Araştırma Makalesi / Original Research Article https://doi.org/10.35232/estudamhsd.1390144

FACTORS AND BARRIERS RELATED TO FRUIT AND VEGETABLE CONSUMPTION OF UNIVERSITY STUDENTS: KAYSERİ, TÜRKİYE

Üniversite öğrencilerinin meyve ve sebze tüketimi ile ilişkili faktörler ve engeller: Kayseri, Türkiye

Aslı Gizem ÇAPAR[1], Neslihan ÖNER[2], Aslıhan BEŞPARMAK[1], Mualla AYKUT[1]

Abstract

This study aimed to examine university students' fruit and vegetable (F/V) consumption status and related factors and determine the influencing factors and barriers. The study was conducted with 630 students studying at university in the 2016-2017 academic year. Data were collected using a questionnaire questioning students' sociodemographic characteristics, daily fruit and vegetable (F/V) consumption, factors and barriers affecting F/V consumption. F/V intake status was assessed according to World Health Organization (WHO) recommendations, and the adequacy of F/V intake was compared with nutrition and health habits. The mean daily total F/V consumption of students was 3.1 (1-5) portions. According to WHO recommendations, 71.4% had inadequate daily F/V consumption, while only 28.6% had adequate F/V consumption. As vegetable consumption increased, fruit consumption also increased (r=0.398, p<0.001). The correlation between body weight and fruit and vegetable consumption was statistically not significant (r=-0.007, r=-0.026, respectively) (p>0.05). A significant difference was found only between place of living and adequate F/V consumption (p<0.001). There were no significant differences between gender, socioeconomic status and Body Mass Index (BMI) and adequate F/V consumption. The main factors preventing F/V consumption were; long preparation and cooking times (52.0%), vegetable dishes were not found to be satisfying (48.7%), and vegetable consumption was not liked (36.2%). The most important barrier is the perception of adequate consumption. A significant difference was found between students' perceptions of their F/V consumption and current status (p<0.001). Of the students who thought their F/V consumption was adequate, 58.1% consumed inadequate among the students who consume inadequate F/V, 50.0% think of increasing their F/V consumption. The F/V consumption of 71.4% of the students was inadequate, and the inadequate F/V consumption status of students living in dormitories, students who consumed biscuits-chocolates at snacks, and students who preferred fast food for meals outside the home was higher than the other groups. University students do not consume adequate F/V. Therefore, it is necessary to improve the knowledge and behaviors of university students regarding F/V consumption and overcoming the barriers to F/V consumption.

Keywords: Fruit, vegetables, university students, barriers.

Özet

Bu çalışmada üniversite öğrencilerinin meyve ve sebze tüketim sıklıkları ve ilişkili faktörler incelenerek öğrencilerin meyve ve sebze tüketimleri ile ilişkili faktörler ve engellerin saptanması amaçlanmıştır. Çalışma üniversitede eğitim gören 630 öğrenci ile 2016-2017 eğitim öğretim yılında yürütülmüştür. Veriler öğrencilerin sosyodemografik bilgileri, günlük meyve sebze tüketim miktarları, meyve ve sebze tüketimlerini etkileyen faktörler ve engelleri sorgulayan anket formu ile toplanmıştır. Meyve ve sebze alımları Dünya Sağlık Örgütü (DSÖ) önerilerine göre değerlendirilmiştir ve yeme ve sağlık alışkanlıkları ile meyve ve sebze (M/S) alımının yeterliliği karşılaştırılmıştır. Öğrencilerin günlük ortalama toplam meyve ve sebze tüketimi 3,1 (1-5) porsiyondur. DSÖ önerilerine göre %71,4'ünün günlük M/S tüketimi yetersizken, yalnızca %28,6'sının M/S tüketimi yeterlidir. Sebze tüketimi arttıkça meyve tüketimi de artmaktadır (r=0,398, p<0,001). Vücut ağırlığı ile meyve ve sebze tüketimi arasındaki korelasyon istatistiksel olarak anlamlı değildir (sırasıyla r=-0,007, r=-0,026) (p>0,05). Yalnızca yaşanılan yer ve yeterli M/S tüketimi arasında anlamlı farklılık saptanmıştır (p<0,001). Cinsiyet, sosyoekonomik durum ve Beden Kütle İndeksi (BKİ) ile yeterli M/S tüketimi arasında anlamlı bir fark bulunmamıştır. M/S tüketimini engelleyen faktörlerin başlıcaları hazırlama ve pişirme sürelerinin uzun olması (%52,0), sebze yemeklerinin doyurucu bulunmaması (%48,7), sebze tüketiminin sevilmemesidir (%36,2). En önemli bariyer ise yeterli tüketim algılarıdır. M/S tüketiminin yeterli olduğunu düşünen öğrencilerin %58,1'i DSÖ önerilerine göre yetersiz tüketmektedir. Yetersiz tüketen öğrencilerin ise yalnızca %50,0'si M/S tüketimini artırmayı düşünmektedir. Öğrencilerin %71,4'ünün M/S tüketimi DSÖ önerilerine göre yetersiz olup; yurtta kalan öğrencilerin, ara öğünlerde bisküvi-çikolata tüketen öğrencilerin ve ev dışında yemeklerde fast food tercih eden öğrencilerin yetersiz M/S tüketim durumu diğer gruplara göre anlamlı olarak yüksektir. Üniversite öğrencileri yeterli M/S tüketmemektedir. Bu nedenle üniversite öğrencilerinin M/S tüketimine ve M/S tüketimi önündeki engellerin aşılmasına ilişkin bilgi ve davranışlarının geliştirilmesi gerekmektedir.

Anahtar kelimeler: Meyve, sebze, üniversite öğrencileri, engeller.

1- Department of Nutrition and Dietetics, Faculty of Health Sciences, Nuh Naci Yazgan University. Kayseri, Türkiye
2- Department of Nutrition and Dietetics, Faculty of Health Sciences, Erciyes University. Kayseri, Türkiye

Sorumlu Yazar / Corresponding Author: Asst. Prof. Dr. Aslı Gizem ÇAPAR
e-posta / e-mail: gizem_pekmezci@hotmail.com
Geliş Tarihi / Received: 13.11.2023, **Kabul Tarihi / Accepted:** 20.01.2024

ORCID: Aslı Gizem ÇAPAR : 0000-0001-5459-9424
Neslihan ÖNER : 0000-0001-6773-4963
Aslıhan BEŞPARMAK : 0000-0002-7262-3982
Mualla AYKUT : 0000-0002-9308-0454

Nasıl Atıf Yaparım / How to Cite: *Çapar AG, Öner N, Beşparmak A, Aykut M. Factors and barriers related to fruit and vegetable consumption of university students: Kayseri, Türkiye. ESTUDAM Public Health Journal. 2024;9(1):34-47.*

Introduction

Fruits and vegetables (F/V), an important food group for human health (1); are an essential determinant of overall diet quality, and inadequate F/V consumption is known to be a major risk factor for non-communicable diseases (2). Globally, approximately 16 million (1.0%) disability-adjusted life year (DALYs) and 1.7 million (2.8%) deaths are associated with low F/V consumption (3). The World Health Organization (WHO) recommends at least 400 g (5 servings) of F/V daily to prevent chronic diseases such as heart disease, cancer, diabetes, and obesity (2). The Turkey Dietary Guidelines (TUBER) (2022) also state that at least 5 servings of fruits and vegetables should be consumed daily (4).

Nutritional habits are developed and transferred to adulthood during youth, aged between 18 and 24, a critical period to promote healthy eating (5). Students are observed to adopt unhealthy eating habits and consume inadequate F/V during this period with changing living conditions in the university period, which is the transition to adulthood (6). Recent studies have shown that university students have decreased compliance with healthy and balanced nutrition and consume less F/V than the recommended amounts, as well as increased frequency of skipping meals, fast food consumption, consumption of packaged ready-to-eat products with high energy density, snacks, sweets and confectionery, processed meat, fried products, alcoholic and non-alcoholic beverages, and low consumption of fish, cereal products, milk, and dairy products (7-9).

According to the Turkish Statistical Institute's Turkey Health Survey, between 2016 and 2019, the proportion of young people aged 15-24 who consumed fruit once or more a day decreased from 48.2% to 40.3%, and the proportion of those who consumed vegetables and salads decreased from 56.1% to 49.1%. There was an increase in the proportion of those who did not use at all (10). A study conducted in Türkiye in 2018 reported that 65.8% of university students (11), and in another study 93.6% consumed less than 5 servings of F/V per day (12). Accordingly, young people in Türkiye (aged 15-24 years) have inadequate F/V consumption habits according to WHO and TUBER (2022) recommendations (2,4).

In the literature, the barriers that prevent university students from consuming adequate F/V include the high cost of F/Vs, preferences varying according to eating habits and tastes, lack of time required for the preparation stage of vegetable dishes, and lack of cooking equipment, inability to provide appropriate storage conditions due to the rapid deterioration of F/Vs, and university students' perceptions that they provide adequate intake despite consuming inadequate F/Vs (13, 14).

In a study conducted in Türkiye, the F/V consumption status of final-year medical students and the affecting factors were examined (15). However, there is no other study in Türkiye that simultaneously examined F/V consumption and related factors. In the current study, students from different departments were included, and the study was more specific in terms of F/V consumption barriers.

This study aimed to evaluate the F/V consumption status of Nuh Naci Yazgan University students and determine the factors and barriers related with their consumption.

Material and Method

Place, Time, and Sample of the Study

This study is a cross-sectional study and the study population consists of 3198 students studying at Nuh Naci Yazgan University in the 2016-2017 academic year. The sample size using the G*Power (version 3.1). Based on the 2010 Turkey Nutrition and Health Survey (TNHS) (16), which showed that the ratio of adequate F/V consumption in Türkiye was 29%, and the sample size

was calculated of the study was determined as a minimum of 560 people with power of 80% and α error of 0.05. Students from the departments of psychology, interior architecture, architecture, economics, business administration, political science and public administration, electrical-electronics engineering, civil engineering, nutrition and dietetics, physical therapy and rehabilitation, and nursing were included in the study. The sample was weighted according to departments and gender and was determined as 965 in total. A simple random sampling method was used, and the study was completed with 630 students who agreed to participate. The inclusion criteria of the students were that they were studying at Nuh Naci Yazgan University, were 18 years of age or older, did not have any food allergies, and voluntarily agreed to participate in the study. Those who did not meet these criteria were not included in the study.

Data Collection

The research data was collected by face-to-face questionnaire method. The questionnaire consisted of 31 questions, including socio-demographic information about the students, daily F/V consumption amounts, factors affecting F/V consumption, and sections questioning barriers. One-day F/V consumption records were questioned by showing the amounts of portions from food catalogs. F/V consumption was evaluated as "adequate" when consuming 5 or more servings per day and "inadequate" when consuming less than 5 per day following WHO recommendations. Body weight and height measurements were taken according to self-reports. Body Mass Index (BMI) was calculated using the formula Body Weight (kg)/Height (m^2). Based on the WHO adult BMI classification, BMI below 18.5 kg/m^2 was classified as underweight, 18.5-24.9 kg/m^2 as normal, 25.0-29.9 kg/m^2 as pre-obese, and 30 kg/m^2 and above as obese (17). In addition to descriptive findings, according to WHO recommendations, consumption status was compared with characteristics and dietary habits. After the comparison, the interaction between the variables found to be significant with gender on consumption status was analyzed.

Data Analysis

IBM Statistics Package for the Social Sciences (SPSS) version 22.0 program was used for statistical analysis of the data. Data were expressed as mean ± standard deviation (SD) or number (n) and percentage (%). The Chi-square and Fisher Exact tests were applied to determine the difference between categorical variables. Group comparisons were made with a one-way analysis of variance (ANOVA). The Shapiro-Wilk test was used to determine whether the data were normally distributed. Spearman correlation analysis was used to determine the relationship between the variables since they were not normally distributed. The strength of the Spearman Correlation Coefficient, rho, was graded as very strong (>±0.70), strong (±0.40 to ±0.69), moderate (±0.30 to ±0.39), weak relationship (±0.20 to ±0.29) or no and negligible relationship (±0.01 to ±0.19) (18). The significance level was accepted as $p<0.05$.

Ethical Approval

The 'Ethics Committee Approval' dated 11.01.2017 was obtained from Nuh Naci Yazgan University Ethics Committee. Also the required permission to conduct the study was obtained from the university rectorate. The participants were ensured to read the informed consent form before starting the survey.

Results

The study included 630 university students. The mean age of the participants was 20.9±2.1 years; 54.8% were female, 98.4% were single, and 77.3% lived with their families. 8.2% of the students were underweight, 69.7% were normal weight, 22.1% were pre-obese and obese, and the mean BMI was 22.69±3.30 kg/m^2 (Table 1).

Table 1: Sociodemographic characteristics of the students.

Characteristic	Mean±SD
Age (year)	20.9± 2.1
BMI (kg/m²)	22.6± 3.3
	n(%)
Gender	
Male	285 (45.2)
Female	345 (54.8)
Marital Status	
Single	620 (98.4)
Married	10 (1.6)
Family Type	
Nuclear Family	536 (85.1)
Extended Family	94 (14.9)
Living Arrangement	
In Dormitory	110 (17.5)
In Family House	486 (77.3)
In Student House	33 (5.2)
Economic Status	
Low	15 (2.4)
Middle	261 (41.4)
High	354 (56.2)
Physical Activity	
Yes	307 (48.7)
No	323 (51.3)
Nutritional status	
Underweight	52 (8.2)
Normal weight	439 (69.7)
Pre-obese	121 (19.2)
Obese	18 (2.9)
Smoking	
Yes	162 (25.7)
No	468 (74.3)
Alcohol Intake	
Yes	109 (17.3)
No	521 (82.7)
Department	
Psychology	70 (11.1)
Interior Architecture	25 (4.0)
Architecture	62 (9.8)
Economics	48 (76.0)
Business Administration	79 (12.5)
Political Science and Public Administration	40 (6.3)
Electrical-Electronics Engineering	92 (14.6)
Civil Engineering	67 (10.6)
Nutrition and Dietetics	43 (6.8)
Physical Therapy and Rehabilitation	40 (6.3)
Nursing	64 (10.2)

The mean total daily F/V intake of the students was 3.1 (1-5) portions, fruit was 1.9 (0-3), and vegetable was 1.2 (0-2) portions. It was determined that 28.6% of the students consumed adequate F/V, and 48.1% consumed inadequate F/V. It was found that 23.3% of the students did not consume F/V at all (Table 2). The top three barriers that prevented F/V consumption were long preparation and cooking times (52.0%), not finding vegetable dishes satisfying (48.7%), and disliking vegetable consumption (36.2%). Although vegetable consumption barriers were more frequently emphasized among students, fruit consumption barriers included disliking fruit consumption (20.5%) and gastrointestinal symptoms after consumption (8.6%). In addition, inaccessibility of vegetables and fruits (11.0%), lack of proper storage conditions

(26.7%), being expensive (10.5%), and the time allocated for preparation and cooking (24.1%) were among the barriers to consumption (Table 2). In current study findings showed that only 23.8% of the students living with their families considered preparation and cooking times as time-consuming, while only 21.4% of the students living with their families, 33.3% of those living in student houses, and 48.2% of those living in dormitories considered the difficulty of storing F/Vs, which are known to spoil quickly, as an obstacle to F/V consumption (data not shown table).

Table 2: Daily consumption of vegetables and fruits and affecting barriers.

Daily Average Fruit and Vegetable Consumption Portions	**Mean (Q1-Q3)**
Total Fruit and Vegetable	3.1 (1-5)
Fruit	1.9 (0-3)
Total Vegetables	1.2 (0-2)
Raw Vegetables	0.6 (0-1)
Cooked Vegetables	0.6 (0-1)
Daily Fruit and Vegetable Consumption	**n (%)**
Adequate (≥ 5 Portions)	180 (28.6)
Inadequate (<1-4 Portions)	303 (48.1)
None	147 (23.3)
Barriers to Fruit and Vegetable Consumption*	**n (%)**
Long preparation and cooking times	328 (52.0)
Vegetable dishes are not filling	307 (48.7)
Disliking vegetable consumption	228 (36.2)
Difficulty in storing vegetables/fruits	168 (26.7)
Cohabitants do not like vegetables	154 (24.4)
Disliking fruit consumption	129 (20.5)
Difficulty accessing vegetables/fruits	69 (11.0)
Expensive-economic reasons	66 (10.5)
Gastrointestinal symptoms after fruit consumption	54 (8.6)
Gastrointestinal symptoms after consumption of vegetables/vegetable dishes	51 (8.1)

**Participants specified more than one option.*

Of the students who consumed inadequate F/V; 74.4% lived in family houses, 21.2% in dormitories and 4.4% in student houses. Of the students who consumed adequate F/V; 84.4% lived in a family home, 8.3% in a dormitory and 7.3% in a student house. There was a significant difference between F/V consumption according to place of living ($p<0.001$). However, no significant difference was found between F/V consumption according to gender, marital status, family type, economic status, physical activity, weight, smoking, alcohol use and department ($p>0.05$) (Table 3).

The nutritional habits of the students were shown in Table 4. There was no significant difference between the groups in terms of adequate and inadequate intake status of F/Vs according to the number of meals, the status, and frequency of eating outside the home ($p>0.05$) (Table 4). 78.3% of the students consume 3 or more main meals daily, and 50.8% consume snacks. While 63.3% of students with adequate F/V consumed snacks, 36.7% did not. Similarly, 54.2% of the students who consumed inadequate F/V did not consume snacks, and a significant difference was found in the F/V intake status according to the snack consumption status of the students ($p<0.001$). Of the students who consume snacks, 44.4% consume biscuits-chocolate, 43.7% fruits and vegetables, 8.8% nuts, and 3.1% consume milk-yogurt as snacks. Inadequate F/V consumption (49.0%) was significantly higher in students who preferred biscuit-chocolate for snacks compared to the other groups ($p<0.001$). There was a significant difference in F/V intake according

Table 3: Fruit and vegetable intake status of students according to some characteristics.

Characteristic	Fruit and Vegetable Intake Status Inadequate (n=450) n (%)	 Adequate (n=180) n (%)	χ^2	p
Gender				
Male	196 (43.6)	89 (49.4)	1.800	0.180
Female	254 (56.4)	91 (50.6)		
Marital Status				
Single	443 (71.5)	177 (28.5)	0.010	0.920
Married	7 (70.0)	3 (30.0)		
Family Type				
Nuclear Family	383 (85.1)	153 (85.0)	0.001	0.972
Extended Family	67 (14.9)	27 (15.0)		
Living Arrangement				
In Dormitory	95 (21.2)	16 (8.3)	15.436	**<0.001**
In Family House	335 (74.4)	151 (84.4)		
In Student House	20 (4.4)	13 (7.3)		
Economic Status				
Low	11 (2.4)	4 (2.2)	0.632	0.729
Middle	182 (40.4)	79 (43.9)		
High	257 (57.1)	97 (53.9)		
Physical Activity				
Yes	211 (46.9)	96 (53.3)	2.137	0.144
No	239 (53.1)	84 (46.7)		
Nutritional status				
Underweight	37 (8.2)	15 (8.3)	1.439	0.684
Normal weight	314 (69.8)	125 (69.4)		
Pre-obese	84 (18.7)	37 (20.6)		
Obese	15 (3.3)	3 (1.7)		
Smoking				
Yes	119 (26.4)	43 (23.9)	0.440	0.507
No	331 (73.6)	137 (76.1)		
Alcohol Intake				
Yes	77 (17.1)	32 (17.8)	0.040	0.842
No	373 (82.9)	148 (82.2)		
Department				
Psychology	54 (12.0)	16 (8.9)	14.070	0.170
Interior Architecture	16 (3.6)	9 (5.0)		
Architecture	48 (10.7)	14 (7.8)		
Economics	38 (8.4)	10 (5.6)		
Business Administration	49 (10.9)	30 (16.7)		
Political Science and Public Administration	27 (6.0)	13 (7.2)		
Electrical-Electronics Engineering	62 (13.8)	30 (16.7)		
Civil Engineering	47 (10.4)	20 (11.1)		
Nutrition and Dietetics	33 (7.3)	10 (5.6)		
Physical Therapy and Rehabilitation	34 (7.6)	6 (3.3)		
Nursing	42 (9.3)	22 (12.2)		

to preferred snacks (p=0.027). In addition, 91.1% of the students stated that they ate meals outside the home; 34.0% of those who consumed meals outside the home consumed meals outside the home every day, 53.7% consumed meals outside the home at least once a week, and 57.0% stated that they preferred fast food for meals outside the home. Among students who consume food outside, 59.8% of students with inadequate F/V intake prefer fast food, while 50.0% of students with adequate F/V intake. A significant difference in F/V intake was determined according to types of eating out preferences (p=0.025). Also, among the nutritional habits of the students in the study group that may affect F/V consumption, there was no difference between the groups in terms of the number of main meals per day, the status and frequency of eating outside

the home and F/V consumption status (p>0.05) (Table 4).

When the students' perception of their F/V consumption was questioned, 40.2% thought that they consumed enough, 58.5% thought that they consumed inadequate, and 1.3% thought that they consumed too much (data not shown table). Of the students who consumed enough F/V according to WHO recommendations, 58.9% thought they consumed enough, 37.8% thought they consumed inadequate, and 3.3% thought they consumed too much. In addition, 32.7% of students who consumed inadequate F/V thought they consumed adequate, 66.9% thought they consumed inadequate, while only 0.4% thought they consumed too much. A significant difference was found between students' perceptions of their F/V consumption and their current status (p<0.001) (Table 4). Also, among the students who consume inadequately according to WHO recommendations, 50.0% think they should increase their fruit and vegetable consumption, while 49.6% do not think to make any changes (data not shown in table).

Table 4: Fruit and vegetable intake according to dietary habits and consumption perceptions.

Dietary Habits	Fruit and Vegetable Intake Status		χ^2	p
	Inadequate (n=450) n (%)	Adequate (n=180) n (%)		
Number of meals				
<3	106 (23.6)	31 (17.2)	3.031	0.082
3 and more	344 (76.4)	149 (82.8)		
Snacking				
Yes	206 (45.8)	114 (63.3)	15.854	**<0.001**
No	244 (54.2)	66 (36.7)		
Preferred Snacks *				
Biscuit-Chocolate	101 (49.0)	41 (36.0)	9.144	**0.027**
Fruit-Vegetable	86 (41.8)	54 (47.4)		
Nuts	12 (5.8)	16 (14.0)		
Milk-Yogurt	7 (3.4)	3 (2.6)		
Eating out				
Yes	414 (92.0)	160 (88.9)	1.537	0.215
No	36 (8.0)	20 (11.1)		
Frequency of Eating Out				
Every day	158 (35.1)	56 (31.1)	2.459	0.483
At least once a week	239 (53.1)	99 (55.0)		
Less frequent	17 (3.8)	5 (2.8)		
None	36 (8.0)	20 (11.1)		
Types of Eating Out Preferences				
Fast food	269 (59.8)	90 (50.0)	5.015	**0.025**
Other	181 (40.2)	90 (50.0)		
Perception of Fruit and Vegetable Consumption				
Those Who Think They Consume Adequate	147 (32.7)	106 (58.9)	49.047	**<0.001**
Those Who Think They Consume Inadequate	301 (66.9)	68 (37.8)		
Those Who Think They Consume Too Much	2 (0.4)	6 (3.3)		

**Student who consume snacks (n=320)*

Also, the relationship between fruit consumption, vegetable consumption, and body weight was examined. As a result, fruit and vegetable consumption, a moderate positive correlation was found between vegetable consumption and fruit consumption, and it was determined that vegetable consumption increased as fruit consumption increased (r=0.398, p<0.001). The correlation between body weight and fruit and vegetable consumption was statistically not significant (r=-0.007, r=-0.026, respectively) (p>0.05). In addition, vegetable consumption (1.2 (0-2) portion) was

significantly lower than fruit consumption (1.9 (0-3) portion) ($p<0.001$) (data not shown table).

The interaction of gender with the variables determined to affect F/V consumption status was examined. As a result, it was determined that preferred snacks and F/V consumption perception affect F/V consumption status with gender (Table 5).

Table 5: The effect of some parameters on fruit and vegetable consumption status by gender.

Variables	Sum of Squares	df	Mean Square	F*	p
Living Arrangement	0.051	3	0.017	0.084	0.969
Snaking	0.049	1	0.049	0.244	0.621
Preferred Snacs	1.823	3	0.608	2.750	**0.043**
Types of Eating Out	0.044	1	0.044	0.214	0.644
Perception of Fruit and Vegetable Consumption	1.403	2	0.702	3.745	**0.024**

**ANOVA analysis was used to analyze the data.*

Discussion

In this study, the F/V consumption status of university students was examined, and the factors and barriers affecting their consumption were evaluated.

As a result of the study, the F/V consumption of university students was found to be 71.4% of the students consume inadequate fruit and vegetables. According to the results of the study conducted by Alkazemi and Salmean (2019) with 300 university students, students consume an average of 1.76 servings of F/V per day, and they found that only 13% of students consume adequate F/V according to WHO recommendations (14). A cross-sectional study involving 1956 university students aged 19-21 years reported that the average F/V intake of students was 1.80±1.3 servings per day (19). Considering the studies, it was seen that the F/V consumption of university students was inadequate. However, compared to other studies, the F/V consumption of university students in the current study was relatively higher.

In the study by Mirabitur et al. (2016) evaluating the F/V consumption of 514 university students, the daily F/V consumption of female students was significantly higher than that of males (4.8 and 4.3 servings/day, respectively) (20). Recently, American College Health Association-National College Health Assessment III Spring 2022 report stated that the ratio of female and male students consuming adequate F/V was equal (3%) (21). Although the relationship between gender and adequate F/V consumption has not been clearly demonstrated, it is thought that women have higher F/V consumption in addition to healthy nutrition because they have higher nutritional knowledge, attitudes, and responsibility awareness compared to men (22, 23). However, in this study, ratio of inadequate F/V consumption was higher in women, although difference was not significant. Also, in this study, gender does not seem to have an interaction with many of the variables determined to affect F/V consumption status.

Bogerd et al. (2019) examined the relationship between study discipline and F/V consumption and found that health-related department students consumed more F/V than others (24). Similarly, Oberne et al. (2022) found that the health literacy of students studying in health-related departments was higher than that of non-health-related departments and that F/V consumption increased as health literacy increased (25). However, similar to our findings, Alkazemi and Salmean (2021) found that the relationship between

department and F/V consumption was not significant (14). This may indicate that the health literacy of our university students is low.

A meta-analysis of 26 cohort studies by Wang et al. revealed that adequate F/V consumption was associated with lower mortality (26). Increased F/V consumption is also associated with a decrease in the risk of cardiovascular diseases and obesity as a result of decreased body weight, waist circumference, and BMI (27-29). The importance of adequate F/V consumption at an early age to prevent the development of chronic diseases is evident. In the current study, no difference was found in the F/V consumption status of students according to their weight status. Also, normal weight, physical activity, and non-smoking have been associated with adequate F/V consumption (30, 31). The literature reveals that healthy behaviors tend to cluster, and healthy eating habits are acquired with adopting healthy habits (32, 33). This study shows that students who reported being physically active and students who did not smoke ratio of consumed adequate fruits and vegetables is higher. This finding may reflect the relationship between healthy habits and healthy eating habits.

In this study, it was found that as vegetable consumption increased, fruit consumption also increased. In addition, this study observed that university students frequently preferred biscuit-chocolate and F/V in their snacks. Most students who consumed insufficient F/V consumed biscuits and chocolate in their snacks, while most students who consumed sufficient F/V consumed F/V. This may be because F/V consumption in snacks supports the total daily F/V consumption. However, vegetable consumption is lower than fruit consumption.

In the literature, studies on F/V consumption have focused on fruit consumption only or together, and it is known that studies evaluating vegetable consumption separately are inadequate (30, 34). The fact that fruit and vegetable consumption is recommended together in the WHO recommendations may be a factor in this situation. In TUBER 2022, the recommended 5 servings of F/V per day are detailed, and it is stated that at least 2.5-4 servings should be vegetables and 2-3 servings should be fruits. These vegetables and fruits should include at least two servings of green leafy vegetables (such as spinach and broccoli) or other vegetables such as tomatoes, and fruits should be citrus fruits such as oranges, lemons, or other fruits rich in antioxidants (4). Considering that fruit and vegetable consumption increases linearly with each other, interventions to increase the frequency of individual consumption should also aim to increase total F/V consumption (35).

Alkazemi and Salmean (2021) reported taste, discomfort, and lack of knowledge about F/V intake recommendations and preparation methods as the main barriers to F/V consumption among students (36). Other barriers to F/V consumption in the literature are cost, perishability, lack of time, dislike of taste, habits, and lack of knowledge (37-39). In this study, the most prominent barriers were identified as long preparation and cooking times, vegetable dishes being unsatisfying, and disliking vegetable consumption.

The Household, Income and Labour Dynamics in Australia (HILDA) Survey shows that time constraints lead to decreased F/V consumption and increased high-energy food intake outside the home (40). Llanaj et al. (2018) examined university students' food intake and eating habits outside the home. They found that students consumed sweets, salty snacks, and fast food more frequently, while fruit and vegetable consumption was extremely low (41). Arslan et al. (2023) determined that the frequency of fast food consumption was higher in individuals who had the habit of snacking on food and beverages at night. They also stated that adequate F/V consumption is related to low fast food consumption (42). Similar to the literature, fast food consumption was common among students with inadequate F/V intake in our study.

It was determined that the students ratio of adequate F/V consumption living in dormitories was lower than those living in family houses. The findings of the present

study showed that the majority of students living with their parents did not consider time-consuming preparation and cooking time as a barrier compared to other groups; however, students living in dormitories considered the difficulty of storing fruits and vegetables as a barrier more than other groups. In addition, the fact that the people living together (family, roommates, etc.) do not like vegetables is also a barrier to F/V consumption. This result shows that cohabitants play an active role in managing the dietary process of university students and that the place of residence affects not only adequate F/V consumption but also the factors that prevent consumption. In addition, it should not be ignored that students' inadequate preparation and cooking skills may be the reason for the excessive preparation and cooking time of F/Vs and the low satiety of vegetable dishes as barriers preventing F/V consumption (43, 44).

Lim et al. (2017) found a significant association between higher socioeconomic status and adequate F/V intake according to recommendations (45). Similarly, Poscia et al. (2018) found an association between higher socioeconomic status and higher F/V consumption (46). However, no significant relationship was found between socioeconomic status and F/V consumption in this study. In addition, 10.5% of the students stated expensive/economic reasons as barriers to F/V consumption. The students in the study had similar economic status, and only 2.4% considered their economic status low. This situation may be misleading in understanding the impact of economic reasons as a barrier to F/V consumption among university students.

An important finding of this study is the students' perception that they consume F/V adequately. In a 2014-2015 study evaluating F/V consumption and associated factors among final-year medical students in Türkiye, 13.9% of students with inadequate F/V portions reported that their consumption was adequate, and 26.5% reported that they did not plan any change in their F/V consumption (15). In a recent study by Cole et al. (2021), 21.3% of adults who consumed less F/V than the recommendations thought they consumed enough fruits, and 53.7% thought they consumed enough vegetables (35). Only half of the students who consumed inadequate F/V according to WHO recommendations considered increasing their F/V consumption, while almost half did not consider making changes. This result may be considered one of the most significant barriers to F/V consumption and may result from students' lack of awareness about the importance of vegetables and fruits in the diet or lack of knowledge about vegetable and fruit portions.

Limitations

This study has limitations. The similar economic levels of the students and the fact that the majority of the study group had normal BMI can be considered as the limitations of the study.

Conclusion

The daily F/V consumption of the students was low. Furthermore, according to WHO recommendations, the majority of students consume inadequate amounts of F/V and students living in dormitories consume more F/V than other groups. Also, inadequate F/V consumption is more common in students who consume biscuits and chocolate in their snacks. The first three barriers to F/V consumption are high preparation and cooking times, not finding vegetable meals satisfying and not liking vegetable consumption. More than half of the students who think that their F/V

consumption is sufficient consume insufficient F/V and this suggests that self-assessment of the F/V consumption situation may be misleading. In line with study's results, the current F/V consumption barriers can be overcome by interventions to improve the cooking skills of university students to increase F/V consumption and by informing students about fast-prepared, filling meals along with traditional dishes. In addition, intervention programs should be developed for university students to provide effective nutrition education, encourage behavioral changes, and adopt healthy eating habits.

Acknowledgments

The authors would like to thank all the participants who took part in the study.

Conflict of interests

The authors declare no conflict of interests.

Financial Support

The authors declared that no financial support was received for this paper.

References

1. Pehrsson PR, Haytowitz DB, Holden JM. The USDA's National Food and Nutrient Analysis Program: update 2002. Journal of Food Composition and Analysis. 2003;16:331–41. doi:10.1016/S0889-1575(03)00049-8.
2. World Health Organization. Diet, nutrition and the prevention of chronic diseases: report of a joint WHO/FAO expert consultation. Geneva; 2002.
3. Fruit and vegetable intake [Internet]. World Heath Organization. [cited 2022 Dec 27]. Available from: https://www.who.int/data/gho/indicator-metadata-registry/imr-details/3417.
4. T.C. Ministiry of Health. Türkiye Beslenme Rehberi (TÜBER) 2022. Ankara: T.C. Sağlık Bakanlığı Yayın No:1031; 2022.
5. Poobalan AS, Aucott LS, Clarke A, Smith WCS. Diet behaviour among young people in transition to adulthood (18–25 year olds): a mixed method study. Health Psychol Behav Med. 2014;2:909. doi:10.1080/21642850.2014.931232.
6. Jean Pierre E, Adriana Hernandez S, Sharly Waleska B. Unhealthy Eating Behaviors of First Year Latin-American Students, An Opportunity for Sustainable Nutritional Interventions. Biomed J Sci Tech Res. 2021;34. doi:10.26717/BJSTR.2021.34.005602.
7. Alkazemi D. Gender differences in weight status, dietary habits, and health attitudes among college students in Kuwait: A cross-sectional study. Journal of Nutrition and Health. 2019;25:75–84. doi:10.1177/0260106018817410.
8. AlJohani S, Salam M, BaniMustafa A, Zaidi ARZ, Aljohani AA, Almutairi A, et al. Dietary Habits of Students Enrolled in Faculties of Health Sciences: A Cross-sectional Study. Cureus. 2019;11. doi:10.7759/CUREUS.6012.
9. Pop LM, Iorga M, Muraru ID, Petrariu FD. Assessment of Dietary Habits, Physical Activity and Lifestyle in Medical University Students. Sustainability. 2021;13:3572. doi:10.3390/SU1306357 2.
10. Youth in Statistics, 2020 [Internet]. Turkish Statistical Institute (TurkStat),2021. [cited 2022 Dec 27]. Available from: https://data.tuik.gov.tr/Bulten/Index?p=Istatistiklerle-Genclik-2020-37242.
11. Uysal H, Ayvaz MY, Oruçoğlu HB, Say E. Assessment of Nutritional Status and Sleep Quality of University Students. Journal of Turkish Sleep Medicine. 2018;5:31–39. doi:10.4274/jtsm.69775.
12. Çatak Ş, Öğüt S. The Effect of University Students' Nutrition Habits and Probiotic Dairy Consumption Frequency on Anxiety Disorder. Turkish Journal of Health Science and Life. 2022;5:182-8. doi:https://10.56150/tjhsl.1192652.
13. Hilger-Kolb J, Diehl K. 'Oh God, I Have to Eat Something, But Where Can I Get Something Quickly?'—A Qualitative Interview Study on Barriers to Healthy Eating among University Students in Germany. Nutrients 2019, Vol 11, Page 2440. 2019;11:2440. doi:10.3390/NU11102440.
14. Alkazemi D, Salmean Y. Fruit and Vegetable Intake and Barriers to Their Consumption among University Students in Kuwait: A Cross-Sectional Survey. J Environ Public Health [Internet]. 2021 [cited 2022 Dec 27];2021. doi:10.1155/2021/9920270.
15. Borlu A, Aykut M, Çelik N, Gün İ, Timur A, Karaca S. Fruit and vegetable consumption of last grade medical students and related factors. Progress in Nutrition [Internet]. 2019 [cited 2023 Jan 20];21:86-92. doi:10.23751/PN.V21I1.6384.
16. T.C. Ministiry of Health. Turkey Nutrition and Health Survey 2010: Evaluation of Nutritional Status and Habits Final Report. 2014.
17. A healthy lifestyle - WHO recommendations [Internet]. World Health Organization, 2010 [cited 2022 Dec 27]. Available from: https://www.who.int/europe/news-room/fact-sheets/item/a-healthy-lifestyle---who-recommendations.
18. Dancey CP, Reidy J. Statistics without maths for psychology. 4th ed. Harlow, England; 2007.

19. *Wattick RA, Hagedorn RL, Olfert MD. Relationship between Diet and Mental Health in a Young Adult Appalachian College Population. Nutrients 2018;Vol 10:957. 2018;10:957. doi:10.3390/NU10080957.*
20. *Mirabitur E, Peterson KE, Rathz C, Matlen S, Kasper N. Predictors of college-student food security and fruit and vegetable intake differ by housing type. Journal of American College Health. 2016;64:555–64. doi:10.1080/07448481.2016.1192543.*
21. *American College Health Association. American College Health AssociationNational College Health Assessment III: Reference Group Data Report. American College Health Association, National College Health Assessment III: Reference Group Report, Spring. 2022.*
22. *Koch F, Hoffmann I, Claupein E. Types of Nutrition Knowledge, Their Socio-Demographic Determinants and Their Association With Food Consumption: Results of the NEMONIT Study. Front Nutr. 2021;8:32. doi:10.3389/FNUT.2021.630014/BIBTEX.*
23. *Hsiao PY, Mitchell DC, Coffman DL, Allman RM, Locher JL, Sawyer P, Jensen GL, Hartman TJ. Dietary patterns and diet quality among diverse older adults: The university of Alabama at Birmingham study of aging. Journal of Nutrition, Health and Aging. 2013;17:19–25. doi:10.1007/S12603-012-0082-4/METRICS.*
24. *Van Den Bogerd N, Maas J, Seidell JC, Dijkstra SC. Fruit and vegetable intakes, associated characteristics and perceptions of current and future availability in Dutch university students. Public Health Nutr [Internet]. 2019 [cited 2023 Jan 20];22:1951–9. doi:10.1017/S136898001800174X.*
25. *Oberne A, Vamos C, Wright L, Wang W, Daley E. Does health literacy affect fruit and vegetable consumption? An assessment of the relationship between health literacy and dietary practices among college students. Journal of American College Health. 2022:70. doi:10.1080/07448481.2020.1727911.*
26. *Wang DD, Li Y, Bhupathiraju SN, Rosner BA, Sun Q, Giovannucci EL, Rimm EB, Manson JAE, Willett WC, Stampfer MJ, et al. Fruit and Vegetable Intake and Mortality: Results from Two Prospective Cohort Studies of US Men and Women and a Meta-Analysis of 26 Cohort Studies. Circulation. 2021;143:1642. doi:10.1161/CIRCULATIONAHA.120.048996.*
27. *Aune D, Giovannucci E, Boffetta P, Fadnes LT, Keum NN, Norat T, et al. Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality—a systematic review and dose-response meta-analysis of prospective studies. Int J Epidemiol. 2017;46:1029. doi:10.1093/IJE/DYW319.*
28. *Seifu CN, Fahey PP, Hailemariam TG, Frost SA, Atlantis E. Dietary patterns associated with obesity outcomes in adults: an umbrella review of systematic reviews. Public Health Nutr. 2021;24:6390-414. doi:10.1017/S1368980021000823.*
29. *Nyanchoka MA, van Stuijvenberg ME, Tambe AB, Zuma MK, Mbhenyane XG. Fruit and Vegetable Consumption Patterns and Risk of Chronic Diseases of Lifestyle among University Students in Kenya. International Journal of Environmental Research and Public Health. 2022;19:6965. doi:10.3390/IJERPH19126965.*
30. *Rodrigues VM, Bray J, Fernandes AC, Bernardo GL, Hartwell H, Martinelli SS, et al. Vegetable Consumption and Factors Associated with Increased Intake among College Students: A Scoping Review of the Last 10 Years. Nutrients. 2019;11:1634. doi:10.3390/NU11071634.*
31. *Van Den Bogerd N, Maas J, Seidell JC, Dijkstra SC. Fruit and vegetable intakes, associated characteristics and perceptions of current and future availability in Dutch university students. Public Health Nutr. 2019;22:1951-9. doi:10.1017/S136898001800174X.*
32. *Colby S, Zhou W, Sowers MF, Shelnutt K, Olfert MD, Morrell J, Koenings M, Kidd T, Horacek TM, Greene GW, et al. College Students' Health Behavior Clusters: Differences by Sex. Am J Health Behav.*

2017;41:378-89. doi:10.5993/AJHB.41.4.2.
33. Jao NC, Robinson LD, Kelly PJ, Ciecierski CC, Hitsman B. Unhealthy behavior clustering and mental health status in United States college students. 2018;67:790-800. doi:101080/07448481 20181515744.
34. Appleton KM, Hemingway A, Saulais L, Dinnella C, Monteleone E, Depezay L, Morizet D, Armando Perez-Cueto FJ, Bevan A, Hartwell H. Increasing vegetable intakes: rationale and systematic review of published interventions. Eur J Nutr. 2016;55:869. doi:10.1007/S00394-015-1130-8.
35. Wellard-Cole L, Watson WL, Hughes C, Tan N, Dibbs J, Edge R, Dessaix A. Perceptions of adequacy of fruit and vegetable intake as a barrier to increasing consumption. Nutr Diet. 2022; doi:10.1111/1747-0080.12735.
36. Alkazemi D, Salmean Y. Fruit and Vegetable Intake and Barriers to Their Consumption among University Students in Kuwait: A Cross-Sectional Survey. J Environ Public Health. 2021;2021. doi:10.1155/2021/9920270.
37. Chapman K, Goldsbury D, Watson W, Havill M, Wellard L, Hughes C, Bauman A, Allman-Farinelli M. Exploring perceptions and beliefs about the cost of fruit and vegetables and whether they are barriers to higher consumption. Appetite. 2017;113:310-9. doi:10.1016/J.APPET.2017.02.043.
38. McMorrow L, Ludbrook A, Macdiarmid JI, Olajide D. Perceived barriers towards healthy eating and their association with fruit and vegetable consumption. J Public Health (Oxf). 2017;39:330-8. doi:10.1093/PUBMED/FDW038.
39. Livingstone KM, Burton M, Brown AK, McNaughton SA. Exploring barriers to meeting recommendations for fruit and vegetable intake among adults in regional areas: A mixed-methods analysis of variations across socio-demographics. Appetite. 2020; 153. doi:10.1016/J.APPET.2020.104750.
40. Venn D, Strazdins L. Your money or your time? How both types of scarcity matter to physical activity and healthy eating. Soc Sci Med. 2017;172:98-106. doi:10.1016/J.SOCSCIMED.2016.10.023.
41. Llanaj E, Ádány R, Lachat C, D'Haese M. Examining food intake and eating out of home patterns among university students. van Wouwe JP, editor. PLoS One [Internet]. 2018 [cited 2024 Jan 9];13:e0197874. doi:10.1371/journal.pone.0197874.
42. Arslan N, Aslan Ceylan J, Hatipoğlu A. The relationship of fast food consumption with sociodemographic factors, body mass index and dietary habits among university students. Nutr Food Sci. 2023;53:112-23. doi:10.1108/NFS-01-2022-0003.
43. Bernardo GL, Rodrigues VM, Bastos BS, Uggioni PL, Hauschild DB, Fernandes AC, et al. Association of personal characteristics and cooking skills with vegetable consumption frequency among university students. Appetite. 2021;166:105432. doi:10.1016/J.APPET.2021.105432.
44. de Borba TP, da Silva MV, Jomori MM, Bernardo GL, Fernandes AC, Proença RP da C, et al. Self-efficacy in cooking and consuming fruits and vegetables among Brazilian university students: the relationship with sociodemographic characteristics. British Food Journal. 2020;123:2049-65. doi:10.1108/BFJ-04-2020-0311/FULL/XML.
45. Lim RBT, Tham DKT, Müller-Riemenschneider F, Wong ML. Are University Students in Singapore Meeting the International and National Recommended Daily Servings of Fruits and Vegetables? Asia Pac J Public Health. 2017;29:199–210. doi:10.1177/1010539517696553.
46. Poscia A, Teleman AA, Azzolini E, de Waure C, Maged D, Virdis A, et al. Eating episode frequency and fruit and vegetable consumption among Italian university students. Ann Ist Super Sanita. 2018;53:199–204. doi: 10.4415/ANN_17_03_04.