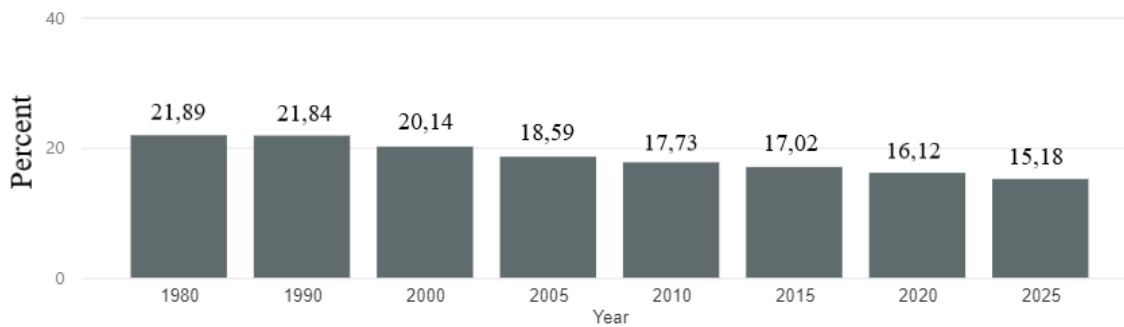
- Early Adolescent Stage: This stage started between the ages of 10-14, and physical and behavioral changes appear at this stage. Growth and development are faster in girls than in boys. This rapid change can cause a tendency to depression, anxiety, and eating disorder in girls. The most important thing for adolescents in this period is their appearance and emerging secondary gender characteristics. The end of childhood is when the perceptions of male and female identity begin.
- Middle Adolescent Stage: They begin to accept the changes in their bodies. They tend to make their families accept themselves, prove that they are a different individual, and turn outward. This causes conflict with parents. There is an increase in relations with the opposite sex compared to other stages. The most important thing that adolescents attach importance to in this period is the appreciation of their clothing style, appearance, and behavior by their friends due to a lack of self-confidence. During this period, they may acquire bad habits (smoking, alcohol, prohibited substances).
- Late Adolescent Stage: Growth and development have now been completed in this stage and adaptation to change has been achieved. Independence from the family was fully accepted and a sense of self-sufficiency prevailed. More social relations have started to be established with the environment. ¹⁴

According to the current data from the World Health Organization (WHO), the adolescent population (between the ages of 10-19) is more than 16% of the world's total population density. ¹⁵

In the report published in 2020 using the 2019 data of the Human Development Report of the United Nations Development Programme, 11.85% of the population of Norway, which is a country with a very high human development status, and 13.75% of the population of Ireland, which is the next country, are adolescents. Adolescents make up 23.21% of the population of Nigeria, a country with a low level of human development, and 26.06% of the Central African Republic, which has the largest population. In the same report, Turkey ranks 59th with its level of development and is in

the very high human development category. According to the report of the WHO, 15.93% of the general population of Turkey in 2021 consisted of adolescents between the ages of 10-19. This corresponds to the number of 13.547.194 people. ^{15, 16}

Table 2.1.1. Distribution of population density of adolescent between the ages of 10-19 in Turkey by years according to the WHO



With the decrease in fertility, the decrease in the adolescent population in Turkey shows the same parallelism with the world.

According to the results of the Address Based Population Registration System (ADNKS) of the Turkish Statistical Institute (TÜİK), those between the ages of 15-24 who are considered young constitute 15.4% of the population of Turkey as of the end of 2020. When Turkey was compared with the youth population rates of 27 European Union member countries, it has been seen that the population rate was higher. When these rates are examined, it is stated that the countries with the youngest population are Greece and Ireland with South Cyprus with 12.7%, Denmark with 12.5%, and the Netherlands with 12.3%, while the countries with the lowest youth population are Bulgaria with 8.8%, Czech with 9.0% and Latvia with 9.1%, respectively. Hakkari has the highest rate of young population in Turkey with 23.4% and Muğla has the lowest rate with 12.5%. ¹⁷

When we look at the adolescent rates in the population of the countries neighboring Turkey in 2021, 10.25% in Greece, 10.08% in Bulgaria, 12.09% in Georgia, 12.68% in Armenia, 13.38% in Azerbaijan, 14.08% in Iran, 21.65% of Iraq, 18.30% of Syria and 11.70% of Cyprus are adolescent. ¹⁵

2.2. Metabolic and Physical Changes During Adolescence

Physical growth and development of individuals in the adolescent period is the process in which they show the most significant acceleration except for the first year of their lives. At the end of this process, adolescents reach their adult-stage anthropometric body sizes. With physical growth, a significant increase is observed in the size of the internal organs and glands, as well as in bone, fat, and muscle tissues.¹⁸ More than 80% of adolescents' growth occurs during early adolescence between the ages of 10-15.⁴

The stage that lasts 2-3 years with the highest growth and development is called 'Growth Spurt'.¹⁴ The growth spurt is associated with cognitive, emotional, and hormonal changes. All these changes require special nutrition. In girls, the growth spurt in the adolescent period generally starts at the age of 10 and reaches the peak point at the age of 12, in boys; this spurt starts around the age of 12 and surpasses the girls within a year or two.⁴ Height increase during the growth spurt is at maximum speed. 20-25% of adult height is reached during this period and a height increase of 10 to 30 cm occurs in boys and 10 to 20 cm in girls.¹⁸ The increase in boys is about 10 cm per year.¹⁹ There is an average height difference of 12-13 cm between boys and girls. The reason for this is that the sexual development of adolescent boys is late than girls, the growth rate of girls reaches the peak point earlier than boys, and accordingly, the rate of height loss is higher in boys during the growth spurt. In physical growth, the feet and hands grow first, and then the legs and arms follow this. The increase in body length occurs one year after the legs.¹⁸

In the adolescent period, along with rapid physical change, there are also developments in the skeletal system. Approximately 37% of the total bone mass in adulthood is gained during the growth spurt, and the adequacy of the nutrients consumed during these periods is of particular importance to determine the risk of osteoporosis that may occur at later ages. Bone density does not increase after the age of 20.^{3, 18} At the end of the second 10 years of life, 90% of the total bone mass is gained. At the same time, boys develop a heavier skeleton and more red blood cell mass.⁴

In the adolescent period, 25-50% of the ideal weight in adulthood is gained. While there is an increase in their weight in both genders, there are differences in their compositions because boys gain more muscle mass than fat compared to girls, while girls gain more fat compared to muscle mass.⁴ However, an increase is observed in

both genders in both muscles and fat during this period. ¹⁸ Muscles, which make up 25% of the body structure in children, make up almost half of the body at the age of 16. The most prominent muscle development in girls is between the ages of 12 and 15, and in boys, this development occurs between the ages of 15 and 16. ¹⁹

In the pre-pubertal period, the muscle and fat ratios of boys and girls are similar and the lean body mass is equal in both genders. ⁴ With puberty, the breasts and hips become prominent in girls, especially in the abdomen and hips, while the fat tissues increase, the pelvic bones also begin to expand. ¹⁹ The change in adipose tissue, which is one of the body composition changes, especially subcutaneous adipose tissue, increases by 23% in girls and decreases by 12% in boys. ²⁰ With puberty, the changes in men shrinkage of the hips, growth of the body muscles, and a lower-fat appearance. ¹⁹ The normal percentage of body fat in adults is about 23% for women and 15% for men.

4

During the adolescent period, several hormonal changes occur as well as physical changes. However, there is a regression in the lymphoid tissues (thymus, tonsils, adenoids) of individuals. In puberty, sex hormones that have never been secreted begin to be secreted. Growth in the reproductive system develops rapidly with sexual maturation. ²⁰

In boys; one of the features that determine adolescence in men is the formation of a male-specific voice and the development of the larynx with the cracking voice. With the formation of fat on the skin, pimple formation begins. Sexual development, which starts with hormonal changes secreted with puberty, causes growth in the testicles and male-specific hair in the genital area, breasts, and legs, and the formation of a mustache and beard. The height increase spurt is about a year or two after the testicles begin to grow. As the production of androgen secretions increases, the mature penis and testicles begin to produce sperm. However, the production of sex steroids, which are testosterone, also increases. ^{19, 21, 22} Sexual development in boy starts between the ages of 9.5-13.5 and continues for 2-5 years. ¹⁴

In girls, the sexual development process, that is, puberty begins with the development of the breast called telarchy. Approximately 2 years after the onset of breast growth, egg production begins in the ovaries, and menarche (first menstrual bleeding) is observed. The average menarche age is between 9-17 years and varies depending on race, socioeconomic status, nutrition, and genetic and cultural characteristics. ¹⁴ In girls, hairs mainly occur in the pubarche and under the armpit.

Estradiol production, which is one of the sex steroids, increases in girls.^{21, 22} These sexual developments are between the ages of 9-13, and the development of breasts, uterus, ovaries, vagina, and clitoris takes an average of 4 years.¹⁴

As head and brain growth reached 96% of adult values around the age of 10, there are no significant changes during puberty, but it is partly shaped by social, emotional, and behavioral exposures. In addition to physical changes, adolescence is also a period in which the brain develops adult abilities and skills necessary for target-driven behavior. During early adolescence, the brain experiences significant cell growth that affects how emotions are organized, how information is processed, and how decisions are made. With these psychological changes, the adolescent can make an effort to create his/her own self and make the family accept him/herself.¹⁹ These changes increase the capacity for greater social and emotional participation and shape the orientation of adolescents towards peer-based interactions, including increased exploration, experimentation, thrill-seeking, and risk-taking^{6, 20}

The right habits gained during this period last a lifetime and determine their own characteristics. Therefore, the correct eating habits to be acquired in this period are of particular importance as they will affect their health throughout their lives.

2.3. Nutrition in Adolescence

Nutrition is a behavior that needs to be done consciously to conserve and improve health and improve the quality of life and receive the nutrients needed by the body in sufficient amounts and at appropriate times. When any of these elements are not taken, or taken more or less than necessary, it has proven that growth and development are hindered and health is deteriorated.²³ Adequate and appropriate intake of each of the energy and nutrients required for body growth, regeneration, and health protection is expressed as “Adequate and Balanced Nutrition”.²⁴ An adequate and balanced diet should cover all the nutrients required for the individual in the required quantities. The most important diseases indirectly caused by nutritional deficiency and imbalance are infectious diseases, arteriosclerotic heart diseases, diabetes, hypertension, obesity, dental caries, and liver diseases.⁵ It is of great importance to raise awareness of healthy nutrition through nutrition education for the prevention of unbalanced nutrition.²³

Adolescence, which is the transition period from childhood to adulthood, is an important process to prevent the occurrence of chronic diseases that may occur due to nutrition in adulthood with the importance given to health.¹ Good nutrition during adolescence is critical to cover deficiencies in the first 10 years of infancy and childhood.⁴ Healthy lifestyle behaviors that are effective in improving health are acquired in this period. This period determines how the individual will become an adult in the future. Therefore, it should be considered a priority group in terms of public health.²⁰

In the pre-adolescent period, the eating habits of individuals are mostly shaped by the foods given by the family and the eating habits they obtain from the family, and what, when, and where they eat.^{1, 18} However, with the transition to adolescence, the child, who starts to make more individual decisions and moves away from the supervision of the family, starts to spend more time outside with his/her friends and takes them as role models. They can transform these behaviors into habits by directly affecting their growth and development with the wrong choices they make. Nutrition education should be given to adolescents for the choices to be correct. In a study conducted on young people, it was found that there was a significant relationship between insufficient vegetable and fruit consumption and poor family communication, excessive television watching, computer use, and low nutritional knowledge.¹⁸

More than 80% of growth and emotional and hormonal changes occur in the adolescent period. All these changes need a special nutritional plan.⁴ When an adolescent's general energy and nutrient needs are not met, linear growth may slow down, shortness may occur, and sexual development and menarche may be delayed. During adolescence, both macro- and micro-nutrient requirements increase, and meeting the requirement is of great importance.⁶

2.3.1. Nutrient Element Need and Importance in the Adolescence

Due to the growth spurt that develops with the adolescent period, energy increases in parallel with the need for proteins, carbohydrates, fats, vitamins, and minerals.

- Energy Requirement - During growth and development, the body consumes more energy by working more than in other periods of life, however, adolescent basal metabolism also accelerates, which increases the need for energy.²⁰

Gender and age are the leading factors that determine the nutritional needs of adolescents. The development and changes of the adolescent age group differ in both genders. ²⁵ It is stated as the cause of the excess energy requirement in men since the muscle mass is higher in boys than in girls. ²⁰ Calculation formulas of energy requirements by gender for adolescent age groups are given in Table 2.3.1.

Table 2.3.1. Recommended daily energy calculation formulas for the adolescence

Age (year)	Men	Women
10-12	$26.5 \times W^* \times 1.75$	$33.0 \times W \times 1.64$
12-14	$32.5 \times W \times 1.78$	$25.5 \times W \times 1.55$
14-16	$29.5 \times W \times 1.60$	$26.5 \times W \times 1.55$
16-18	$27.5 \times W \times 1.60$	$25.5 \times W \times 1.53$

* Ideal Weight
Source: ¹⁸

Although energy requirement is related to age, gender, body weight, and pubertal development, it also varies from person to person according to the degree of physical activity. Changes in energy requirements according to age, gender, and physical activity status of the Türkiye Beslenme Rehberi (Turkish Nutrition Guide - TÜBER) ²⁶ published by the Turkish Ministry of Health are given in Table 2.3.2.

Table 2.2.2. Energy requirements for adolescents by age, gender and physical activity status

	Sedentary		Medium Active		Active	
1600 kcal	M:10 age	F: 10-11 age				
1800 kcal	M:11-12age	F: 12-14 age	M:8-10 age	F: 10-11 age		
2000 kcal	M:13 age	F: 15-18 age	M:11-12age	F: 12-14 age	M:8-10 age	F: 9-11 age
2200 kcal	M:14 age		M:13 age	F: 15-18 age	M:11 age	F: 12-13age
2400 kcal	M:15-16age		M:14 age		M:12 age	F: 14-16age
2600 kcal	M:17-18age		M:15 age		M:13 age	F: 17-18age
2800 kcal			M:16-17age		M:14 age	
3000 kcal			M:18 age		M:15-16age	
3200 kcal					M:17-18age	

Kcal: Kilo calorie; M: male; F: female
sedentary: PAL=1.4; Medium Active: PAL=1.6; Active: PAL=1.8
PAL: Physical activity level
Source: ²⁶

The daily recommendations of Dietary Reference Intake (DRI) for adolescents are 2279 kcal for boys aged and 2071 kcal for girls between 9-13, 3152 kcal for boys, and 2368 kcal for girls aged 14-18. ²⁷

It is necessary to distribute the energy to be taken in a ratio that supports growth and development. 10-20% of the total energy should be met from protein, 50-60% from carbohydrates, and 25-35% from fat. ²⁴

- **Protein Requirement** - After the proteins in the structure of foods are digested, they are divided into base elements called amino acids. The fragmented protein molecules are transported by blood and reach the liver. In the liver, tissue proteins are produced from amino acids. Proteins are not stored in the body, they form the main structure of cells. Cells wear out and die over time and replace them with new ones. Proteins are one of the most important nutrients for growth and development due to the increase in muscle mass, the need for erythrocytes and myoglobin, the presence of enzymes and hormones that regulate body structure and important hormonal changes in this period due to the highest level of the growth spurt in the adolescent period. ^{20, 24} Due to such physiological and metabolic changes, the individual's protein requirement reaches the highest level and the requirement is higher in girls between the ages of 11-14 compared to boys, while it is higher in boys between the ages of 15-18. ⁴ The daily protein requirement of adolescents is approximately 45-60 g. Sufficient intake is met with 0.8 g/kg/day in girls and 1 g/kg/day in boys. ²⁸ When enough protein is not taken according to the age requirement, it may cause retardation in linear growth and sexual maturation, shortness, decrease in lean body tissue and muscle mass. ^{4, 28}
- **Carbohydrate Requirement** - While most of the daily energy used in the body is met from carbohydrates, this need increases with growth and development. After the carbohydrates are digested, they are divided into small molecules called glucose. Increased excess glucose from instantaneous energy use is stored as glycogen in the liver and muscles and is converted back into glucose and mixed into the blood when needed. ²⁴ In the consumption of carbohydrate products, complex carbohydrate and fiber consumption is important for a balanced diet. The daily amount of fiber is recommended as 12-24 g. ¹⁸ At the same time,

WHO has suggested that the amount of added sugar (sucrose-fructose) should be less than 10% of daily energy intake. ²⁹

- **Fat Requirement** - On average, 18% of the adult body consists of fats. Fat mass in the female body is usually higher than men have. After the fats are digested, they break down into fatty acids. It is the most energizing nutrient and is stored, and these stores are used when the energy is not sufficiently taken. In particular, stored fats and subcutaneous adipose tissues are important for maintaining body temperature. Since fats are an intensive source of energy, unconscious and excessive restrictions on fat intake cause energy deficiency, the use of proteins for this purpose, and growth and negative effect on the development. Some of the vitamins are dissolved in fat and are included in the metabolism, at the same time fats are involved in the production of hormones involved in the regular work of the body. ^{20, 24} Saturated fatty acids should not exceed 10% of the total intake of fats. Cholesterol intake should also be less than 300 mg/day. ³⁰ Many studies have proven that there is a relationship between the amount of saturated fat taken in the diet, the excess serum cholesterol level, and cardiovascular diseases. Nutritional habits in adolescence are the basis of diseases in adulthood.
2
- **Vitamin and Mineral Requirements** - Although vitamins and minerals are scarce in the body, their effects are quite high. Some are the basis of the body and others play a regulatory role in chemical events. ²⁰

With the increased energy requirement, the body needs more thiamine, riboflavin, and niacin to produce energy from carbohydrates.

An increase in tissue synthesis with a growth spurt, folic acid, and vitamin B₁₂ requirements for DNA and RNA metabolism increase.

With the increase in skeletal and bone mass, the need for vitamin D, calcium, and phosphorus increase for dental health.

The need for iron, which plays a role in the increase in blood volume and skeletal development, increases. At the same time, the needs of girls increase due to the menstrual cycle. The need for vitamin C increases to increase iron absorption.

The need for vitamins A, C, and E increases to maintain the structural and functional functions of the newly formed cells, prevent cell damage, and remove harmful substances from the body.

The need for zinc increases for growth, height increase and sexual development.

20, 24, 31

The recommended daily micronutrient intake amounts for the adolescent age period are given in detail in Table 2.3.4 and Table 2.3.5 according to age and gender differences.

Table 2.3.3. Amount of vitamins to be recommended daily in adolescents

	Women		Men	
	9-13 age	14-18 age	9-13 age	14-18 age
A vitamin (µg/day)	600	700	600	900
C vitamin (mg/day)	45	65	45	75
D vitamin (µg/day)	5	5	5	5
E vitamin (mg/day)	11	15	11	15
K vitamin (µg/day)	60	75	60	75
Thiamine (mg/day)	0,9	1,0	0,9	1,2
Riboflavin (mg/day)	0,9	1,0	0,9	1,3
Niacin (mg/day)	12	14	12	16
B6 vitamin (mg/day)	1,0	1,2	1,0	1,3
Folate (µg/day)	300	400	300	400
B12 vitamin (µg/day)	1,8	2,4	1,8	2,4
Pantothenic acid (mg/day)	4	5	4	5
Biotin (µg/day)	20	25	20	25
Choline (mg/day)	375	400	375	550

Table 2.3.4. Amount of minerals to be recommended daily in adolescents

	Women		Men	
	9-13 age	14-18 age	9-13 age	14-18 age
Calcium (mg/day)	1300	1300	1300	1300
Chromium (µg/day)	21	24	25	35
Copper (µg/day)	700	890	700	890
Fluorine (mg/day)	2	3	2	3
Iodine (µg/day)	120	150	120	150
Iron (mg/day)	8	150	8	11
Magnesium (mg/day)	240	360	240	410
Manganese (mg/day)	1,6	1,6	1,9	2,2
Molybdenum (µg/day)	34,0	43	34,0	43
Phosphorus (mg/day)	1250	1250	1250	1250
Selenium (µg/day)	40	55	40	55
Zinc (mg/day)	8	9	8	11

Recommendations for adolescents of Dietary Reference Intake (DRI) and Adequate Intake (AI); Calcium intake of 1300 mg/day between the ages of 9-18, Iron intake of 8 mg/day between the ages of 9-13, 11 mg/ day in boys between the ages of

14-18 due to menstruation 15 mg/day. Zinc intake is 8 mg/day in 9-13 years old, 11 mg/day in 14-18 years old boys, and 9 mg/day in girls. Vitamin A intake is 600 µg/day in 9-13 years of age, 900 µg/day in 14-18 years of age in boys, and 700 µg/day in girls. Vitamin E intake is 11 mg/day between the ages of 9-13, and 15 mg/day between the ages of 14-18. Vitamin C intake is 45 mg/day in 9-13 years old, 75 mg/day in 14-18 years old boys, and 5 mg/day in girls. Folate intake is recommended as 300 µg/day between the ages of 9-13 and 400 µg/day between the ages of 14-18.³²

When all necessary nutrients are taken together, the body can maintain normal growth and development, and healthy and strong functioning.

2.3.2. Food Groups Need and Importance in the Adolescence

The recommended amount of nutrients in the basic nutritional group should be consumed for adequate and balanced nutrition.

- **Milk Group;**

This group includes foods such as milk, yogurt, ayran and cheese in this group. Important nutrients it contains; Protein, calcium, phosphorus, riboflavin, and vitamin B₁₂. The milk group, which is rich in calcium, plays an important role in bone and dental health development and cell work.

- **Meat-Egg-Legume-Nut Group;**

This group includes foods such as meat, chicken, fish, eggs, beans, chickpeas, lentils, walnuts, hazelnuts, and almonds. Its nutrients are protein, iron, zinc, phosphorus, magnesium, B₆, B₁₂, B₁, and A vitamins and fiber. It includes nutrients involved in cell regeneration, tissue repair, visual function, and blood production. Most of the nutrients involved in nervous, digestive, immune system, and skin health are included in this group.

- **Vegetable and Fruit Group;**

This group includes all kinds of edible parts of plants, vegetables with dark green leaves, starchy vegetables, red-orange-purple vegetables, vegetable juices, all fruits, dry fruits, and fruit juices. The nutrients it contains are folic acid, vitamin A, E, C, B₂, beta-carotene, calcium, potassium, iron, magnesium, fiber, and other antioxidant compounds. They help the growth and development of cell regeneration and tissue repair. They protect the health of teeth, gums, skin, and eyes. They are rich in elements

that help immunity and boost blood production. It gives a feeling of saturation with the amount of fiber it contains, allowing the intestines to work regularly.

- Bread and Grain Group;

This group includes foods such as wheat, flour, bulgur, pasta, cracked wheat, rice, corn, rye, oats, and pastry. The nutrients it contains are important for health in terms of containing vitamins, minerals, fiber, protein, and fat. Vitamin E, A, B₁₂, B₁ (thiamine), folic acid, beta-carotene, calcium, potassium, iron, magnesium, fiber, and other antioxidant compounds. It is a good source of the vitamin B group. It is intestinal friendly with its richness in terms of fiber. ³³

The daily and weekly nutrient amounts of the adolescents living in Turkey according to gender and age are stated in Table 2.3.6.

Table 2.3.5. Standard Portion Sizes and Amount of Nutrients by Food Groups for Adolescents

Food Groups	Total Portion Frequency	11-14 Age		15-18 Age		Standard Portion Size (g)
		Women	Men	Women	Men	
Milk-Yogurt	Daily	3	3	3	3	240
Cheese						50
Meat, Chicken	Daily	¾	¾	1	1¼	80
Egg	Daily	½	½	½	½	100
Fish	Weekly	2	2	2	2	150
Legumes	Weekly	3	3	3	3-4	60
Nuts	Daily	½	½	½	1	30
Bread, Cereals	Daily	4-4½	4½ -5	4-5	7-8	30-50
Vegetables	Daily	2-2½	2-2½ -3½	3½	3½ -4	75-150
Fruit	Daily	2-2½	2½	2½	2½ -3	150
Oil	Daily					30-40

Source: ²⁶

2.3.3. Nutritional Health Disorders in Adolescences

Inadequate and unbalanced nutrition intake in the adolescent period forms the basis of health problems that may be experienced in adulthood. Anemia due to iron and B₁₂ deficiency, growth retardation due to zinc and calcium deficiency, extreme weakness, eating disorders (bulimia, anorexia neurosis), obesity, dental caries, acne vulgaris, depression, polycystic ovary syndrome are health problems that can be seen in this period. ^{14, 31}

- Iron Deficiency Anemia;

According to WHO, anemia is a common public health problem that leads to an increase in mortality and morbidity, especially in children and pregnant women.³⁴ Iron deficiency occurs when the total amount of iron in the body falls below the normal level and iron anemia occurs with the depletion of iron stores in the later stages.¹⁹ According to diagnostic criteria of WHO, anemia is defined as a hemoglobin level below over 15 years of age 13 g/dl in boys, 12 g/dl in girls, and 11 g/dl in children and pregnant women.¹⁴ Anemia due to iron deficiency is common in infants aged 6-24 months, in women of childbearing age, and in school-aged children and adolescents. In developing countries, 3.5 billion people have anemia due to iron deficiency. Anemia affects growth in infants and children and reduces resistance to infections. Babies are born with enough iron reserves for the first 4-6 months, and nutritional methods are very important for the continuity of these reserves.³⁴ Due to the increase in blood volume and muscle mass during the adolescent period, the need for iron is even higher in girls who start their menstruation period compared to boys.¹⁹ In this period, deficiency symptoms are fatigue, attention deficit, difficulty in focusing on lessons, low working capacity, negative impact on physical and mental development, susceptibility to infections, weakness in the immune system, and low intellectual performance.^{19, 25}

- Iodine Deficiency (Goiter)

The body's need for iodine is very small, but this amount is very important for life. Iodine is necessary for the production of thyroid hormones in the thyroid gland. These hormones pass into the blood and control various functions in the body. The tasks of thyroid hormone include ensuring normal growth and development, ensuring the normal functioning of the nervous system and brain, regulating body temperature, and controlling body energy. The most negative and destructive effects of iodine deficiency are observed in women of childbearing age, pregnant women, infants, and children.³⁵ Growth and developmental retardation in iodine deficiency in children, preventable mental retardation, 13.5 points decrease in IQ test compared to their peers, decrease in learning ability and school success, risk of miscarriage and stillbirth during pregnancy and goiter disease are some of the important health problems.¹

- Zinc Deficiency

In the adolescent period, linear growth may slow down due to nutrient deficiencies as a result of insufficient and unbalanced nutrition; these are caused by iron, vitamin A and zinc deficiency.¹ Zinc is found in the structure of more than 100 enzymes. The immune system is essential for wound healing, senses of taste and smell, DNA synthesis, and normal growth and development.²⁵ Inadequate zinc intake limits skeletal development, especially in infants, children, and adolescents. Therefore, it may cause stunting in this period, and studies are showing that this is more common in men.

¹ Especially in adolescent girls, due to the importance, they attach to their external appearance and body perception during this period, they may have unbalanced restrictions and changes in their diet. In this respect, female adolescents are at risk.²⁵ In Canada, iron and zinc intake has been reported to be well below optimal levels in adolescent girls consuming vegetarian or omnivorous diets.¹ Another group at risk for zinc deficiency is breastfeeding mothers. It should not be ignored that zinc deficiency negatively affects fetal growth in our country, where adolescent pregnancy is still high.²⁵ It is effective on bone mass and density while supporting growth attack in adolescent girls and boys with adequate zinc intake and supplements. In this way, the loss of bone structure that can be seen at later ages is prevented. Zinc supplemented bread was tested in a case-control study on school-age children in Turkey with low serum zinc levels. Positive results showing satisfactory zinc bioavailability have been reported.¹

- Eating Disorders;

Eating disorders have both physical and psychosocial dimensions and cause disorders in one's thoughts and eating behaviors related to body weight and physical appearance.¹⁹ The causes of this disorder include obesity, the progression of obesity, environmental pressure to be weak, dissatisfaction with the body, desire to diet, and weak body perception due to adolescence.³¹ Eating disorders are mostly seen during adolescence and especially in girls, the most common psychological disorders are anorexia nervosa and bulimia nervosa.¹⁴ The prevalence of eating disorders is 5.7% - 15.2% in females and 2.9% -1.2% in males. As a result, eating disorders in adolescents stop or slow down healthy growth and development and increase the risk of diet-related diseases.³⁶

- Dental Caries

The main reason for dental caries, which is frequently seen in adolescence, is the high consumption of sugar and sugary drinks.³¹ Apart from this, insufficient fluoride in water, insufficient calcium consumption, and insufficient oral and dental health care also cause dental caries.¹⁹

- Obesity

Obesity is defined by WHO as “abnormal or excessive fat accumulation in the body to the extent that it will impair health”. As in the whole world, overweight and obesity have become a serious public health problem in children and adolescents in our country. The WHO stated that one out of every four children in the European Region is in a state of obesity. Adolescent obesity is known to be associated with overweight and obesity in adulthood. However, the health problems that may be experienced are listed as insulin resistance, hyperinsulinemia, type 2 diabetes, hypertension, liver fattening, metabolic syndrome, menstrual irregularities, excessive hair growth, orthopedic problems, and some mental health disorders. To protect against all these non-communicable chronic diseases, the prevention of adolescent obesity is of great importance. According to the Project Research Report on Monitoring Growth in School-Aged Children in Turkey (TOÇBİ 2009), 14.3% of the children in the 6-10 age group in Turkey are overweight and 6.5% are obese. While the incidence of obesity is 7.5% in boys and 5.4% in girls, the rate of being overweight is 15.1% in boys and 13.1% in girls.³⁷

2.4. Sport Nutrition in the Adolescence

The human body was created to be physically active. Throughout history, the survival of the human species depended on hunting or gathering food resources, seeking physical activity that was long-lasting and often tiring. The emergence of mechanization and modern technology in the last few decades has caused the human race to become more immobile than ever before, and we are paying the price with our health.

There is much research evidence showing gradually decreasing levels of physical activity in human life in both developed and developing countries. Physical inactivity is widely accepted as an important risk factor for chronic diseases. In the past, while children spent most of their free time in outdoor active games, with the

emergence of television, computer games, and the internet, there was an increase in the time spent idly by children.³⁸ This increase in sedentary time increases the incidence of diseases such as obesity, cardiovascular diseases, hypertension, diabetes, and osteoporosis.⁹ Physical activity in children and adolescents causes improved physical health (heart, respiratory, and muscle health), cardiometabolic health (blood pressure, dyslipidemia, glucose, and insulin resistance), bone health, cognitive health (academic achievement), mental health (decreased symptoms of depression) and decreased fat.³⁹

Let's explain the definition of some concepts and terms:

Physical Activity: It covers all activities that occur with energy expenditure by using muscles and joints in daily life, increasing heart and respiratory rate and resulting in different severity and intensity.⁹

Physical Activity Dose: It is the combination of frequency, intensity, duration, and type of activity.

Exercise: Physical activities that are regular, planned, repetitive, and purposeful are defined as exercise.

Physical Fitness: daily vital activities provide a degree of protection against chronic diseases and a basis for participation in sports. It is about how well the person performs the physical activity. The dose of physical activity can gradually increase without overload to improve. Physical fitness must be evaluated by a physician before starting exercise and sports.³⁸

Sports: It is defined as the whole of physical activities carried out to maintain or improve physical fitness through temporary or organized participation.³

2.4.1. Physical Activity and Importance in the Adolescence

There is an almost linear relationship between the amount of physical activity performed and health status, for example, physically active individuals have a low risk of chronic disease. Physical inactivity is highly likely to contribute to increased obesity appearance, increased insulin resistance, irregular lipid profile, high blood pressure, and increased prevalence of type 2 diabetes in children and adolescents. Generally, cardiovascular diseases are not related to youth. However, studies have shown that if adolescents have low physical activity and low cardiovascular (aerobic) endurance, they are more likely to develop cardiometabolic risk factors such as lower good cholesterol levels (high-density lipoprotein cholesterol, HDL), higher blood pressure, high insulin

levels, and excessive fat. Physical activity is also important for the psychological health of children. Reduced anxiety, stress, and depression are associated with higher self-esteem, improved cognitive function and social interaction, and academic achievement.

38

Since bone development is not yet complete, weight-lifting sports and overloads are not recommended in the adolescent period. Therefore, the physical capacity of the person should be known, and unnecessary strain should be avoided. Tension and compression force formed as a result of muscle contraction and stretching stimulates growth plaques in adolescents and provides healthy and strong development of bone tissue. At the same time, as a result of regular activity, skeletal muscle fibers develop, and the strength of the muscle increases. The purpose of physical exercise in adolescence is to feel healthy and good, to provide growth and development, to adopt an active lifestyle in adulthood, to increase bone mineral density, to reduce the risk of osteoporosis in the future, to reduce the incidence of overweight and obesity and the risk of chronic diseases in adulthood.⁹

It should be kept in mind that physical activity must be regular to have a beneficial effect on health. It is wiser to do a moderate physical activity all or most days of the week than to do intense physical activity in a short time.³⁸ The World Health Organization (WHO) has stated that children and adolescents should have moderate to intense and mostly aerobic physical activity for at least 60 minutes a day during the week. In addition to intense aerobic activity at least 3 days a week, it is recommended that it be included in activities that strengthen muscle and bone.³⁹ Adolescents who have grown up with confidence in their physical skills and bodies since their school years and have positive physical activity experiences are more likely to be active in adulthood.³⁸

2.4.2. Physical Activity and Energy Metabolism

Adequate and balanced nutrition means taking the necessary amounts of energy and nutrients from each of the energy and nutrients sources for the growth, regeneration, and proper functioning of the body in the adolescent period as well as in every age period. Adequate and balanced nutrition is essential in protecting the health and preventing diseases.²⁴ An imbalance in energy intake can be seen in every age group,

that is, the energy received is more than the energy spent causes obesity, and the energy received is less than the energy spent causes weakness. In athletes, an adequate and balanced diet plan does not make an average athlete elite, but an inadequate and unbalanced diet can reduce elite athletes to an average level as it may cause some health problems and poor performance.^{7, 40}

To ensure adequate and balanced nutrition, it is first necessary to determine the daily energy need. It varies depending on factors such as gender, age, height, weight, and amount of adipose tissue, amount of lean tissue, type, severity, and frequency of exercise.⁷

Energy balance is expressed as Energy in = Energy out. It means that the energy consumed by the energy received is in balance. Food is the only factor affecting energy intake. Consuming energy also includes components such as basal metabolism, the thermal effect of foods, and physical activity. It indicates the amount of energy that our body needs daily in the energy spent on these components.

Daily Energy Requirement = Basal Metabolic Rate (70%) + Physical Activity (20%) + Thermogenesis (10%)

Basal Metabolism: It is the energy spent by the body while resting, for the organs to work, that is, to breathe, for blood circulation in the body, for the food to move for digestion, for the absorption of nutrients, for the transmission of nervous system signals and to maintain body temperature. It is affected by age, gender, genetics, body composition (especially skeletal-muscle mass), ambient temperature, exercise, diet content, caffeine and smoking, and some hormones (thyroid).⁸

Physical Activity: It is the energy spent in exercise and sports during the day. It varies depending on the dose of physical activity. In elite athletes, the energy spent by physical activity reaches 30-35%.

Thermogenesis: It refers to the thermal effect of foods, that is, energy spent by digestion and absorption.⁴¹

The amount of energy spent varies according to the type and intensity of the exercise. (Table 2.4.1)

Table 2.4.1. Amounts of energy spent on some activities

Type of activity	Kcal/kg/h	Type of activity	Kcal/kg/h
Sleep	1.2	Slow running	7.0
Desk work	1.8	Football	7.0
Walking traveling(<3.2 km/h)	2.0	Aerobic exercise (high level)	8.0
Meal preparation, cooking	2.5	Bicycle (19-22.3 km/h)	8.0
Aerobics (low level)	3.0	Swimming (intermediate)	8.0
Bicycle (<16 km/h)	4.0	Running (9.5 km/h)	10.0
Brisk walking (5.6 km/h)	4.0	Running (11.2 km/h)	11.5
Gardening	5.0	Running (16 km/h)	16.0
Tennis	6.0		

Source: ⁴²

Any muscle needs the energy to work. Therefore, the primary energy form used by the body in chemical form, namely adenosine triphosphate (ATP), a high-energy phosphate compound, is required. When the body's energy demands increase during the activity, the body uses three different energy systems to transfer the stored energy to ATP: the phosphogenic system, anaerobic glycolysis/lactic acid system, and aerobic system (Figure 2.4-1).

The Phosphogenic System uses phosphocreatine stored in muscle cells to directly produce ATP and is primarily used for very short-term and high-intensity exercises such as sprinting, high jumping, or rapid weight lifting. This system can only provide enough ATP to support activity that lasts less than 20 seconds.

Anaerobic Glycolysis System is a fuel provider for short-term and intensive activities. (20 to 45 seconds and above) ⁴³ ATP production is relatively rapid but limited due to lactate accumulation, cell pH relationship, and muscle fatigue. It is also advantageous because it does not require oxygen. ⁸

Aerobic System is a system that needs oxygen to produce ATP through the oxidation (oxidative phosphorylation) of carbohydrates, fats, and proteins. ⁴³ ATP production is unlimited, but it is slower than other systems due to chemical steps and

the need for oxygen. As a result of protein metabolism, a very small amount of energy is usually released, which occurs in exceptional cases such as hunger. 85% of the body's energy expenditure during the resting process is met by fat metabolism. The use of carbohydrates and fat as an energy source may vary depending on the content of the previous diet, and the intensity, and duration of the activity. Carbohydrates become the dominant source of fuel as the intensity of exercise rises above moderate levels. ⁸ This system is valid for low-intensity activities lasting more than 45 seconds. ⁴³

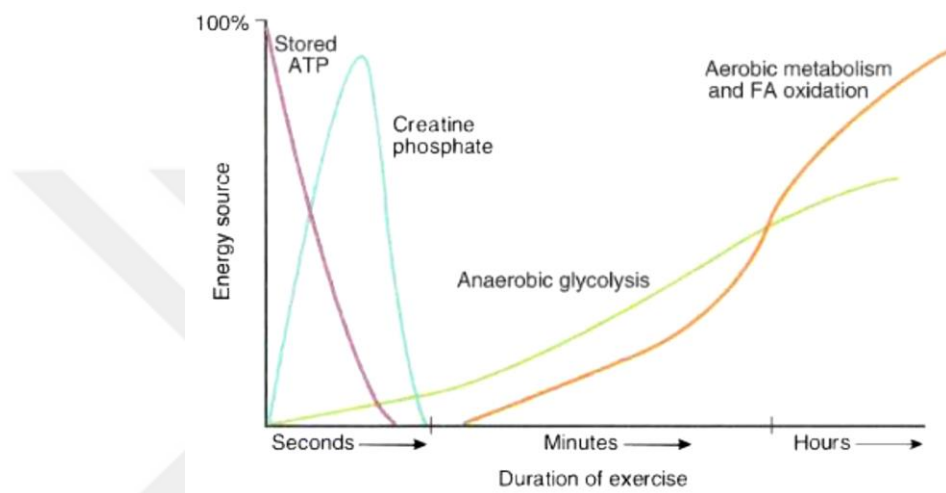


Figure 2.4-1 Energy sources used at different times during the activity

Each of these energy systems is always active. However, one of the systems may be the dominant energy source for ATP regeneration, depending on various factors related to the energy need such as the duration, intensity, and force requirements of the activity. ⁸ The sports branches, which are similar in terms of energy systems and energy use, are grouped under three groups; endurance sports, power/strength sports, and team sports (high intensity-intermittent). ⁴⁴

Endurance sports include sports branches that require long-term and low-intensity activity. Examples of endurance sports include long-distance running (3200 m) and marathons, walking (20-25 km). ⁴² Rowing, cycling, swimming (200-1500 m), canoeing, mountaineering, and ice skating are the sports branches that want strength as well as durability. ⁴¹ Endurance athletes become active for between 30 minutes and 4 hours, and ultra-endurance athletes become active for more than 4 hours. During the activity, energy is supplied from all three energy systems, but the dominant one is the

aerobic system. Due to the length of the activity, the energy requirement should also be met with supplements to be taken from outside during the activity.⁴²

Power-force sports include short-term sports branches that require explosive power. Examples of weight lifting, discus throwing, shot putting and hammer throwing are examples of strength sports.⁴² Examples of sports branches that are also called quick power and generally require less body mass include short jogging (100-400 m), swimming (100 m), gymnastics, fencing, table tennis, artistic gymnastics, decathlon, skiing (alpine style), jumping and ski jumping sports. Boxing, wrestling, judo, karate, and taekwondo are classified as sports branches that require struggle and strength.⁴¹ The predominantly used system is the phosphogenic energy system, but it is used in the anaerobic glycolysis system as the time increases. The aerobic system is responsible for filling the ATP and creatine tanks emptied during the recovery process. While the training lasts a few hours, the competitions can last for seconds or minutes.⁴²

Team sports include sports branches that require explosive power and high-intensity muscle activity during the activity. Football, basketball, tennis, handball, water polo, and volleyball are examples of team sports. Although three energy systems are used, the dominant system is anaerobic. While the anaerobic energy system is used in high-intensity activities that require sprinting, throwing, jumping, and running, the aerobic energy system is used in the low-intensity activity and recovery process during the game.⁴²

2.4.3. Sport Nutrition and Importance in the Adolescence

Exercise physiology is the science that examines the response and adaptation that occurs due to the difficulty of movement on body systems. Nutrition is the science of digestion, absorption, and metabolism of nutrients and their biochemical functions. Athlete nutrition, on the other hand, is the integration and implementation of the principles of science-based nutrition and exercise physiology that support and increase performance. These principles also help athletes to be healthy and maintain their health.

8

In addition to genetic predisposition in the success of the athlete, it is very important to choose the most appropriate nutrition plan according to the sports done

together with regular training and motivation.⁴¹ Since the needs of athletes for energy and nutrients vary according to age, gender, and sports branches, the nutrition of the athletes aims to ensure that athletes eat in an adequate and balanced way according to their energy expenditures and nutritional habits depending on these basic variables.^{7, 42} The performance of the athlete who is provided with these conditions increases, the effectiveness, attention, and concentration of the training reaches the highest level, the likelihood of getting sick and injury decreases, the recovery process is shortened, and especially for adolescents, growth, and development easily reach the expected level.⁷

In the long term, the goal of athlete nutrition is to meet the energy demand in training by getting enough energy, fill the glycogen deposits in the muscle and liver with sufficient carbohydrate consumption, support growth and muscle repair with adequate protein intake, to be fed enough to ensure a healthy immune system (e.g. with protein, antioxidants, vitamin), to prevent dehydration with adequate fluid consumption.

8

The need increases, even more, when the energy to be consumed during physical activity is added to the increase in the energy requirement caused by the growth and development factor of adolescent athletes.⁴⁵ In cases where the energy requirement is not met, it may cause shortness, delayed puberty, menstrual dysfunction, loss of muscle mass, fatigue, and low resistance to injury or disease.⁴⁶ In order not to adversely affect growth and development and to have an impact on sports performance, nutrition order, recommendations, and the quality of nutrition is of great importance.⁴⁵ Adolescent athletes, athletes need to learn information such as which foods give the best energy, which foods should be consumed before, during, and after the activity, and the time of the diet.⁴⁶ Adolescent athletes may experience health problems due to some unhealthy eating habits due to adolescence. Eating disorders such as anorexia, bulimia neurosis, vitamin and mineral deficiencies due to malnutrition and related health problems, disorders in physical development, and malnutrition are some of them. Therefore, it is very important to understand the nutritional habits of adolescent athletes and to raise their awareness through appropriate training.⁴⁵

The need for energy and nutrients of adolescent athletes is generally the same as that of adult athletes.⁴⁵ And unfortunately, studies on athlete nutrition specific to children and adolescents are very few in the literature.⁴⁴

The Canadian Pediatric Society ⁴⁶, stated that to meet the energy requirement, the energy spent during the activity should be added on top of the energy requirement during the growth attack for adolescents doing sports. In addition to the energy spent daily, an average of 270 kcal for a 30 kg girl who plays football for 60 minutes, and an average of 936 kcal for a 60 kg boy who plays ice hockey for 60 minutes can be given as an example and necessary additions should be made.

TÜBER ²⁶ recommended 1800-2200 kcal for moderately active males between the ages of 10-13 and 2400-2900 kcal for 14-18, while it recommended 1700-2000 kcal for moderately active females between the ages of 10-13 and 2100-2200 kcal for 14-18. At the same time, TÜBER recommended 2000-2500 kcal for an active male between the ages of 10-13 and 2500-3200 kcal for 14-18, and 2000-2300 kcal for an active female between the ages of 10-13, and 2400-2500 kcal for 14-18.

Although the energy needs of young athletes are the same as adult sports, their energy production metabolism differs. ⁴⁵ Adolescents have lower muscle phospho-fructokinase levels, small glycogen stores, and low glycolytic capacity compared to adults. ^{44, 45} In addition, higher citrate loop enzyme activity and increased lactate dehydrogenase activity were noted in girls aged 11-14 years. It was noted that this level was reached at an earlier point during exercise with a significant increase in free glycerol levels in the blood even during prolonged exercise (30-120 min) compared to adults, even in moderate to high-intensity exercise. Due to this enzymatic profile in adolescents, free fatty acids (FFA) are used as the primary energy source in exercises compared to carbohydrates. The substrates used by the muscles during exercise are carbohydrates and free fatty acids. The main source of carbohydrates is muscle glycogen, blood sugar, or hepatic glycogen stores. Fatty acids are obtained from adipose triglyceride or intramuscular triglyceride stores through plasma fatty acids. The contribution of these substrates during exercise depends on the intensity, and the ratio of carbohydrate to fatty acids increases as the intensity of exercise increases. ⁴⁴

The amount and type of macronutrient to be taken vary according to the sports branch. The reason for this is that the nutrients used as energy sources are different according to the type of sports. For example, while endurance and team athletes meet 60% of the calories they need to take daily from carbohydrates and 15% from proteins, martial arts athletes should meet 50% from carbohydrates and increase their protein and

fat ratios slightly. Since more protein is needed in power athletes, 15-20% of the calories that should be taken daily are met by protein, and intake is increased, therefore carbohydrate (50%) intake should be reduced. ⁴¹

International Society of Sports Nutrition (ISSN) made similar recommendations regarding the macronutrient requirements of athletes. ISSN reported that athletes who exercise at a moderate and high intensity should get 55-65% of their daily total energy from CHO and 30% of their total energy from oil, although it varies depending on the intensity of exercise. Protein requirement is recommended as 1-1.5 g/kg/day. ⁴⁷

Carbohydrate taken with diet breaks down into glucose and constitutes the most important energy source used during exercise. Excess glucose is stored as glycogen in muscles (70%), liver (20%), and blood (5%). ⁴⁰ For adolescent athletes, meeting 45-65% of daily energy from carbohydrates is important for performance. ⁴³ The need for carbohydrates to recover the energy to be spent in training and to fill the glycogen tanks should be met. Targets for daily carbohydrate intake are based on body mass and exercise load. According to the intensity and duration of the exercises, Burke et al. recommended the number of carbohydrates to be taken daily as 3 - 5 g/kg in sports requiring low-intensity skills, 5 - 7 g/kg in medium intensity sports lasting approximately one hour a day, 6 - 10 g/kg in medium-high intensity sports requiring 1 - 3 hours of endurance training, 8 - 12 g/kg in medium-high intensity sports for 4 - 5 hours a day and more. ⁴⁸ During long-term exercises, both muscle glycogen and blood glucose levels decrease and performance is adversely affected unless carbohydrate stores are renewed. ⁴³

Protein is an essential nutrient for the regeneration and repair of muscles. Protein is not used as the primary energy source in light-intensity and short-term exercises. However, as exercise intensity increases, proteins contribute to the sustaining of blood sugar level by the liver through gluconeogenesis. ⁴⁶ There is no difference between adults and adolescents in protein metabolism. The increasing protein need in active adolescents is not due to exercise, but due to the need for growth. ⁴⁴ For the general population, the current RDA for protein is 0.8 g/kg/day. Athletes require a higher protein intake (1.5 - 1.7 g/kg/day - according to body weight) at the initial stage of resistance and endurance training due to increased muscle mass. When the protection phase of the training is started, the amount of protein taken daily can be reduced to 1.0 -

1.4 g/kg. Weightlifters who practice resistance training require a daily intake of 1.2 - 4.4 g/kg of protein. In general, 12% to 15% of the total daily energy for active adolescents and adults should be met by protein. When athletes take a large amount of protein and amino acid supplements, they cause dehydration, calcium loss through urinary, weight gain, and stress on the kidney and liver. Because protein metabolism requires seven times more water than fat and carbohydrates. ⁴³

Recommendations for fat intake for athletes are the same as for non-athletes to improve health. Adequate consumption of essential fatty acids required for energy balance, muscle triacylglycerol reservoir renewal, and vitamin absorption is of great importance for athletes and it is allowed to reach the upper level of the limit in intake. In general, athletes are advised to consume moderate levels of fat (25-30% of the total daily energy requirement). ⁴⁷ Children and adolescents usually have higher levels of glycerol in their blood, which leads to an increase in the use of free fatty acids during exercise, but it is recommended that the fat consumption of adolescents should not exceed 30%. In addition, both adolescent and adult diets should not contain more than 10% saturated, 10% polyunsaturated, and 10% monounsaturated fats. ⁴³

For athletes, water is as essential as oxygen. Athletic performance is related to what fluid the athlete consumes, how much, and when. Fluid consumption helps regulate blood pressure during exercise and recover lost fluid. Ambient temperature and humidity are the factors that determine how much sweat athletes produce and how much liquid they should drink during exercise. Dehydration causes if a sufficient amount of fluid is not taken. ⁴⁶ It is seen blood volume and physical performance decrease by 3% fluid loss, concentration deterioration by 5% fluid loss, dizziness by 8% fluid loss, difficulty in breathing and fatigue, muscle spasm, excessive fatigue, circulation, and kidney failure in 10% fluid loss. 20% loss of body water results in death. ⁴⁰ For proper hydration, fluid intake is required before, during, and after exercise. ⁴⁶

Generally speaking, the amounts of nutrients that athletes should consume daily depending on the intensity, severity, and duration of training of sports branches are given in Table 2.4.2.

Table 2.4.2. Energy system and nutrition recommendations according to sports branches

Category	Predominant Energy System	Typical Sports	General Nutrition Guidelines (Daily)
Very high intensity, very short duration	Creatine Phosphate Anaerobic Glycolysis	Athletics: Sprints (50-200m); Jumps (hurdles, long, high, pole vault); Throws (Shot, Javelin, Discus, Hammer); Swimming sprints (50m); Cycling sprints (200m); Weight lifting (Barbell)	CHO: 5-8 g/kg Pro: 1.2-1.7 g/kg Fat: remainder of kcal to meet energy needs Fluid: losses may high if training in high temperature and humidity need replaced during and after training
High intensity, short duration (Endurance-Strength sport and Struggle (power) sport)	Anaerobic Glycolysis Oxidative Phosphorylation	Running (200-1500m or elite 10km); Swimming (100-1500m); Short distance cycling; Rowing; Figure or speed Skating; Mountain bike; Wrestle; Boxing; Martial art; Body building	CHO: 5-8 g/kg Pro: 1.2-1.7 g/kg top level to increase and maintain muscle mass Fat: enough to cover energy deficit Fluid: (see above)
Intermittent, high intensity (Team sport)	Anaerobic Glycolysis Oxidative Phosphorylation	Football; Volleyball; Basketball; Rugby; Ice Hokey; Tennis	CHO: 6-8 g/kg; heavy training 8-10 g/kg Pro: 1.4-1.7 g/kg Fat: enough to cover energy deficit Fluid: if the amount of fluid lost is high it is difficult to recover during the competition. Sodium: losses may be high when exercises lasting more than 2 hours, need to be replaced during or after exercise
Endurance and ultra-endurance	Oxidative Phosphorylation	Long distance running (Marathon, Triathlon); Distance swimming (25km open water); Distance cycling (100km); Cross country skiing	CHO: 5-7 g/kg when training reduce; 12-19 g/kg in high training and ultra-distance competitions Pro: 1.2-2.0 g/kg Fat: 0.8-2.0 g/kg Fluid: the amount of fluid lost is much greater Sodium: need to replace during or after exercise as loss may be excessive

m = metre, km = kilometre, g = gram, kg = kilogram, CHO = carbohydrate, Pro = protein

Source: ⁸

2.4.4. Nutrition Before, During and After Training and Competition

Nutrition strategies before, during, and after training are important factors affecting sports success in athletes. Nutrition-related factors have a great effect, especially in preventing fatigue and tiredness and improving performance. These factors are fluid-electrolyte balance, hydration, glycogen storage status, hypoglycemia, gastrointestinal fitness, and acid-base balance. ⁴⁹

- **Before Exercise**

When it comes to pre-exercise, it generally refers to four hours before the activity. Although it may seem like the same thing before training and before the competition, sometimes the training takes hours, while the competition lasts only minutes or even seconds. In this case, the strategies to be made the change. The goal of the nutritional and fluid supplements to be taken before the activity is to ensure the glucose balance in the body, delay fatigue during long-lasting exercise, prevent hypodehydration or dehydration, minimize gastrointestinal stress, and eliminate hunger. In general, eating 1 to 4 hours before training is important to facilitate digestion. According to the other research, carbohydrates consumed before training or competition delay fatigue and improve performance. The recommended general rule is to consume 1 g/kg of carbohydrate per hour before the competition. (1.0-4.5 g/kg/CHO before 1-4 h) When the time before exercise increases, the number of carbohydrates added to the pool will also increase. In addition to carbohydrates, moderate levels of protein and small amounts of fat and some liquid should be consumed. The digestion of fat is slower than the carbohydrates and proteins, but much more fulfilling. According to the American College of Sports Medicine, athletes should consume approximately 5-7 ml/kg of fluid at least 4 hours before exercise. ⁸

- **During Exercise**

For endurance and ultra-endurance athletes, as well as athletes interested in intermittent and high-intensity exercise, that is, team sports, food, and fluid intake is vital during training and competition lasting more than 1 hour. The goal here is to provide glucose, delay fatigue, prevent dehydration and excessive change in electrolyte balance such as hyponatremia (decrease of sodium in the blood), and reduce gastrointestinal stress. Hypohydration that may occur due to the temperature and

humidity of the air disrupts performance, contributes to fatigue, and puts health at risk. Hypoglycemia (low blood sugar) that may occur due to the depletion of muscle glycogen stores during exercise disrupts performance and causes fatigue. For this reason, it is of great importance to consume both during training or competition. It is recommended to consume 30 to 60 g of carbohydrates per hour during exercise. (1 g/kg/glucose) Athletes are recommended to consume 150-300 ml of fluid every 15 to 20 minutes from the beginning to the end of the exercise. Excessive fluid intake in endurance and ultra-resistance athletes is not recommended due to sodium loss. In cases of excessive sweating, a sodium intake of 1 g/hour is recommended. (0.5 - 0.7 g sodium/liter liquid). Sports drinks that include all of these may also be appropriate. ⁸

- After Exercise

The renewal process starts as soon as the exercise or match is over. Sometimes this process can be very short, as participation in two competitions on the same day may be required. Therefore, replenishment is very critical. The goal here is to provide carbohydrates to resynthesize muscle glycogen, provide protein for muscle regeneration and rehydration, and recover lost electrolytes. The rates and capacities of resynthesis of muscle glycogen depend on several factors such as the amount of depletion, the presence of insulin, the enzyme activity required for glycogen synthesis, the degree of muscle damage, and the amount and time of carbohydrate intake. It is recommended to consume 1.5 g/ kg of carbohydrate consumed after exercise within one hour after the end of the exercise for the re-filling of muscle and blood glycogens. Foods with a moderate or high glycemic index are preferred. Consumption of 0.75 - 1.5 g/kg/CHO every hour for the next three hours is recommended for maximum storage. In addition to carbohydrate intake, it is essential to add protein to the meal to contribute to the healing of muscles. It is sufficient for athletes to take 0.1 g per kilogram. In this direction, fruit yogurt, chocolate milk, or a chicken sandwich after exercise or competition is one of the ideal foods to consume. Fluid losses may occur during the activity. For recovery, the consumption of 1.5 L of fluid per weight difference between the weight before and after the exercise is sufficient to meet the requirement. Salty snacks are recommended to ensure the balance of lost electrolytes and sodium. Salt food consumption will contribute to rehydrating due to its water retention feature. ⁸

2.5. Nutrition Knowledge and Nutrition Education

Worsely says nutritional knowledge is knowing the relationship between nutrition and nutrient. Nutrition knowledge is an important factor that affects healthy eating habits throughout the life cycle and ensures that nutritional needs are met.⁵⁰ Individuals with general nutritional knowledge were observed to benefit from their knowledge during food selection. In many studies, it has been shown that individuals do not prioritize their nutritional needs when choosing foods due to their inadequate knowledge of national nutrition guidelines.⁵¹ To act consciously in this regard, it is necessary to first know the energy and nutrients needed by our body and to know from which nutrients these needs can be met. It is an indication that individuals have wrong and unhealthy eating habits as a result of lack of information, and that it becomes very difficult to get rid of these habits as they get older, and therefore individuals have an inadequate and unbalanced nutrition plan.⁵²

Adequate and balanced nutrition, which is important for all age groups, is even greater for children and adolescents because they are in the most important periods of growth and development in their lives.⁵³ Nutritional habits and patterns of individuals who start feeding in the first family are under the influence of family situations. Many eating habits related to what and how to eat change since the school-age child is away from family supervision and out of the house more. Factors such as teachers, school officials, peers, and the environment play an important role in shaping the nutritional habits of individuals as well as their parents and relatives.⁵⁴ Nutrition-related health problems are seen in many developed and developing countries.⁵³ Accurate eating habits gained in the school-age period will reduce the risk of developing chronic diseases such as obesity, coronary heart disease, hypertension, diabetes, and cancer. Although mild nutritional deficiencies are not taken into consideration by families, they may result in learning disorders. It is thought that nearly 40% of the children of developing countries are affected by growth retardation and that the negativities in their mental development and school achievement are due to nutritional deficiencies.⁵⁵ These situations have great effects on the structure and economic power of the society as a public health problem.⁵⁶

When the causes of unbalanced nutrition are investigated, it is seen that nutritional knowledge deficiency is of great importance. For this reason, it is of great

importance to raise the awareness of nutrition education and healthy nutrition among children and adolescents in the prevention of unbalanced nutrition.²⁴ The development of nutritional awareness is only achieved through nutrition education. Nutrition education aims to improve the nutritional status of the society by educating the public on the development of adequate and balanced food consumption habits, eliminating wrong and negative nutrition practices, preventing food from becoming disruptive to health, and more effective and economical use of food resources.⁵

It is a system consisting of the stages of informing people in education, ensuring that they have an attitude about the subject they are informed about, and reaching the desired behavior. This system process is completed with the suitability of the trainer, education method, and tools. Education, which is left in the information phase, is not education, but teaching. Education is a completely dynamic process. Transforming education into behavior, especially acquiring a healthy eating habit, is achieved by applying long-term behavior change methods. Nutrition education, which should be started from an early age, is essential for the life-long health of the individual.^{57, 58}

Nutrition is a multifaceted behavior. Nutrition education is planned to increase and support healthy nutrition intake of knowledge in a community or a particular population.⁵¹ When providing education, the educator should take into account the age, gender, physical activity, economic, social-cultural, personal, and religious characteristics and attitudes of the individuals.^{53, 56} Especially in nutrition education given to adolescents, it should be aimed to teach them to take sufficient and balanced amounts of energy and nutrients that meet their needs according to their age and development level and socio-cultural differences and to develop an ideal healthy nutrition model.⁵⁹ On the other hand, the importance of nutrition in education should be presented in a structure based on information about nutrients and correct nutritional behaviors.⁶⁰

3. MATERIALS AND METHODS

The purpose, method, and management of the study and the confidentiality of the participants were communicated to Yeditepe University Non-Interventional Clinical Research Ethics Committee and the study was started after obtaining the necessary permissions. It was approved by the Ethics Committee of Yeditepe University on 27 January 2022 and as a result of the decision numbered 202112136 (ANNEX-1) and approval was obtained from Rotary 100.Year Anatolian High School Sports Club, where the study will be conducted. (ANNEX-2)

3.1. Participants

The research was conducted at Rotary Sports Club in Istanbul. Athletes and their parents were informed about the study and only volunteer athletes were included in the study after obtaining written informed consent from their parents.(ANNEX-3) The study is based on volunteering. Participants with a temporary disability that cannot exercise, those who have been exercising for less than 3 months or who have been exercising irregularly, and those who are younger than 10 years or older than 16 years were excluded from the study. The reason for choosing the sports club is primarily that they volunteer to participate in our study. All athletes in the sports club between the ages of 10-16 constitute the population. The total population is 254. When the confidence level is selected as 95%, the margin of error as 5%, and the P-value (prevalence) as 30%, the number of samples constitutes 142 people. The sample was determined by a simple randomization method.

3.2. Data Collection

Consent forms were delivered to the parents of all athletes in the sports club. Adolescent athletes with parental consent were asked to fill in the first data collection form on Google Form between February 12 and March 5, 2022. Subsequently, nutrition education for athletes was given face-to-face between 26 February and 5 March in the meeting room of the sports club by the researcher. The education was prepared in different weeks according to age groups and branch differences in a way not to disrupt the training and competitions. The Republic of Turkey Regarding the Nutrition Education Guide for Educators ⁶¹ prepared by the Ministry of Health General

Directorate of Health Education, an education lasting approximately one hour was prepared in the Microsoft PowerPoint program. 206 athletes participated in the education. The reason for the participation of more people in the education is the presence of athletes who do not apply the first form but want to listen to the education. To understand the information given through nutrition education and to transform it into behavior, food consumption frequency and nutrition knowledge level questionnaire forms were reapplied to the participants after a 2-month break. Burcu Ateş Özcan ⁶² (2019), Betül Sarıdağ Devran ⁶³ (2019), Mahsa Melek ⁶⁴ (2010), Şafak Taner Gürsoy ⁶⁵ (2008) also applied the same application management in their studies. In this way, both the current knowledge levels of the athletes before and after the education could be measured and the change in their knowledge levels after the education was determined. None of the volunteers had a medical condition that required a special diet. None of the volunteer participants wanted to leave during the research. 161 athletes filled out the data collection form completely before the education, participated in the nutrition education, and then filled the form again.

The data of the study were collected with the demographic information form of the participants, the questionnaire for determining the nutritional knowledge level of adolescents, and the food consumption frequency form (ANNEX-4).

3.2.1. Demographic information form

To obtain the general demographic information of the participants, age, gender, weight, height, parental education levels, number of meals, meal skipping status, sports branch and weekly physical activity status (day, hour) were asked in the form. BMI percentile values by age and gender were calculated and recorded by the researcher according to the source WHO. ⁶⁶

3.2.2. The nutritional knowledge questionnaire for adolescence

The Nutritional Knowledge Questionnaire for Adolescents was developed by Yahya Özdoğan ⁶⁷ in 2013, and validity and reliability tests were performed. As a result of the analysis, factor loadings ranged between 0.303 and 0.572, and the Cronbach alpha value was found to be 0.89. The questionnaire consists of 45 questions; the correct questions should be calculated as 1 point and the wrong questions as 0 points.

Minimum 0 - Maximum 45 points can be obtained. Evaluation criteria for the nutrition knowledge test; ≤ 12 points were evaluated as poor, 13-22 as moderate, 23-33 as good, and ≥ 34 as very good. Permissions related to the use of the questionnaire were obtained. (ANNEX-5)

3.2.3. Food consumption frequency form

According to the athlete nutrition literature, the personalized meal frequency questionnaire prepared by the researcher was filled in by the athletes.⁶⁸ In this form, consumption status and amounts are questioned based on the food groups categorized in TÜBER. These food groups are grouped as Milk, Dairy Products, Meat, Eggs, Legumes-Nuts, Vegetables, Fruits, Bread and Cereals, Pastry, Packaged Products, Fats, Candy, Fast-food, Carbonated-Beverage, and Water. To determine the frequency of consumption, they were asked to mark it as Every Day, 5-6 days a week, 3-4 days a week, 1-2 days a week, every 15 days, once a month or never, and to specify the daily consumption amounts.²⁶

3.3. Statistical Analysis

All data obtained will be analyzed with the SPSS 22 statistical program. Numerical variables will be indicated by the mean, standard deviation (SD), number (S), and percentage (%). To determine whether there is a relationship between the parameters, the correlation coefficient will be calculated. Kolmogorov-Smirnov analytical method will be used in the SPSS 22 program to measure the normal distribution of variables. Independent ANOVA and t-tests will be used in binary variables in groups with normal distribution, and Mann-Whitney U tests will be used in groups without normal distribution. Wilcoxon Signed Test was used for the variables that were not normally distributed and Paired T-Test was used for the variables that were normally distributed. The confidence interval will be determined as 95% in all analyzes and the results will be considered statistically significant with a significance level of 5% and $p < 0.05$.

4. RESULTS

206 athletes participated in the nutrition education held at the sports club. However, 45 athletes were not included in the study and only participated as listeners because they did not meet the age criteria of the study, did not have parental approvals, or did not fill out the before education form. The study group consisted of 161 athletes who had a parent consent form, completed the data collection form completely before the education, participated in the education, and then filled out the data form again and met the criteria completely. 49.7% of the study population consists of women (n=80) and 50.3% of the population consists of men (n=81). The largest percentage of our athletes between the ages of 10-16 was composed of 15-year-old participants with 23.6%. 8 participants (5%) were thin, 110 were at normal body weight (68.3%), 35 were overweight (21.7%) and 8 were obese (5%). 47.2% (n=76) of the participants play volleyball and 52.8% of the participants (n=85) play basketball. There were 9 participants (5.6%) who said the number of main meals they consumed per day was 1, 53 participants (32.9%) who said 2, and 99 participants (61.5%) who said 3. There were 14 participants (8.7%) who said they would not consume any snacks, 50 participants (31.1%) who said they would consume once a day, 66 participants (41%) who said they would consume 2 times a day, 21 participants (13%) who said they would consume 3 times a day and 10 participants (6.2%) who said they would consume 4 times a day. While 16 (9.9%) participants' mothers were primary school graduates, 17 (10.6%) were secondary school graduates, 67 (41.6%) were high school graduates and 61 (37.9%) were university graduates. While the fathers of 12 (7.5%) participants were primary school graduates, 23 (14.3%) were secondary school graduates, 61 (37.9%) were high school graduates and 65 (40.4%) were university graduates. The demographic characteristics of the research population are presented in Table 4.1.

Table 4.1. Demographic Characteristics

Demographic Characteristics		n	%
Age	10	10	6.2
	11	11	6.8
	12	14	8.7
	13	23	14.3
	14	29	18.0
	15	38	23.6
	16	36	22.4
Sex	Women	80	49.7
	Men	81	50.3
BMI	3-15 per (Thin)	8	5.0
	15-85 per (Normal)	110	68.3
	85-97 per (Overweight)	35	21.7
	> 97 per (Obese)	8	5.0
Sports Branch	Volleyball	76	47.2
	Basketball	85	52.8
Number of Main Meals	1	9	5.6
	2	53	32.9
	3	99	61.5
Number of Snacks	Do not consume snakes	14	8.7
	1	50	31.1
	2	66	41.0
	3	21	13.0
	4	10	6.2
Mother Education Level	Primary School Graduate	16	9.9
	Middle School Graduate	17	10.6
	High School Graduate	67	41.6
	University Graduate	61	37.9
Father Education Level	Primary School Graduate	12	7.5
	Middle School Graduate	23	14.3
	High School Graduate	61	37.9
	University Graduate	65	40.4

Descriptive characteristics, such as age, weight, height, and the year in which athletes do sports, weekly days, and daily hours, for participants for continuous variables are shown with mean and standard deviation in Table 4.2. . The mean age of women and men is close to each other. There was no statistically significant difference ($p=0.66$). While the mean weight of women was 53.85 ± 7.03 , the mean weight of men was 63.17 ± 14.77 . While the mean height of women was 162.68 ± 6.55 , the mean height of men was 171.17 ± 12.06 . The mean body mass index was 20.33 ± 2.31 in females and 21.33 ± 3.18 in males. According to this result, the body mass index of men is statistically higher than that of women ($p=0.024$). 76 of the female participants play volleyball while 4 of them play basketball. All 81 of the men play basketball. There are no men playing volleyball. Since the number of days in a week of basketball training is higher than volleyball training, the time spent by boys on physical activity is significantly higher than that of girls ($p=0.00$).

Table 4.2. Descriptive characteristics of participant for continuous variables

	Women (n=80)			Men (n=81)			Sig p
	Mean	SD	Min-Max	Mean	SD	Min-Max	
Age (years)	13.975	1.80	10-16	13.852	1.81	10-16	0.666
Weight (kg)	53.85	7.03	37-76	63.17	14.77	38-109	0.000*
Height (cm)	162.68	6.55	143-180	171.17	12.06	137-197	0.000*
BMI (kg/m ²)	20.331	2.31	15.8-26.8	21.331	3.18	15.4-31.0	0.024*
Year of participation in the sports	2.781	2.08	0-9	4.302	2.54	0-10	0.003*
Days of participation in sports per week	3.20	1.23	1-7	4.23	1.45	1-7	0.000*
Hours of participation in sports per day	1.75	0.53	1-3	2.11	0.54	1-3	0.000*

* $p < 0,05$

Tablo 4.3. is showing the distribution of questions and answers regarding general characteristics. 56.5% (n=91) of the athletes did not know about sport nutrition, 43.5% (n=70) of them know information about. 62.7% (n=101) of the athletes consume regularly all meals but 37.3% (n=60) of them were skipped the meal. 17.4% (n=28) of the athletes stated that they skip breakfast, 22.4% (n=36) skip lunch and 3.1% (n=5) were skip dinner.

Table 4.3. Distribution of question and answers regarding general characteristics

General Characteristics		n=161	%
Do you know about sports nutrition?	Yes	70	43.5
	No	91	56.5
Do you consume regularly main meals? (Breakfast, Lunch, Dinner)	Yes	101	62.7
	No	60	37.3
Do you skip breakfast?	Yes	28	17.4
	No	133	82.6
Do you skip lunch?	Yes	36	22.4
	No	125	77.6
Do you skip dinner?	Yes	5	3.1
	No	156	96.9

Descriptive questions and nutritional knowledge level scores of athlete participants before nutrition education were compared in Table 4.4. While the mean of Nutrition Knowledge score of the athletes who stated that they knew about athlete nutrition was 29.5, the mean of Nutrition Knowledge score of those who stated that they did not know about nutrition was calculated as 29.4. There was no statistically significant difference ($p>0.05$). The education levels of the parents were analyzed considering that they may be related to the nutritional knowledge levels of the children. The mean of nutritional knowledge level score of the children whose mothers are primary school graduates is 29.31 ± 8.81 , secondary school graduate is 25.47 ± 8.98 , high school graduate is 29.73 ± 7.89 , and university graduate is 30.39 ± 7.45 . The mean nutritional knowledge level scores of the children whose fathers were primary school graduates were 24.41 ± 9.37 , secondary school graduates were 28.95 ± 8.65 , high school graduates were 30.86 ± 6.96 , and university graduates were 29.32 ± 8.16 . There was no statistically significant difference groups as determined by one-way ANOVA (Mother / $F=1.739$ $p=0.161$; Father/ $F=2.315$ $p=0.078$).

Table 4.4. Distribution descriptive statistics of Nutrition Knowledge Score

		Nutrition Knowledge Score		Significance
		Mean	SD	p
Information about Sport Nutrition	Yes	29.58	7.67	0.895
	No	29.41	8.27	
Mother Education Level	Primary school	29.31	8.81	0.161
	Middle school	25.47	8.98	
	High school	29.73	7.89	
	University	30.39	7.45	
Father Education Level	Primary school	24.41	9.37	0.078
	Middle school	28.95	8.65	
	High school	30.86	6.96	
	University	29.32	8.16	

A scale was applied to the athlete participants to measure their nutritional knowledge levels before and after nutrition education. Table 4.5 presents a summary of the nutritional knowledge levels of the athletes before and after the education. While 5% of the participants had poor nutritional knowledge, there were no participants in this category after the education. Participants with moderate nutritional knowledge decreased from 16.85% to 2.5%, and participants with good nutritional knowledge decreased from 44.1% to 37.9%. The number of participants with a very good level of knowledge increased from 34.2% to 59.6%. The number of people in the category, which could be considered insufficient after the education, decreased from 35 to 4 people.

Table 4.5. Distribution categorical frequency of before and after education Nutritional Knowledge Score

Nutrition Knowledge Level	Before Education		After Education	
	n	%	n	%
≤ 12 Bad	8	5.0	0	0
13-22 middle	27	16.8	4	2.5
23-33 good	71	44.1	61	37.9
≥ 34 very good	55	34.2	96	59.6
Total	161	100	161	100

While the mean nutritional knowledge score of women before the education was 30.78 ± 7.56 , the mean nutritional knowledge score of men was 28.21 ± 8.24 . According to this result, women's before education nutrition knowledge scores were statistically higher than men's ($p=0.04$). After the education, while the mean nutritional knowledge score of women was 35.37 ± 5.68 , the mean nutritional knowledge score of men was 33.39 ± 5.90 . According to this result, women's after education nutrition knowledge scores are statistically higher than men's ($p=0.032$) (Table 4.6.).

Table 4.6. The Nutritional Knowledge Questionnaire score at before and after education

Nutrition Knowledge Score	Before Education		After Education	
	mean $\pm$ SD	p	mean $\pm$ SD	p
Women	30.78 ± 7.56	.040*	35.37 ± 5.68	.032*
Men	28.21 ± 8.24		33.39 ± 5.90	

$p<0.05$

While the mean Nutrition Knowledge score before the education was 29.49 ± 7.99 in all participants, this score increased to 34.37 ± 5.86 after the education. On average, the Nutrition Knowledge score increased by 4.88 points after the education. The mean difference between Nutrition Knowledge scores was statistically significant ($t_{160} = -8.476$, $p < 0.001$) (Table 4.7.).

Table 4.7. Result of paired sample test for Nutrition Knowledge score before and after the education

	n	Mean	Std. Deviation	Sig.
Nutrition Knowledge score before the education	161	29.49	7.99	0.000*
Nutrition Knowledge score after the education	161	34.37	5.86	

$p<0.001$

While there was no relationship in nutritional knowledge levels according to age before education, a statistically weak correlation was found in the same direction after education ($r=0.196$). This may indicate that the information obtained from education is more permanent as the age increases. No relationship was found between before or after

education nutritional knowledge levels and the body mass index variables ($r=0.00$; $r=0.081$). A weak correlation was found between age and body mass index in the same direction. ($r=0.194$). Correlation results are given in Table 4.8.

Table 4.8. Correlation of Nutrition Knowledge Score and some descriptive variable

		Nutrition Knowledge score before the education	Nutrition Knowledge score after the education	Age	BMI
Nutrition Knowledge score before the education	Pearson Correlation	1	.477**	.044	.000
	Sig. (2-tailed)		.000	.581	.997
	N	161	161	161	161
Nutrition Knowledge score after the education	Pearson Correlation	.477**	1	.196*	-.081
	Sig. (2-tailed)	.000		.013	.305
	N	161	161	161	161
Age	Pearson Correlation	.044	.196*	1	.194*
	Sig. (2-tailed)	.581	.013		.014
	N	161	161	161	161
BMI	Pearson Correlation	.000	-.081	.194*	1
	Sig. (2-tailed)	.997	.305	.014	
	N	161	161	161	161

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

The frequency and amount of food consumption of the participants were recorded before and after the education. Table 4.9 and Figure 4-1 show the before education and after education consumption frequencies of food groups. As can be seen in Figure 4-1, the consumption frequency categories of foods are 1 - every day, 2 - 5-6 days a week, 3 - 4-3 days a week, 4 - 2-1 days a week, 5 - every 15 days. According to the statements of the participants, the number of those who consume milk every day was 46%, while it was 39.1% after the education. There was no statistically significant change in the frequency of milk consumption after the education ($p=0.762$). While 55.9% of the participants consumed dairy products every day, 65.2% of them started to consume dairy products every day after the education. There is a statistically significant increase in the frequency of dairy product consumption ($p=0.002$). The number of

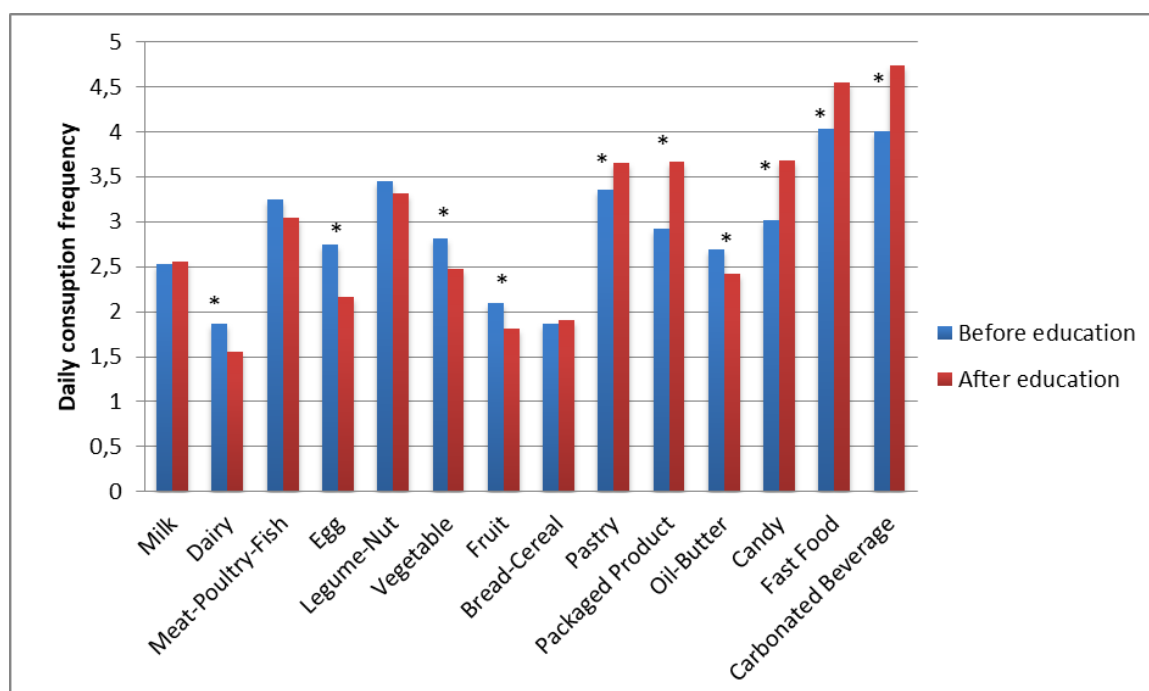
people who said meat group consumption 3-4 days a week decreased from 33.5% to 30.4% and the number of people who consumed it every day increased. There was no statistically significant change in the frequency of meat, poultry, and fish consumption ($p=0.074$). While 40.4% of the participants consumed eggs every day, 42.2% of them started to consume eggs every day after the education. There is a statistically significant increase in the frequency of egg consumption ($p=0.000$). The number of people who said consumption of legumes and nuts increased from 31.7% to 35.4% 1-2 days a week, but the number of people who consumed 3-4 days a week also increased. There was no statistically significant change in the frequency of consumption of legume and oilseed groups ($p=0.074$). The number of people who say they consume vegetables 3-4 days a week has decreased from 31.7% to 31.1% and the number of people who consume vegetables every day has increased. There is a statistically significant increase in the frequency of vegetable consumption ($p=0.000$). While 47.8% of the participants consumed fruit every day, 49.7% of them started to consume it every day after the education. There is a statistically significant increase in the frequency of fruit consumption ($p=0.000$). While 54.0% of the participants consumed bread and cereals every day, 57.1% of them started to consume them every day after the education. There was no statistically significant change in the frequency of consumption of bread and cereals ($p=0.794$). While 31.1% of the participants consumed pastry products 3-4 days a week, 24.8% of them started to consume 1-2 days a week after the education. There was a statistically significant decrease in the frequency of pastry consumption ($p=0.005$). The number of people who say they consume packaged products every day has decreased from 24.8% to 10.6%, but the number of people who consume them 3-4 days a week has also increased. There is a statistically significant decrease in the frequency of packaged product consumption ($p=0.000$). The number of people who say they consume fat 3-4 days a week has decreased from 29.2% to 26.7% and the number of people who consume it every day has increased. There was a statistically significant increase in the frequency of fat consumption ($p=0.038$). The number of people who say they consume candy 5-6 days a week has decreased from 22.4% to 14.3% and the number of people who consume 3-4 days a week has increased. There is a statistically significant decrease in the frequency of sugar consumption ($p=0.000$). The number of people who say they consume fast food 3-4 days a week has decreased from 25.5% to 16.8% and the number of people who consume 1-2 days a week has increased. There is a statistically significant decrease in the frequency of fast food consumption ($p=0.000$).

The number of people who say they consume carbonated beverages 3-4 days a week has decreased from 23.6% to 14.9% and the number of people who consume 1-2 days a week has increased. There is a statistically significant decrease in the frequency of carbonated beverage consumption ($p=0.000$).

Table 4.9. Dairy consumption food groups frequency (%)

	Everyday		5-6 days a week		3-4 days a week		1-2 days a week		Every 15 day		Once in a month		Never		Total
	EB	EA	EB	EA	EB	EA	EB	EA	EB	EA	EB	EA	EB	EA	
Milk	46.0	39.1	13.7	19.9	14.9	16.8	11.8	9.9	1.9	3.7	3.7	5.0	8.1	5.6	100
Dairy	55.9	65.2	21.7	20.5	11.2	8.7	6.2	4.3	1.9	0.6	1.2	0.6	1.9	0	100
Meat Groups	13.7	17.4	13.0	18.6	33.5	30.4	24.8	17.4	7.5	9.9	4.3	3.7	3.1	2.5	100
Egg	40.4	42.2	10.6	23.0	17.4	31.1	17.4	9.3	2.5	1.2	3.7	0	8.1	3.1	100
Legume-Nut	8.7	5.0	12.4	14.3	30.4	37.3	31.7	35.4	9.9	4.3	3.7	1.9	3.1	1.9	100
Vegetable	21.1	25.5	19.3	26.1	31.7	31.1	18.0	12.4	6.8	3.7	1.2	0.6	1.9	0.6	100
Fruit	47.8	49.7	18.6	28.0	19.9	15.5	7.5	5.0	3.7	1.9	1.2	0	1.2	0	100
Bread-Cereal	54.0	57.1	19.3	14.3	16.1	17.4	8.7	6.2	0.6	2.5	0	1.2	1.2	1.2	100
Pastry	8.7	8.7	19.3	14.9	31.1	23.6	21.7	24.8	10.6	14.9	5.6	8.7	3.1	4.3	100
Packaged Prd.	24.8	10.6	21.1	15.5	21.7	24.2	15.5	19.3	7.5	14.3	4.3	8.7	5.0	7.5	100
Oil-Butter	23.0	29.8	21.7	25.5	29.2	26.7	18.0	11.8	5.0	3.1	3.1	2.5	0	0.6	100
Candy	21.7	9.9	22.4	14.3	22.4	25.5	16.1	21.1	6.8	14.9	3.7	5.6	6.8	8.7	100
Fast Food	7.5	1.9	7.5	5.6	25.5	16.8	21.1	25.5	16.8	23.6	16.1	14.9	5.6	11.8	100
Carb.Beverage	7.5	1.2	12.4	6.8	23.6	14.9	23.6	23.6	8.1	21.1	11.2	11.2	13.7	21.1	100

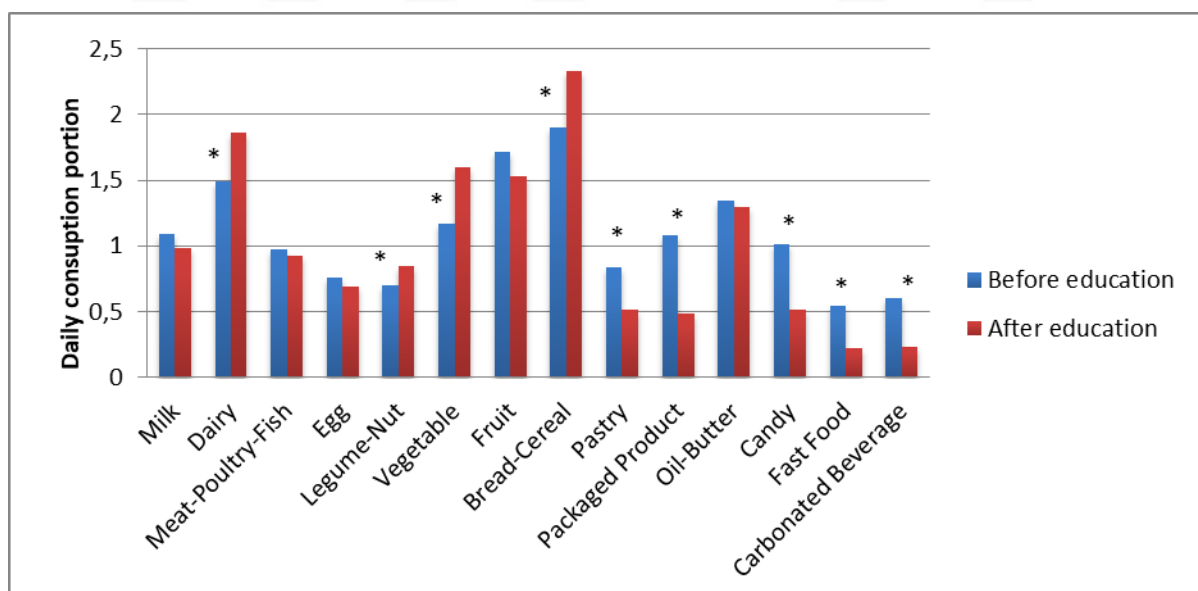
EB: Education before ; EA: Education after



* $p < 0.05$

Figure 4-1. Daily consumption frequency of food groups

When the consumption amounts of daily food groups are examined, no statistically significant difference was found in the portion amount of milk consumption in Figure 4-2. A statistically significant increase was found in the portion amount of dairy consumption ($p=0.000$). There was no statistically significant difference in the amount of meat group consumption portions ($p=0.923$). There was no statistically significant difference in the amount of egg consumption portions ($p=0.228$). A statistically significant increase was found in the consumption portion amount of legume and oilseed groups ($p=0.000$). A statistically significant increase was found in the number of vegetable consumption portions ($p=0.000$). There was no statistically significant difference in the amount of fruit consumption portions ($p=0.098$). A statistically significant increase was found in the bread consumption portion amount ($p=0.001$). A statistically significant increase was found in the amount of pastry and packaged product consumption portions ($p=0.000$). There was no statistically significant difference in the amount of fat consumption portion ($p=0.88$). A statistically significant increase was found in the amount of sugar, fast food, and carbonated beverage consumption portions ($p=0.000$).



* $p < 0,05$

Figure 4-2. Daily consumption portion of food groups

5. DISCUSSION AND CONCLUSION

In adolescent period known that, the physiological, psychological and social development of individual is rapid, life-long behaviors and habits are most suitable to be acquired, and the risk is high in terms of the development of diseases that may be encountered in adulthood. ²⁶

One of the most common wrong eating habits that can be seen in this period is skipping meals. In studies conducted in Turkey and in the world, in which many dietary habits are analyze, it has been determined that the most frequently skipped meal by children and adolescents are breakfast. ²⁶ However, it is the most important meal of our daily life. Children, who do not have breakfast, decrease in academic success, lack of concentration, low perception capacity and learning difficulties. ⁶⁹ According to national survey studies, it has been reported that 24% of women and 20% of men skip breakfast. It has been observed that 15% of adolescent's aged 9-13 skip breakfast, while aged 14-18 of 34% female adolescents and 28% of male adolescents skip breakfast. When looking at the lunch meal, it was determined that a quarter of the adolescents skip it. ⁷⁰ In this study, 37.3% of our participants stated that they do not regularly consume the main meal and 17.4% of the participants stated that they skipped breakfast, 22.4% of they skipped lunch, and 3.1% of they skipped dinner. Similar results to our study were also obtained in Yıldırım (2006) ⁷¹ that 44.4% of male volleyball players between the ages of 12-16 skip meals, and 16.7% of the skip meals they breakfast and 27.8% skip lunch. No one skipped dinner. In the study report conducted among adolescents aged 15-18 throughout Turkey, it was reported that 28.3% of them skipped meals and the most skipped meal was breakfast (21%). ⁷² Contrary to other studies, athletes who skip meals, skip lunch rather than breakfast, which shows those athletes are more conscious of the importance of breakfast.

Acquiring healthy eating habits to individuals from a young age, reduces the risk of chronic diseases that may result from the consumption of wrong nutritional content. Forming healthy eating habits in adolescence can be achieved with nutrition education that starts in the family from childhood. ⁷³ Showed that Low- and Middle- Income Countries (LMIC) people's low access to education is due to their socioeconomic status.

It has been reported that the level of nutritional knowledge is high in adolescents with have a high socioeconomic level and have educated parents.⁵⁹ Considering that the education level of the parents may affect the nutritional knowledge levels of their children, in our study, the nutritional knowledge scores of the participants before they received nutrition education and the education levels of their parents were compared. While the value of significance between the mother's education level and the child's nutritional knowledge level was $p=0.161$, the value of significance between the father's education level and the child's nutritional knowledge level was found $p=0.078$. There was no statistically significant difference between the education levels of both mothers and fathers and their children's nutritional knowledge levels ($p>0.05$). In another study, there was a positive and significant relationship between high school students' nutritional knowledge levels and their mothers' education levels ($p=0.009$), while there was no significant relationship between their fathers' education levels, which was similar to our study ($p=0.170$).⁷⁴

In this study, participants were asked about whether their knowledge of sports nutrition and general nutrition and were compared with their before education nutritional knowledge score. There was no statistically significant difference between the knowledge scores of the participants who declared that they had knowledge about nutrition and those who did not ($p>0.05$). In another study, swimmers between the ages of 10 and 18 were asked whether they had knowledge about sports nutrition, and was not found statistically significant difference between the mean of general nutrition knowledge and the mean of sports nutrition knowledge test ($p>0.05$).⁷⁵ In a similar study on adults, 51.9% of the participants between the ages of 18-65 received nutrition education and 48.1% did not. However, there was no significant difference between the basic nutritional knowledge scores and nutritional preference scores of those who received education and those who did not ($p>0.05$).⁷⁶ Other study results were similar to our study. As a result of the researches, although the participant declared that they have knowledge about nutrition, but it is seen that nutrition and behaviors are lacking in their daily lives.

In this study, it was investigated the effect of gender differences on the nutritional knowledge level. Before the nutrition education, the nutritional knowledge of the women participants were found to be statistically significantly higher than the

nutritional knowledge of the men participants ($p < 0.05$). Likewise, the significant difference in women about knowledge continued after the education ($p < 0.05$). Kaplan et al. (2011) conducted in primary school obtained different results in their study. There was no statistical significant relationship between the knowledge about before and after the nutrition education according to the genders (EB women-men $p = 0.457$; EA women-men $p = 0.051$) ($p > 0.05$).⁶⁹ Similar finding results Özdoğan (2013)⁶⁷ and Duman Unutmaz (2011)⁷⁵ stated in their study that, gender had no effect on nutritional knowledge. However, in the study conducted in adults, the basic nutrition scores of the men were found to be statistically significantly higher than the women ($p = 0.008$).⁷⁶ In the study of Holden et al (2019), in which 77 participants were investigated, the knowledge level of sports nutrition on volleyball players, it was stated that the nutritional knowledge level calculated according to the results of the ANOVA test was statistically significant according to the genders ($p < 0.05$).⁷⁷ It is thought that this difference may be due to the fact that the majority of the women athletes which play in the volleyball branch in this study, the volleyball players pay more attention to their weight and nutrition, perhaps their trainers direct them in terms of nutrition education.

Considering that age may be a factor to affect the level of nutritional knowledge, it was compared. In this study, there was no significant difference in the nutritional knowledge levels according to the ages before the education, but statistically the same way correlation was found after the education. ($r = 0.196$; $p < 0.05$) This means that in order to understand, adopt and use the information in the future, the participants in the middle adolescence listened to the education more carefully and adopted it during the follow-up period (even though it was 2 months later) and this led to an increase in their nutritional knowledge scores. Similar results were observed in the study, which the same nutrition knowledge scale was used, and statistical analysis according to age revealed significant differences ($p < 0.05$).⁶⁷ Contrary to our study, there is no statistically significant difference between the mean scores of general nutritional knowledge between the 10-14 and 15-18 age groups in licensed swimmer adolescents ($p > 0.05$).⁷⁵

A scale was used to measure the current knowledge levels of adolescent athletes participating in this study before nutrition education. Mean nutritional knowledge scores are 29.49 ± 7.99 . After receiving nutrition education by the researcher, 2 months were waited to determine the permanence of the information and the same scale was applied

again. It was found that the means of nutritional knowledge scores increased as 34.37 ± 5.86 . A statistically significant increase was obtained in the nutritional knowledge of the participants before and after the nutrition education ($p < 0.001$). Likewise, Vardanjani et al. (2015) ⁵⁴ conducted a study in Iran, in which 72 primary school female students participated, and the mean knowledge score before education was 28.94 ± 15.10 , immediately after education 93.52 ± 8.93 , 2 months later 90.27 ± 8.79 ($p < 0.001$). In another study supporting the findings of the study, it was determined that after the education knowledge score of high school students aged 14-17 in Bingöl, increased from 7.1 ± 2.3 to 8.6 ± 2.8 and to 9.9 ± 3.1 after 2 months of waiting. It was determined that the difference in knowledge score after education and two months of waiting the education was statistically significant ($p < 0.001$). ⁶³ In the study conducted by Başoğlu and Baysal (1987) ⁷⁸, it was aimed to determine the effects of the nutrition lesson taught at school for one year on the knowledge level and behaviors of the students. After the education, the rate of knowledgeable students increased from 6% to 73.8%, and the increase was found to be statistically significant ($p < 0.001$). In the study of Yıldırım (2006) ⁷¹, the general nutritional knowledge test results of adolescent male volleyball players were 10.67 ± 2.83 at the beginning of the education, while it increased to 11.17 ± 3.11 points at the end of the education, but it was not found to be statistically significant relationship ($p > 0.05$). However, while the mean score on sports nutrition knowledge test was 6.06 ± 2.04 at the beginning of the education, it was found to be statistically significant with an increase to 7.89 ± 2.59 after the education ($p < 0.05$). In another similar study, it was aimed to determine the effect of different education methods given to 120 students studying at the second level of primary education on their nutritional knowledge and habits. A handbook covering nutritional information was prepared for the first group and education was given accompanied by the book. The second group was given only verbal education. The third group did not receive any education. It was determined that there was a significant difference between the nutritional knowledge levels of the students (between 1-2 groups, 3-2 groups and 1-3 groups) ($p < 0.05$). It has been found to be more effective in the education given to the students with the nutrition handbook. ⁷⁹ In general, studies have proven the positive effect of nutrition education on the level of knowledge and behavior.

Food groups and nutrient consumption frequencies for school age child and adolescence are specified in the Turkish Nutrition Guideline (TÜBER). In this study,

the changes were examined by asking the participants to fill of chart in the frequency of food consumption before and after the education, taking the guideline (TÜBER) data as a reference. According to TÜBER recommendations, the ages of the adolescents were grouped as 7-10, 11-14 and 15-18. Since this study covers the 10-16 age range, the recommendations in this range are taken as reference. While it specifies the food groups that should be consumed every day for adolescents as Milk and Dairy products, Meat, Chicken, Eggs, Oily seeds, Nuts, Bread and Cereals, Vegetables and Fruits, it recommends the consumption of Legumes 3 days a week, Fish and Seafood 2 days a week.²⁶

In this study, the food groups and portion amounts that they should consume daily according to their age groups were given in the nutrition education to adolescent athletes. They were expected to apply the knowledge they received in education in their lives. Milk and dairy products that they should consume every day. While the number of those consuming milk every day decreased from 46% to 39.1% with education, the number of those consuming dairy products (yogurt, cheese, ayran) every day increased from 55.9% to 65.2% in the participants. The meat group is one of the food groups that should be consumed every day, 13.7% was consumed before the education, although it increased by 17.4% after the education, although the increase is still insufficient. The number of participants consuming eggs every day increased from 40.4% to 42.2%. Legume which should be consumed 3 days a week, increased from 30.4% to 37.3%. Vegetable which should be consumed every day, increased from 21.1% to 25.5%, but still insufficient. The frequency of vegetable consumption remained around 31%, 3-4 days a week. It is thought that the insufficient consumption of vegetables is perceived by the participants as a vegetable dish rather than a raw vegetable or salad. Fruit which should be consume every day, increased 47.85% to 49.7%. Bread and cereal which should be consume every day, increased 54% to 57.1%. Oil or butter which should be consume every day, increased 23% to 29.8%. Before education oil consumption is higher at the frequency of 3-4 days a week because the participants reported that they added extra to salads or consumed them for breakfast because they could not detect the amount of oil in the meals due to age. Considering their statistical significance, there was a significant increase ($p<0.05$) in the consumption frequency of dairy products, eggs, vegetables, fruits and fat groups, while a significant decrease was found in the consumption frequencies of pastry, packaged product, candy, fast food and carbonated beverage, which TÜBER states that the consumption of these foods should be reduced

for health reasons ($p < 0.05$). Another study, which is similar to our study, compared the frequencies of primary school students in Bursa by taking the food consumption record before and after the nutrition intervention. While the number of participant who said they would consume milk daily EB (education before) was 61.9%, it became 66.7% EA (education after). Daily yogurt consumption is 19% EB, while it is 23.8% EA. Daily cheese consumption is 57.1% EB, while it is 61.9% EA. Daily egg consumption is 23.8% EB, while it is 28.6% EA. 1 or 2 times a week legume consumption is 66.7% EB, while it is 71.4% EA. 3 or 4 times a week vegetable consumption is 42.9% EB, while it is 47.6% EA. Daily fruit consumption is 38.1% EB, while it is 43% EA. Daily bread consumption is 90.5% EB, while it is 95.2% EA. Daily oil consumption is 66.7% EB, while it is 57.1% EA. Daily butter consumption is 4.8% EB, while it is 0% EA. Daily sugar consumption is 28.6% EB, while it is 19% EA. EB fast food consumption is 1-2 times a week, while it is decrease 9.5% EA. 3-4 times a week carbonated beverages consumption is 9.5% EB, while it is 4.8% EA. As a result, while the frequency of consumption of foods such as milk, yoghurt, cheese, eggs, red meat, legumes, vegetables, fruits and bread increased, the frequency of consumption of foods such as rice-pasta, oil, sugar, pastry desserts, acidic beverages and fast food decreased after the education.⁸⁰ Powers et al (2005) also aimed to examine the effect of the nutrition education given to 1100 primary school first and second grade students in the state of Alabama, USA, on their nutritional behaviors and nutritional knowledge. As a result of the research, a significant improvement was observed in the consumption of dairy products, fruits and vegetables in the participant children in the intervention group compared to those in the control group (not given education) ($p < 0.001$).⁸¹

The daily consumption portion amounts of foods and food groups are specified in the TUBER guideline according to age. Recommendations were determined for age groups at moderate activity level, but in this study were used adolescents who regularly exercise. In this study, athletes participating will have more energy needs because they spend more energy than the average adolescent. That's why the upper limit of recommended portion is targeted. When the food and food groups consumed by the athletes before the education were compared with the portion amounts recommended in TUBER, if consumption is below the recommended level is insufficient, if consumption it recommended level is sufficient and is consumption is above the recommended level is excessive. However, after the education some food groups consumed reached

sufficient amounts. It is thought that the reason for the all food groups that are not reached in sufficient quantities is that they still have family attachments due to their age, living with their families and consuming the foods parents cook and buy. Daily consumption of milk and dairy products are recommended as 3 portions in the guideline.²⁶ In our study, milk consumption of athletes before education is 1 portion and 1.5 portions of dairy products per day. In other words, with a total of 2.5 portions, it is insufficient according to the guide. Although the amount of milk and dairy products consumption increased to a total of 2.85 servings per day after the education, a consumption amount that is very close to the guideline has been reached, although it is still insufficient. Daily consumption of meat group (meat, poultry, fish) was recommended as $\frac{3}{4}$ portions (0.75) in the guideline.²⁶ Although the daily consumption of the meat group of the athletes before the education is considered excessive compared to the consumption value of the average adolescents with 0.97 portions, but it is sufficient for the athletes. After the education, the daily portion amount decreased to 0.92 and approached the average. Daily consumption of egg recommended as $\frac{1}{2}$ portions (1 egg) in the guideline.²⁶ While the portion amount of daily egg before the education was 0.76, it decreased to 0.69 after the education. The amount of egg consumption before and after education is excessive according to the guideline, but it can be considered sufficient for athletes. The daily consumption amount of legumes is 0.42 portions, which should be consumed 3 portions a week. For the adolescents in the active group to 15-18 years, it is recommended daily to consume 1 portion (40g) of the upper portion amount for nut. The guideline recommended amount of nut for average adolescents is 0.5 portions.²⁶ In other words, the daily consumption of legumes and nuts were recommended as 0.90 portions. While the amount of legumes and nut portions consumed daily before the education was considered insufficient with 0.70 portions, it increased to 0.85 portions after the education and was considered sufficient according to the guideline. But the insufficient for athletes continues. Daily consumption of vegetables was recommended between as 2 to 3 $\frac{1}{2}$ portions in the guideline and fruit was recommended between 2 to 2 $\frac{1}{2}$ portions.²⁶ Daily consumption of vegetables in athletes increased from 1.17 portions to 1.60. Fruit consumption in daily athletes decreased from 1.71 portions to 1.53. The consumption of both was found insufficient according to the guideline. Daily consumption of bread and cereals groups were recommended between as 3 to 7 portions in the guideline.²⁶ While the daily bread and cereal portion amounts of the athletes before the education were 1.9, it increased to

2.33 portions after the education, but it is still considered insufficient according to the guideline. In the guideline, the upper limit for the consumption of optional foods (pastries, packaged products, sugary products, oils, carbonated drinks with added sugar) is determined as 4 portions daily. ²⁶ While the before education total consumption amounts of these optional foods, the excess of which may threaten our health, are over-consumed with 5.41 portions according to the guideline recommendation, it is considered sufficient amount according to the guideline by decreasing to 3.28 servings after the education. As a result of the study, many food groups that were questioned about the frequency and amount of food consumption of the participants before the education were consumed insufficiently. After the education, there was a statistically significant increase in dairy products, legumes and nuts, vegetables, bread and cereals, while a statistically significant decrease in pastry, packaged product, candy, fast-food and carbonated beverage ($p<0.05$). Despite this, only milk and dairy products, meat group, eggs, legumes and optional products have been approached to the ideal reference value in the TÜBER guideline.

In similar study in which the consumption of the adolescent swimmers were evaluated by given nutrition education to their parents, was determined that most of the food and food groups asked in the food consumption frequency questionnaire of the participating athletes before the education were consumed insufficiently. Although the consumption of some food groups increased statistically significantly after the education, only legumes and nuts reached a sufficient level according to the TÜBER guideline. ⁸² In a similar study, it was aimed to examine the effects of nutrition education on the nutritional knowledge and nutritional status of professional volleyball players with an mean age of 16.5 years. While the consumption amount of milk and dairy products of the athletes, whose food consumption frequency was questioned before and after the education, was 522.6 grams the EB, was 861 grams the EA. While the consumption amount of meat, chicken, fish and legumes was 155 g, it increased to 202.3 g at after education. There was a statistically significant increase in nutrition education in these food groups ($p<0.05$). ⁴⁹ In their systematic review Meiklejohn et al. (2016) aimed to examine the effects of multi-strategy nutrition education interventions on the health and nutrition outcomes and behaviors of adolescents between the ages of 10 and 18 in secondary schools in developed countries. 9 of the 13 articles they reviewed proved that nutrition education had significant results on food consumption.

Most of the studies included in the review study the consumption of vegetables, fruit, fish, fats, sugar sweetened beverages, fiber, sucrose and water. Significant dietary changes related to vegetable, fruit and fat consumption have been reported. It has been reported that the changes are most beneficial with parent involvement, education by teachers or staff, and changes in school canteens and vending machines.⁸³ In another study evaluating nutritional knowledge, attitudes and practices from 2213 high school students in New Orleans, reported that girls can eat more fruit and vegetables than boys ($p < 0.05$).⁸⁴ In different studies, different foods and food groups showed a significant increase. The reason for this is thought to be due to the differentiation of the content of education interventions, economic purchasing difficulties, inter-communal, family structure and cultural differences.

As a result of all the studies conducted throughout the study, it was determined that while the differences between the nutrient needs of adults who do and not do sports are clear, the differences between the food and nutrient requirements and habits of sports adolescents from their peers are not clear. It is important to carry out studies on athlete adolescents to emphasize the importance of this issue. For this reason, it is aimed to determine the current knowledge levels and nutritional habits of adolescent athletes and investigate the effects of healthy nutrition education on them.

As a result of the findings, it was determined that the nutrition education given to adolescent athletes in our study increased the nutritional knowledge levels of the athletes, as well as the amount and frequency of the food and food groups recommended to be consumed by the guidelines were approached, despite only one education intervention. It is thought that if these educations are repeated in sports clubs and also in schools, the awareness of nutrition will become permanent and the awareness of consuming the nutrients necessary for their growth and development will be formed. Awareness of healthy nutrition in adolescent athletes is an important factor in bringing healthy and successful athletes to the society in the future.

In order to guide the next studies, no matter how much the knowledge level of adolescents has increased, they are still attached to their families and they live with the guidance of their families because they live together. Family changes are necessary for them to adopt a healthier lifestyle. For this reason, in addition to providing education to adolescents, it is important to provide healthy nutrition education to the people responsible for their care in order to raise healthy adults.

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7. APPENDICES

7.1. Ethical Approval



T.C. YEDİTEPE ÜNİVERSİTESİ
GİRİŞİMSSEL OLMAYAN KLİNİK ARAŞTIRMALAR
ETİK KURULU

Versiyon No
1.0
Sayfa 1 / 2

KARAR FORMU

27.01.2022

ETİK KURUL BİLGİLERİ	Etik Kurulun Adı	Yeditepe Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu
	Açık Adres	Yeditepe Üniversitesi Dış Hekimliği Fakültesi, Bağdat Cad. No. 238 Göztepe 34728 Kadıköy, İstanbul
	İnternet Sayfası	
	Telefon	
	E-posta	

DEĞERLENDİRİLEN BELGELER	İslak imzalı başvuru dosyası, CD'si ve elektronik başvuru	☒
	Araştırma başlığı ve araştırmacıların isimleri	☒
	Başvuru dilekçesi	☒
	Araştırmacının;	☒
	• Niteliği	☒
	• Önemi ve özgün değeri	☒
	• Amaç ve hedefleri	☒
	• Yöntemi	☒
	• Yönetimi	☒
	• Yaygın etkisi	☒
	• Araştırma bütçesi (Mevcutsa)	☒
	• Süresi ve uygunluğu (Zaman cetveli)	☒
	• Kaynakları	☒
	Araştırma izin belgesi / belgeleri	☒
	Bilgilendirilmiş Gönüllü Olur Formu (yapılan araştırmaya özel olarak hazırlanmış)	☒
	Taahhütname-1 Dünya Tıp Birliği Helsinki Bildirgesinin son versiyonunun ve Sağlık Bakanlığı'nın ilgili tüm kılavuzlarının okunmasına dair taahhüt	☒
	Taahhütname-2 Daha önce yapılmış etik kurul başvuruları mevcut olup olmadığına dair taahhüt	☒
	Taahhütname-3 Araştırma sırasında araştırma bütçesinde yer almayan ve gönüllünün kendisine veya Sosyal Güvenlik Kurumuna ek yük getirecek hiçbir işlem uygulanmayacağına dair taahhüt	☒
	Taahhütname-4 COVID-19 hastalarında tedavi yaklaşımları ve bilimsel araştırmalar genelgesi okunmasına dair taahhüt	☒
	Araştırmacıların her birisine ait geçmiş formu	☒
	Ek belgeler (Varsa kullanılan ölçek izinleri vb.)	☒

KARAR BİLGİLERİ	Başvuru Numarası	202112136
	Toplantı Tarihi	14.01.2022
	Toplantı Yeri	Çevirim içi (Google Meet)
	Karar No	13

Araştırmacının Başlığı: Özel bir spor kulübünde düzenli spor yapan 10-16 yaş arası adölesan sporculara verilen beslenme eğitiminin beslenme bilgi düzeylerine olan etkisinin incelenmesi: Kesitsel bir çalışma

Araştırmacılar: Dyt. Nora Kumral, Prof. Dr. Serdar Baki Öztezcan

BAŞVURU NUMARASI: 202112136

KARAR

27.01.2022

☒ KABUL	☐ RET ☐ KAPSAM DIŞI (GİRİŞİMSSEL) ☐ BİLİMSSEL VE/VEYA ETİK KURALLARA AYKIRI ☐ BİR SORUMLU ARAŞTIRMACININ (TEZ İŞE TEZ DANIŞMANI), BİR TOPLANTIYA İKİ (2) ADETTEN FAZLA ÇALIŞMA BAŞVURUSUNDA BULUNMASI ☐ KURUM İÇİ BAŞVURULARINDA YEDİTEPE UZANTILI E-POSTA HESABI İLE GİRİŞ YAPILMAMIŞ OLMASI ☐ ŞARTLI KABULDE BELİRTİLEN REVİZYONLARIN ZAMANINDA VE/VEYA İSTENİLDİĞİ ŞEKİLDE YAPILMAMIŞ OLMASI
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7.2. Rotary Sports Club Approval



ROTARY 100. YIL ANADOLU LİSESİ SPOR KULÜBÜ

İstinye Mahallesi Nuri Paşa Cd. No:16 34460 Sarıyer/İstanbul - Türkiye
Tel: 0532 255 09 31

Yeditepe Üniversitesi

Girişimsel Olmayan Klinik Araştırmalar Etik Kurul Başkanlığı

Konu: Araştırma izni hk.

27 Kasım 2021

Yeditepe Üniversitesi Beslenme ve Diyetetik Anabilim Dalı yüksek lisans öğrencisi Nora Kumral tarafından akademik amaçlı olarak yapılması planlanan ' 10-16 yaş arası düzenli spor yapan adölesan sporculara verilen beslenme eğitiminin beslenme bilgi düzeylerine olan etkisinin incelenmesi' isimli araştırmanın Kulübümüzde uygulanmasında herhangi bir sakınca bulunmamaktadır.

Bilgilerinize arz ederim.

Saygılarımla,

Rotary 100. Yıl Anadolu Lisesi Spor Kulübü

Yönetim Kurulu Başkanı



Bilimsel araştırma amaçlı klinik bir çalışmaya katılmak üzere davet edilmiş bulunmaktasınız. Bu çalışmaya çocuklarınızın katılabilmesi için veli onayının bulunması şarttır. Kabul etmeden önce çalışmanın ne amaçla yapılmak istendiğini tam olarak anlamanız ve kararınızı özgürce vermeniz gerekmektedir. Lütfen bu formu dikkatlice okuyunuz. Bu araştırmaya katılıp katılmamakta serbestsiniz. Çalışmaya katılım gönüllülük esasına dayanmaktadır.

1. **Araştırmanın Adı**
10-16 yaş arası özel bir spor kulübünde düzenli spor yapan adölesan sporculara verilen beslenme eğitiminin beslenme bilgi düzeylerine olan etkisinin incelenmesi
2. **Araştırmanın Amacı**
Bu tez çalışması ile spor kulübüne kayıtlı düzenli spor yapan 10-16 yaş arası sporcu öğrencilerinin sporcu beslenmesi eğitimine bağlı olarak beslenme bilgi düzeylerindeki ve besin tüketim alışkanlıklarındaki değişimini incelemek amaçlanmıştır.
3. **Araştırmaya Katılım Süresi**
Bu çalışmayı tamamlamak için öngörülen süre formu doldurmak için 30 dakika, beslenme eğitimine ayrılan süre 1 saattir. Anketi doldurduktan sonra beslenme eğitimi alınacaktır ve sonrasında öğrenilen bilgilerin tutuma dönüşmesi için 2 ay beklenecek ve daha sonrasında tekrar aynı anketi öğrencilerin doldurmalarını isteyeceğiz.
4. **Gönüllü Sayısı**
Bu araştırmada yer alması öngörülen toplam katılımcı sayısı 142 kişidir.
5. **Araştırmanın Yöntemi**
Çalışma kapsamında öğrencilere ilişkin genel bilgilerini, beslenme alışkanlıklarını ve bilgi düzeylerini belirlemek amacıyla bir anket formu uygulanacaktır. Bu form ile genel ve antropometrik bilgileriniz, beslenme eğitim öncesi ve sonrası beslenme bilgi düzeylerindeki farklılıklar ve beslenme tüketim alışkanlıklarındaki değişimler incelenecektir.
6. **Araştırmaya Katılma Koşulları**
Çalışmaya 10-16 yaş arası, en az 3 aydır düzenli spor yapmak, kronik hastalığı teşhisi almamış, gönüllü olarak katılmak isteyen öğrenciler dâhil edilecektir. Dâhil edilme koşullarına uygun olmayan gönüllü katılımcılar araştırma dışı bırakılacaktır.
7. **Araştırmadan Kaynaklanabilecek Olası Riskler**
Araştırmadan kaynaklanacak bir risk yoktur.
8. **Araştırmada Uygulanacak Tedaviler**
Araştırma kapsamında uygulanacak bir tedavi yoktur.
9. **Gönüllünün Sorumluluğu**
Katılımcıların çalışma boyunca herhangi bir sorumluluğu yoktur. Araştırmaya katılmanın isteğe bağlı olduğu ve gönüllünün istediği zaman, herhangi bir cezaya veya yaptırıma maruz kalmaksızın, hiçbir hakkını kaybetmeksizin araştırmaya katılmayı reddedebileceği veya araştırmadan çekilebileceği bilinmelidir. Çalışmaya katılmakla herhangi bir parasal yükümlülüğünüz yoktur, herhangi bir ödeme de yapılmayacaktır. Beslenme eğitimi ücretsizdir.
10. **Bilgilerin Gizliliği**
Araştırmanın sonuçları yalnızca bilimsel amaçla kullanılacaktır. Araştırma yayınlanırsa bile kimlik bilgileriniz saklı kalacaktır. Ancak, gerektiğinde araştırmanın danışmanları, izleyiciler, yoklama yapan kişiler, etik kurul, kurum, ilgili sağlık otoritelerinin ve resmi makamlar tıbbi bilgileriniz ulaşabilecek fakat tekrardan gizli tutulacak, kamuoyuna açıklanmayacaktır.
11. **Araştırma Süresince Çıkabilecek Sorunlarda Aranacak Kişi**
Araştırma hakkında yeni bilgiler elde edildiğinde katılımcının ebeveynlerine bilgi verilecektir. Ek bilgiler almak için aşağıda belirtilen telefon ile ilgili diyetisyene ulaşabilirsiniz.
Diyetisyen Nora KUMRAL 0(535) 639 71 37 norakumral@gmail.com

Paraf:

Sayfa 1 / 2

Yukarıda yer alan ve araştırmaya başlanmadan önce gönüllüye verilmesi gereken bilgileri gösteren metni okudum. Aklıma gelen tüm soruları yukarıda adı geçen araştırmacıya sordum, yazılı ve sözlü olarak bana ve çocuğuma yapılan tüm açıklamaları ayrıntılarıyla anlamış bulunmaktayım. Çocuğumun araştırmaya katılımı için rızası alınacak ve kedisine de bilgilendirme yapılacaktır. Araştırmaya çocuğumun katılımını isteyip istemediğime karar vermem için bana yeterli zaman tanındı. İster doğrudan, ister dolaylı olsun araştırma uygulamasından kaynaklanan nedenlerle meydana gelebilecek herhangi bir sağlık sorununun ortaya çıkması halinde, her türlü tıbbi müdahalenin sağlanacağı konusunda gerekli güvenceye sahibim. Bu koşullar altında, çocuğuma ait bilgilerin gözden geçirilmesi, transfer edilmesi, işlenmesi, yayın, rapor ve benzeri bilimsel dokümanlarda kullanılması konusunda araştırmacıya yetki veriyor ve söz konusu araştırmaya zorlama ve baskı olmaksızın, istediği zaman araştırmadan ayrılabilceğini bilerek, büyük bir gönüllülükle çocuğumun katılmasına izin veriyorum.

Araştırmaya Katılmayı Onaylıyorum



YASAL VASİSİ		İMZASI
AD ve SOYAD		
ÖĞRENCİNİN AD ve SOYAD		
ADRES/TELEFON		
TARİH		

KATILIMCI		İMZASI
AD ve SOYAD		
TELEFON		
TARİH		

TANIK		İMZASI
AD ve SOYAD		
ADRES/TELEFON		
TARİH		

ARAŞTIRMACI		İMZASI
AD ve SOYAD	Dyt. Nora KUMRAL	
ADRES/TELEFON	Yeditepe Üni. Sağlık Bilimleri Fakültesi Beslenme ve Diyetetik Anabilim Dalı	
TARİH	Kasım 2021	

Paraf:

Sayfa 2 / 2

7.4. Questionnaire Form

VERİ TOPLAMA FORMU

Adınız - Soyadınız :

1. Yaş :

2. Cinsiyet:

a. Kadın b. Erkek

3. Kilo :

4. Boy :

5. Fiziksel aktivite yapmanızı engelleyecek bir durumunuz var mı?

a. Evet
b. Hayır

6. Ne kadar süredir düzenli spor yapıyorsunuz? senedir

7. Haftada Gün, Günde Saat düzenli spor yaparım.

8. Hangi spor branşıyla ilgileniyorsunuz?

a. Jimnastik
b. Voleybol
c. Basketbol
d. Diğer

9. Doktor tanısı konmuş kronik bir hastalığınız var mı?

a. Evet (Nedir?)
b. Hayır

10. Düzenli olarak ana öğün (Kahvaltı, Öğlen yemeği, Akşam yemeği) tüketir misiniz?

a. Evet
b. Hayır

11. Cevabınız “Hayır” ise, genellikle hangi öğünü atlarsınız?

a. Sabah
b. Öğle
c. Akşam

12. Günlük tükettiğiniz ana ve ara öğün sayıları nedir?

a. ana öğün
b. ara öğün

13. Ebeveynlerinizin eğitim durumu nedir?

Annenizin

a. İlkokul
b. Ortaokul
c. Lise
d. Üniversite

Babanızın

a. İlkokul
b. Ortaokul
c. Lise
d. Üniversite

14. Sporcu beslenmesi konusunda bilginiz var mı?

a. Evet
b. Hayır

1. Beslenmenin tanımını en doğru olarak veren ifade aşağıdakilerden hangisidir?

- A) Günlük yeme alışkanlıklarına göre besinleri tüketmektir.
B) Tüm besin öğelerini vücuda almaktır.
C) Açlık duygusunu gidermek için yemek yemektir.
D) Besinleri tür ve miktar olarak yeterli ve dengeli tüketmektir

2. Aşağıdaki yiyeceklerden hangisinin tüketiminin artırılması doğrudur?

- A) Kurubaklagiller B) Tereyağı
C) Beyaz ekmek D) Çay şekeri

3. Bireylerin enerji ihtiyacı ile ilgili olarak aşağıdakilerden hangisi yanlıştır?

- A) 50 yaşındaki bir kişinin enerji ihtiyacı 15 yaşındakinden azdır.
B) Bireylerin vücut ağırlığı enerji ihtiyacını etkiler.
C) Kadın ve erkeklerin enerji ihtiyacı aynıdır.
D) Çalışma şekli ve süresi bireylerin enerji ihtiyacını etkiler.

4. En doğru nasıl beslenilir?

- A) Çok fazla yiyerek
B) Her besin grubundan yeterince yiyerek
C) Sevilen şeyleri yiyerek
D) Gece süt içerek

5. I. Fiziksel aktiviteyi artırmak
II. Bol bol greyfurt suyu içmek
III. Öğün atlamak
IV. Yiyecek alımını azaltmak

Yukarıdaki davranışlardan hangileri kilo vermede etkilidir?

- A) I-III B) II-IV C) I-IV D) II-III

6. Et ve süt grubu besinlerde hangi besin öğeleri daha çok bulunur?

- A) C vitamini-Protein B) Protein-Kalsiyum
C) Protein-Demir D) C vitamini-Kalsiyum

7. I. Vitaminler IV. Mineraller
II. Yağlar V. Proteinler
III. Karbonhidratlar

Vücutta asıl görevi enerji vermek olan besin öğesi çifti yukarıdakilerden hangisidir?

- A) I-II B) II-III C) II-IV D) III-IV

8. Vücutta esas görevi büyütücü-onarıcı olan besin öğesi aşağıdakilerden hangisidir?

- A) Protein B) Mineraller
C) Yağlar D) Karbonhidratlar

9. Aşağıdaki besin öğelerinden hangisi vücuda enerji vermez?

- A) Protein B) Mineraller
C) Yağlar D) Karbonhidratlar

10. Aşağıdaki grupların hangisinde besin öğelerinin tamamı yer alır?

- A) Yağ, protein, karbonhidrat, vitaminler, mineraller, su
B) Protein, karbonhidrat, yağ, vitaminler, mineraller, şekerler
C) Su, yağ, protein, karbonhidrat, vitaminler

D) Karbonhidrat, yağ, vitaminler, mineraller

11. Bir öğrencinin öğün aralarında aşağıdakilerden hangisini tüketilmesi en uygundur?

- A) Bisküvi-Kola
B) Elma-Çikolata
C) Peynirli sandviç-Taze meyve suyu
D) Patates kızartması-Ayran

12. Amino asitler aşağıdaki besin öğelerinin hangisinin yapısında bulunur?

- A) Karbonhidratlar B) Proteinler
C) Yağlar D) Vitaminler

13. Sağlıklı olabilmek için aşağıdaki yağlardan hangisi tercih edilmelidir?

- A) Tereyağı B) Zeytinyağı
C) Margarin D) Kuyruk yağı

14. Aşağıdakilerden hangisi vücutta demirin emilimini azaltır?

- A) Et B) Çay
C) Portakal D) Maydanoz

15. Kaliteli protein yönünden zengin yiyecekler aşağıdakilerden hangisidir?

- A) Taze fasulye-Patlıcan B) Yumurta-Et
C) Bulgur-Pirinç D) Nohut-Mercimek

16. Nohut, mercimek, kuru fasulye aşağıdaki gruplardan hangisinin içinde yer alır?

- A) Tahıllar B) Sebzeler
C) Kurubaklagiller D) Yağlar

17. Glikoz Aşağıdaki besin öğelerinin hangisinin yapısında bulunur?

- A) Vitaminler B) Proteinler
C) Karbonhidratlar D) Yağlar

18. Vücutta fazla miktarda yağ alındığında hangi hastalık görülür?

- A) Kalp damar hastalığı B) Kemik erimesi
C) Kansızlık D) Guatr

19. Aşağıdaki yiyeceklerden hangisinin protein içeriği en fazladır?

- A) Elma-Patlıcan B) Et-Yumurta
C) Süt-Yoğurt D) Ekmek-Makarna

20. Süt ve süt ürünlerinin tüketim sıklığı ile ilgili hangisi doğrudur?

- A) Her gün tüketilmeli
B) On beş günde 1 tüketilmeli
C) Haftada 1-2 tüketilmeli
D) Ayda 1 tüketilmeli

21. Aynı miktarlarda tüketildiğinde aşağıdaki besinlerden hangisi kalsiyum bakımından en zengindir?

- A) Yoğurt B) Ayçiçeği yağı
C) Patates D) Bal

22. Kan yapımı için gerekli olan besin ögesi aşağıdakilerden hangisidir?

- A) Kalsiyum B) Demir
C) D vitamini D) İyot

23. Karaciğer, kemik iliği, kandaki kırmızı hücrelerde önemli bir kısmı bulunan mineral aşağıdakilerden hangisidir?

- A) İyot B) Demir
C) Çinko D) Florür

24. Vücuda yeteri kadar demir minerali alınmadığında hangi hastalık görülür?

- A) Kansızlık B) Guatr
C) Beriberi D) Skorbüt

25. Kansızlıkta verilebilecek en uygun yiyecek aşağıdakilerden hangisidir?

- A) Yağ-Reçel B) Süt-Yoğurt
C) Karaciğer-Et D) Ekmek-Makarna

26. Aşağıdaki yiyeceklerden hangisinin diş çürütücü etkisi en fazladır?

- A) Yer fıstığı B) Çikolata
C) Kereviz D) Süt

27. Süt tüketemediğiniz zaman eşdeğer olarak hangisini tüketebilirsiniz?

- A) Yumurta B) Yoğurt
C) Balık D) Ekmek

28. Et tüketmediğiniz zaman eşdeğer olarak hangisini tüketebilirsiniz?

- A) Yumurta B) Bal
C) Pekmez D) Tereyağı

29. Aşağıdaki yiyeceklerden hangisinde kolesterol bulunur?

- A) Et B) Meyve
C) Zeytinyağı D) Bulgur

30. İnsan vücudunun mutlaka alması gereken yağ aşağıdakilerden hangisidir?

- A) Margarin B) Tereyağı
C) Kuyruk yağı D) Bitkisel sıvı yağ

31. Aynı miktarlarda tüketildiğinde hangisinin yağ içeriği en fazladır?

- A) Süt B) Reçel
C) Mayonez D) Yoğurt

32. Aşağıdaki yiyeceklerden hangisinin iyot içeriği en fazladır?

- A) Balık B) Dana eti
C) Süt D) Elma

33. Vücuda yeteri kadar iyot alınmadığı zaman aşağıdaki hastalıklardan hangisi görülür?

- A) Kansızlık B) Guatr
C) Raşitizm D) Hipertansiyon

34. Vitaminlerle ilgili olarak doğru olan ifade aşağıdakilerden hangisidir?

- A) Vücudun dirençli olmasına yardım ederler
B) Her yiyecek maddesinde bol miktarda bulunurlar
C) Vücuda enerji verirler
D) Yiyeceklerle alınmaları gerekli değildir

35. Minerallerin (madensel maddelerin) vücuttaki görevleri ile ilgili aşağıdakilerden hangisi yanlıştır?

- A) Kemiklerin normal olmasını sağlarlar
B) Birçok enzimin yapısını oluştururlar
C) Vücuda enerji verirler
D) Hücre içi ve hücre dışı sıvıların dengede olmasını sağlarlar

36. Hangi vitamin ve mineral yetersizliğinde kemik sağlığı bozulur?

- A) E vitamini-Çinko C) K vitamini-Bakır
B) D vitamini-Kalsiyum D) C vitamini-Demir

37. Kanın pıhtılaşmasında görev alan vitamin aşağıdakilerden hangisidir?

- A) D vitamini B) A vitamini
C) B1 vitamini D) K vitamini

38. Aşağıdakilerden hangisi suda eriyen vitamindir?

- A) D vitamini B) A vitamini
C) E vitamini D) C vitamini

39. A vitamini eksikliğinde oluşan hastalık hangisidir?

- A) Gece körlüğü B) Kemik erimesi
C) Guatr D) Raşitizm

40. Güneş ışınları aşağıdaki vitaminlerden hangisinin sentezinde rol oynar?

- A) C vitamini B) A vitamini
C) D vitamini D) E vitamini

41. Güneş ışığından yararlanmak hangi vücut sisteminin sağlıklı olmasını sağlar?

- A) Dolaşım sistemi B) İskelet sistemi
C) Solunum sistemi D) Sindirim sistemi

42. Aynı miktarlarda tüketildiğinde hangisinin demir içeriği en fazladır?

- A) Bulgur B) Süt
C) Karaciğer D) Taze fasulye

43. Aşağıdakilerden hangisinde vitaminler en iyi korunur?

- A) Pişmiş yiyeceklerde
B) Taze yiyeceklerde
C) Dondurulmuş yiyeceklerde
D) Konserve yiyeceklerde

44. Osteoporoz aşağıda verilenlerden hangisi ile ilgili bir hastalıktır?

- A) Kan B) Kalp
C) Kemik D) Bağır sak

45. Aşağıdaki besinlerden hangisi probiyotik içerir?

- A) Soğan B) Enginar
C) Yer elması D) Yoğurt

Besin Tüketim Sıklığı Çizelgesi Size uygun yere işaretleyin[x]

	Hergün/ Kaç porsiyon	Haftada 5-6 gün	Haftada 3-4 gün	Haftada 1-2 gün	15 günde bir	Ayda Bir	Hiç
Süt							
Süt Ürünleri							
Et							
Yumurta							
Kurubaklagil							
Sebze							
Meyve							
Ekmek							
Hamur işleri							
Paketlenmiş ürünler							
Yağlar							
Şekerler							
Fast Food							
Gazlı içecekler							
Su (Bardak)							

Süt: İnek, Manda, Koyun, Keçi sütünü

Süt Ürünleri: Yoğurt, Peynir, Kefir, Dondurma, Süt tozu

Et: Kırmızı et, Tavuk, Hindi, Balık, Diğer Kümes hayvanları, Salam, Sosis, Sucuk gibi işlenmiş etler

Yumurta: Tavuk Yumurtası

Kurubaklagil: Baklagiller (Nohut, Mercimek, Bakla, Fasulye, Bezelye, Börülce, Soya Fasulyesi, Barbunya vb.) ; Sert Kabuklu Yemişler (Fındık, Ceviz, Badem, Susam vb.)

Sebze: Tüm sebzeler (sebzen bütünü, çiğ veya pişmiş, dondurulmuş vb.)

Meyve: Tüm meyveler (meyvenin bütünü, meyve suyu, kurutulmuş meyve vb.)

Ekmek ve Tahıllar: Ekmek, Yufka, Bazlama, Buğday, Pirinç, Makarna, Erişte, Kuskus, Bulgur, Yulaf, Arpa, Çavdar, Kahvaltılık gevrek, Tahılların unları

Hamur işleri: Kek, Pasta, Kurabiye, Poğaç ve diğer hamur işleri

Paketlenmiş ürünler: Cips, Hazır Kurabiye, Krakerler

Yağlar: Bitkisel yağlar (Zeytinyağı, Ayçiçeği, Fındık, Mısırozü, Pamuk, Susam, Kanola yağı vb.); Hayvansal yağlar (Tereyağı, Margarin, Kuynuk Yağı vb.)

Şeker: Rafine eklenti şeker, Bal, Pekmez, Reçel, Şekerlemeler, Lokum, Lolipop, Jelibon, Çikolata vb.

Gazlı içecekler: Kolalı, Gazlı içecekler, Limonata, Hazır meyve suları

Katılımlarınız için teşekkür

7.5. Questionnaire Approve

Kimden: Doç. Dr. Yahya ÖZDOĞAN
Gönderilme: 25 Kasım 2021 Perşembe 16:29
Kime: Nora Kumral
Konu: Ynt: Adölesanlarda Beslenme Bilgisi anketini kullanım izni

Tezimde geliřtirdiđim ölçeđi akademik kurallar çerçevesinde kullanabilirsiniz. Sađlıklı günler dilerim.

*Doç. Dr. Yahya ÖZDOĞAN
Ankara Yıldırım Beyazıt Üniversitesi
Sađlık Bilimleri Fakóltesi
Beslenme ve Diyetetik Bölümü
Esenbođa Merkez Külliyesi
Dumlupınar mah. B Blok Kat:1
06760 Çubuk/ANKARA*

Gönderen: Nora Kumral <[redacted]>
Gönderildi: 25 Kasım 2021 Perşembe 15:10
Kime: Doç. Dr. Yahya ÖZDOĞAN <[redacted]>
Konu: Adölesanlarda Beslenme Bilgisi anketini kullanım izni

Sayın Doç. Dr. Yahya Özdođan
Yeditepe Üniversitesi Sađlık Bilimleri Enstitüsü Beslenme ve Diyetetik Bölümü Yüksek Lisans öđrencisi
Nora Kumral'ın yüksek lisans tez çalışmasında geçerlik ve güvenirlik çalışmasını yaptığınız 'Adölesanlarda
Beslenme Bilgisini Saptama' ölçeđinin kullanımı için izin istemekteyim. Tez çalışmasına başlayabilmek için
ölçeđin kullanımı konusunda yazılı izninizi talep etmekteyim

Saygılarımlar
Dyt. Nora KUMRAL

Windows için [Posta](#) ile gönderildi

7.6. Curriculum Vitae

Kişisel Bilgiler

Adı	Nora	Soyadı	KUMRAL
Doğum Yeri	İstanbul	Doğum Tarihi	
Uyruğu	T.C.	TC Kimlik No	
E-mail		Tel	

Öğrenim Durumu

Derece	Alan	Mezun Olduğu Kurumun Adı	Mezuniyet Yılı
Doktora			
Yüksek Lisans	Beslenme ve Diyetetik	Yeditepe Üniversitesi	2022
Lisans	Beslenme ve Diyetetik	Yeni Yüzyıl Üniversitesi	2017
Lise	-	Özel İstek Atanur Oğuz Lisesi	2011

Bildiği Yabancı Dilleri	Yabancı Dil Sınav Notu (#)
İngilizce	YDS

Başarılmış birden fazla sınav varsa (KPDS, ÜDS, TOEFL; EELTS vs), tüm sonuçlar yazılmalıdır

İş Deneyimi (Sondan geçmişe doğru sıralayın)

Görevi	Kurum	Süre (Yıl - Yıl)
		-
		-

Bilgisayar Bilgisi

Program	Kullanma becerisi
Microsoft Office	Çok iyi
SPSS	İyi

*Çok iyi, iyi, orta, zayıf olarak değerlendirin

Bilimsel Çalışmaları

SCI, SSCI, AHCI indekslerine giren dergilerde yayınlanan makaleler

Diğer dergilerde yayınlanan makaleler

Uluslararası bilimsel toplantılarda sunulan ve bildiri kitabında (Proceedings) basılan bildiriler

Hakemli konferans/sempozyumların bildiri kitaplarında yer alan yayınlar

Diğer (Görev Aldığı Projeler/Sertifikalari/Ödülleri)
