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Assessment of Nutritional Composition of Turkish Red Crescent Menus After the M7.8 and M7.6 Earthquakes in Kahramanmaraş, Türkiye

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Original Research

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Keywords:
earthquakes; food; minerals; nutrients; vitamins

Abbreviations:
ANOVA, analysis of variance; EFSA, European Food Safety Authority; FDA, Food and Drug Administration; LIM, limited nutrient; MDV, maximum daily values; NR, nutrient rich; NRF, Nutrient Rich Food; ORAC, oxygen radical absorbance capacity; RDV, recommended daily values; SD, standard deviation; TDG, Türkiye Dietary Guideline; TRC, Turkish Red Crescent

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Abstract

Objective: This study aims to evaluate the nutritional content and quality of the Turkish Red Crescent (TRC) menus delivered to earthquake victims after the 2023 earthquakes in Kahramanmaraş, Türkiye.

Methods: The menus of general, search-rescue, diabetes, and celiac were obtained from the TRC following the magnitudes of 7.8 and 7.6 Kahramanmaraş earthquakes. The nutrient content of the menus was evaluated with the Nutrient Rich Food (NRF20.3) score. In addition, the menus' energy, macronutrient, and micronutrient contents were compared with the dietary reference intake values of the Türkiye Dietary Guideline—2022, European Food Safety Authority, and Food and Drug Administration.

Results: The general menu was insufficient to meet the daily requirements of vitamin D, vitamin K, vitamin C, calcium, and potassium for earthquake victims. The sodium, phosphorous, and omega-6/omega-3 ratios were much higher than the recommended intakes. The NRF20.3 score of the diabetes menu was significantly higher than the search-rescue and celiac menus ($P < 0.05$). The energy content of the search-rescue menu was significantly higher than that of other menus ($P < 0.05$).

Conclusion: The several nutritional risks were determined in TRC menus for earthquake victims who suffered from the Kahramanmaraş earthquakes. Several supplementation programs can be applied to the earthquake regions to obtain strength immunity and effectively challenge posttraumatic stress symptoms.

Introduction

A disaster is a natural, technological, or human-induced problem that causes physical, economic, and social losses for the whole society or specific segments of it, disrupts or interrupts routine life and human activities, and exceeds the coping capacity of the affected community. Earthquakes are significant natural disasters resulting from the breaking of the Earth's crust due to tectonic forces or volcanic activities, causing severe loss of life and serious economic damage.[1,2] Much of Türkiye's territory is located in seismically most active zones worldwide.[3] For this reason, destructive earthquakes frequently emerge along fault lines. Recently, the Kahramanmaraş-centered earthquakes occurred on the Eastern Anatolian fault line on February 6, 2023. Two earthquakes, magnitudes of 7.8 and 7.6, affected 11 provinces and resulted in significant loss of life and property. Following the earthquakes that caused significant destruction in Kahramanmaraş, Gaziantep, Şanlıurfa, Diyarbakır, Adana, Adıyaman, Osmaniye, Hatay, Kilis, Elazığ, and Malatya, a total of 11 020 aftershocks occurred in the region, and the death toll reached around 50 000.[4]

Due to food insecurity and shortages after an earthquake, access to nutrition services is quite challenging.[5] Earthquake victims have difficulties meeting their daily energy requirements, protein, essential fatty acids, and micronutrients. Malnutrition weakens immunity and increases the susceptibility to infections.[6] Consistent with this situation, there is an increase in the frequency, severity, and duration of infectious diseases and morbidity in earthquake areas. Vitamins A, D, and B12 deficiencies frequently appear after the earthquake, especially in sensitive populations such as children, pregnant women, lactating mothers, and women in childbearing periods.[5,7,8]

It is necessary to consume sufficient amounts of water, energy, protein, minerals, and water-soluble vitamins and to pay attention to food safety and hygiene to survive and maintain optimal health. Adequate and balanced nutrition facilitates the adaptation of earthquake-affected

Figure 1. Nutrition services of the Turkish Red Crescent following the Kahramanmaraş earthquakes[46].

individuals to environmental conditions and increases their immunity.[6] Many non-governmental organizations meet the needs of disaster victims, such as nutrition, shelter, and clothing, by working in a coordinated manner in disaster situations. In addition, they operate in disaster preparedness, prevention, and minimizing losses.

The Turkish Red Crescent (TRC) is one of the non-governmental organizations established to provide social assistance and solidarity in Türkiye and to carry out crisis and disaster management since 1868. TRC provides kitchen units to the earthquake region within the scope of the nutritional needs of the disaster victims, such as hot food, clean water, and meal/pot catering service.[9] Meeting the daily recommended intake of energy and nutrients with menus served to earthquake victims is vital in maintaining cognitive performance and health status. This study aims to evaluate the nutritional content and dietary quality of the menus delivered to earthquake victims by the TRC after the 2023 earthquakes in Kahramanmaraş, Türkiye. Moreover, identifying a potential nutritional risk will guide future intervention efforts.

Materials and Methods

Study Design

This study was carried out with permission from the Turkish Red Crescent Society General Directorate. The Turkish Red Crescent Academy provided the earthquake menus and recipes in affected provinces from the dietitians and food engineers working in the disaster region (Figure 1). In this context, a 40-day general menu and a 15-day special celiac, diabetes, and search-rescue menu informations were obtained. However, various recipes in diabetes (n = 6), celiac (n = 3), and search-rescue (n = 2) menus of several days remained unknown, and all of these days were excluded from the study. The general, diabetes, and celiac menus were prepared for the earthquake victims, whereas the search-rescue menu was delivered for the search and rescue team who participated in the wreckage studies. All menus included 3 main meals, including breakfast, lunch, and dinner without options. The contents of all menus are different from each other. The general menu's breakfast includes cheese, olives, honey or jam, butter, chocolate or tahini molasses, and bread. In addition, the search and rescue menu's breakfast usually included soup and bread. While there were diabetic plates on the diabetic menu, there were breakfast items or soup on the celiac menu. Each meal was approximately 600–800 kcal. Hot meals were available for lunch and dinner depending on the menu type. Apart from the other menus, diabetes menus had fruit as a night snack, and about 500 calories of snacks were available in the search-rescue diet. The 1-day nutrient content of the meals on the menus was calculated with the Nutrition Information System (BeBIS 9.0) program. In the study, the energy, macronutrient, and micronutrient levels of the menus were evaluated in terms of adequacy according to the United States Food and Drug Administration (FDA), the European Food Safety Authority (EFSA), and the Türkiye Dietary Guideline—2022 (TDG-2022).[10–15] In addition, the nutrient content of the menus was evaluated with the Nutrient Rich Food Index 20.3 (NRF20.3).

Dietary Data

The nutrient contents of the meals in the menus were calculated with the BeBIS 9.0 program. BeBIS is a scientific and professional computer program that calculates the nutritional value of foods, diet plans, and recipes with a database of over 20 000 foods and more than 130 nutrient analyses.[16] The evaluated contents of nutrients in menus were energy, protein, carbohydrate, fat, saturated fatty acids, monounsaturated fatty acids, polyunsaturated fatty acids, omega 3, omega 6, cholesterol, glucose, fiber, vitamin A, vitamin D, vitamin E, vitamin K, thiamin, riboflavin, niacin, pyridoxine, folate, biotin, cobalamin, ascorbic acid, sodium, potassium, calcium, magnesium, phosphorus, chlorine, iron, zinc, copper, and iodine. In addition, BeBIS can provide the glycemic index, oxygen radical absorbance capacity (ORAC), and antioxidant values.[16]

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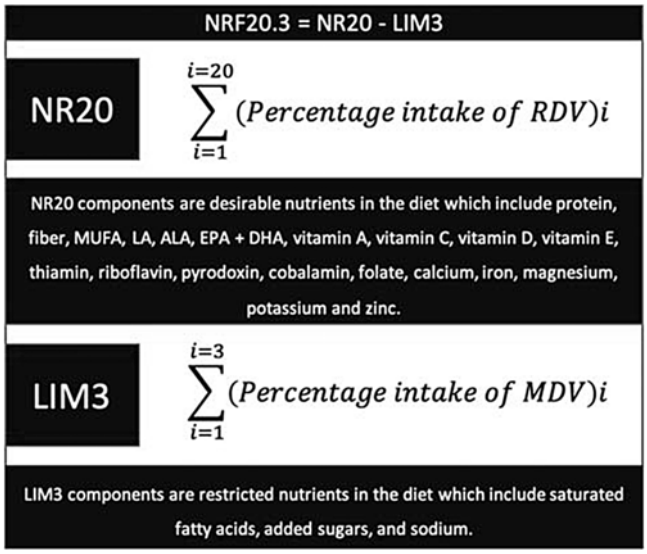

Figure 2. Calculation of the NRF20.3 Index. LIM, limited nutrients; NR, nutrient-rich; NRF, nutrient-rich foods; MDV, Maximum Daily Values; RDV, Recommended Daily Values.

Nutrient-Rich Food Index 20.3

The nutrient profile of the menus was examined with the Nutrient Rich Food 20.3 (NRF20.3) index developed by Drewnowski et al.[17] In the literature, NRF6.3, NRF9.3, NRF11.3, NRF15.3, NRF18.3, NRF19.3, and NRF20.3 indexes are defined.[18] NRF algorithms are a combination of positive nutrient rich (NR) and negative limited nutrient (LIM) subscores. In the NRF20.3 index, positive scores comprised protein, dietary fiber, monounsaturated fat, linoleic acid, α-linolenic acid, fish fatty acids, vitamin A, vitamin C, vitamin D, vitamin E, thiamin, riboflavin, pyridoxine, cobalamin, folate, calcium, iron, potassium, magnesium, and zinc; the negative scores included added sugars, saturated fatty acids, and sodium. The sum of the percentage intake of recommended daily values (RDV) for 20 nutrients to encourage was NR20 score. In contrast, the sum of the percentage intake of maximum recommended values (MDV) for 3 nutrients to restrict was the LIM3 score.[18] NR20 minus LIM3 yields the NRF20.3 score (Figure 2).[19] NRF index values are usually calculated per 100 kcal based on testing, validation, and other processes.[20,21] The calculation evaluated foods in this study according to their 100 kcal energy yield.

NRF20.3 includes the nutritional components effective in recovering from post-earthquake complications. Higher NRF20.3 index scores indicate higher nutrient density per 100 kcal; thus, menus with a high NRF20.3 index score are considered to have a healthier dietary pattern than those with a low NRF20.3 index score.[22]

According to TDG-2022, RDV values vary by age and sex. However, there is no gender and age discrimination in the menus knowledge obtained from the TRC Academy. Therefore, RDVs and MDVs were determined from FDA guidelines when calculating the NFR 20.3 score.[23] Also, EFSA was taken as a reference for the nutrients whose daily average values specific to the FDA could not be determined (Table S1).[18,24]

Statistical Analysis

Quantitative variables were indicated in descriptive statistics with mean ($\bar{x}$) and standard deviation (SD). Regarding quantitative variables, group comparisons were made with 1-way ANOVA, where variance homogeneity was achieved, and with Welch's ANOVA tests, where variance homogeneity was not achieved. When overall statistical significance was found in the ANOVA tests, Tukey Honestly Significant Difference (HSD) or Games–Howell post hoc tests were applied to determine the source of the difference.

Results

In the current study, average macronutrient levels per day in 40-day TRC menus were given with offered RDVs by TDG-2022, EFSA, and FDA (Table 1).[10–15] Except for the amount of omega-6 fatty acids, the average energy and macronutrient contents in the 40-day TRC menus are very close to the RDVs by national and international authorities.

The daily amounts of vitamins and minerals in 40-day general menus were presented with their RDVs offered by TDG-2022, EFSA, and FDA (Table 2). According to that, vitamin D, vitamin K, vitamin C, potassium, and calcium levels were too low when compared with RDVs of authorities. On the other hand, the daily average intakes of vitamin E, phosphorus, sodium, and iodine were higher than the reference intake.

As a result of the comparison of time-dependent changes for the general menu, statistically significant differences were found in terms of energy, fat, protein, NR20, and NRF20.3 measurements ($P = 0.016$, $P = 0.003$, $P = 0.036$, $P < 0.001$, and $P < 0.001$, respectively) (Table 3).

In the comparison of menu types, statistically significant differences were found in terms of all measurements, except antioxidant and LIM3 (Table 4). According to that, the search-rescue menu's energy, fat, fiber, and ORAC values were significantly higher than other menus ($P < 0.001$). The lowest and highest carbohydrate and fiber values were found in diabetes and search-rescue menus, respectively ($P < 0.001$). Glycemic index values of general and diabetes menus were significantly lower than other menus ($P < 0.001$). NR20 and NRF20.3 values of the diabetes menu were significantly higher than search-rescue and celiac menus ($P = 0.001$).

Discussion

Disaster nutrition is vital to provide earthquake victims with adequate, healthy, and safe foods after natural disasters.[25] In this regard, governments and various humanitarian organizations are responsible. In Türkiye, the nutritional needs of the earthquake victims have been met with the support of various institutions and organizations under the leadership of TRC. This study investigated the nutritional quality of TRC menus delivered to earthquake victims after the Kahramanmaraş, Türkiye, earthquakes. The current study demonstrated that menus presented by TRC generally have sufficient amounts in terms of the contents of energy, macronutrients, and micronutrients apart from several nutrients, according to national and international authority guidelines. The present study has a unique value in the literature regarding including an assessment of nutrition services in the earthquake region. This study had massive data about menus distributed to thousands of people, containing 4 menus prepared for different populations in the earthquake region, including breakfast, lunch, dinner, and snacks. From this aspect, it provides an innovative approach to the current literature on disaster nutrition and public preparedness for earthquakes.

Earthquakes are frequently seen since Türkiye is located on hazardous and still active fault lines. In this context, the August 17,

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Table 1. Average daily macronutrient levels of TRC general menus for 40 days and RDVs of macronutrients according to TDG-2022, EFSA, and FDA[10–15]

	TRC	TDG-2022	EFSA	FDA
Energy (kcal)	2161	1582–2260	2696–3832 (M) 1815–2579 (F)	2000
Carbohydrate (g)	255.9	185–261	334–574.8 (M) 204.2–386.9 (F)	300
Carbohydrate (%)	48.8	55–70	45-60	60
Fat (g)	91.7	60–89	74.9-106.4 (M) 50.4-71.6 (F)	65
Fat (%)	37.5	25–30	25	38 (M) 25 (F)
Protein (g)	72.6	82.1 (M) 70.3 (F)	67-114 (M) 59-102 (F)	56 (M) 46 (F)
Protein (%)	13.8	11–22.4 (M) 11.9–20 (F)	12-20	10
Fiber (g)	35	25	25	38 (M) 25 (F)
Cholesterol (mg)	196.7	< 300	ND	< 300
Omega 3 (g)	1.0	%0.5 of energy	2.3	0.6–1.2
Omega 6 (g)	26.3	%4 of energy	10.0	5–10

TRC, Turkish Red Crescent; TDG-2022, Türkiye Dietary Guideline-2022; EFSA, European Food Safety Authority; FDA, Food and Drug Administration; M, male; F, female; and ND, not detected.

Table 2. The amounts of vitamins and minerals in 40-day TRC general menus and their offered RDVs by TDG-2022, EFSA, and FDA

	TRC	TDG-2022	EFSA	FDA
Vitamin A (µg)	506.6	750 (M) 650 (F)	570 (M) 490 (F)	900
Vitamin D (µg)	0.8	15	15	20
Vitamin E (mg)	28.7	13 (M) 11 (F)	13 (M) 11 (F)	15
Vitamin K (µg)	44.1	120 (M) 90 (F)	70	120
Thiamin (mg)	1.2	1.3 (M) 1.1 (F)	0.6–1.0 (M) 0.5–0.7 (F)	1.2
Riboflavin (mg)	1.4	1.3 (M) 1.1 (F)	1.3	1.3
Niacin (mg)	12.4	6.7	12.3–17.5 (M) 8.3–11.8 (F)	16
Pyridoxine (mg)	1.6	1.3	1.5 (M) 1.3 (F)	1.7
Folate (µg)	257.7	330	250	400
Cobalamin (µg)	4.6	4	4	2.4
Vitamin C (mg)	45.5	110 (M) 95 (F)	90 (M) 80 (F)	90
Sodium (mg)	4359	1500	2000	< 2300
Potassium (mg)	2730.9	4700	3500	4700
Calcium (mg)	646.3	950–1000	750	1300
Magnesium (mg)	375.9	350 (M) 300 (F)	350 (M) 300 (F)	420
Phosphorus (mg)	1420.8	550	550	1250
Iron (mg)	15.2	11 (M) 16 (PREMF) 11 (POMF)	6 (M) 7 (PREMF) 6 (POMF)	18
Zinc (mg)	13.7	7.5–16.3 mg (depends on sex and phytate intake)	7.5–12.7 mg (depends on sex and phytate intake)	11
Iodine (µg)	190.3	150	150	150

TRC, Turkish Red Crescent; TDG-2022, Türkiye Dietary Guideline-2022; EFSA, European Food Safety Authority; FDA, Food and Drug Administration; M, male; F, female; ND, not detected; PREMF, pre-menopause female; POMF, post-menopause female.

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Table 3. Comparison of time-dependent changes for the general menu

	1–10 days (n = 10)	11–20 days (n = 10)	21–30 days (n = 10)	31–40 days (n = 10)	*P*
Energy (kcal)	2438.61 ± 332.84[a]	2093.88 ± 276.18[a,b]	2145.53 ± 383.72[a,b]	1964.64 ± 275.02[b]	**0.016**†
Carbohydrate (g)	269.08 ± 50.09	250.59 ± 24.67	262.21 ± 48.05	241.8 ± 23.66	0.413
Fat (g)	111.02 ± 14.71[a]	87.65 ± 18.54[b]	87.32 ± 16.07[b]	80.64 ± 20.81[b]	**0.003**†
Protein (g)	85.44 ± 14.41[a]	69.97 ± 13.33[a,b]	72.27 ± 21.56[a,b]	62.76 ± 16.69[b]	**0.036**†
Fiber (g)	35 ± 6.01	34.42 ± 6.75	36.53 ± 8.06	33.91 ± 6.67	0.847
Cholesterol (mg)	226.31 ± 98.25	152.89 ± 94.94	160.4 ± 105.41	139.06 ± 130.01	0.293
Glycemic Index	44.19 ± 28.45	41.33 ± 32.46	47.28 ± 30.17	53.36 ± 46.24	0.884
ORAC	6916.08 ± 3621.81	5949.32 ± 4446.34	6470.77 ± 5000.9	5660.63 ± 3380.03	0.910
Antioxidant	2.04 ± 0.78	1.44 ± 0.68	1.57 ± 0.76	1.37 ± 0.71	0.181
NR20	99.32 ± 12.52[a]	97.86 ± 9.55[a]	157.69 ± 24.94[b]	80.84 ± 12.65[c]	< **0.001**‡
LIM3	18.03 ± 1.7	17.79 ± 2.91	18.47 ± 2.36	17.49 ± 1.15	0.772
NRF20.3	81.28 ± 11[a]	83.74 ± 11.68[a]	139.22 ± 25.77[b]	63.35 ± 12.45[c]	< **0.001**‡

†One-way ANOVA;
‡Welch's ANOVA. Lowercase letters (a, b, and c) indicate the results of pairwise comparisons as Tukey HSD or Games–Howell post hoc test. According to the post hoc test result, there is no statistically significant difference at the 0.05 level between the group averages indexed with the same letters.

Table 4. Nutrient values of general, search-rescue, diabetes, and celiac menus (Data were given as mean ± standard deviation.)

	General menu* (n = 10)	Search-rescue menu (n = 13)	Diabetes menu (n = 9)	Celiac menu (n = 12)	*P*†
Energy (kcal)	2438.61 ± 332.84[a,b]	3484.27 ± 388.75[c]	2059.22 ± 331.63[a]	2601.81 ± 277.71[b]	< **0.001**
Carbohydrate (g)	269.08 ± 50.09[a]	443.35 ± 50.2[b]	197.13 ± 30.34[c]	324.94 ± 47.12[d]	< **0.001**
Fat (g)	111.02 ± 14.71[a]	135.53 ± 19.79[b]	97.35 ± 26.83[a]	112.06 ± 15.14[a]	< **0.001**
Protein (g)	85.44 ± 14.41[a,b]	115.5 ± 21.07[c]	92.84 ± 17.95[b]	68.52 ± 20.9[a]	< **0.001**
Fiber (g)	35 ± 6.01[a]	60.85 ± 5.31[b]	33.93 ± 6.81[a]	19.74 ± 5.14[c]	< **0.001**
Cholesterol (mg)	226.31 ± 98.25[a]	255.5 ± 115.24[a]	412.54 ± 54.76[b]	225.42 ± 99.09[a]	< **0.001**
Glycemic Index	44.19 ± 28.45[a]	60.56 ± 26.19[a]	149.03 ± 33.91[b]	149.73 ± 45.35[b]	< **0.001**
ORAC	6916.08 ± 3621.81[a]	10 881.71 ± 2831.45[b]	6434.82 ± 2348.59[a]	4072.11 ± 3004.18[a]	< **0.001**
Antioxidant	2.04 ± 0.78	2.16 ± 0.65	1.81 ± 0.56	2.21 ± 0.66	0.544
NR20	99.32 ± 12.52[a]	87.32 ± 15.66[a]	121.82 ± 11.29[b]	84.12 ± 24.07[a]	< **0.001**
LIM3	18.03 ± 1.7	20.99 ± 13.13	24.02 ± 5.66	16.03 ± 2.26	0.115
NRF20.3	81.28 ± 11[a,b]	66.33 ± 20.42[b]	97.79 ± 14.77[a]	68.08 ± 23.26[b]	**0.001**

*First 10 days on general menu were evaluated, to provide a more accurate comparison with other menus;
†one-way ANOVA test (and Tukey HSD post hoc test); *P* values indicate significance between the means of 4 groups of data according to 1-way ANOVA test. Lowercase letters (a, b, and c) indicate the results of pairwise comparisons as Tukey HSD post hoc test. According to the post hoc test result, there is no statistically significant difference at the 0.05 level between the group averages indexed with the same letters.

1999, Marmara Earthquake, the October 23, 2011, Van Earthquake, and the February 6, 2023, Kahramanmaraş Earthquakes are the most destructive earthquakes in the history of Türkiye. Various action plans have been developed to deal with these disasters. Within the scope of the Türkiye National Disaster Response Plan, criteria for nutritional services were determined based on adequate nutritional requirements for the general population and high-risk populations, including infants, children, pregnant women, patients, and individuals with special nutritional needs. Provincial and District Disaster and Emergency Management Centers also meet the early-term nutrition and later long-term needs during disasters' first hours. Various nutrition service-related booklets, including nutritional aids for vulnerable groups, food safety, and the TRC nutrition service model, have been delivered to TRC employees who took part in disasters.[26,27]

The amounts of energy, carbohydrates, fat, protein, cholesterol, and omega-3 in TRC menus were nearly close to their recommended values in national and international guidelines. Conversely, according to the study of Sanlier and Yabanci, it was declared that energy and nutrient intake was lower than daily reference intake values after the Marmara earthquakes in 1999. The differences between studies can be explained by the different study designs (survey or menu) and how much time elapsed after the earthquakes.[28]

Apart from that, the average amount of omega 6 and the ratio of omega 6/omega 3 in TRC menus were higher in comparison with their daily reference intake values in several guidelines. A high-level availability of omega-6 fatty acids in the diet blocks the anti-inflammatory effects of omega-3 fatty acids.[29] Therefore, a high omega-6/omega-3 ratio stimulates inflammation and increases the risk of chronic metabolic disorders, which are highly prevalent in Western societies.[30,31] Various inflammatory disease complications can appear after a natural disaster, and a high ratio of omega 6/omega 3 can harm public health status and delay earthquake recovery.[28]

The average levels of vitamin A, thiamin, riboflavin, niacin, pyridoxine, folate, cobalamin, magnesium, iron, and zinc in TRC menus for the first 40 days of the earthquake were quite close to their recommended daily intake amount in TDG-2022, EFSA, and FDA. Vitamins D, K, C, calcium, and potassium levels were lower, while vitamin E, sodium, and iodine levels were higher in TRC menus than in reference values of TDG-2022, EFSA, and FDA. After the 1999 Marmara earthquakes, the daily intake of thiamin, riboflavin, niacin, calcium, iron, vitamin C, and vitamin A was below the recommended levels.[28] In another study, earthquake victims living in temporary shelters have taken inadequate levels of vitamins, apart from thiamin, and excess levels of sodium in the Great East Japan Earthquake disaster.[32] In these studies, micronutrient deficiencies can be associated with a lack of meats, poultries, fish, and dairy products. In the current study, the amount of meat and meat products on TRC menus is sufficient, but more dairy products and fruits are required. After the Great East Japan Earthquake, Japan's Ministry of Health, Labour and Welfare has referred to the "Nutritional Reference Values for Evacuation Shelters".[33] The levels of energy, protein, thiamin, and riboflavin in TRC menus were compatible with these reference values.

Even if energy and protein requirements can be met after a disaster such as an earthquake, it is difficult to meet essential fatty acids and micronutrient requirements. In particular, populations such as pregnant women, nursing mothers, and infants are at high risk for vitamin and mineral deficiencies. In this regard, several studies are showing similar results in post-earthquake nutrition. Zhao et al. have reported that deficiencies of vitamin A, vitamin D, iron, and zinc were highly prevalent among children under 60 months old after 1 year of the earthquake in Wenchuan.[34] In another study, Dong et al. reported that iron, zinc, vitamin D, vitamin B12, and vitamin A deficiencies commonly appeared among pregnant, nursing, and child-bearing women living in rural disaster areas 1 year after the Wenchuan earthquake.[35] However, the current study did not contain any data for risky groups. Further studies should be detailed, and the nutritional status of infants and child-bearing-age women in Kahramanmaraş, Türkiye, should be analyzed to determine personalized nutritional risks.

According to collected disaster-associated field data and critical reviews, attention was drawn to infectious diseases after the Kahramanmaraş earthquakes.[36–40] In this context, cold weather conditions, overcrowding in tents, poor hygiene conditions, and low socio-economic status were reported as risk factors regarding infectious diseases in the affected residential areas from the first hours of the emergency state.[39] In addition, vitamin D and vitamin C deficiencies and high omega-6/omega-3 ratio in the menus also risk triggering inflammation, weakening the immune system, and causing a higher incidence of infectious diseases.[41–43] Infectious diseases can be prevented by regulating the micronutrient content of menus and good hygiene practices in post-earthquake nutrition services.

In the first 0–10 days after the earthquake, the energy, fat, protein, NR20, and NRF20.3 values in the menus given to the earthquake victims were significantly higher in the menus during 30–40 days ($P < 0.05$). Food and nutrition management during a natural disaster differs according to the stage of the disaster.[5] Adequate and balanced nutrition is essential for a robust immune system and avoiding malnutrition immediately after an earthquake.[44] Significantly higher NRF20.3 scores of the menus presented to earthquake victims in the first 10 days are necessary for a robust immune response. This situation can explain the differences between energy and nutrient contents.

The statistically significant highest energy, carbohydrate, fat, protein, fiber, and ORAC values belong to the search-rescue menu ($P<0.05$). It could be related to higher energy, protein requirements, and search-rescue tasks. However, NR20 and NRF20.3 values in the search-rescue menu were similar to general and celiac menus. This situation can be explained with no excess micronutrient content per 100 kcal in search-rescue menus. According to NR20 and NRF20.3 index findings, the significantly highest nutrient content was determined in the diabetes menu.

Interestingly, the LIM3 values of all menus were approximately close to each other. Excess dietary sodium intake drew attention to TRC menus. The most crucial goal for preventing and controlling non-communicable diseases in the disaster area is the state of hypertension.[45] Excess sodium intake should be under control in earthquake regions. Mainly, attention should be paid to the limited consumption of canned foods during this period due to their high sodium content.[32]

The current study has several limitations. First, there were no differences in the gender and age in the menus. Males and females have different nutrient requirements depending on fat and muscle mass. However, obtained menus have limited capacity in the assessment of meeting daily requirements values for each individual. Second, menu data reflect the menus given to earthquake victims immediately after the earthquake. In addition, it is not clear for how long and in which region diabetes and celiac menus were distributed after the earthquake. However, nutrition services to earthquake victims are most intense during this period, and various aid organizations may ignore earthquake victims in the

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future. Therefore, it is necessary to evaluate the menus presented to earthquake victims in 3 months, 6 months, or 1 year in the future. Third, only the menus offered to disaster victims by the TRC were evaluated, and the menu contents offered by other aid organizations, nutrition platforms, and municipalities could not be accessed. Also, it could not obtain direct data from the earthquake victims. Conducting the study on a multicenter and observational basis will increase validity and reliability. Fourth, the nutritional content in the menus was evaluated with the NRF20.3 index because the disaster nutrition index was not found in the literature. A novel index for disaster nutrition should be defined in further studies. Last, the focus was only on micronutrient and macronutrient intake, and the effect of nutritional status on the immune system and the incidence of infectious diseases was not examined. The relationship between health screenings in the earthquake zone and nutritional status can be investigated. It could give additional information for planning future meals to adequately meet the needs of the victims so that infectious diseases are reduced.

Conclusion

This study generally determined several nutritional risks for earthquake victims who suffered from the Kahramanmaraş, Türkiye, earthquakes. In this context, the general menu was insufficient to meet the daily requirements of vitamin D, vitamin K, vitamin C, calcium, and potassium for earthquake victims. The sodium, phosphorous, and omega-6/omega-3 ratios were much higher than the daily recommended intake values. It could give rise to an increased ratio of hypertension and inflammation. The menus of earthquake victims must have adequate and balanced nutrients to obtain strength immunity and effectively challenge posttraumatic stress symptoms. Disaster nutrition guidelines containing nutrient intake reference values with national standards should be developed for emergencies such as earthquakes. In addition, several supplementation programs should apply to the earthquake regions.

Supplementary material. For supplementary material accompanying this paper visit https://doi.org/10.1017/dmp.2024.16

Data availability statement. We can share all the data of the study.

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