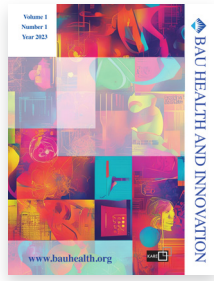
BAU HEALTH AND INNOVATION

DOI: 10.14744/bauh.2024.43153
BAU Health Innov 2023;1(2):51–64



Original Article

Adolescent Football Players' Nutritional Knowledge Levels, Nutritional Status, and Nutritional Habits During the COVID-19 Pandemic

Aslıcan Ateş,[1] **Yonca Sevim**[2]

[1]Bahçeşehir University, Graduate School, İstanbul, Türkiye
[2]Department of Nutrition and Dietetics, Bahçeşehir University, İstanbul, Türkiye

Abstract

Objectives: This study was conducted to evaluate the nutritional knowledge levels, habits, nutritional status, and changing nutritional habits during the pandemic period of adolescent football players aged 14–18 years who play football in a football academy.

Methods: 89 male football players (62 middle-adolescents and 27 late-adolescents) participated in the study. Information about general characteristics, health, nutritional habits, and knowledge level of the athletes were obtained by a questionnaire method applied by face-to-face interview. Height and weight measurements were taken by researcher. Three-day food records were taken, and dietary nutrient intakes were calculated with a software program and the data were statistically evaluated.

Results: The majority of the athletes do not skip meals. When those who skipped meals were analyzed, it was found that the majority skipped the midday meal. As a reason, they stated that it coincided with the training time. According to the rate of correct answers to the questions in the nutrition knowledge level section, the success rate of the middle adolescent group was 81%, and 75% of the late adolescent group. The majority of the athletes did not change their eating habits during the pandemic period. Dietary intake of energy, carbohydrate, fiber, calcium, iron, potassium, zinc, and Vitamin B1 of the athletes were lower than recommendations, protein intake was sufficient, and fat, sodium, and phosphorus intakes were higher than recommendations. The percentages of the recommended intakes of nutrients in the eighteen age group were found to be lower than the other age groups.

Conclusion: Athletes generally have fat-weighted diets, and dietary intakes were insufficient in terms of some important nutrients required for growth, development, and sports performance.

Keywords: Adolescent, dietary habits, eating behavior, nutritional status, sports.

Cite This Article: *Ateş A, Sevim Y. Adolescent Football Players' Nutritional Knowledge Levels, Nutritional Status, and Nutritional Habits During the COVID-19 Pandemic. BAU Health Innov 2023;1(2):51–64.*

Adolescence is a period covering the age range of 10–19 years in which cognitive and social maturation takes place in addition to rapid physical growth. In this period, as the age increases, the adolescent approaches the physical structure of adulthood and cognitive and social development increases.[1] As the rate of growth and development increases, nutrient requirements also increase.[2] Unhealthy and inadequate eating habits are seen in adolescents. They have high-fat and high-calorie diets due to increased consumption of foods such as ready meals, fast food, and carbonated drinks.[3,4] These wrong eating habits may adversely affect the growth and

Address for correspondence: Yonca Sevim, MD. Bahçeşehir Üniversitesi, Beslenme ve Diyetetik Bölümü, İstanbul, Türkiye
Phone: +90 505 700 58 90 **E-mail:** yonca.sevim@bau.edu.tr

Submitted: January 27, 2024 **Revised:** February 18, 2024 **Accepted:** February 20, 2024 **Available Online:** May 08, 2024

development, physical, and mental health of adolescents.[2] In adolescent athletes, energy and nutrient requirements have increased with the effect of both sports, and growth and development. Adequate and balanced nutrition is very important to increase sports performance, and to ensure healthy growth and development in adolescents.[5]

The postponement or cancellation of sports competitions during the pandemic affected athletes physically and psychologically. Athletes' sports performances and eating habits were affected.[6] The tendency to eat high-calorie, high-fat, and high-carbohydrate diets has increased.[7] Such unhealthy eating habits negatively affect the immune system health, sports performance, growth, and development of adolescent athletes.[1] Adequate and balanced nutrition, rich in antioxidant vitamins and minerals and omega-3 is very important for the growth and development, immune system, and sports performance of adolescent athletes, especially during this period.[6]

The aim of this study was to determine the nutritional habits and nutritional knowledge level of adolescent football players, to determine possible changes in nutritional habits during the pandemic period, and to determine whether the nutrient intake of athletes during the pandemic period is adequate. At the same time, this study was planned to determine whether the difference in the cognitive and social development of adolescent football players in middle and late adolescence affects their nutritional behaviors, nutritional knowledge level, nutritional habits, and food intake during the pandemic period and to compare these nutritional parameters between the two age groups.

Materials and Methods

Universe and Sample

The universe of this descriptive and cross-sectional study consists of 100 youth football players between the ages of 14–18 who were in Yılport Samsunspor Football Academy in April and May 2021. The sample of the study consists of youth football players who voluntarily accepted to participate in the study by themselves and their parents. The sample number was calculated to be at least 80 with 95% confidence interval and 5% margin of error and random sampling method was selected. Athletes with communication barriers, athletes with any chronic disease diagnosed by a doctor that may affect their food choices diagnosed by a doctor were not included in the study. As a result, this study was conducted with 89 youth football players aged 14–18 years playing football in the academy. The athletes were evaluated in two groups as mid-adolescent athletes (MAS: 14 –<17 years) and late-adolescent athletes (LAS: 17–18 years).

Questionnaire Form

The questionnaire form used in this study, which was conducted by face-to-face interview method, consists of four different sections and 68 questions.

General Characteristics

In this section, questions such as age (years), height (cm), body weight (kg), education, living place, diseases, years of playing football, and training frequency were included in the study.

Eating Habits

In this section, the number of meals and skipping meals of the participants were questioned. In addition, fluid intake and nutritional habits during training and match times were also questioned.

An open-ended question was asked about the foods that are thought to increase performance by the athlete. The answers given by the athletes were evaluated and classified as "Energizing foods (honey, butter, cream, peanut butter, tahini, and molasses), Oil seeds (walnuts, hazelnuts), Protein-containing foods (meat, milk, and eggs), Nutritional supplements (caffeine, omega 3, and multi-vitamin), Vegetables and fruits, and Carbohydrate."

Nutrition Knowledge Level

The questions in this section were formed by the researchers by evaluating similar studies in the literature[8,9] that examined the nutritional knowledge levels and habits of amateur and professional football players. There are 16 questions in this section, including 5 questions with options and 11 multiple choice questions (True, False, Undecided). Since a validity and reliability questionnaire was not used to evaluate the level of knowledge in our study, the number of questions answered correctly by the athletes was calculated as a percentage and a success rate (%) was found.[10,11]

The Changes in Eating Habits during the Pandemic Period

The questions in this section were created by the researcher by evaluating the literature examining the changes in the eating habits of adults and athletes during the pandemic period.[12] There are 22 questions with options in this section.

Dietary Intake

There-day food consumption records were taken to determine the food consumption of the athletes. The researcher explained to the athletes how to take 3-day food consumption records and then the food consumption records of the athletes were checked and evaluated by the researcher to prevent any possible missing, error, etc. Food consumption records were taken on 3 consecutive days,

one of which was at the end of the week. Energy, macro and micronutrient intakes from the recorded food consumption were analyzed with a software, Computer Assisted Nutrition Programme Nutrition Information Systems Package Program 8.2.[13] Since there is no specific nutritional guideline for adolescent football players, dietary intakes were compared with the recommended safe intake levels according to age and sex in the Turkish Nutrition Guide 2015 (TUBER)[14] and expressed as percentages of meeting nutrient requirements.

Anthropometric Measurements

The height (cm) and body weight (kg) measurements of the athletes were taken by the researcher. Body mass index (BMI) (kg/m^2) was calculated by dividing body weight (in kilograms) by the square of height (in meters). The percentile data of the World Health Organization were used in the evaluation of anthropometric measurements.[15]

Height for age percentiles: <3rd percentile (stunted), ≥3.–<15th percentile (short), ≥15.–<85th percentile (normal), ≥85.–<97th percentile (tall), ≥97th percentile (very tall); BMI for age percentiles: <3rd percentile (very underweight), ≥3.–<15th percentile (underweight), ≥15.–<85th percentile (normal), and ≥85.–<97th percentile (overweight).

Ethical Approval

For this research, ethics committee approval dated February 10, 2021, and numbered 2021/02 was obtained from Bahçeşehir University Scientific Research and Publication Ethics Committee. The parents of the athletes participating in the study were informed verbally and in writing, and written consent was obtained from the parents with the "Parent Information and Consent Form" indicating that they agreed to participate in the study. This study was derived from a master's thesis.

Statistical Analysis

IBM SPSS Statistics 27 (IBM Corp, 2020) package program was used for statistical analysis. Descriptive statistics for demographic and nutritional characteristics of the participants were presented as mean, standard deviation, median, minimum and maximum for numerical variables; qualitative data were presented as number (n) and percentage (%). Kolmogorov–Smirnov and Shapiro–Wilk tests and histogram graphs were used to determine the normality of the distribution. Chi-square test was used for pairwise comparisons between categorical variables and Fisher's exact test was used when the Chi-square condition was not met. Since the normal distribution condition was met for numerical variables, independent samples t-test was used for comparisons of two group means, one-way ANOVA was used for comparisons of more than two group means and Welch statistics was used when the condition of homogeneity of group variances was not met. Post hoc tests were used to determine the source of the significant difference in ANOVA; Tukey test was applied when the homogeneity assumption was fulfilled, and Games-Howell test was applied when the homogeneity assumption was not fulfilled. In the study, $p<0.05$ was accepted for statistical significance level.

Results

General Characteristics

Among the adolescent footballers in the study, 62 were in middle adolescence (14, 15, and 16 age groups) and 27 were in late adolescence (17 and 18 age groups). The mean age of the athletes was 15.82±1.34 years (MAS:15.06±0.77 years, and LAS:17.56±0.51 years). General and anthropometric characteristics of the athletes are given in Table 1. The majority of athletes had BMI and height for age within the normal range. Sports age, weekly training frequency, and daily training duration were higher in LAS than in MAS ($p<0.05$).

The meal habits and nutritional behaviors of the athletes and the nutritional beliefs on performance are shown in Table 2. It was found that the majority of athletes consumed 3 main meals and most of them consumed two snacks. No significant difference was found in the number of main and snack meals in both groups. LAS mostly skipped meals, and the main reason for skipping meals in both groups was that the meal coincided with the training time. While 45.2% of MAS thought that there are foods that improve performance, 51.8% of LAS stated that they had no idea. Most of the athletes believe that protein-containing foods and bananas have a positive effect on performance.

The Level of Nutrition Knowledge

The answers given by the athletes for the nutrition knowledge level questions are given in Tables 3 and 4. The athletes gave mostly correct answers to the questions about meals. Considering the correct answer rates of both groups, the success of MAS was 81%, while the success of LAS was 75%. The athletes gave mostly correct answers to the questions about recognizing high carbohydrate and high protein foods. The majority of MAS gave the correct answer to the glycemic index question, but the majority of LAS stated that they did not have knowledge on this subject ($p<0.05$) (Table 3). All of the athletes thought that there is a relationship between adequate and balanced nutrition and sports success and that water consumption is important for performance. The majority of the athletes (MAS: 61.3%, LAS: 48.2%) think that excessive consumption of protein does not cause muscle increase but increases performance; excessive consumption of carbohydrate causes fat storage

Table 1. Athletes general and anthropometric features

General features	Middle adolescent (n=62) Mean±SD		Late adolescent (n=27) Mean±SD		p
	n	%	n	%	
Sport age (years)	6.0±1.9		8.7±1.8		**<0.001**
Weekly training duration (day)	3.5±0.9		4.8±1.0		**<0.001**
Daily training duration (hour)	1.7±0.3		1.9±0.4		**0.011**
BMI (kg/m^2)	20.5±1.7		22±1.3		
BMI by age					
Underweight	2	3.2	0	–	1.000[b]
Normal	58	93.6	27	100	
Overweight	2	3.2	0	–	
Height by age					
Stunded	1	1.6	0	0	0.748[b]
Short	4	6.4	1	3.7	
Normal	46	74.2	24	88.9	
Tall	8	13.0	2	7.4	
Very tall	3	4.8	0	0	
Education					
Primary	10	16.1	1	3.7	**0.009[b]**
High school	52	83.9	23	85.2	
University	0	0	3	11.1	
Living place					
With family	51	82.3	19	70.4	0.208[a]
Facility	11	17.7	8	29.6	

[a]: Independent groups t-test, [b]: Fisher exact Chi-square analysis (p<0.05). SD: Standard deviation, BMI: Body mass index.

but also causes muscle increase. Most of the athletes (MAS: 82.3% and LAS: 85.2%) think that vitamins are also needed for energy during exercise, and the need for antioxidant vitamins and minerals may increase in athletes. Most of the athletes (MAS: 66.1% and LAS: 59.3%) think that water loss decreases performance in athletes and that only water loss occurs with sweating (MAS: 42% and LAS: 48.2%) (Table 4).

The Changes in Eating Habits during the Pandemic Period

The changes in eating habits and body weight of the athletes during the pandemic period are given in Table 5. The majority of the athletes stated that their eating habits did not change during the pandemic period. On the other hand, when the possible changes were asked separately, it is seen that the number of meals, night eating, and water consumption increased in the majority of athletes. In addition, the majority of the athletes stated that they started to eat a carbohydrate-based diet. When MAS and LAS were compared, statistically significant differences were found between the changes in carbohydrate, fat, meat, chicken, and fish consumption (p<0.05). The majority of the athletes stated that they started to eat protein and vitamin-based diet; their consumption of fast food, ready meals, frozen food did not increase, but their consumption of snacks, bread, and desserts increased and they started to prepare more meals at home. The majority of the athletes increased their consumption of milk and yoghurt (MAS: 83.9% and LAS: 63.0%), egg (MAS: 85.5% and LAS: 66.7%), meat, chicken and fish (MAS: 90.3% and LAS: 63.0%), vegetables and fruits (MAS: 80.6% and LAS: 66.7%), and oil seeds such as hazelnuts, walnuts, and almonds (MAS: 72.6% and LAS: 66.7%).

Dietary Intakes

The average daily energy and nutrient intakes of the athletes are given in Table 6 and the percentages of meeting these nutrient requirements are given in Table 7. In general, each age group had lower carbohydrate intake and higher fat intake. Protein intake was adequate in all age groups and

Table 2. Athletes' eating behaviors and the nutritional beliefs on performance

Eating behaviors	Middle adolescent (n=62)		Late adolescent (n=27)		p
	n	%	n	%	
Number of main meals					0.235*
2	15	24.2	3	11.1	
3	45	72.6	24	88.9	
4	2	3.2	0	0	
Number of snack meals					0.926*
None	1	1.6	1	3.7	
1	24	38.7	11	40.7	
2	30	48.4	12	44.4	
3	7	11.3	3	11.1	
Skipping meals					**0.025**
Yes	13	21	9	33.3	
No	33	53.2	6	22.2	
Sometimes	16	25.8	12	44.4	
Skipped meals					0.355*
Breakfast	2	7	3	14.3	
Lunch	16	55	11	52.4	
Dinner	10	35	4	19	
Snacks	1	3	3	14.3	
Reasons for skipping meals					0.937*
Lack of time	5	17.2	4	19	
Lack of appetite	4	13.8	4	19	
Lack of food	2	7	0	0	
Coinciding with training time	9	31	8	38.2	
Desire to lose weight	1	3.5	1	4.8	
Lack of habit	7	24	4	19	
Financial impossibility	1	3.5	0	0	
Nutritional Beliefs					
Believes that there is a food improve performance					**0.007**
Yes	28	45.2	6	22.2	
No	22	35.5	7	26	
No idea	12	19.3	14	51.8	
Foods considered by the athlete improve performance**					0.870
Energy giver foods (honey, butter, milk cream, peanut butter, tahini, molasses)	7	25.0	1	16.7	
Oily seeds (walnuts, hazelnuts)	4	14.3	0	0	
Protein-containing foods (meat, milk, and egg)	10	35.7	2	33.3	
Dietary supplements (caffeine, omega3, multi-vitamin)	2	7.1	0	0	
Vegetables and fruits	4	14.3	0	0	
Carbohydrate	2	7.1	1	16.7	
Banana	9	32.1	2	33.3	

P value has been analyzed with Pearson Chi-square test. *: Fisher Exact Chi-square analysis, **: Multiple reply has been given (p<0.05).

the amounts of energy, carbohydrate (percentage), dietary fiber, calcium, iron, potassium, zinc, Vitamin B1, folate, and water were lower than need. The percentage of fulfillment of the needs of the 18-year-old group is lower than the other age groups. In athletes, protein (g) intake increased with increasing age, except for 18 years of age. It was found that energy (kcal/kg), protein (g/kg), and B6 intakes were different between ages (p=0.043, p=0.014, p=0.013).

Table 3. Distribution of athletes' answers to nutrition knowledge level questions

Nutrition knowledge level questions	Middle adolescent (n=62)		Late adolescent (n=27)		p*
	n	%	n	%	
How many main meals should a footballer have a day?					0.099*
≥3[a]	50	80.6	26	96.3	
<3	12	19.4	1	3.7	
Which of the following meals is more appropriate as the last meal before a match?					0.575*
Easy digestible, fiber free, and low fatty[a]	56	90.4	25	92.6	
High fat, and energy	3	4.8	0	0	
Vegetable dishes, and fruit	3	4.8	2	7.4	
Which foods have the highest carbohydrate content?***					0.194**
Bread, rice, bulgur, pasta[a]	56	90.3	26	96.3	
Legumes	16	25.8	4	14.8	
Meat, chicken, fishes, egg	4	6.4	3	11.1	
Oily seeds such as hazelnuts, walnuts, almonds etc.	4	6.4	2	7.4	
Milk, yoghurt, buttermilk, kefir	4	6.4	0	0	
Vegetables	6	9.7	0	0	
Fruits	7	11.3	0	0	
Don't know	1	1.6	1	3.7	
Which foods have the highest protein content?***					0.876**
Meat, chicken, fishes, egg[a]	58	95	25	92.6	
Bread, rice, bulgur, pasta	0	0	0	0	
Legumes	5	8.2	1	3.7	
Oily seeds such as hazelnuts, walnuts, almonds etc.	5	8.2	1	3.7	
Milk, yoghurt, buttermilk, kefir	10	16.4	5	18.5	
Vegetables	3	5	1	3.7	
Fruits	2	3.3	0	0	
Don't know	0	0	0	0	
Which foods have the highest glycemic index?***					**0.003***
Sweets, desserts[a]	22	35.5	4	15	
Bread, rice, bulgur, pasta	17	27.4	3	11.1	
Oat	7	11.3	7	26	
Milk, yoghurt	13	21	1	3.7	
Don't know	20	32.3	15	55.6	

[a]: True answer. *: Chi-square test, **: Fisher exact Chi-square analysis, ***: Multiple reply has been given ($p<0.05$).

Discussion

In this cross-sectional study, which was planned to determine the nutritional habits and nutritional knowledge level of adolescent football players, to determine effect of the pandemic period on diet, it was determined that the most skipped meal by the athletes was lunch, the reason for this was the overlap with the training time, LAS skipped more meals, and MAS had more ideas about the relationship between nutrition and performance. The success of the athletes in the nutrition questions was 81% in MAS and 75% in LAS. The athletes stated that the pandemic period and quarantine did not change their eating habits, but in detailed questions, they also stated that the number of meals, eating at night, water consumption, vitamin-based diet, snack consumption, milk, yoghurt, egg, vegetables, fruits, oil seed group, and dessert consumption increased during this period. In this period, both an increase and constancy in body weight were reported. It was determined that the athletes were under-nourished in terms of energy and carbohydrate and over-nourished in terms of fat. In general, it was observed that the 18 age group had different dietary intakes compared to other ages.

In studies conducted with adolescent athletes, most of the athletes provided the recommended number of meals, but

Table 4. Distribution of athletes' answers to multiple choice nutrition knowledge level questions

Questions	Middle adolescent (n=62)		Late adolescent (n=27)		p
Choices	**n**	**%**	**n**	**%**	
There is a relationship between adequate and balanced nutrition and sports success					
True[a]	62	100	27	100	**
Excess weight affects performance negatively					
True[a]	58	93.6	25	92.6	0.620*
Indecisive	2	3.2	2	7.4	
False	2	3.2	0	0	
Water consumption is important for performance					
True[a]	62	100	27	100	**
Excessive consumption of protein causes muscle increase					
True	9	14.5	5	18.5	0.511
Indecisive	15	24.2	9	33.3	
False[a]	38	61.3	13	48.2	
Excess carbohydrate consumption causes fat storage					
True[a]	46	74.2	17	63	0.285*
Indecisive	15	24.2	8	29.6	
False	1	1.6	2	7.4	
Excess protein consumption increases performance					
True	23	37.1	12	44.4	0.646
Indecisive	22	35.5	10	37	
False[a]	17	27.4	5	18.6	
Excess carbohydrate consumption causes muscle growth					
True	33	53.2	13	48.2	0.904
Indecisive	19	30.7	9	33.3	
False[a]	10	16.1	5	18.5	
Vitamins are also needed for energy formation during exercise					
True[a]	51	82.3	23	85.2	0.169*
Indecisive	5	8	4	14.8	
False	6	9.7	0	0	
Athletes need antioxidant vitamins more than normal individuals					
True[a]	47	75.8	20	74	0.854*
Indecisive	14	22.6	7	26	
False	1	1.6	0	0	
In athletes, only water loss occurs with sweating					
True	26	42	13	48.2	0.492
Indecisive	17	27.4	9	33.3	
False[a]	19	30.6	5	18.5	
Water loss in athletes decreases performance					
True[a]	41	66.1	16	59.3	0.065
Indecisive	11	17.8	10	37	
False	10	16.1	1	3.7	
Percentage of correct answers (success %)	81		75		

[a]: Correct answer. P-value has been analyzed with Chi square. *: Fisher exact chi-square analysis, **: Since all answers were the same, p-value could not be calculated ($p<0.05$).

meal skipping behavior is also common.[16,17] In our study, the meal usually skipped was lunch, whereas in other studies it was breakfast. As a reason, athletes stated that they did not have enough time and habits.[18–20] In these studies, most of the athletes stated that the reason for skipping meals was lack of time and also lack of appetite. It should be kept in

Table 5. Responses of athletes about changing eating behaviors and body weight during the pandemic period

Questions	Answers	Middle adolescent (n=62)		Late adolescent (n=27)		p
		n	%	n	%	
Has your diet changed during the pandemic?	Yes	30	48.4	9	33.4	0.084*
	No	31	50.0	15	55.5	
	No Idea	1	1.6	3	11.1	
Reason for changing diet during the pandemic?	To increase immunity	5	16.7	1	11.1	0.480*
(mid- adolescent n=30 and late- adolescent n=9)	Psychological reason	6	20.0	1	11.1	
	Lack of exercise	3	10.0	0	0.0	
	Feeling more hungry	16	53.3	6	66.7	
	Does not know what to do for diet in pandemic	–	0.0	1	11.1	
Detailed questioning of dietary pattern						
The number of meals increased	Yes	34	54.8	14	51.9	0.958
	Indecisive	7	11.3	3	11.1	
	No	21	33.9	10	37.0	
Night eating behavior increased	Yes	39	62.9	14	51.9	0.145
	Indecisive	2	3.2	4	14.8	
	No	21	33.9	9	33.3	
Water consumption increased	Yes	49	79.0	18	66.7	0.292
	Indecisive	6	9.7	6	22.2	
	No	7	11.3	3	11.1	
Started to a carbohydrate-rich diet	Yes	27	43.5	7	25.9	**0.009**
	Indecisive	14	22.6	15	55.6	
	No	21	33.9	5	18.5	
Started to a protein-rich diet	Yes	44	71.0	13	48.2	0.108
	Indecisive	13	21.0	11	40.7	
	No	5	8.0	3	11.1	
Started to a fat-rich diet	Yes	20	32.3	5	18.5	**0.033**
	Indecisive	13	21.0	13	48.2	
	No	29	46.7	9	33.3	
Started to a vitamin-rich diet	Yes	40	64.5	13	48.2	0.155
	Indecisive	13	21.0	11	40.7	
	No	9	14.5	3	11.1	
Fast food consumption increased	Yes	17	27.4	6	22.2	0.549
	Indecisive	16	25.8	5	18.5	
	No	29	46.8	16	59.3	
Consumption of ready meals increased	Yes	18	29.0	8	29.6	0.760
	Indecisive	10	16.1	6	22.2	
	No	34	54.9	13	48.2	
Frozen food consumption increased	Yes	11	17.7	4	14.8	0.564
	Indecisive	12	19.4	8	29.6	
	No	39	62.9	15	55.6	
Snack consumption increased	Yes	37	59.7	11	40.8	0.224
	Indecisive	9	14.5	7	25.9	
	No	16	25.8	9	33.3	
Started to prepare more meals at home	Yes	34	54.8	12	44.5	0.487
	Indecisive	8	12.9	6	22.2	
	No	20	32.3	9	33.3	

Table 5 (cont.). Responses of athletes about changing eating behaviors and body weight during the pandemic period

Questions	Answers	Middle adolescent (n=62)		Late adolescent (n=27)		p
		n	%	n	%	
Bread consumption increased	Yes	30	48.4	10	37.0	0.132
	Indecisive	6	9.7	7	25.9	
	No	26	41.9	10	37.1	
Consumption of milk and yoghurt group increased	Yes	52	83.9	17	63.0	0.052*
	Indecisive	3	4.8	5	18.5	
	No	7	11.3	5	18.5	
Egg consumption increased	Yes	53	85.5	18	66.7	0.078*
	Indecisive	4	6.4	6	22.2	
	No	5	8.1	3	11.1	
Consumption of meat, chicken and fish increased	Yes	56	90.3	17	63.0	**0.002***
	Indecisive	4	6.5	9	33.3	
	No	2	3.2	1	3.7	
Consumption of vegetables and fruits increased	Yes	50	80.6	18	66.7	0.199
	Indecisive	6	9.7	7	25.9	
	No	6	9.7	2	7.4	
Consumption of oilseeds such as hazelnuts, walnuts and almonds increased	Yes	45	72.6	18	66.7	0.817
	Indecisive	10	16.1	6	22.2	
	No	7	11.3	3	11.1	
Dessert consumption increased	Yes	28	45.2	14	51.8	0.823
	Indecisive	17	27.4	6	22.2	
	No	17	27.4	7	26.0	
Body weight increased	Yes	21	33.9	10	37.1	0.890
	Indecisive	17	27.4	8	29.6	
	No	24	38.7	9	33.3	

P-value was calculated with Pearson chi-square analysis. *: Fisher exact chi-square analysis ($p<0.05$).

mind that this group of athletes is also at school age, and for this reason, training program as well as school program may be an obstacle in planning meal times. In our study, the first reason was the overlap with the training time, and then the reasons such as lack of habit and feeling of satiety were listed. These differences may also be due to the different training plans of the athletes. In addition, as the age increases, footballers train more intensively and the number and duration of training increases.[21] It is of great importance to plan training and meal times in a way that does not cause any deficiency for adolescent athletes who are in the growth and development phase.

In this study, when the correct answer rates of both groups to the questions determining the level of nutritional knowledge were analyzed, the success rate of MAS was 81%, while the success rate of LAS was 75%. In two different studies conducted with adolescent footballers in Ireland, in which the same scale was used, the success rate was found to be 59.6% and 45.6% and it was stated that the nutritional knowledge level of the participants was low in these studies.[22,23] In another study, the success level of nutritional knowledge of adolescent football players was found to be 54.6%, and the success levels in other studies using the same scale varied between 36.9% and 77.6%.[10,11,24] Reasons such as the fact that our study is more recent than similar studies in the literature and the increased interest in nutrition content focused on increasing immunity in social media and visual media during the pandemic period may be effective in our higher success rate. In general, the reason for the low level of nutritional knowledge of adolescent athletes may be that athletes focus on learning football skills and are less interested in nutrition. The level of nutritional knowledge of the sources from which athletes learn may also be an important factor.

The results of the related literature, in parallel with the results of our study, show that the rate of correct answers to nutritional knowledge questions in MAS is higher than in LAS and the rate of correct answers decreases with increasing age.[10,23,25] In fact, cognitive level, comprehension, and awareness

Table 6. Athletes daily energy, macro and micro nutrients, and water intakes

Age	14 (n=16) Mean±SD Min-max	15 (n=26) Mean±SD Min-max	16 (n=20) Mean±SD Min-max	17 (n=12) Mean±SD Min-max	18 (n=15) Mean±SD Min-max	p*
Energy (kcal)	1635±508	1789±355	1808±339	1869±511	1620±424	0.377
	817–2659	1199–2513	1229–2460	881–2846	1126–2776	
Energy (kcal/kg)	30±9	29±7	26±5	28±8	23±6	**0.043**
	16–48	17–45	18–38.5	11–43	13–37	
Carbohydrate (g)	133±37	148±43	124±44	143±53	123±41	0.263
	75–173	78–257	54–228	60–224	59–190	
Carbohydrate (% energy)	34±5	34±9	28±7	31±7	32±10	0.060
	26–49	19–53	16–42	17–43	16–49	
Fat (% energy)	49±6	49±8	54±7	51±6	53±11	0.107*
	34–58	34–62	43–68	41–61	34–73	
Protein (g)	66±20	74±18	79±19	82±28	61±16	**0.020**
	36–107	45–123	47–111.8	41–139	38–94	
Protein (% energy)	17±1	17±3	18±3	18±6	16±3	0.164
	13–19	12–22	11–25	12–36	10–20	
Protein (g/kg)	1.2±0.4	1.2±0.3	1.0±0.3	1.2±0.5	0.9±0.2	**0.014**
	0.7–2.0	0.7–1.9	0.7–1.6	0.5–2.3	0.6–1.3	
Fiber (g)	18±6	19±8	15±5	19±9	15±7	0.177
	8–31	8–38	6–26	5–39	5–26	
Calcium (mg)	788±316	851±308	848±276	710.4±261	634±261	0.137
	301–1468	274–1599	386–1386	300–1196	204–1366	
Iron (mg)	9±3	10±4	9±3	11±4	8±2	0.161
	4–14	5–26	6–17	4–19	5–12	
Magnesium (mg)	265±75	281±104	259±60	308±125	208±72	0.058
	158–396	153–567	157–387	108–525	108–349	
Phosphorus (mg)	1239±396	1352±455	1273±270	1354±500	1024±342	0.127
	642–1959	754–2720	836–1734	558–2213	693–1998	
Potassium (g)	2.0±0.5	2.0±0.8	2.0±0.6	2.0±1.0	2.0±0.7	0.087
	1.5–3.0	1.0–4.0	1.0–3.5	1.0–4.0	0.8–3.0	
Sodium (g)	8±10	7±11	4±4	14±23	4±4	0.265
	1–35	1–53	1–19	1–80	1–21	
Zinc (mg)	9.5±3.0	10.5±2.6	11.6±3.6	11.0±3.0	8.6±2.5	0.055
	5–18	6–17	7–21	6–18	6–14	
Vitamin A (mcg)	982±315	1095±356	1173±437	1273±560	1085±379	0.399
	481–1646	458–1791	650–2430	652–2639	540–2125	
Vitamin E (mcg)	156±10	13±5	14±6	15±10	13±7	0.863
	4–34	6–23	5–29	4–38	4–27	
Vitamin C (mg)	94±44	72±45	75±40	107±69	69.5±50	0.172
	45–178	7–179	6–163	23–280	1–210	
B1 (mg)	1.0±0.2	0.9±0.3	0.8±0.2	1.0±0.3	0.7±0.3	0.112
	0.5–1	0.5–2	0.5–1	0.3–1.6	0.3–1.2	
B2 (mg)	1.5±0.3	1.7±0.4	1.7±0.5	1.7±0.5	1.3±0.4	0.078
	1–2	1–2.5	1–2.7	0.8–2.4	0.7–2.3	
B6 (mg)	1.4±0.3	1.3±0.4	1.5±0.4	1.7±0.5	1±0.3	**0.013**
	0.8–2	0.7–2	0.7–2	1–2	0.5–1.7	
Folate (mcg)	261±65	266±80	268±82	310±113	254±70	0.450
	150–380	140–492	164–505.5	146.5–493	137–402	
Water (ml)	959±169	934±261	893±241.5	1041±364	767±258	0.084
	668–1302	582–1457	517–1303	529–1623	365–1188	

*: Welch statistics ($p<0.05$).

Table 7. The percentages of dietary recommendation intakes

Age Percentages	14 (n=16) Mean±SD Min-max	15 (n=26) Mean±SD Min-max	16 (n=20) Mean±SD Min-max	17 (n=12) Mean±SD Min-max	18 (n=15) Mean±SD Min-max	p*
Energy (kcal)	58±18	60±12	60±11	58±16	50.6±13	0.280
	29–95	40–84	41–82	275–89	35–87	
Carbohydrate (g)	102±28	114±33	95±34	110±40	95±31	0.263
	58–133	60–198	42–1755	46–172	455–146	
Carbohydrates (% energy)	65±10	65±16	53±14	59±13	60±18	0.060
	49–93	36–101	30–80	32–82	30–93	
Fat (% energy)	178±20	177±28	197±25	184±21	192±40	0.107
	123–211	123–225	156–247	149–222	124–265	
Protein (g)	146±44	148±37	148±35	147±49	114±30	0.063
	80–237	90–247	88–209	74–248	72–177	
Protein (% energy)	120±11	117±18	125±23	127±41	104±20	0.068
	93–136	83–152	76–172	83–248	67–133	
Protein (g/kg)	111±32	109±30	104±26	113±43	82±23	0.052
	66–175	64–169	69–150	48–214	54–129	
Fiber (g)	97±33	92±39	72±25	93±45	61±27	**0.012**
	43–161	37–182	30–123	26–185	20–105	
Calcium (mg)	68±27	74±27	74±24	62±23	63±26	0.514
	26–128	24–139	34–120.5	26–104	20–137	
Iron (mg)	83±27	90±38	85±24	99±35	71±20	0.161
	39–130	50–235	58–152	40–178	45–110	
Magnesium (mg)	88±25	94±35	86±20	103±41	59±20	**0.001**
	53–132	51–189	52–129	36–175	31–100	
Phosphorus (mg)	194±62	211±71	199±42	211±78	186±62	0.725
	100–306	118–425	131–271	87–346	126–363	
Potassium (g)	48±10	47±17	45±14	52±17	36±14	0.087
	33–65	22–81	26–74	22–81	16–66	
Sodium (g)	543±652	451±731	259±253	909±1558	274±310	0.264
	95–2369	105–3559	109–1300	101–5316	87–1376	
Zinc (mg)	89±32	74±18	82±26	77±22	61±17	**0.020**
	46–165	42–119	50–148	44–126	42–97	
Vitamin A (mcg)	164±53	146±47	156±58	169.7±75	145±50.5	0.657
	80–274	61–239	86–324	87–352	72–283	
Vitamin E (mcg)	122±77	102±42	108±50	118±82	100±58	0.788
	32–265	46–181	40–225	30–292	34–212	
Vitamin C (mg)	134±63	72±45.5	75±40.4	107±69	63±46	**0.001**
	64–255	7–179	6–163	23–280	2–191	
B1 (mg)	72±20	72±27	63.5±18	78±30	56.6±21	0.112
	37–114	39–151	37–94	28–136	29–102	
B2 (mg)	118±27	129±35	131±40	129±35	101±28	0.078
	70–176	72–196	69–207	59–187	57–178	
B6 (mg)	109±29	104±34	113±33	132±39	87±26.5	**0.013**
	65–169	57–163	52–172	67–188	39–134	
Folate (mcg)	96±24	80±24	8±25	94±34	77±21	0.113
	55–140	42–149	49–153	44–149	41–122	
Water (mL)	38±6	37±10	36±10	42±14	31±10	0.084
	27–52	23–58	20–52	21–65	15–47	

*: Welch statistics ($p<0.05$).

increase with increasing age in adolescents; therefore, it is expected that late adolescents would have higher rates of correct answers to the questions due to both their football experience and their age and therefore higher cognitive level. These results did not meet our expectation because the rate of correct answers to the nutrition knowledge level questions of the athletes did not increase with increasing age, on the contrary, it decreased. The reason for this may be that the search for identity and future anxiety are higher in late adolescence than in middle adolescence, and therefore their interests are self-realization and academic activities in these fields rather than sports, performance and therefore nutrition. At the same time, adolescents may not have been able to answer the questions properly due to these concerns. Therefore, the 18-year-old age group should be followed up with a separate focus in terms of nutrition.

Nutritional beliefs may also affect nutritional behavior and knowledge levels. Nutritional beliefs of athletes should also be well understood. Most of the athletes thought that there is a special food that improves performance and these foods are protein-containing foods.[26,27] However, in a study conducted with adolescent football players, most of the athletes thought that the food that increased performance was multivitamin cereal.[17] In our study, most of the athletes believed that protein-containing foods and bananas affected performance.

In this study, athletes stated that the pandemic period and quarantine did not change their eating habits. This result was also obtained in similar studies conducted with adolescent football players.[28,29] In our study, it was found that the majority of the athletes did not increase their consumption of ready meals, frozen foods, and fast food, but their consumption of snacks and the frequency meal preparation at home increased. In another study conducted with adolescent football players, the frequency of preparing and eating food at home increased too.[12] In another study, ready-to-eat food consumption of athletes did not increase.[29] In the pandemic, it was observed that ordering ready-to-eat meals was avoided with the concern of virus transmission. In this current study, athletes stated that their consumption of bread, milk, yoghurt, egg, meat, chicken, fish, vegetables, fruits, and desserts increased. Similarly, it has been reported that vegetable and fruit consumption increased,[29] dessert, bread, snacks, and fruit consumption increased, but vegetable consumption decreased.[28]

In this current study, in which dietary intakes were analyzed, carbohydrate intake of athletes was found to be lower than it should be, fat intake was found to be higher than it should be, and it was observed that they were fed predominantly with fat. In other studies, athletes were found to have a fat-dominant diet.[30–32] Similar to our study, energy and carbohydrate intake was low, protein intake was sufficient and fat intake was high in studies conducted with adolescent athletes.[16,19,33] Also in other studies, similar to our study, calcium, iron, zinc, potassium, and Vitamins B intakes were found to be low.[19,20,24] In addition, similar to the present study, sodium and phosphorus intakes of athletes were found to be much higher than the recommended levels.[19,33] In our study, the fact that the percentage of macro and micronutrient intakes were lower in the 18-year-old age group compared to the other age groups may be related to the fact that this group was stressed and anxious during the year of preparation for the university exam and therefore paid less attention to their nutritional status. In the literature, similar to our study, it was observed that the general nutrient intake of athletes was lower than it should be.[24,32] Since low intake of micronutrients such as calcium, iron, and zinc may adversely affect growth, development, sports performance, and general health, it is very important for adolescent athletes to meet the increased nutrient requirements of sports, growth, and development in every age group.

This study has several limitations and strengths. Due to the cross-sectional nature of this study, a cause and effect relationship cannot be established. The single-center nature of the study makes the study results not generalizable to the general population. On the other hand, this single-center study is a strength in terms of generating homogeneous data from the participants. So far, this is the first study to examine adolescent Turkish football players according to their adolescence period during the pandemic.

Conclusion

It was determined that adolescent football players mostly skipped lunch due to training time and their nutritional knowledge level decreased towards the age of 18. In a special period such as the pandemic, it is seen that nutritional behaviors and body weights differ, and it has been determined that these athletes, who are in the growth and development phase, are not fed in accordance with the recommendations. However, it cannot be said that these deficiencies are caused by the pandemic alone. The adolescent period, which is determined as a growth period, should be evaluated as separate ages in itself, and especially 18-year-old athletes should be followed up separately. It is seen that the nutrient intake of adolescent football players who are at risk for inadequate and unbalanced nutrition is inadequate and needs to be improved. It is thought that athletes can gain healthier eating habits and their nutritional status can be improved and nutritional quality can be increased by the nutritionist's regular follow-up.

Disclosures

Ethics Committee Approval: The study was approved by the Bahçeşehir University Scientific Research and Publication Ethics Committee (no: 2021/02, date: 10/02/2021).

Authorship Contributions: Concept – A.A.; Design – A.A., Y.S.; Supervision – Y.S.; Funding – A.A.; Materials – A.A.; Data collection and/or processing – A.A.; Data analysis and/or interpretation – Y.S., A.A.; Literature search – Y.S., A.A.; Writing – Y.S., A.A.; Critical review – Y.S.

Conflict of Interest: All authors declared no conflict of interest.

Use of AI for Writing Assistance: Not declared.

Financial Disclosure: The authors declared that this study received no financial support.

Peer-review: Externally peer-reviewed.

References

1. Choufani J, Kim SS, Nguyen PH, Heidkamp R, Grummer-Strawn L, Saha KK, et al. Measuring coverage of infant and young child feeding counselling interventions: A framework and empirical considerations for survey question design. Matern Child Nutr 2020;6(4):e13001.
2. Diker G, Müniroğlu S. Examination of selected physical characteristics of 8-14 age group football players according to age groups. SPORMETER J Phys Educ Sports Sci 2016;14(1):45–52.
3. Yavuz CM, Özer BK. Eating habits and nutrition in adolescent school children. J Tour Gastron Stud 2019;7(1):225–43.
4. Mor A, İpekoğlu G, Arslanoğlu C. Examination of nutritional habits of sports high school students (Sinop Province Sample). Gaziantep Univ J Sports Sci 2018;3(3):67–77.
5. Oliveira CC, Ferreira D, Caetano C, Granja D, Pinto R, Mendes B, et al. Nutrition and supplementation in soccer. Sports (Basel) 2017;12;5(2):28.
6. Chen P, Mao L, Nassis GP, Harmer P, Ainsworth BE, Li F. Coronavirus disease (COVID-19): The need to maintain regular physical activity while taking precautions. J Sport Health Sci 2020;9(2):103–4.
7. Şahin T. Sports nutrition during the COVID-19 pandemic: Nutritional habit changes and recommendations. Çanakkale Onsekiz Mart Univ J Sports Sci 2021;4(1):1–9.
8. Yüksek M. Examination of Nutritional Habits and Knowledge Levels of Amateur and Professional National Team Football Players. Haliç University, Institute of Health Sciences, Master's Thesis, 115s, Istanbul; 2013.
9. Saygin Ö, Göral K, Gelen E. Examination of nutritional habits of amateur and professional football players. Int J Hum Sci 2009;6(2):177–96.
10. Argôlo D, Borges J, Cavalcante A, Silva G, Maia S, Moraes A, et al. Poor dietary intake and low nutritional knowledge in adolescent and adult competitive athletes: A warning to table tennis players. Nutr Hosp 2018;5;35(5):1124–30.
11. Rodrigues Leite MM, Santos Barbosa Machado AC, da Silva DG, Falcão Raposo OF, Mendes Netto RS. Conocimiento sobre alimentación y nutrición después del desarrollo de actividades de educación alimentaria entre niños y adolescentes deportistas. Pensar Prát 2016;19(1):1–10.
12. Sidebottom C, Ullevig S, Cheever K, Zhang T. Effects of COVID-19 pandemic and quarantine period on physical activity and dietary habits of college-aged students. Sports Med Health Sci 2021;3(4):228–35.
13. Ebispro for Windows, Stuttgart, Germany; Turkish Version (BeBiS 8.2). Istanbul: Pasifik Elektirik Elektronik Ltd. Şti; 2019.
14. Türkiye Beslenme Rehberi TÜBER 2015, T.C. Ankara: Sağlık Bakanlığı Yayın No: 1031; 2016.
15. WHO Growth Reference Data for 5-19 Years. Available from: https://www.who.int/tools/growth-reference-data-for-5to19-years. Accessed Jul 19, 2021.
16. Demir HP, Onur HN, Mızrak E. Examination of the relationship between quality of life and nutritional status of adolescents under the age of 18 doing sports. Eur Res Sport Sci 2019;4(2):121–31.
17. Otman ÖT. Evaluation of Nutritional Status, Fluid Consumption and Caffeine Intake of Adolescent Football Players. Hacettepe University, Institute of Health Sciences, Master's Thesis. 149s, Ankara; 2017.
18. Özkarabulut AH, Yürek MA. Nutritional status of male and female students in basketball clubs and the differences between them. Istanbul Gelişim Univ J Health Sci 2017;3:239–59.
19. Güldemir HH, Bayraktaroğlu E. Evaluation of nutritional status of adolescent amateur football players. SPORMETER J Phys Educ Sports Sci 2020;18(3):42–51.
20. Onbaşı Z. The Effect of Nutrition Education on Adolescent Volleyball Players' Nutritional Knowledge Levels, Nutritional Status and Fluid Consumption. Başkent University, Institute of Health Sciences, Master's Thesis. 126s, Ankara; 2017.
21. Patton-Lopez MM, Manore MM, Branscum A, Meng Y, Wong SS. Changes in sport nutrition knowledge, attitudes/beliefs and behaviors following a two-year sport nutrition education and life-skills intervention among high school soccer players. Nutrients 2018;10(11):1636.
22. Manore MM, Patton-Lopez MM, Meng Y, Wong SS. Sport nutrition knowledge, behaviors and beliefs of high school soccer players. Nutrients 2017;9(4):350.
23. Walsh M, Cartwright L, Corish C, Sugrue S, Wood-Martin R. The body composition, nutritional knowledge, attitudes, behaviors, and future education needs of senior schoolboy rugby players in Ireland. Int J Sport Nutr Exerc Metab 2011;21(5):365–76.

24. Noronha DC, Santos MI, Santos AA, Corrente LG, Fernandes RK, Barreto AC, et al. Nutrition knowledge is correlated with a better dietary intake in adolescent soccer players: A cross-sectional study. J Nutr Metab 2020;2020:3519781.
25. Erdoğdu A. Medipol Examination of Nutritional Habits and Knowledge Levels of Başakşehir Football Club Players Based on Age. Gelişim University, Institute of Health Sciences, Master's Thesis, 87s, Istanbul; 2018.
26. Parnell JA, Wiens KP, Erdman KA. Dietary intakes and supplement use in pre-adolescent and adolescent Canadian athletes. Nutrients 2016;8(9):526.
27. Yarar H, Gökdemir K, Eroğlu H, Özdemir G. Evaluation of nutritional knowledge and habits of elite level athletes. Selçuk Univ J Phys Educ Sports Sci 2011;13(3):368–71.
28. Yüksel A. Evaluation of sleep quality and nutritional status of elite athletes during the COVID-19 pandemic period. OPUS Int J Soc Res 2021;17:3919–42.
29. Roberts C, Gill N, Sims S. The influence of COVID-19 lockdown restrictions on perceived nutrition habits in Rugby union players. Front Nutr 2020;7:589737.
30. Asfuroğlu Y. Evaluation of the relationship between fluid consumption, body composition and nutritional status in athletes. Bilim University, Institute of Health Sciences, Master's Thesis. 97s, Istanbul; 2013.
31. García-Rovés PM, García-Zapico P, Patterson AM, Iglesias-Gutiérrez E. Nutrient intake and food habits of soccer players: Analyzing the correlates of eating practice. Nutrients 2014;6(7):2697–717.
32. Zeng D, Fang ZL, Qin L, Yu AQ, Ren YB, Xue BY, et al. Evaluation for the effects of nutritional education on Chinese elite male young soccer players: The application of adjusted dietary balance index (DBI). J Exerc Sci Fit 2020;18(1):1–6.
33. Abbey EL, Wright CJ, Kirkpatrick CM. Nutrition practices and knowledge among NCAA division III football players. J Int Soc Sports Nutr 2017;14:13.