

Energy and nutrient intake and food patterns among Turkish university students

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Abstract

The goal of this study was to determine the nutritional value and nutrients provided by each meal and snack of consumed by university students. Subjects were randomly selected from volunteer students at five universities in Ankara. A sample of 400 students (167 female and 233 male) aged between 19 and 24 years participated in this study. A questionnaire designed to assess general characteristics, anthropometric measurements, and 24 hours dietary records was administered using face to face interviews. According to body mass index classifications, 69.5% of male students, and 77.7% of female students were found to be in the normal weight categories. Overweight categories were found to be 25.1% and 5.6% for males and females, respectively. Breakfast and lunch were the most frequently skipped meals, with a total of 47.7% of students skipping breakfast and 25.2% skipping lunch. The percentages of energy deficiency were found to be 78.4% in males, and 81.1% in females. Dinner was the main meal for consumption of energy and the other nutrients, except saturated fatty acids, for both genders. Also, dinner was the largest contributor of energy in both genders. Students ate more bread, cereals, and meat at dinner than during the other meals and snacks. Fruit was consumed more during snacks than at the other meals by all students. It was concluded that students need more nutritional information about healthy nutritional habits, adequate intake of nutrients, and ideal body weights.

Key Words: Nutritional status, food pattern, university students

Introduction

Good eating habits are an essential part of a healthy lifestyle. Healthy nutrition is an important factor in preventing many specific health problems of young people such as vitamin A deficiency, iron deficiency anemia, and excess body weight. Also, eating behavior can affect long term health. Unhealthy eating habits such as skipping breakfast and excessive intake of foods with high carbohydrate and fat contents are the main factors causing nutritional problems. Risk of chronic diseases including obesity, cardiovascular disease, osteoporosis, and cancer may increase as a result of unhealthy nutrition [1]. Adolescents often do not have sufficient knowledge and experience to make appropriate decisions, and tend to develop unhealthy eating habits. These habits include skipping breakfast, replacing lunch meals with snack foods, and increasing soft drink intake, all of which can lead to inadequate nutrient intake. It was reported in a study in Greece that students living away from home developed more unfavorable eating habits than students living at the family home [2]. It was found that unbalanced eating is an important health problem for Turkish university students with a mean age of 21.28 ± 2.32 years [3]. In a study with university students, according to BMI classification, 23.5% were underweight and 10.5% were overweight. The percentage of people having breakfast every morning was found to be 55.6% [4]. In another

study, it was found that the use of energy drinks is quite common among college students, but their knowledge of ingredients and potential health hazards of such drinks is very limited [5].

The intakes of fiber, total fat, saturated fatty acids, cholesterol, and sodium among Turkish adolescents were found to be high; however, their vitamin E, vitamin B₆, and folate intakes were found to be low according to the American Heart Association. Turkish adolescents' fruit and vegetable intakes were also found to be low [6]. More than 50% of the responders were meeting 2/3 of the RDAs for niacin, riboflavin, vitamin B₆, vitamin C, phosphorus, and zinc [7]. A population of girls studied in Japan showed insufficient intakes of energy, protein, and minerals such as calcium and iron. [8].

The important finding here is that knowledge, attitudes, and behaviors all affect a university student's nutrition. Desire for a thin body size is another factor that especially affects nutritional status in women. Half of the students were concerned about their body size, and > 60% were dissatisfied with their weight [9]. Nowak [10], concluded that weight-conscious adolescents, especially girls, exhibited restrictive eating practices and a preoccupation with a slim image. Adolescents need a food culture based on foods to eat rather than foods to avoid, and an understanding of suitable weight-control measures.

The purpose of this study was to evaluate daily energy and nutrient intakes among male and female university students, and

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to determine the energy sources and nutrients provided in each meal and snack.

Subjects and Methods

Subjects

A cross-sectional study was conducted with volunteer students from the 5 state universities including the University of Hacettepe, Ankara, Gazi, Bilkent, and the Middle East Technical University in Ankara. The examined subjects were 400 university students (167 female and 233 male) with an average age of 21.7 ± 1.8 years. Forty three percent of the subjects were from the Hacettepe University, 29.5% from the Ankara University, 11.7% from the Gazi University, 9.8% from the Bilkent University, and 6.0% were from the Middle East Technical University. All students attending classes on the day of data collection were approached and included in the study if they agreed to participate. Participation was totally voluntary and no incentives were provided to participants. Students who had diseases such as diabetes, gluten enteropathy etc., affecting nutritional habits, and students who were dieting for weight reduction were excluded from the study.

Anthropometric measurements

The body weights of students wearing minimal clothing without shoes were measured to the nearest 0.5 kg with a portable scale. Height to the nearest 0.1 cm was measured with a fiber-glass tape. All measurements were obtained as previously described [11]. Body Mass Index (BMI: $\text{weight}/\text{height}^2$, kg/m^2) was calculated for each subject. The BMI classification was made according to the World Health Organization [12].

Data collection and dietary intake

Data were collected by face to face interviews using a standard questionnaire. The questionnaire consisted of questions on students' socio-demographic characteristics, smoking, and eating habits. Subjects who answered "yes" to the question "Do you smoke > 1 cigarettes per day?" were categorized as smokers.

Food intake was assessed by 24 hours recall dietary records maintained for one day by using a photographic atlas of food portion sizes [13]. Energy and nutrient intakes were calculated separately for breakfasts, lunches, dinners, and snacks, and also as a total daily intake using food composition tables by a computer program [14]. Results were compared with recommended daily allowances (RDAs) according to age and gender [15]. Nutrient intakes < 67% of the RDA were accepted as deficient. Depending on the reference, cut off points for the estimations of nutritional adequacy were suggested as follows: high, $1^{1/2}$ RDA; medium, $1^{1/3}$ - $1^{2/3}$ RDA; low, $2/3$ RDA or

below [16].

Statistical analysis

Statistical evaluation of results was performed using Statistical Packages for Social Sciences (SPSS 10, SPSS Inc. Chicago, IL, USA). The results were presented as mean \pm SEM values. The Kolmogorov-Smirnov test was used to determine whether outcome variables were normally distributed. The Wilcoxon signed-rank test was used to compare the differences between mean values of two paired variables of non-normally distributed data. The differences between each meal and snack with paired samples were assessed using the Wilcoxon Signed-Ranks test. The Mann-Whitney U-test was used to define the differences between male and female students. The level of $P < 0.05$ was considered as the cut-off value for statistical significance.

Results

Characteristics of the sample and BMI categories

The students' ages, heights, weights, and BMIs are shown in Table 1. The average ages were 22.3 ± 0.12 years for males and 21.4 ± 0.11 years for females. The average BMI values for male and female students were 23.5 ± 0.21 kg/m^2 and 20.9 ± 0.18 kg/m^2 , respectively. According to WHO BMI classification, 69.5% of male, 77.7% of female students were classified as being in normal weight categories. The proportion of overweight students was found to be 25.1% for males and 5.6% for females. Several of the students were obese, and most of them were males. Also, 1.8% of male and 16.3% of female students were found to be underweight. The percentages of waist circumferences > 102 cm for men and > 88 cm for women were found 1.2% and 0.9%, respectively. Smoking habits were more widespread among males than females (47.3% and 28.3%, respectively).

Table 1. Characteristics of students (Mean \pm SEM)

	Male (n = 167)	Female (n = 233)
Age (yrs)	22.3 \pm 0.12	21.4 \pm 0.11
Weight (kg)	74.1 \pm 0.76	56.1 \pm 0.51
Height (cm)	177.5 \pm 0.49	163.9 \pm 0.40
BMI (kg/m^2)	23.5 \pm 0.21	20.9 \pm 0.18
Waist circumference	85.5 \pm 0.82	69.1 \pm 0.51
BMI*		
Below 18.5 (underweight)	3 (1.8)	38 (16.3)
18.5-24.9 (normal)	116 (69.5)	181 (77.7)
25.0-29.9 (overweight)	42 (25.1)	13 (5.6)
30 and above (obese)	6 (3.6)	1 (0.4)
Smoker*	79 (47.3)	66 (28.3)

* N (%)

Energy and nutrient intake

The percentage of students regularly taking meals was found to be 67.1% and 58.8% in males and females, respectively. Breakfast and lunch were the most frequently skipped meals with a total of 47.7% students skipping breakfast and 25.2% skipping lunch. The percentage of males who skipped breakfast was higher than that of females. Also, females skipped lunch more frequently than males. The percentages of energy supplied from proteins, fats, and carbohydrates were found to be 12.9%, 32.0%, and 55.1% in males, and 13.2%, 35.4%, and 51.5% in females, respectively.

Daily dietary energy and nutrient intakes and comparisons with the RDAs are presented in Table 2. The mean daily energy intake was 2217 ± 62.74 kcal in males and 1714 ± 45.32 kcal in females. The percentages of energy deficiency were found to be 78.4% in men and 81.1% in women. The mean percentages of students meeting dietary fiber, vitamin B₆, vitamin B₁₂, vitamin C, niacin, folate, iron, and zinc requirements according to RDAs were found to be different in male and females ($P < 0.05$). Also, the percentages of these nutrients that were $< 67\%$ of RDAs in males were 77.2%, 22.2%, 25.7%, 40.7%, 6.0%, 52.7%, 16.8% and 27.5%, respectively. In females, these percentages were found to be 45.5%, 33.5%, 36.9%, 33.0%, 16.7%, 64.4%, 80.7%, and 39.9%, respectively.

The energy and nutrient intakes of meals and snacks for males and females are shown in Table 3. Dinner was the main meal for energy intake and the intake of other nutrients for both

genders, excluding saturated fatty acid intake ($P < 0.05$). In males and females, the intakes of energy, carbohydrates, polyunsaturated fatty acids, thiamin, vitamin B₆, vitamin E and iron at breakfast and snacks were found to be similar. Also, daily total fat and dietary fiber intakes at breakfast and from snacks were the same in males. Dinner was the largest contributor of energy in both genders, and breakfast and snacks were the smallest contributors of energy in both males and females.

Consumption of food groups according to meals and snacks is shown in Table 4. At dinner, students ate more bread, cereals, and meat than at the other meals or during snacks. Fruit was consumed more during snacks than the other meals in both genders ($P < 0.05$). Lunch and dinner were the main meals for vegetable consumption in both males and females ($P < 0.05$). Daily fruit and vegetable consumption of < 400 g was found in 66.1% and 63.1% of males and females, respectively. Total fat consumption was found to be higher at lunch and dinner than at breakfast and snacks. Students ate more sweets from snacks than the other meals (18.9 ± 1.95 g/day in males, 13.4 ± 1.41 g/day in females). Also, consumption of bread, meat, and sweets was significantly higher in males than in female students ($P < 0.05$).

Discussion

This study was conducted to evaluate nutritional status and habits in university students. Also, it attempted to determine the

Table 2. Daily energy and nutrient intakes and comparisons with the recommended daily allowances in university students

Nutrient	Daily intake (Mean \pm SE)		% RDA [†] (Mean \pm SE)		Percentages of deficiency* (n = 167)	
	Males (n = 167)	Females (n = 233)	Males (n = 167)	Females (n = 233)	Males (n = 167)	Females (n = 233)
Energy (kcal)	2,216.5 \pm 62.74	1,713.6 \pm 45.32	82.1 \pm 2.32	81.6 \pm 2.16	131 (78.4)	189 (81.1)
Total protein (g)	74.0 \pm 2.60	55.5 \pm 1.73	132.1 \pm 4.63	120.7 \pm 3.77	14 (8.4)	30 (12.9)
Total fat (g)	86.0 \pm 3.09	73.0 \pm 2.56				
SFA (g)	29.2 \pm 1.11	24.0 \pm 0.99				
MUFA (g)	27.4 \pm 1.06	24.2 \pm 0.95				
PUFA (g)	23.5 \pm 1.12	19.8 \pm 0.87				
Cholesterol (g)	288.0 \pm 18.34	199.9 \pm 10.66				
Carbohydrate (g)	269.2 \pm 7.96	203.1 \pm 5.44				
Dietary fiber (g)	21.0 \pm 0.82	19.2 \pm 0.65	55.3 \pm 2.10 ^a	76.8 \pm 2.61 ^b	129 (77.2)	106 (45.5)
Vitamin A (g)	1,267.0 \pm 97.03	577.8 \pm 190.43	140.8 \pm 1.78	225.4 \pm 27.20	57 (34.1)	61 (26.2)
Thiamin (g)	0.90 \pm 0.03	0.76 \pm 0.03	74.9 \pm 2.56	69.3 \pm 2.28	82 (49.1)	126 (54.1)
Riboflavin (g)	1.27 \pm 0.04	1.04 \pm 0.04	97.6 \pm 3.20	94.8 \pm 3.49	43 (25.7)	69 (29.6)
Vitamin B ₆ (mg)	1.4 \pm 0.05	1.16 \pm 0.04	107.1 \pm 3.94 ^a	89.3 \pm 3.11 ^b	37 (22.2)	78 (33.5)
Vitamin B ₁₂ (mg)	4.02 \pm 0.25	2.7 \pm 0.16	167.6 \pm 10.42 ^a	112.4 \pm 6.80 ^b	43 (25.7)	86 (36.9)
Vitamin C (mg)	97.1 \pm 6.87	99.6 \pm 5.49	107.9 \pm 7.63 ^a	132.8 \pm 7.32 ^b	68 (40.7)	77 (33.0)
Vitamin E (mg)	21.5 \pm 1.08	19.5 \pm 0.82	143.4 \pm 7.22	129.8 \pm 5.45	26 (15.6)	53 (22.7)
Niacin (mg)	27.4 \pm 1.08	18.8 \pm 0.73	171.0 \pm 6.75 ^a	134.5 \pm 5.21 ^b	10 (6.0)	39 (16.7)
Folate (mcg)	287.8 \pm 10.34	242.8 \pm 8.43	72.0 \pm 2.58 ^a	60.70 \pm 2.11 ^b	88 (52.7)	150 (64.4)
Calcium (mg)	596.8 \pm 23.00	557.2 \pm 22.28	59.7 \pm 2.30	55.7 \pm 2.23	106 (63.5)	159 (68.2)
Iron (mg)	11.4 \pm 0.40	9.3 \pm 0.33	113.5 \pm 3.99 ^a	51.5 \pm 1.82 ^b	28 (16.8)	188 (80.7)
Zinc (mg)	10.7 \pm 0.40	8.5 \pm 0.34	97.5 \pm 5.12 ^a	84.5 \pm 4.10 ^b	46 (27.5)	93 (39.9)

[†] P values calculated with the Mann-Whitney u-test.

* N (%)

Table 3. Energy and nutrient intakes meals and snacks (Mean \pm SE) of students[†]

Nutrients	Males (n = 167)				Females (n = 233)			
	Breakfast	Lunch	Dinner	Snacks	Breakfast	Lunch	Dinner	Snacks
Energy (kcal)	421.5 \pm 27.37 ^a	597.6 \pm 34.30 ^b	754.2 \pm 31.66 ^c	443.2 \pm 31.11 ^a	342.4 \pm 19.22 ^a	434.3 \pm 22.24 ^b	602.4 \pm 23.34 ^c	334.5 \pm 23.50 ^a
Total protein (g)	12.4 \pm 0.90 ^a	22.9 \pm 1.57 ^b	30.5 \pm 1.59 ^c	8.1 \pm 0.83 ^d	11.6 \pm 0.73 ^a	14.7 \pm 0.92 ^b	22.0 \pm 1.13 ^c	7.3 \pm 0.61 ^d
Total fat (g)	17.8 \pm 1.39 ^a	24.3 \pm 1.75 ^b	28.6 \pm 1.50 ^c	15.2 \pm 1.30 ^a	14.7 \pm 0.96 ^a	18.8 \pm 1.24 ^b	26.6 \pm 1.34 ^c	12.9 \pm 1.15 ^d
SFA (g)	7.8 \pm 0.66 ^a	7.5 \pm 0.58 ^a	8.4 \pm 0.50 ^a	5.5 \pm 0.50 ^b	6.5 \pm 0.57 ^a	5.8 \pm 0.42 ^a	6.9 \pm 0.41 ^a	4.8 \pm 0.42 ^b
MUFA (g)	6.2 \pm 0.49 ^a	7.8 \pm 0.57 ^b	9.1 \pm 0.52 ^c	4.4 \pm 0.41 ^d	5.5 \pm 0.42 ^a	6.1 \pm 0.41 ^a	8.3 \pm 0.45 ^b	4.3 \pm 0.40 ^c
PUFA (g)	2.6 \pm 0.27 ^a	7.7 \pm 0.73 ^b	9.2 \pm 0.61 ^c	3.9 \pm 0.51 ^a	2.2 \pm 0.21 ^a	5.7 \pm 0.49 ^b	9.1 \pm 0.51 ^c	2.8 \pm 0.41 ^a
Cholesterol (g)	72.8 \pm 10.13 ^a	81.5 \pm 11.41 ^a	99.6 \pm 9.38 ^b	34.0 \pm 4.70 ^c	62.7 \pm 6.37 ^{ab}	44.8 \pm 4.71 ^a	61.9 \pm 5.91 ^b	30.5 \pm 4.26 ^c
Carbohydrate (g)	52.0 \pm 3.49 ^a	68.7 \pm 4.04 ^b	88.2 \pm 4.06 ^c	60.3 \pm 4.19 ^{ab}	40.2 \pm 2.60 ^a	49.6 \pm 2.56 ^b	67.9 \pm 2.90 ^c	45.4 \pm 3.06 ^{ab}
Dietary fiber (g)	3.1 \pm 0.23 ^a	6.2 \pm 0.45 ^b	7.9 \pm 0.48 ^c	3.8 \pm 0.42 ^a	2.7 \pm 0.19 ^a	4.6 \pm 0.30 ^b	7.9 \pm 0.46 ^c	3.9 \pm 0.30 ^b
Vitamin A (g)	191.7 \pm 17.86 ^a	453.7 \pm 60.69 ^b	478.1 \pm 55.52 ^c	143.5 \pm 31.34 ^d	153.5 \pm 12.32 ^a	324.5 \pm 40.79 ^b	959.9 \pm 183.36 ^c	139.8 \pm 19.67 ^d
Thiamin (g)	0.13 \pm 0.01 ^a	0.28 \pm 0.02 ^b	0.35 \pm 0.02 ^c	0.14 \pm 0.01 ^a	0.11 \pm 0.01 ^a	0.19 \pm 0.01 ^b	0.32 \pm 0.02 ^c	0.14 \pm 0.01 ^a
Riboflavin (g)	0.24 \pm 0.02 ^a	0.37 \pm 0.02 ^b	0.47 \pm 0.02 ^c	0.19 \pm 0.02 ^d	0.25 \pm 0.02 ^a	0.25 \pm 0.02 ^a	0.36 \pm 0.02 ^b	0.18 \pm 0.01 ^c
Vitamin B ₆ (mg)	0.17 \pm 0.01 ^a	0.43 \pm 0.03 ^b	0.57 \pm 0.03 ^c	0.23 \pm 0.02 ^a	0.16 \pm 0.01 ^a	0.31 \pm 0.02 ^b	0.52 \pm 0.03 ^c	0.17 \pm 0.02 ^a
Vitamin B ₁₂ (mg)	0.66 \pm 0.08 ^a	1.39 \pm 0.14 ^b	1.80 \pm 0.18 ^b	0.18 \pm 0.05 ^c	0.77 \pm 0.1 ^a	0.80 \pm 0.09 ^{ab}	0.97 \pm 0.09 ^b	0.15 \pm 0.03 ^c
Vitamin C (mg)	9.2 \pm 2.25 ^a	27.2 \pm 2.78 ^b	38.9 \pm 4.01 ^c	21.9 \pm 3.21 ^b	7.5 \pm 1.23 ^a	25.5 \pm 2.94 ^b	40.6 \pm 3.43 ^c	25.9 \pm 3.57 ^b
Vitamin E (mg)	2.6 \pm 0.28 ^a	7.5 \pm 0.72 ^b	8.7 \pm 0.58 ^c	2.8 \pm 0.31 ^a	2.1 \pm 0.22 ^a	5.6 \pm 0.48 ^b	9.1 \pm 0.52 ^c	2.6 \pm 0.30 ^a
Niacin (mg)	3.6 \pm 0.25 ^a	8.8 \pm 0.71 ^b	11.8 \pm 0.71 ^c	3.1 \pm 0.33 ^d	3.5 \pm 0.32 ^a	5.3 \pm 0.36 ^b	7.8 \pm 0.49 ^c	2.3 \pm 0.18 ^d
Folate (mcg)	61.9 \pm 4.67 ^a	86.0 \pm 6.05 ^b	108.0 \pm 6.17 ^c	31.9 \pm 3.25 ^d	57.2 \pm 3.52 ^a	59.6 \pm 3.79 ^a	95.8 \pm 6.17 ^b	30.2 \pm 2.76 ^c
Calcium (mg)	141.6 \pm 12.43 ^a	158.7 \pm 13.67 ^a	192.3 \pm 11.68 ^b	104.1 \pm 10.00 ^c	147.1 \pm 10.57 ^{bc}	121.4 \pm 8.80 ^{ab}	180.8 \pm 13.02 ^c	108.0 \pm 9.14 ^b
Iron (mg)	1.7 \pm 0.12 ^a	3.6 \pm 0.24 ^b	4.3 \pm 0.22 ^c	1.8 \pm 0.16 ^a	1.5 \pm 0.10 ^a	2.3 \pm 0.15 ^b	3.8 \pm 0.23 ^c	1.6 \pm 0.14 ^a
Zinc (mg)	1.7 \pm 0.13 ^a	3.4 \pm 0.23 ^b	4.3 \pm 0.25 ^c	1.2 \pm 0.13 ^d	1.8 \pm 0.21 ^a	2.2 \pm 0.15 ^b	3.3 \pm 0.20 ^c	1.2 \pm 0.10 ^d

Values within a row with different superscripts are significantly different for each gender ($P < 0.05$).

[†] P values calculated with Wilcoxon Signed-Ranks test.

Table 4. Consumption of food groups according to meals and snacks (g/d)

	Male (n = 167)					Female (n = 233)				
	Breakfast [†]	Lunch [†]	Dinner [†]	Snacks [†]	Total [‡]	Breakfast [†]	Lunch [†]	Dinner [†]	Snacks [†]	Total [‡]
Bread/cereals	64.3 \pm 4.62 ^a	87.8 \pm 5.56 ^b	104.7 \pm 5.14 ^c	45.7 \pm 5.67 ^d	307.9 \pm 12.17 ^a	53.3 \pm 3.61 ^a	61.1 \pm 3.53 ^a	75.7 \pm 3.51 ^b	35.1 \pm 3.81 ^c	224.9 \pm 7.12 ^b
Vegetables	16.2 \pm 3.94 ^a	94.9 \pm 9.71 ^b	119.9 \pm 11.10 ^a	24.4 \pm 5.00 ^a	255.4 \pm 17.17	24 \pm 3.89 ^a	68.1 \pm 6.47 ^b	126.6 \pm 8.83 ^c	10.4 \pm 2.15 ^d	229.1 \pm 11.62
Fruits	19.1 \pm 6.02 ^a	3.0 \pm 1.44 ^b	10.7 \pm 3.67 ^{ab}	68.4 \pm 9.16 ^c	101.1 \pm 12.02	7.1 \pm 2.06 ^a	20.8 \pm 5.02 ^a	20.2 \pm 4.98 ^a	79.8 \pm 9.43 ^b	128.0 \pm 11.89
Meats	20.0 \pm 3.00 ^a	65.1 \pm 8.09 ^b	75.7 \pm 5.77 ^c	9.7 \pm 2.04 ^d	170.5 \pm 10.83 ^a	21.3 \pm 2.60 ^a	33.1 \pm 3.54 ^b	50.6 \pm 4.28 ^c	9.4 \pm 1.59 ^d	114.4 \pm 6.37 ^b
Dairy	36.1 \pm 4.41 ^a	52.9 \pm 6.13 ^{ab}	71.8 \pm 8.20 ^b	28.8 \pm 6.38 ^c	189.6 \pm 12.45	40.9 \pm 5.74 ^a	41.7 \pm 4.74 ^a	52.4 \pm 4.89 ^b	33.3 \pm 5.03 ^a	168.2 \pm 11.45
Sweets	8.8 \pm 1.02 ^a	4.8 \pm 0.99 ^{bc}	6.3 \pm 1.19 ^c	18.9 \pm 1.95 ^d	38.9 \pm 2.79 ^a	6.39 \pm 0.64 ^a	4.4 \pm 0.81 ^{bc}	4.7 \pm 0.91 ^c	13.4 \pm 1.41 ^d	28.8 \pm 2.01 ^b
Fats	7.4 \pm 0.94 ^a	13.7 \pm 1.27 ^{bc}	15.2 \pm 1.06 ^c	2.8 \pm 0.66 ^d	39.0 \pm 2.14	4.3 \pm 0.54 ^a	11.6 \pm 1.05 ^b	17.9 \pm 1.2 ^c	2.9 \pm 0.58 ^d	36.6 \pm 1.75

Values within a row with different superscripts are significantly different for each gender ($P < 0.05$).

[†] P values calculated with Wilcoxon Signed-Ranks test.

[‡] P values calculated with the Mann-Whitney U-test between genders.

energy and nutrients provided in each meal and snack. There are many studies regarding the nutritional status and nutritional habits of university students. However, to our knowledge, the intake of energy and nutrients from meals and snacks has not been previously examined in Turkey. Eating regular meals and the composition of meals and snacks are important factors for healthy nutrition.

In this study, most of the students were in the normal body weight range (69.5% males, 77.7% females). Also, it was found that 25.1% of males were overweight, and 16.3% of females were underweight. It appears that females paid more attention to maintaining an ideal body weight than males. In a study with university students in Turkey, it was found that 32.6% of females had BMIs of $< 20 \text{ kg/m}^2$ [17]. In another study, students who

perceived themselves as being overweight were found to have a mean BMI of 23.5 kg/m^2 , whereas a group of students with a mean BMI of 20.1 kg/m^2 evaluated themselves as being underweight. It was concluded that young adults have insufficient knowledge about healthy body weight and weight-control practices [18].

In other countries, similar studies have been conducted and different results were found. A cross-sectional study in five public and private universities in Beirut showed that the overall prevalence of students trying to lose weight was 30%, with 71% of them being under weight and normal weight. The attempt to lose weight was ascribed to socio-economic factors [19]. A study conducted in China, found that 80.5% of university students were of a normal weight, and 16.6% of students were underweight,

and the prevalence of BMIs $> 30 \text{ kg/m}^2$ was very low (0.4%). In China, female students had a significantly greater desire to be thinner than did males in the same study [20]. In Sweden, male students showed high levels of being overweight and obese, and were also less interested in nutritional advice and health enhancing activities [21]. In another study conducted in the USA, 35% of college students were found to be overweight or obese ($\text{BMI} \geq 25 \text{ kg/m}^2$) and nearly half (46%) of all students reported they were trying to lose weight [22]. In another study conducted at Madrid University, with 234 students (48 males and 186 females) aged 22.3 ± 1.5 years old, approximately half of them (47.9%) expressed their desire to lose weight even though the percentage of overweight students was low. However, no great differences were found in the food habits and nutrition knowledge of those who wished to lose weight and those who did not [23]. The above studies show that the prevalence of obesity in each country changes according to social, economic, and cultural factors. In conclusion, many university students, especially females, in different countries want to lose weight despite the fact that their body weight is normal.

Skipping meals was found to be more prevalent in smoking students than other students in this study. Another study conducted with 200 Turkish university students aged 19-24 years old found that most smoking and non-smoking students had normal body mass index values (85% and 79%, respectively). The consumption of fresh fruit and vegetables between meals was found to be lower in smoking students than in non-smoking students (15% and 38%, respectively) [24]. It was reported that smokers consume ≥ 1 serving/day fewer vegetables than non-smokers [25]. Mean intakes of energy and fat were found to be significantly higher in smoking than non-smoking males. In addition, fiber and vitamin C intakes were found to be higher in non-smoking than in smoking females [24]. In a Turkish heart study, low levels of physical activity and a high prevalence of smoking were reported and considered to be among the factors associated with an increased risk of heart disease [26].

Another study found that both gender the college major were important factors for nutritional attitudes. Female students had higher nutritional knowledge scores and better nutritional attitudes than male students. Also, it was found that the students who had better positive nutritional attitude scores tended to skip breakfast less, ate more green vegetables, and consumed less soft drinks and less alcohol [27]. In our study, breakfast and lunch were the most frequently skipped meals, with a total of 47.7% students skipping breakfast and 25.2% skipping lunch. In another study, the percentage of skipping meal was found to be 82.5% among students of Ankara University in Turkey [3]. In conclusion, skipping meals was found to be significantly correlated with anemia. The nutrient intakes of 71 female students, aged 19-23 years, were examined in Japan [8]. Skipping of breakfast was more common among girls who lived away from home, and they had lower intakes of energy, protein, and minerals such as calcium and iron than they had at their homes.

An energy intake of $< 67\%$ RDA was found in 78.4% of men and in 81.1% of women in this study. Also, high percentages of fiber (77.2%), calcium (63.5%), and folate (52.7%) deficiencies were found in males, while iron (80.7%), calcium (68.2%), and folate (64.4%) deficiencies were high in females. Dietary intakes of calcium, fiber, and cholesterol were lower than recommended in Agriculture University students aged 22-26 years in Pakistan [28]. Eighty two percent of male students and 21% of female students had lower than recommended energy intakes. In another study, mean energy intakes were lower than Spanish recommendations in male (2,462 vs. 2,988 kcal/d) and female (1,912 vs. 2,295 kcal/d) university students [29]. In the same study, the mean intakes of magnesium for males; and iron, magnesium, and zinc for females were also lower than recommended. However, calcium intakes were higher than recommended levels in both genders. Similarly, the percentages of iron intake deficiency were also higher in females in this study. In Turkey, iron deficiency anemia is an important public health problem among young children and especially in women of childbearing age. The possible causes of anemia are low intake of iron, low bioavailability of iron, parasitic infections, and high consumption of foods containing substances that inhibit iron absorption, such as tea [30]. Calcium intake was lower than recommended in this study. In general, cheese and yoghurt were the main sources of calcium in diets. Dairy products were consumed at dinner and lunch., High milk consumption at breakfast to increase calcium intake would be beneficial. Total protein, iron, vitamin B₁₂, niacin, and zinc intakes were higher in males than females, and depended on the higher consumption of foods such as meat, eggs, etc, obtained from animals.

In this study, dinner was the largest contributor of energy in both genders. Breakfast and snacks were the smallest contributors of energy in both males and females. Similar results were found for adolescents. Breakfast also contributed the smallest amount of energy for adolescent males [31]. The intakes of carbohydrate, total and saturated fat were found to be lowest for breakfast. In our study, students ate more bread, cereals, and meat at dinner than at other meals or during snacks. Total fat consumption was found to be higher at lunch and dinner than at breakfast and snacks because of greater food consumption during these main meals. Also, bread, meat, and sweet consumption were significantly higher in males than females. Students ate more sweets in snacks than at other meals. Luebke and Driskel [32], reported that most of students at a Midwestern university ate sugary foods 1 to 3 times per week or once daily. According to their study, 25% of the students reported eating sugary foods more than once daily. The average sucrose consumption in all subjects (Thai undergraduate students) was $69 \pm 38 \text{ g/day}$, ranging from 4 to 182 g/day, or 17 teaspoons of added sucrose per day [33]. In this study, daily sweet consumption (especially sugar) was found to be $38.9 \pm 2.79 \text{ g/d}$ for male and $28.8 \pm 2.01 \text{ g/d}$ for female students (Table 4). It was suggested that sugar consumption of Turkish university students was lower than the results reported in the other study.

In a previous study it was reported that red meat, cereals, and fast food were consumed more often by males, and that low-fat dairy products such as whole grain products and breakfast cereals were consumed more often by females. The most common choice for snacks was fruit [34]. Fruits were also consumed more often in snacks than in other meals by both genders in our study. Lunch and dinner were the main meals for vegetable consumption by both males and females. However, there was no difference between the amounts of fruits and vegetables consumed by both genders. The percentages of students consuming <400 grams of total fruits and vegetables were 66.5%, 63.1% for male and female university students, respectively. In a study conducted in Turkey, it was found that compared to male students, female students were more likely to eat fruit and vegetables [35]. Male students were less likely to eat fruit instead of dessert. Vegetables were more preferred by female students at lunch and dinner and this study showed that Turkish students do not eat enough fruits and vegetables; therefore nutrition education efforts must be targeted towards students. Similarly, in a study performed to establish the status of nutrition and incorrect nutritional behaviors in 538 students from the Faculty of Medicine, it was found that only 36% of students ate fruits and vegetables once a day [36]. In a study in Greece, fruit and vegetable intake was favorably related to intakes of dietary fiber, calcium, magnesium, potassium, folate, and vitamins C, E, A, B₁ and B₆, and inversely related to the intakes of saturated and trans fatty acids, and cholesterol in medical students [37].

It was determined that unhealthy nutritional behaviors such as irregular consumption of meals, low frequency of vegetable and fruit consumption, preference for butter, and low physical activity were characteristic of students in general so there is a need to create programs for health education at universities [38]. It was shown that female students had higher nutritional knowledge scores and better nutritional attitudes. It was suggested that females in general are more concerned about their nutrition and health than are males [27]. Koch and Pokorn [39], found that in Slovenia, the population aged between 46 and 65 years demonstrated better eating habits, compared with other age groups (18 to 25 years, 26 to 45 years). The age group <45 years had a lower quality of nutritional habits, as reflected by unsuitable intervals between meals, excessive amounts of fats, and saturated fatty acids, and excessively high food energy values.

In conclusion, Turkish students should be educated about having healthy body weights and consuming enough foods rich in calcium and folate. In females, it is necessary to focus on the adequate consumption of iron. Decreasing fat consumption at the main meals and during snacks is recommended for all students. Instead of fatty and sweet foods, foods with higher nutritional values should be preferred. Also, increasing the daily fruit and vegetable consumption would be beneficial for students. Unhealthy nutrition is a major risk factor for chronic diseases including obesity, cardiovascular disease, osteoporosis, and

cancer in later life. Also, university courses can be used for improving healthy eating habits. Additional nutrition knowledge is required to evaluate the nutritional status of all male and female students. It is necessary for educational authorities and dietitians to intensify their efforts to provide nutritional information to students.

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