DISASTER-RELATED NUTRITION AWARENESS AMONG ADULTS IN TÜRKİYE

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Abstract. Nutritional problems frequently occur during disasters due to limited access to safe food, clean water and appropriate food storage conditions. Proper knowledge regarding nutrition before, during and after disasters may help reduce nutrition-related health risks and improve disaster preparedness. In this study we aimed to evaluate disaster-related nutrition knowledge and practices among adults living on the European side of İstanbul, Türkiye and to identify any associations between these knowledge scores and demographic, anthropometric and dietary factors in order to inform efforts to improve preparedness in the study population. This cross-sectional study was conducted during August-December 2025. Subjects aged 19-65 years were recruited through face-to-face interviews conducted in universities, public areas and accessible community settings. The minimum number of subjects calculated to be needed for the study was 200. Data were collected using a structured questionnaire asking about demographic characteristics, dietary habits, a 24-hour diet recall and anthropometric measurements. We assessed disaster-related nutritional knowledge with 18 researcher-developed questions asking about emergency food selection, food safety, food storage, hydration, infant feeding and nutrition for vulnerable groups during disasters. Knowledge scores were calculated based on the percentage of correct responses. Current diet was assessed using a 24-hour diet recall obtained by a trained dietitian and analyzed using Beslenme Bilgi Sistemi (BEBIS) software. A total of 254 subjects were included in the study, 228 (89.8%) females. The mean (±standard deviation) age of subjects was 27 (±11) (range: 19-65) years. Male subjects had a significantly higher body mass index and waist-to-hip ratio than female subjects (p-value <0.05). Diet was similar between males and females, although vitamin B2 intake was significantly

lower among males and vitamin C intake was significantly higher among females (p-value <0.05). The overall nutrition in disaster-related nutrition knowledge correct response percentage was 59.1%. When asked about the foods that should be included in an emergency kit, 15.4% of subjects in the 19-39 year age group and 33.3% of those in the 40-65 year age group answered correctly (p-value = 0.012). 62.7% of female subjects and 57.7% of male subjects provided the correct answer to the question regarding foods that should not be consumed at the onset of a disaster (p-value = 0.044). Female subjects who were parents had a significantly higher percentage of correct answers (64.21%) than those who were not parents (58.49%) (p-value = 0.035) but there was no significant difference in male subjects (p-value >0.05). Female subjects who regularly took medication had a significantly higher percentage of correct answers (62.43%) than those who did not (58.85%) (p-value = 0.020) but there was no significant difference in male subjects (p-value >0.05). We found a significant negative association between waist circumference and percentage of correct answers to disaster-related nutrition knowledge questions among male subjects (p-value = 0.032) but not female subjects (p-value = 0.896). We found a significant positive association among female between correct answers disaster-related nutrition knowledge and daily intake of potassium (p-value <0.001), magnesium (p-value = 0.006), iron (p-value = 0.038), vitamin B2 (p-value = 0.012) and vitamin B6 (p-value = 0.008) based on the 24-hour diet but in males we only found a sigificant assocition between correct answer and calcium (p-value = 0.039) and phosphorus (p-value = 0.025) intake. In summary, the overall disaster-related nutrition knowledge among study subjects was only fair and was significantly associated with parental status, regular medication use, waist circumference and current dietary intake. We conclude, there is a need to educate the study population regarding disaster-related nutrition. Further studies are need to determine how best to educate the study population regarding this imporatnt issue in order to reduce risk for nutrition-related problems during disasters.

Keywords: disaster nutrition, disaster awareness, healthy nutrition, diet, disaster, emergency nutrition

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INTRODUCTION

A disaster is an event caused by natural, technological or human-related factors that disrupts normal life, overwhelms local resources and results in physical, social and economic losses (AFAD, 2022). Due to its geographical and geological characteristics, Türkiye is frequently affected by both natural and human-induced disasters (Kaya, 2022). Disasters, such as earthquakes, floods, epidemics and armed conflicts, may lead to serious public health problems, including food insecurity, malnutrition, dehydration, and increased risk of infectious diseases (Nour and Altıntaş, 2025).

Adequate nutrition before, during and after disasters is essential for maintaining health and reducing nutrition-related complications, particularly among vulnerable groups, such as infants, children, older adults, pregnant and lactating women and individuals with chronic diseases or disabilities (Ongan *et al*, 2023). In disaster situations, limited access to safe food, clean water and appropriate storage conditions may negatively affect nutritional status and increase morbidity and mortality risk (Kiliç, 2022). Therefore, selecting appropriate foods, maintaining adequate hydration, ensuring food safety and meeting the nutritional needs of vulnerable individuals are important components of disaster preparedness and management.

Public knowledge regarding appropriate nutritional practices during disasters may contribute to better individual preparedness and improved public health outcomes. Previous studies focused mainly on disaster preparedness or emergency nutrition services but there are few studies evaluating disaster-related nutrition knowledge and food selection practices before, during and after disasters among adults in Türkiye.

Disaster-related nutritional knowledge refers to knowledge regarding appropriate food choices and nutrition-related practices before, during and after disasters,

including emergency food storage, safe food and water consumption, infant feeding, hydration and nutrition for vulnerable groups.

In this study we aimed to evaluate disaster-related nutrition knowledge and practices among adults living on the European side of İstanbul, Türkiye and to identify any associations between this knowledge and demographic, anthropometric and dietary factors, in order to inform efforts to improve disaster preparations in the study population.

MATERIALS AND METHODS

Study design and subjects

We conducted this cross-sectional study during August-December 2025.

Inclusion criteria for study subjects were being aged 19-65 years, living on the European side of İstanbul, Türkiye, being able to communicate in the study language, being willing to participate in the study and able to complete the study questionnaire. Exclusion criteria for study subjects were having communication difficulties, cognitive impairment preventing questionnaire completion or being unwilling to participate in the study.

Subjects were recruited from universities, public areas and community settings in the study area.

The minimum number of subjects calculated to be needed for the study 254, based on a 95% confidence interval and 80% statistical power (Biglari *et al*, 2017).

Study instrument

Data were collected through face-to-face interviews following a structured questionnaire consisting of 47 items. The questionnaire consisted of the following sections: demographic characteristics, dietary habits, anthropometric measurements, a 24-hour diet recall and questions assessing knowledge about nutrition before, during and after disasters. The questionnaire was developed after a review of relevant literature.

Disaster-related nutrition knowledge was evaluated with 18 questions. The questions addressed emergency food selection, food safety, food storage, hydration, infant feeding and nutrition for vulnerable groups during a disaster. The answer to each question was determine to be either correct, in which case it was given a score of 1 point, or incorrect, in which case it was given a score of 0 points, giving a total possible knowledge score of 0-18 points.

The subject's current diet was assessed using a 24-hour diet recall evaluation conducted by a dietitian. Daily energy and nutrient intake values were calculated from this diet recall evaluation using Beslenme Bilgi Sistemi (BEBIS) nutrition analysis software, version 9.0 (BEBIS Software, Istanbul, Türkiye). BEBIS is a nutrition analysis program based on Turkish food composition databases and can be obtained from the official BEBIS website. Daily energy and nutrient intake calculations were performed according to the software guidelines.

Anthropometric measurements

Subject weight was measured using a Xiaomi Mi Body Composition Scale 2 (Xiaomi Corporation, Beijing, China) with the subject barefoot and wearing light clothing. Subject height was measured with a Frankfurt plane with shoulders relaxed and heels together and the subject standing upright. Subject waist circumference was measured at the midpoint between the lower rib margin and the iliac crest at the end of normal expiration using a non-stretch measuring tape. Subject hip circumference was measured at the widest point of the gluteal region with the tape positioned parallel to the ground.

Body mass index (BMI) was calculated as body weight in kilograms divided by height in square meters (kg/m^2).

A waist-to-hip ratio of less than 0.85 for women and less than 0.90 for men is considered the normal range (WHO, 2011).

Statistical analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 24.0 (IBM Corporation, Armonk, NY). The normality of continuous variables was evaluated using skewness and kurtosis values, and values within the ±1 range were considered indicative of normal distribution.

Descriptive data are presented as numbers, percentages, means and standard deviations. The student's t-test and One-Way ANOVA were used to compare normally distributed variables and the Mann-Whitney U and Kruskal-Wallis H tests were used to compare non-normally distributed variables. Pearson correlation analysis was used to evaluate parametric variables and Spearman correlation analysis was used to evaluate non-parametric variables. A p-value <0.05 was considered statistically significant.

Ethical approval

Ethical approval for the study was obtained from the Biruni University Scientific Research Ethics Committee (decision no. 2024-BİAEK/12-29; 28 July 2025). Written informed consent was obtained from all study subjects prior to inxluaion in this study.

RESULTS

A total of 254 subjects were included in the study, 228 (89.8%) women subjects. 79.4% of men subjects and 69.3% of women subjects had a bachelor's degree (p-value = 0.263). 56.6% of women subjects were students and 42.4% of men subjects were employed in occupations classified as "other" (p-value = 0.012) (which excluded those who were self-employed, academics, civil servants, students, and workers). 76.8% of women subjects and 57.7% of men subjects were single (p-value = 0.034). 83.8% of women subjects and 84.7% of men subjects had a middle level income (p-value >0.05). 81.1% of women subjects and 65.4% of men subjects did not have children (p-value >0.05). 79.8% of women subjects and 80.8% of men subjects

did not have a chronic illness (p-value >0.05). 85.1% of women subjects and 84.6% of men subjects did not take medication regularly (p-value >0.05). 30.7% of women subjects and 38.5% of men subjects exercised regularly (p-value >0.05) (Table 1).

Regarding dietary and lifestyle habits, 88.6% of women subjects and 69.2% of men subjects were non-smokers (p-value = 0.012). 85.1% of women subjects and 65.4% of men subjects did not drink alcohol (p-value = 0.023). Emotional state influenced eating habits among

Table 1

Demographic characteristics of study subjects (N=254)

Demographical characteristics	Frequency, *n* (%)		*p*-value
	Female (N=228)	Male (N=26)	
Education level			0.263
Primary school	6 (2.6)	1 (3.8)	
Middle school	4 (1.8)	0 (0.0)	
High school	8 (3.5)	3 (11.5)	
Associate/Bachelor's degree	181 (79.4)	18 (69.3)	
Master's/PhD	29 (12.7)	4 (15.4)	
Profession			0.012
Self-employed	4 (1.8)	4 (15.4)	
Civil servant	13 (5.7)	1 (3.8)	
Employee	3 (1.3)	0 (0.0)	
Academic	17 (7.5)	1 (3.8)	
Student	129 (56.6)	9 (34.6)	
Others	62 (27.1)	11 (42.4)	

Table 1 (cont)

Demographical characteristics	Frequency, *n* (%)		*p*-value
	Female (N=228)	Male (N=26)	
Marital status			0.034
Married	53 (23.2)	11 (42.3)	
Single	175 (76.8)	15 (57.7)	
Income level			0.518
Low	21 (9.2)	1 (3.8)	
Medium	191 (83.8)	22 (84.7)	
High	16 (7.0)	3 (11.5)	
Having children			0.059
Yes	43 (18.9)	9 (34.6)	
No	185 (81.1)	17 (65.4)	
Having chronic disease			0.999
Yes	46 (20.2)	5 (19.2)	
No	182 (79.8)	21 (80.8)	
Regular medication			1.000
Yes	34 (14.9)	4 (15.4)	
No	194 (85.1)	22 (84.6)	
Regular exercise			0.420
Yes	70 (30.7)	10 (38.5)	
No	158 (69.3)	16 (61.5)	

The income level was based on the subject's perception of whether they had a low, average or high income.

PhD: Doctor of Philosophy

89.5% of women subjects and 46.2% of men subjects (p-value <0.001) (Table 2).

The mean (±standard deviation) BMI among women subjects was 23.57 (±4.57) and among men subjects was 26.60 (±3.45) kg/m^2 (p-value <0.001). 83.3% of women subjects and 57.7% of men subjects had a normal waist-to-hip ratio (p-value = 0.002). 68.9% of women subjects and 38.5% of men subjects had a BMI <25 kg/m^2 (p-value = 0.002) (Table 3).

Table 2

Dietary habits of study subjects by gender (N=254)

Dietary habits	Frequency, *n* (%)		*p*-value
	Female (N=228)	Male (N=26)	
Number of main meals per day			0.918
1	22 (9.6)	2 (7.7)	
2	151 (66.2)	17 (65.4)	
3	55 (24.2)	7 (26.9)	
Number of snacks per day			0.188
1	144 (63.2)	21 (80.8)	
2	74 (32.5)	4 (15.4)	
3	10 (4.3)	1 (3.8)	
Skipped meals			0.983
Yes	89 (39.0)	10 (38.5)	
No	32 (14.0)	4 (15.4)	
Sometimes	107 (47.0)	12 (46.1)	

Table 2 (cont)

Dietary habits	Frequency, *n* (%)		*p*-value
	Female (N=228)	Male (N=26)	
Type of skipped meal			0.655
Morning	84 (42.0)	9 (42.9)	
Noon	71 (35.5)	6 (28.6)	
Evening	20 (10.0)	4 (19.0)	
Mid-morning	13 (6.5)	2 (9.5)	
Afternoon	10 (5.0)	0 (0.0)	
Night	2 (1.0)	0 (0.0)	
Tobacco smoker			0.012
Yes	26 (11.4)	8 (30.8)	
No	202 (88.6)	18 (69.2)	
Consumed alcohol			0.023
Yes	34 (14.9)	9 (34.6)	
No	194 (85.1)	17 (65.4)	
Where eats breakfast			0.503
Home	151 (66.2)	16 (61.5)	
School canteen	19 (8.3)	1 (3.8)	
Fast food restaurant, eatery, cafeteria, dining hall, *etc*	12 (5.3)	2 (7.7)	
I do not eat (skipped meal)	28 (12.3)	6 (23.1)	
I eat the food I bring with me	18 (7.9)	1 (3.9)	
Where eats lunch			0.068
Home	46 (20.2)	8 (30.8)	
School canteen	39 (17.1)	3 (11.5)	
Fast food restaurant, eatery, cafeteria, dining hall, *etc*	63 (27.6)	12 (46.2)	
I do not eat (skipped meal)	46 (20.2)	1 (3.8)	
I eat the food I bring with me	34 (14.9)	2 (7.7)	

Table 2 (cont)

Dietary habits	Frequency, *n* (%)		*p*-value
	Female (N=228)	Male (N=26)	
Where eats dinner			0.095
Home	189 (82.9)	19 (73.1)	
School canteen	4 (1.8)	0 (0.0)	
Fast food restaurant, eatery, cafeteria, dining hall, *etc*	22 (9.6)	3 (11.5)	
I do not eat (skipped meal)	7 (3.1)	4 (15.4)	
I eat the food I bring with me	6 (2.6)	0 (0.0)	
Type and amount of coffee drunk with milk			0.069
Sugared, 1 cup	24 (22.0)	0 (0.0)	
Sugared, 2 cups	8 (7.3)	0 (0.0)	
Sugared, 3 cups or more	2 (1.8)	0 (0.0)	
Unsweetened, 1 cup	56 (51.4)	5 (71.4)	
Unsweetened, 2 cups	16 (14.7)	0 (0.0)	
Unsweetened, 3 cups or more	3 (2.8)	2 (28.6)	
Type and amount of black coffee drunk			0.223
Sugared, 1 cup	13 (9.8)	0 (0.0)	
Sugared, 2 cups	3 (2.3)	0 (0.0)	
Sugared, 3 cups or more	1 (0.8)	1 (8.3)	
Unsweetened, 1 cup	77 (57.9)	8 (66.7)	
Unsweetened, 2 cups	27 (20.3)	1 (8.3)	
Unsweetened, 3 cups or more	12 (8.9)	2 (16.7)	

Table 2 (cont)

Dietary habits	Frequency, *n* (%)		*p*-value
	Female (N=228)	Male (N=26)	
Type and amount of black tea drunk			0.683
Sugared, 1 cup	11 (5.7)	0 (0.0)	
Sugared, 2 cups	8 (4.1)	1 (5.6)	
Sugared, 3 cups or more	15 (7.7)	1 (5.6)	
Unsweetened, 1 cup	39 (20.1)	2 (11.1)	
Unsweetened, 2 cups	42 (21.6)	3 (16.7)	
Unsweetened, 3 cups or more	79 (40.8)	11 (61.0)	
Type and amount of herbal tea drunk			0.683
Sugared, 1 cup	13 (9.8)	0 (0.0)	
Sugared, 2 cups	3 (2.3)	0 (0.0)	
Sugared, 3 cups or more	1 (0.8)	1 (8.3)	
Unsweetened, 1 cup	77 (57.9)	8 (66.7)	
Unsweetened, 2 cups	27 (20.3)	1 (8.3)	
Unsweetened, 3 cups or more	12 (8.9)	2 (16.7)	
Effect of emotional state on eating habits			<0.001
Yes	204 (89.5)	12 (46.2)	
No	24 (10.5)	14 (53.8)	
The person who does the grocery shopping			0.114
Me	67 (29.6)	13 (50.0)	
My spouse	18 (7.9)	3 (11.5)	
My parent(s)/sibling(s)	135 (59.9)	10 (38.5)	
Online	6 (2.6)	0 (0.0)	

Table 3

Anthropometric data of study subjects

Anthropometric measurements	Female (N = 228)	Male (N = 26)	*p*-value
Mean (±SD) body weight in kg	62.9 (±12.2)	84.2 (±14.0)	-
Mean (±SD) height in cm	163.5 (±5.7)	177.5 (±6.9)	-
Mean (±SD) waist circumference in cm	76.6 (±12.4)	90.7 (±12.1)	-
Mean (±SD) hip circumference in cm	99.7 (±9.5)	102.6 (±11.2)	-
Mean (±SD) waist/hip ratio	0.8 (±0.1)	0.9 (±0.1)	-
Mean (±SD) BMI in kg/m^2	23.6 (±4.6)	26.6 (±3.5)	<0.001
Waist/hip ratio category, *n* (%)			
Abnormal (≥0.85 for women, ≥0.90 for men)	38 (16.7)	11 (42.3)	0.002
Normal (<0.85 for women, <0.90 for men)	190 (83.3)	15 (57.7)	
BMI category, *n* (%)			0.002
<25 kg/m^2	157 (68.9)	10 (38.5)	
≥25 kg/m^2	71 (31.1)	16 (61.5)	

BMI: body mass index; cm: centimeter; kg: kilogram; kg/m^2: kilogram per square meter; SD: standard deviation

67.5% of women subjects and 38.7% of men subjects had an adequate intake of vitamin B2 (*p*-value = 0.038). 46.1% of women subjects and 40.7% of men subjects had an adequate intake of vitamin C (*p*-value = 0.006). There were no other significant differences in caloric, macronutrient intake or micronutrient intake between women and men subjects (*p*-value >0.05) (Table 4).

When asked about the foods that should be included in an emergency kit, 84.6% of subjects age 19-39 years and 66.7% of subjects age

Table 4

Subject energy and nutrient intake (per day) (228 females and 26 males)

Variables	Mean (±SD) value in females	Percent of the reference value	Mean (±SD) value in males	Percent of the reference value	*p*-values*
Total energy in kcal	1150.4 (±285.7	55.3	1237.3 (±341.7)	49.8	0.051
Protein in g	49.2 (±18.2)	94.9	55.0 (±19.2)	88.8	0.448
Protein (%)	17.1 (± 6.3)	121.4	17.8 (± 6.2)	131.9	
Fat (g)	54.8 (±20.0)	85.9	65.0 (±24.5)	81.8	0.097
Fat (%)	42.8 (± 15.6)	45.3	47.3 (±17.8)	44.5	
Carbohydrates (g)	111.7 (±42.7)	71.6	106.3 (±41.1)	75.1	0.543
Carbohydrates (%)	38.8 (±14.8)	101.4	34.4 (±13.3)	85.3	
Fiber (g)	11.3 (±4.6)	73.5	11.1 (±5.8)	75.0	0.819
Monounsaturated fatty acids (g)	39.6 (±9.1)	53.0	10.5 (±7.5)	51.6	0.59
Vitamin A (μg)	658.8 (±377.7)	90.9	639.8 (±445.3)	69.8	0.079
Vitamin E (mg)	8.1 (±5.2)	54.0	9.5 (±8.4)	49.5	0.572
Vitamin B1 (mg)	0.6 (±0.2)	54.9	0.6 (±0.3)	53.8	0.268
Vitamin B2 (mg)	1.0 (±0.8)	67.5	0.9 (±0.4)	38.7	0.038
Vitamin B6 (mg)	0.9 (±0.4)	102.6	0.8 (±0.3)	94.2	0.745
Folate (μg)	181.2 (±131.3)	43.5	177.5 (±90.4)	42.4	0.97

Table 4 (cont)

Variables	Mean (±SD) value in females	Percent of the reference value	Mean (±SD) value in males	Percent of the reference value	*p*-values*
Vitamin C (mg)	64.1 (±53.3)	46.1	42.6 (±36.6)	40.7	0.006
Sodium (mg)	2052.4 (±1349.0)	47.9	1883.2 (±744.6)	48.4	0.701
Potassium (mg)	1523.8 (±513.8)	18.3	1484.8 (±646.8)	19.0	0.789
Calcium (mg)	438.2 (±288.2)	61.1	386.8 (±230.4)	60.6	0.276
Magnesium (mg)	167.6 (±78.0)	72.6	169.6 (±71.92)	81.4	0.807
Phosphorus (mg)	730.4 (±238.0)	55.4	759.14 (±253.3)	49.8	0.731
Iron (mg)	6.7 (±2.7)	94.9	6.7 (±2.3)	88.8	0.956
Zinc (mg)	6.8 (±3.0)	121.4	7.7 (±3.1)	131.9	0.124

Notes: Percent of women meeting the reference values set by Turkish Ministry of Health, 2022.

g: grams; kcal: kilocalories; mg: milligram; SD: standard deviation; µg: microgram

40-65 years gave the wrong answers (p-value = 0.012). When asked what foods should not be consumed in the first minutes of a disaster, 38.9% of subjects aged 19-39 years and 57.6% of subjects aged 40-65 years answered correctly (p-value = 0.042). When asked what foods should not be consumed throughout a disaster, 36.6% of subjects aged 19-39 years and 54.5% of subjects aged 40-65 years answered correctly (p-value =0.049). When asked which foods should not be consumed initially in the event of a disaster, 62.7% of women and 42.0% of men answered correctly (p-value = 0.044).

Women subjects who were parents had significantly higher percentages of correct answers about disaster-related nutrition knowledge (64.21%) than those who were not parents (58.49%) (p-value = 0.035). Women subjects who regularly took medication had significantly higher percentages of correct answers (62.43%) than those who did not (58.85%) (p-value = 0.020) but a significant difference was not seen in men subjects (p-value >0.05). There were no significant differences in percentages of correct answers between women subjects and men subjects by education level, income level, physical activity level, or sleep duration (p-value >0.05) (Table 6).

We found no significant differences in percentages of correct answers about disaster-related nutrition knowledge by BMI category (p-value = 0.999). We found no significant differences in percentages of correct answers about disaster related nutrition knowledge among women by waist circumference category (p-value = 0.807) or among men by waist circumference category (p-value = 0.941).

We found no significant association between BMI category and questions about menstruation among men, women and overall (p-value = 0.290).

We found a significant negative association in men between waist circumference and the percentage of correct answers about disaster-related nutrition knowledge (p-value = 0.032), where

Table 5

Comparison of correct and incorrect answers regarding disaster-related nutrition knowledge among study subjects by gender and age groups

Question and responses	Comparison by gender, *n* (%)		*p*-value	Comparison by age, *n* (%)			*p*-value
	Female (N = 228)	Male (N = 26)		19-39 years (N = 221)	40-65 years (N = 33)	Total (N = 254)	
1. Do you have a disaster bag at home?			0.537				0.794
Yes (Correct)	75 (32.9)	7 (26.9)		72 (32.6)	10 (30.3)	82 (32.3)	
No (Incorrect)	153 (67.1)	19 (73.1)		149 (67.4)	23 (69.7)	172 (67.7)	
2. Whom should an emergency kit be prepared in a family home?			0.250				0.096
Number who answered correctly	105 (46.1)	6 (23.1)		101 (45.7)	10 (30.3)	111 (43.7)	
Number who answered incorrectly	123 (53.9)	20 (76.9)		120 (54.3)	23 (69.7)	143 (56.3)	
3. The disaster bag should be sufficient for how many hours?			1.000				1.000
Number who answered correctly	202 (88.6)	23 (88.5)		195 (88.2)	30 (90.9)	225 (88.6)	
Number who answered incorrectly	26 (11.4)	3 (11.5)		26 (11.8)	3 (9.1)	29 (11.4)	
4. What foods can be in a disaster bag?			1.000				0.012
Number who answered correctly	41 (18.0)	4 (15.4)		34 (15.4)	11 (33.3)	45 (17.7)	
Number who answered incorrectly	187 (82.0)	22 (84.6)		187 (84.6)	22 (66.7)	209 (82.3)	

Table 5 (cont)

Question and responses	Comparison by gender, *n* (%)		*p*-value	Comparison by age, *n* (%)			*p*-value
	Female (N = 228)	Male (N = 26)		19-39 years (N = 221)	40-65 years (N = 33)	Total (N = 254)	
5. What food is not appropriate for a disaster bag?			0.358				0.449
Number who answered correctly	184 (80.7)	19 (73.1)		175 (79.2)	28 (84.8)	203 (79.9)	
Number who answered incorrectly	44 (19.3)	7 (26.9)		46 (20.8)	5 (15.2)	51 (20.1)	
6. What type of water should be consumed during a disaster?			0.704				0.141
Number who answered correctly	211 (92.5)	25 (96.2)		203 (91.9)	33 (100.0)	236 (92.9)	
Number who answered incorrectly	17 (7.5)	1 (3.8)		18 (8.1)	0 (0.0)	18 (7.1)	
7. What food should NOT be consumed in the first few hours of a disaster?			0.753				0.042
Number who answered correctly	95 (41.7)	10 (38.5)		86 (38.9)	19 (57.6)	105 (41.3)	
Number who answered incorrectly	133 (58.3)	16 (61.5)		135 (61.1)	14 (42.4)	149 (58.7)	
8. What foods are appropriate during the first few hours of a disaster?			0.155				0.439
Number who answered correctly	170 (74.6)	16 (51.5)		160 (72.4)	26 (78.8)	186 (73.2)	
Number who answered incorrectly	58 (25.4)	10 (38.5)		61 (27.6)	7 (21.2)	68 (26.8)	

Table 5 (cont)

Question and responses	Comparison by gender, *n* (%)		*p*-value	Comparison by age, *n* (%)			*p*-value
	Female (N = 228)	Male (N = 26)		19-39 years (N = 221)	40-65 years (N = 33)	Total (N = 254)	
9. What food should not be given to a 5-month-old baby who has lost their mother in a disaster?			0.702				0.383
Number who answered correctly	123 (53.9)	13 (50.0)		116 (52.5)	20 (60.6)	136 (53.5)	
Number who answered incorrectly	105 (46.1)	13 (50.0)		105 (47.5)	13 (39.4)	118 (46.5)	
10. What food is not appropriate for long-term consumption in a disaster?			0.236				0.436
Number who answered correctly	197 (86.4)	20 (76.9)		187 (84.6)	30 (90.9)	217 (85.4)	
Number who answered incorrectly	31 (13.6)	6 (23.1)		34 (15.4)	3 (9.1)	37 (14.6)	
11. What foods should not be consumed at the beginning of a disaster?			0.044				0.056
Number who answered correctly	143 (62.7)	11 (42.3)		139 (62.9)	15 (45.5)	154 (60.6)	
Number who answered incorrectly	85 (37.3)	15 (57.7)		82 (37.1)	18 (54.5)	100 (39.4)	
12. What people of the highest energy requirement in a disaster?			0.311				0.620
Number who answered correctly	99 (43.4)	14 (53.8)		97 (43.9)	16 (48.5)	113 (44.5)	
Number who answered incorrectly	129 (56.6)	12 (46.2)		124 (56.1)	17 (51.5)	141 (55.5)	

Table 5 (cont)

Question and responses	Comparison by gender, *n* (%)		*p*-value	Comparison by age, *n* (%)			*p*-value
	Female (N = 228)	Male (N = 26)		19-39 years (N = 221)	40-65 years (N = 33)	Total (N = 254)	
13. Are dietary supplements recommended in disaster?			0.592				0.252
Number who answered correctly	167 (73.2)	18 (69.2)		160 (72.4)	27 (81.8)	185 (72.8)	
Number who answered incorrectly	59 (25.9)	8 (30.8)		61 (27.6)	6 (18.2)	67 (26.4)	
14. What foods should not be consumed during a disaster?			0.955				0.049
Number who answered correctly	89 (39.0)	10 (38.5)		81 (36.7)	18 (54.5)	99 (39.0)	
Number who answered incorrectly	139 (61.0)	16 (61.5)		140 (63.3)	15 (45.5)	155 (61.0)	
15. What is the safest way to clean food during a disaster?			0.383				0.470
Number who answered correctly	166 (72.8)	21 (80.8)		161 (72.9)	26 (78.8)	187 (73.6)	
Number who answered incorrectly	62 (27.2)	5 (19.2)		60 (27.1)	7 (21.2)	67 (26.4)	
16. What foods are considered dangerous to consume in a disaster?			0.777				0.920
Number who answered correctly	191 (83.8)	23 (88.5)		186 (84.2)	23 (84.8)	214 (84.3)	
Number who answered incorrectly	37 (16.2)	3 (11.5)		35 (15.8)	5 (15.2)	40 (15.7)	

Table 5 (cont)

Question and responses	Comparison by gender, *n* (%)		*p*-value	Comparison by age, *n* (%)			*p*-value
	Female (N = 228)	Male (N = 26)		19-39 years (N = 221)	40-65 years (N = 33)	Total (N = 254)	
17. When should hands be washed with soap and water in a disaster?			0.984				0.273
Number who answered correctly	132 (57.9)	15 (57.7)		125 (56.6)	22 (66.7)	147 (57.9)	
Number who answered incorrectly	96 (42.1)	11 (42.3)		96 (43.4)	11 (33.3)	107 (42.1)	
18. What health problems may occur due to dietary changes during a disaster?			0.251				0.862
Number who answered correctly	48 (21.1)	3 (11.5)		44 (19.9)	7 (21.2)	51 (20.1)	
Number who answered incorrectly	180 (78.9)	23 (88.5)		177 (80.1)	26 (78.8)	203 (79.9)	

Table 6

Number and percent correct answers regarding nutrition in disasters among male and female respondents by selected factors

Demographic characteristics and dietary habits	Female respondents (n = 228)		Male respondents (n = 26)	
	Mean (±SD) number of correct answers (%)	p-value	Mean (±SD) number of correct answers (%)	p-value
Percentage of correct answers	59.6 (±15.4)		55.1 (±14.8)	0.06
Education level		0.990		0.406
Primary school	59.3 (±19.5)		50.0 (± 0.0)	
Middle school	63.9 (±14.7)		-	
High school	56.9 (±20.7)		48.1 (±6.4)	
Associate degree / Bachelor's degree	59.9 (±13.9)		57.7 (±12.9)	
Master's degree / PhD	57.5 (±21.7)		50.0 (±26.8)	
Profession		0.259		0.848
Self-employed	75.0 (±9.6)		58.3 (±11.6)	
Civil servant	64.1 (±11.7)		55.6 (± 0.0)	
Employee	55.6 (±9.6)		-	
Academic	57.5 (±19.5)		55.6 (± 0.0)	
Student	59.2 (±14.4)		58.6 (±16.9)	
Others	59.2 (±17.0)		51.0 (±15.7)	

Table 6 (cont)

Demographic characteristics and dietary habits	Female respondents (n = 228)		Male respondents (n = 26)	
	Mean (±SD) number of correct answers (%)	p-value	Mean (±SD) number of correct answers (%)	p-value
Marital status		0.385		0.226
Married	60.6 (±16.3)		53.5 (±8.1)	
Single	59.3 (±15.1)		56.3 (±18.3)	
Income level		0.950		0.237
Low	58.7 (±17.1)		11.1 (±0.0)	
Medium	59.5 (±15.3)		57.1 (±12.7)	
High	61.5 (±14.6)		55.6 (±5.6)	
Having a child or children		0.035		0.623
Yes	64.2 (±12.3)		54.9 (±9.0)	
No	58.5 (±15.9)		55.2 (±17.4)	
Do you have any chronic illnesses diagnosed by a doctor?		0.082		0.373
Yes	62.4 (± 15.0)		62.2 (±15.9)	
No	58.9 (±15.4)		53.4 (±14.4)	
Do you take medication regularly?		0.020		0.105
Yes	65.2 (±13.7)		66.7 (±14.3)	
No	58.6 (±15.5)		53.0 (±14.2)	

Table 6 (cont)

Demographic characteristics and dietary habits	Female respondents (n = 228)		Male respondents (n = 26)	
	Mean (±SD) number of correct answers (%)	p-value	Mean (±SD) number of correct answers (%)	p-value
How many hours do you sleep on average per day?		0.990		0.305
6 hours	59.6 (±14.3)		63.0 (±8.5)	
7 hours	59.4 (±16.8)		56.5 (±8.5)	
8 hours	59.8 (±14.9)		54.3 (±21.1)	
9 hours	58.3 (±15.6)		-	
10 hours	61.1 (±12.8)		38.9 (±15.7)	
Do you exercise regularly (at least 3 times a week)?		0.932		0.323
Yes	59.9 (±15.8)		51.7 (±18.9)	
No	59.4 (±15.2)		57.3 (±11.8)	
Number of main meals per day		0.125		0.059
1	54.0 (±14.2)		33.3 (±31.4)	
2	60.6 (±14.5)		60.5 (±10.6)	
3	59.0 (±17.8)		48.4 (±12.7)	
Number of snacks per day		0.183		0.248
1	58.3 (±15.6)		57.7 (±13.0)	
2	61.6 (±14.9)		41.7 (±20.5)	
3	62.2 (±14.1)		55.6 (±0.0)	

Table 6 (cont)

Demographic characteristics and dietary habits	Female respondents (n = 228)		Male respondents (n = 26)	
	Mean (±SD) number of correct answers (%)	p-value	Mean (±SD) number of correct answers (%)	p-value
Do you skip meals?		0.804		0.557
Yes	59.1 (±14.8)		50.6 (±14.91)	
No	60.8 (±15.3)		52.77 (±20.5)	
Sometimes	59.7 (±16.0)		59.7 (±12.6)	
Which meal do you usually skip?		0.904		0.782
Morning	59.7 (±14.2)		51.9 (±18.2)	
Noon	60.0 (±15.6)		59.3 (±9.1)	
Evening	59.4 (±12.0)		59.7 (±16.0)	
Mid-Morning	56.0 (±18.5)		55.6 (±7.9)	
Afternoon	58.3 (±23.3)		-	
Night	69.4 (±19.6)		-	
Do you smoke?		0.861		0.447
Yes	60.9 (±10.8)		59.0 (±9.4)	
No	59.4 (±15.9)		53.4 (±16.6)	
Do you consume alcohol?		0.276		0.891
Yes	61.6 (±15.9)		53.7 (±18.6)	
No	59.2 (±15.3)		55.9 (±13.0)	

Table 6 (cont)

Demographic characteristics and dietary habits	Female respondents (n = 228)		Male respondents (n = 26)	
	Mean (±SD) number of correct answers (%)	p-value	Mean (±SD) number of correct answers (%)	p-value
Where do you usually eat your breakfast?		0.873		0.424
Home	59.9 (±15.3)		54.5 (±11.7)	
School canteen	60.8 (±15.1)		61.1 (±0.0)	
Fast food restaurant, restaurant, cafeteria, dining hall, *etc*	55.1 (±22.53)		58.3 (±3.9)	
I do not eat (skipped meal)	60.1 (±14.6)		50.0 (±21.9)	
I eat the food I bring with me	57.7 (±13.2)		83.3 (±0.0)	
Where do you usually eat your lunch?		0.769		0763
Home	62.0 (±13.1)		51.4 (±24.3)	
School canteen	58.5 (±11.6)		55.6 (±5.6)	
Fast food restaurant, eatery, cafeteria, dining hall, *etc*	59.4 (±17.0)		56.0 (±9.6)	
I do not eat (skipped meal)	59.4 (±14.4)		55.6 (±0.0)	
I eat the food I bring with me	58.0 (±19.9)		63.9 (±3.9)	

Table 6 (cont)

Demographic characteristics and dietary habits	Female respondents (n = 228)		Male respondents (n = 26)	
	Mean (±SD) number of correct answers (%)	p-value	Mean (±SD) number of correct answers (%)	p-value
Where do you usually eat your dinner?		0.393		0.875
Home	60.4 (±15.1)		55.8 (±11.6)	
School canteen	44.4 (±23.6)		-	
Fast food restaurant, eatery, cafeteria, dining hall, *etc*	56.1 (±15.8)		53.7 (±11.6)	
I do not eat (skipped meal)	58.7 (±11.9)		52.8 (±30.3)	
I eat the food I bring with me	56.49 (±17.7)		-	
What is your daily consumption of coffee with milk?		0.729		0.237
Sugared, 1 cup	62.5 (±12.2)		-	
Sugared, 2 cups	59.0 (±16.2)		-	
Sugared, 3 cups or more	50.0 (±15.7)		-	
Unsweetened, 1 cup	59.0 (±15.5)		62.2 (±10.7)	
Unsweetened, 2 cups	56.3 (±15.7)		-	
Unsweetened, 3 cups or more	55.6 (±20.0)		52.8 (±3.9)	

Table 6 (cont)

Demographic characteristics and dietary habits	Female respondents (n = 228)		Male respondents (n = 26)	
	Mean (±SD) number of correct answers (%)	p-value	Mean (±SD) number of correct answers (%)	p-value
What is your daily consumption of black coffee?		0.695		0.192
Sugared, 1 cup	55.1 (±20.8)		-	
Sugared, 2 cups	57.4 (±16.0)		-	
Sugared, 3 cups or more	61.1 (±0.0)		55.6 (±0.0)	
Unsweetened, 1 cup	58.9 (±15.9)		62.5 (±9.7)	
Unsweetened, 2 cups	62.6 (±14.2)		44.4 (±0.0)	
Unsweetened, 3 cups or more	64.4 (±13.5)		33.3 (±31.4)	
What is your daily consumption of tea?		0.463		0.558
Sugared, 1 cup	57.6 (±14.3)		-	
Sugared, 2 cups	61.1 (±19.7)		50.0 (±0.0)	
Sugared, 3 cups or more	55.2 (±11.2)		55.6 (±0.0)	
Unsweetened, 1 cup	61.3 (±15.9)		63.9 (±3.9)	
Unsweetened, 2 cups	60.4 (±11.9)		50.0 (±9.6)	
Unsweetened, 3 cups or more	59.7 (±16.9)		54.0 (±12.9)	

Table 6 (cont)

Demographic characteristics and dietary habits	Female respondents (n = 228)		Male respondents (n = 26)	
	Mean (±SD) number of correct answers (%)	p-value	Mean (±SD) number of correct answers (%)	p-value
What is your daily consumption of herbal tea?		0.433		0.317
Sugared, 1 cup	66.7 (±0.0)		83.3 (±0.0)	
Sugared, 2 cups	72.2 (±0.0)		-	
Sugared, 3 cups or more	-		-	
Unsweetened, 1 cup	60.6 (±13.5)		-	
Unsweetened, 2 cups	67.8 (±6.1)		44.4 (±0.0)	
Unsweetened, 3 cups or more	-		-	
Does your emotional state affect your eating habits?		0.134		0.322
Affects	59.2 (±15.4)		51.4 (±14.2)	
Does not affect	63.0 (±15.1)		58.3 (±15.1)	
Does your emotional state affect your eating habits?		0.828		0.563
Me	58.0 (±17.7)		51.7 (±13.7)	
My spouse	63.0 (±10.8)		57.4 (±14.0)	
My parent(s)/sibling(s)	60.3 (±14.0)		58.9 (±16.8)	
Online	58.3 (±23.0)		-	

Note: The symbol - used in the Table represents the situation when the individuals in question have not engaged in this type of consumption or practice.

The income level was based on the subject's perception of whether they had a low, average or high income.

PhD: Doctor of Philosophy; SD: standard deviation

a higher waist circumference category was association with a lower knowledge score but we found no significant association among women (p-value = 0.896).

We found a significant positive association among women subjects between percentage of correct answers about disaster-related nutrition knowledge and adequate daily intake of vitamin B2 (p-value = 0.012), vitamin B6 (p-value = 0.008), magnesium (p-value = 0.006), iron (p-value = 0.038) and potassium (p-value <0.001). We found a significant positive association among men subjects between percentage of correct answers about disaster-related nutrition knowledge and daily intake of calcium (p-value = 0.039) and phosphorus (p-value = 0.025). We found no other significant associations between percentage of correct answers about disaster-related nutrition knowledge and other nutrient daily intake values (p-value >0.05).

DISCUSSION

In our study, subjects answered only 59.1% of disaster-related nutrition knowledge questions correctly with no significant differences by gender. A previous study among medical students at Gonabad University in Iran reported 39.0%, 35.5% and 25.5% of subjects had good, average, and poor awareness, respectively, about nutrition in disasters, with no significant differences by gender or fields of study (Biglari *et al*, 2017). The difference between our study results and theirs may be largely due to differences in the populations, education programs, access to this type of information by their public health ministries, education levels and previous disaster experiences.

In our study, women who were parents (64.2%) answered significantly more questions correctly about nutrition in a disaster than women who were not parents (58.5%) (p-value = 0.035). A previous study from Japan found that parents had a higher level of awareness and better preparations for the safety of their children,

explaining the motivation of caring for their children allowed them to have a greater knowledge of the subject (Hatakeyama, 2026).

In our study, subjects who took medication regularly, answered significantly more questions correctly about nutrition during a disaster than subjects who did not take medication. We assume that regular medication use is likely due to the presence of a chronic disease. It appears in our study population that either those with chronic disease made a bigger effort to learn about their health or their frequent visits to health care professionals resulted in being exposed to education about nutrition during disaster. However, a previous study from Wuhan, People's Republic of China, reported people without chronic disease had a greater knowledge about nutrition (Wu *et al*, 2022). The reason for their results conflicting with our results may be due to differences in study populations or the reason why their subjects with no chronic disease had a greater knowledge is that the greater knowledge resulted in lifestyle changes that prevented chronic disease.

In our study, overall, we found no significant differences by sex or education level, unlike a study from Wuhan, People's Republic of China where female workers and those with a Master's degree were significantly more likely to have a good knowledge about nutrition in disaster (Wu *et al*, 2022). These differences may be due to study population and cultural differences.

However, in our study, significantly more women than men answered the following question correctly, "Which of the following foods should not be consumed initially in the event of a disaster?". A previous study of food safety among earthquake victims in Türkiye reported women answered significantly more questions correctly than men, possibly due to having a greater knowledge about food safety (Çakır *et al*, 2026).

In our study, significantly more women than men stated their emotional state influenced their eating habits (p-value <0.001)

similar to the findings of a prevous study (Černelič-Bizjak and Guiné, 2022). This association may be because women may have greater stress from both work and home and may respond emotionally to this stress and use eating as a coping mechanism.

In our study, when asked about food that should be included in an emergency kit, the age group who got the fewest answers correct was the 19-39 year-old group, followed by the 40-65 year-old age group. A previous study from the United States reported that nutrition awaress in disasters is more important among the elderly and previous life experiences influenced this knowledge (Bell *et al*, 2021).

When asked what foods should not be consumed in the first minutes of a disaster, few subjects aged 19-39 years answered correctly but the majority of subjects aged 40-65 years answered correctly. A previous study from the People's Republic of China reported that previous disaster experiences and perceived risks both influenced preparedness behavior among older subjects (Liao and Hu, 2025).

When asked what foods should not be consumed throughout a disaster, few subjects aged 19-39 years and the majority of subjects aged 40-65 years answered correctly. A previous study from Seoul, South Korea reported subjects aged 50-60 years had the greatest knowledge about food safety (Yi and Choi, 2025).

In our study, we found a significant negative association in men between waist circumference and the percentage of correct answers about disaster-related nutrition knowledge, but no association was found among women. A previous study from the People's Republic of China reported finding a significant association between a higher nutritional knowledge and a lower risk of obesity suggesting this knowledge may have influenced healthy food choices (Cui *et al*, 2025).

In our study, we found a significant positive association among women subjects between percentage of correct answers

about disaster-related nutrition knowledge and adequate daily intake of vitamin B2, vitamin B6, magnesium, iron and potassium. In our study, we found a significant positive association among men subjects between percentage of correct answers about disaster-related nutrition knowledge and daily intake of calcium and phosphorus. A previous study reported subjects with greater nutrition knowledge had significantly higher calcium intake (FAO, 2014; Kim and Kim, 2015). A greater nutrition knowledge usually results in better food choices and healthier diet leading to better micronutrient levels.

Our study had several limitations. First, the cross-sectional study design does not allow us to identify causality, only associations. Second, subjects were recruited from accessible community settings on the European side of İstanbul, preventing generalizability. Third, the female predominance of subjects may have influenced gender-related comparisons. Fourth, disaster-related nutrition knowledge was assessed using a researcher-developed questionnaire adapted from the literature rather than a previously validated instrument. Fifth, dietary intake was evaluated using a single 24-hour diet recall, which is subject to recall bias. Sixth, the mean body mass indices of study subjects were normal but the recall of food intake showed the majority of subjects should be undernourished. This shows the 24-hour food recall may be inaccurate, underrepresenting actual food intake.

In summary, the overall disaster-related nutrition knowledge among study subjects was only fair and was significantly associated with parental status, regular medication use, waist circumference and current dietary intake. We conclude, there is a need to educate the study population regarding disaster-related nutrition. Further studies are need to determine how best to educate the study population regarding this imporatnt issue in order to reduce risk for nutrition-related problems during disasters.

ACKNOWLEDGEMENTS

We are thankful to all the subjects in our study for their participation.

CONFLICT OF INTEREST DISCLOSURE

The authors declare no conflict of interest.

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