Original article

An Analysis of the Changes in Food Consumption Frequencies Before and During the COVID-19 Pandemic: Turkey

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Summary. Caused by the SARS-CoV-2, the COVID-19 outbreak that has turned into a global pandemic has proved that many events that would have been deemed as elements of pure fiction can indeed become reality. Millions of people in many countries isolated/are isolating themselves within the scope of self-quarantine to control the outbreak. This might affect one's dietary habits either positively or negatively. One of the first in its field, the present study statistically examines the changes in food consumption frequencies of 3017 individuals living in one of the seven regions of Turkey before and during the COVID-19 pandemic using a scale formulated with this specific purpose. As far as food consumption frequencies are concerned, while no statistically significant differences were spotted in the general total of the scale, 9 out of 10 sub-groups, the exception being the bread group, manifested statistically significant variations ($p<0.001$). Specifically, while the consumption of dietary supplements like propolis or vitamins C and D surged, the consumption of flour, sugar, salt, and various beverages (instant coffee, soft drinks) fell significantly. The post-COVID-19 era is considered to bring about an increase in the demand for products boosting the immune system.

Key words: COVID-19, SARS-CoV-2, pandemic, nutrition, Turkey

Introduction

Discovered in the 20th century, coronaviruses (CoVs) are zoonotic positive-sense single-stranded RNA viruses, transmitted from animals to humans, that might cause mild/severe respiratory tract diseases or even death (1-3). A chronological analysis of pandemics caused by CoVs shows that the Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) emerged in China in 2002 and spread to 26 countries, causing 916 deaths. First detected in Saudi Arabia in 2012, the contagion caused by the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) killed 858 people in 27 countries (4-6). The latest coronavirus outbreak caused by SARS-CoV-2, the new strain of the coronavirus also known as COVID-19, broke out in Wuhan, a city in the Hubei Province of China in December 2019 (7,8) and was declared by the World Health Organisation (WHO) as a global pandemic on 11 March 2020 (9). According to the WHO data from 24 June 2020, the number of people infected with COVID-19 neared 9 million and 500 thousand people lost their lives because of the outbreak (10). Various sources indicate that mortalities linked to COVID-19 are generally among people with relatively weaker immune systems, particularly among older people and individuals with chronic pulmonary diseases, including people with immunosuppressive conditions like cardiovascular diseases, cancer, hypertension, or diabetes (11-13). The first case of COVID-19 in Turkey was recorded on 11 March 2020. The first case of COVID-19 in Turkey was recorded on 11 March 2020. As of 24 June 2020, there are 3,083,121 people infected with COVID-19 with 5,025 mortalities (14). Owing to early-stage precautions and the developed healthcare infrastructure in Turkey, the spread rate of

COVID-19 was slowed down throughout the country and as of 22 April 2020, the authorities declared that the contagion was under control.

Having become a global pandemic, COVID-19 has threatened individuals, families, healthcare systems, and nations in an unprecedented way regardless of country. Therefore, nations, public institutions, local governments, and all other stakeholders need to act together to manage the contagion. One of the factors directly affecting the success in the management of the pandemic is one's own precautions to protect themselves and compliance with the rules set by authorities. Since the data on the COVID-19 pandemic change each day and each hour, one needs to assess themselves and make necessary alterations as far as precautionary measures are concerned. In this respect, having a strong immune system has become more important than ever. A research study states that one of the vital health objectives of present-day consumers is to support their immune systems (15). Many researchers and institutions underline that an adequate and balanced diet, physical activity, and a regular sleep pattern reinforces the immune system and that a strong immune system is crucial for preventing the virus from causing disease and for improving clinical results, including intensive care treatments (16-22).

There are no specialised studies on dietary management of the COVID-19 infection. However, taking the benefits of nutrition to treatments including intensive care into consideration, the detection of a poor diet among at-risk categories, particularly the elderly and those with chronic diseases, should be considered an early step towards preventing the potential damage inflicted by the COVID-19 contagion (19). Furthermore, maintaining the current status of nutrition while preventing or treating malnutrition has the potential of mitigating the complications and negative consequences of COVID-19 for patients in the future (19, 23). A study on the potential interventions against the novel coronavirus found that the dietary habits of a patient infected with COVID-19 should be determined immediately (20, 24). The rise of the number of people suffering from both undernutrition and overnutrition (i.e. the double burden of malnutrition) indicates a period in which disease severity in viral pandemics, as well as the difficulty of dealing with them, is increased (25). Undernutrition will continue to be a problem for future viral pandemics (26).

An adequate and balanced diet has psychological, sociological, and economic aspects as well as physiological ones (27). Occurrences profoundly affecting masses such as wars, earthquakes, pandemics, and quarantine conditions inevitably lead to significant changes in dietary habits. For instance, individuals living in quarantine (out of boredom) seem to have increased intakes of macronutrients such as carbohydrates, fats, and proteins (28). WHO (2020) stated that the limited access to fresh fruit and vegetables in quarantine circumstances might lead to problems in terms of a balanced diet while the consumption of processed products rich in macronutrients may surge (22). The purpose of this study is to examine the changes in food consumption frequencies among individuals with varying demographic backgrounds in Turkey before and during the COVID-19 pandemic.

Material and Methods

Ethical Standards Disclosure

This study was conducted between 15 March and 15 May 2020 according to the guidelines laid down in the Declaration of Helsinki and all procedures involving research study participants were approved by the ethics committee of Recep Tayyip Erdoğan University (Report number: 2020/34). Written informed consent was obtained from all subjects.

Study population

The study was conducted with 3017 individuals living in 7 different regions in Turkey who were not diagnosed with COVID 19, are over 12 years of age, have different demographic features, and participated in the study on a voluntary basis.

A scale for measuring the change in food consumption frequencies

The foods within the scale were selected from the items defined in the Dietary Guidelines for Turkey (29)

and the National Nutrition and Health Survey (30) (Republic of Turkey Ministry of Health) and known to be consumed in daily life; in this respect, a list consisting of 11 sub-groups and 47 items was compiled. The food consumption frequencies were designated as a 5-point Likert scale with the statements of "never", "frequently" (1+ per day), "generally" (1+ per week), "occasionally" (1+ per month), and "rarely" (1+ per year). The first part of the survey defines the purpose of the study and consists of questions aiming to determine the demographic features of participants. The questions in the second part were designed to shed light on the changes in food consumption frequencies among participants before and during the COVID-19 pandemic. The survey was prepared electronically and shared with the public. The survey can be accessed at https://sites.google.com/erdogan.edu.tr/kovid19salginibesleme link.

Statistical analysis

The data from the study were then transferred to IBM SPSS Statistics 23 (*Armonk, New York U.S.A*) and IBM SPSS Amos 21 (*Meadville, PA U.S.A*) to conclude the analyses. Frequency distributions for categorical variables and descriptive statistics (avg±sd) for numerical variables were provided while assessing the data. A confirmatory factor analysis (CFA) was conducted to examine the construct validity of the "Food Consumption Frequency Change Scale" used as a measurement tool within the scope of the study. The reliability of the scale and its sub-dimensions were analysed using the Cronbach's Alpha internal consistency coefficient. The scale and sub-dimension scores of participants were obtained by averaging the relevant items. In this regard, a Kolmogorov-Smirnov test was applied to scale and sub-dimension scores to determine the analyses to be conducted. The test revealed that the scores satisfy the normality conditions and, therefore, the Paired Sample T-Test from parametric tests was chosen to compare the scores.

Results

To use the structure of the "Food Consumption Frequency Change Scale" employed in the study, 480 people were chosen randomly among 3017 participants and a confirmatory factor analysis was conducted to assess scale validity. Reliability analysis was conducted on the scale and its sub-dimensions formulated at the end of the CFA. After confirming the scale structure, the reliability analysis was repeated for the remaining 2537 participants and the study was carried on after seeing that the scale and its sub-dimensions were found to be reliable.

Confirmatory factor analysis of the food consumption frequency change scale

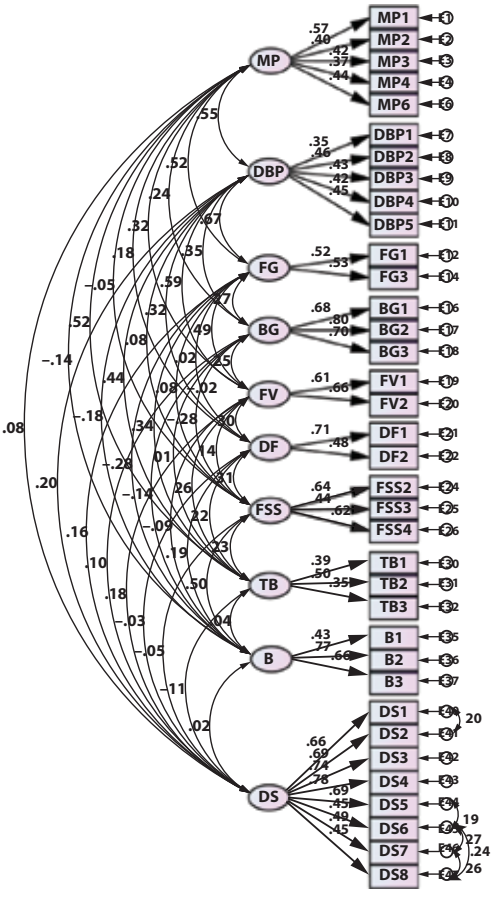
Based on the answers given by the participants, the "Food Consumption Frequency Change Scale" was synchronised with the data using the CFA. The measurement model formulated to confirm the structure consisting of 11 sub-dimensions and 47 items was analysed using CFA. At the end of the analysis, it was observed that the extent of consistency of the model was not sufficient, therefore certain steps were taken to improve the model. The initial step was to examine the factor load values of the items and to exclude 11 items that do not contribute to the model, i.e. items with a factor load below 0.300 (31) (processed meat, sunflower oil, vegetable margarine, spices, canned commercial foods, pickled foods, snacks like biscuits or chocolate, green tea, other herbal teas, alcoholic beverages, energy drinks) from the scale. As the second step, the table showing the modification indices was examined and the chi-square drop-values ("MI" values) were analysed for potential changes to the model. The modification indicated by the highest MI value was connected to conceptually suitable situations (e40<->e41, e44<->e45, e45<->e46, e46<->e47, e45<->e47) and the model was carried out. The fit indices of the model were also examined, revealing that the measurement model is confirmed (Table 1, Figure 1).

Table 1 shows that the fit index value of χ^2/sd (Chi-square Test), RMSEA (root mean square error of approximation), and SRMR (standardised root mean residual) are found to be good fits and that the GFI (goodness of fit), AGFI (adjusted goodness of fit), NFI (normalised fit index), NNFI (non-normalised fit index), and CFI (comparative fit index) values are found to be acceptable fits for the measurement model.

Table 1. Fit index and goodness of fit values of the measurement model (32-37)

	Fit Index Values of the Model	Goodness of Fit	Acceptable Fit
χ^2/sd	1.872	≤3	4-5
GFI	0.896	≥ 0.90	(0.89-0.85)
AGFI	0.873	≥ 0.90	(0.89-0.85)
NFI	0.903	≥ 0.95	(0.94-0.90)
NNFI (TLI)	0.935	≥ 0.95	(0.94-0.90)
CFI	0.948	≥ 0.95	≥ 0.90
RMSEA	0.043	≤ 0.05	(0.06-0,.8)
SRMR	0.053	≤ 0.05	(0.06-0.08)

(Bagozzi and Yi, 1988; Bollen and Lennox, 1991; Jöreskog and Sorbom, 1993; Kline, 1998; Meydan and Şeşen, 2015; Şimşek, 2007)



MP = Meat products, DBP = Dairy and breakfast products, FG=Fats group, BG= Bread group, FV= Fruit and vegetables, DF = Dry food, FSS = Flour, sugar, and salt, TB=Traditional beverages, B=Beverages, DS= Dietary supplements

Figure 1. The Measurement Model of The Food Consumption Frequency Change Scale

The analysis of the confirmed measurement model consisting of 36 items and 10 sub-dimensions shown in Figure 1 includes the items along with their standardised regression coefficients or, in other words, factor loads. The factor load of each item was analysed in detail and no value below 0.300 was found. According to the analysis; the statement M1 is the strongest indicator of the meat products sub-dimension with its value of 0.57, M14 of the fats group with a value 0.53, M17 of the bread group with 0.80, M20 of the fruits and vegetables sub-dimension with 0.66, M21 of the dry foods sub-dimension with 0.71, M24 of the flour-sugar-salt sub-dimension with 0.64, M31 of traditional beverages with 0.50, M36 of beverages with 0.77, and M43 of dietary supplements with 0.78.

Reliability analysis

To determine the reliability of the "Food Consumption Frequency Change Scale" based on the CFA results, the Cronbach's Alpha internal consistency coefficients were examined (Table 2).

Table 2 shows that at the end of the reliability analysis for the principal study conducted with 2537 participants, the "Food Consumption Frequency Change Scale" consisting of 36 items was revealed to be considerably reliable (α=0.732). The sub-dimensions of meat products (α=0.528), dairy and breakfast products (α=0.515), fats group (α=0.454), fruits and vegetables (α=0.544), dry foods (α=0.516), flour-sugar-salt (α=0.561), and traditional beverages (α=0.530) were

Table 2. Reliability analysis results of the dietary behaviours scale

	Preliminary Study (n=480)			Principal Study (n=2537)	
	No. of Items	**Cronbach's Alpha (α)**	**Reliability Level**	**Cronbach's Alpha (α)**	**Reliability Level**
Food Consumption Frequency Change Scale	36	0.719	Considerably Reliable	0.732	Considerably Reliable
Sub-dimensions					
Meat products	5	0.556	Reliable	0.528	Reliable
Dairy products	5	0.538	Reliable	0.515	Reliable
Fats group	2	0.424	Reliable	0.454	Reliable
Bread Group	3	0.760	Considerably Reliable	0.710	Considerably Reliable
Fruits and Vegetables	2	0.575	Reliable	0.544	Reliable
Dry Foods	2	0.506	Reliable	0.516	Reliable
Flour, Sugar, and Salt	3	0.579	Reliable	0.561	Reliable
Traditional Beverages	3	0.423	Reliable	0.530	Reliable
Beverages	3	0.637	Considerably Reliable	0.651	Considerably Reliable
Dietary Supplements	8	0.843	Highly Reliable	0.845	Highly Reliable

$0.00 < \alpha < 0.40$ Scale is Not Reliable, $0.40 < \alpha < 0.60$ Low Reliability, $0.60 < \alpha < 0.80$ Considerable Reliability, $0.80 < \alpha < 1.00$ High Reliability (38)

found to be reliable; the sub-dimensions of bread group (α=0.710) and beverages (α=0.651) were found to be considerably reliable; the sub-dimension of dietary supplements (α=0.845) was found to be highly reliable.

Demographic features of participants

The demographic aspects of people participating in the study (n=2537) are shown in Table 3.

Table 3 shows that 13.2% of participants (335) live in the Mediterranean Region, 13.0% (331) in the Aegean Region, 29.2% (741) in the Marmara Region, 14.3% (363) in the Black Sea Region, 13.1% (333) in the Central Anatolian Region, 5.6% (142) in the Southeastern Anatolian Region, and 11.5% (292) in the Eastern Anatolian Region. 54.4% of the participants (1379) are female while 45.6% (1043) are male. 15.0% of the participants (380) are between 12 to 17 years old, 44.1% (1120) are aged between 18 and 30, 31.3% (795) are between 31 and 50 years of age, 6.8% (173) are between 51 and 65 years old, and 2.7% (69) are over 66 years. While 80.1% of the participants (2033) has no chronic illnesses, 19.9% (504) has a chronic illness.

Changes in food consumption frequencies before and during the COVID-19 pandemic

An examination of Table 4 reveals that at the end of the paired sample T-test, there are no statistically significant differences in total food consumption frequency change scores and between the score averages in the bread group sub-dimension before and during COVID-19 ($p>0.05$). However, there are statistically significant differences between the score averages of the sub-dimensions of meat products, dairy products, fat group, fruits and vegetables, dry foods, flour-sugar-salt, traditional beverages, beverages, and dietary supplements ($p<0.01$). Based on these results, it can be said that the food consumption scores of meat products, fats, flour, sugar, salt, and beverages during COVID-19 are significantly lower when compared with the period before the pandemic. Yet dairy products, fruits, vegetables, dry foods, traditional beverages, and dietary supplements have significantly higher consumption scores when compared with the pre-COVID-19 period (Figures 2, 3, 4, 5, 6, 7, 8, 9, 10, and 11).

Table 3. Distribution of demographic features

	No. of People (n)	Percentage (%)		No. of People (n)	Percentage (%)
Region			**Educational Background**		
Mediterranean Region	335	13.2	Primary School	66	2.6
Aegean Region	331	13.0	High School	677	26.7
Marmara Region	741	29.2	Associate Degree	488	19.2
Black Sea Region	363	14.3	Bachelor's Degree	945	37.2
Central Anatolian Region	333	13.1	Postgraduate	361	14.2
Southeastern Anatolian Region	142	5.6	**Chronic Disease**		
Eastern Anatolian Region	292	11.5	No Diseases	2033	80.1
Sex			Has Diseases	504	19.9
Female	1379	54.4	**In Case of Disease (n=504)**		
Male	1158	45.6	Type 1 Diabetes	8	1.6
Marital Status			Type 2 Diabetes	6	1.2
Single	1494	58.9	Goitre	47	9.3
Married	1043	41.1	Hypertension	46	9.1
Age			Cardiovascular diseases	41	8.1
12-17	380	15.0	Cancer	11	2.2
18-30	1120	44.1	Bone and joint diseases	40	7.9
31-50	795	31.3	Neurological diseases	21	4.2
51-65	173	6.8	Obesity	13	2.6
66 and over	69	2.7	Reflux	111	22.0
			Other	160	31.7

Table 4. The analysis of the differences between score averages regarding the change in food consumption frequencies before and during COVID-19

	Before	**During**		
	Avg±SD	**Avg±SD**	**t**	**p**
Food Consumption Frequency Change (Total Score)	3.07±0.369	3.09±0.386	1.341	0.180
Sub-dimensions				
Meat products	3.34±0.594	3.23±0.633	15.363	**0.000****
Dairy products	4.07±0.677	4.10±0.696	-4.186	**0.000****
Fats group	2.98±1.070	2.95±1.077	6.344	**0.000****
Bread group	2.19±1.146	2.18±1.151	1.667	0.096
Fruits and vegetables	4.54±0.599	4.64±0.547	-11,665	**0.000****
Dry foods	4.20±0.634	4.24±0.604	-5.785	**0.000****
Flour, Sugar, and Salt	3.38±0.935	3.34±0.944	5.659	**0.000****
Traditional Beverages	3.96±0.625	3.98±0.652	-3.398	**0.001***
Beverages	2.71±0.895	2.56±0.914	15.820	**0.000****
Dietary Supplements	1.66±0,.49	1.75±0.921	-12,268	**0.000****

**p<0.01, **p<0.001, Avg=Average, SD=Standard deviation, t=Paired sample T-test, p=Significance level*

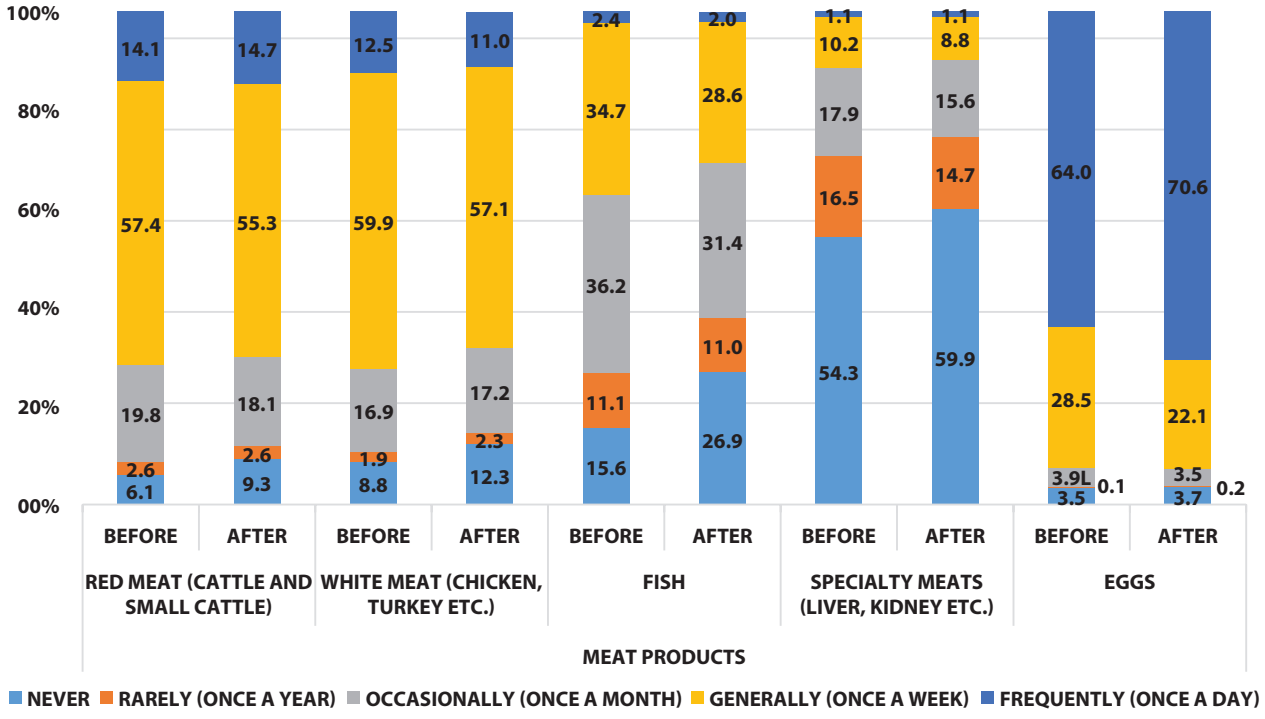


Figure 2. Consumption Frequencies of Meat and Meat Products

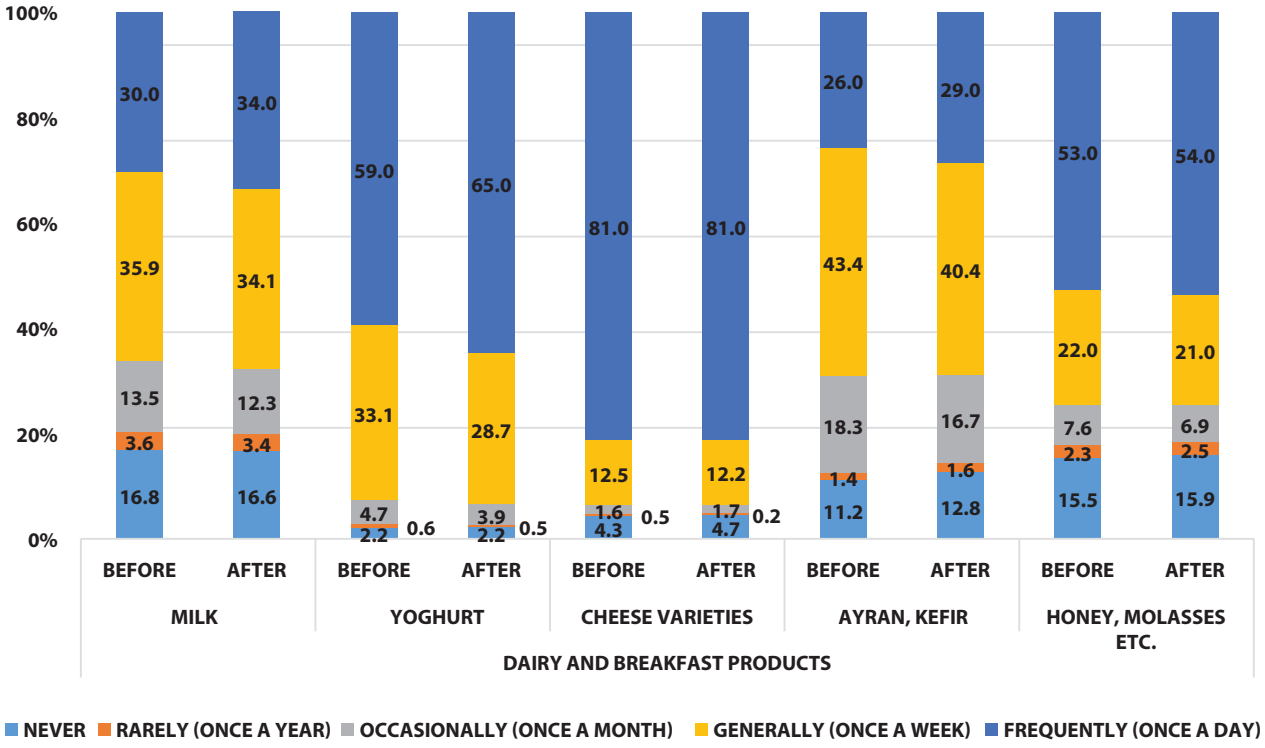


Figure 3. Consumption Frequencies of Dairy and Breakfast Products

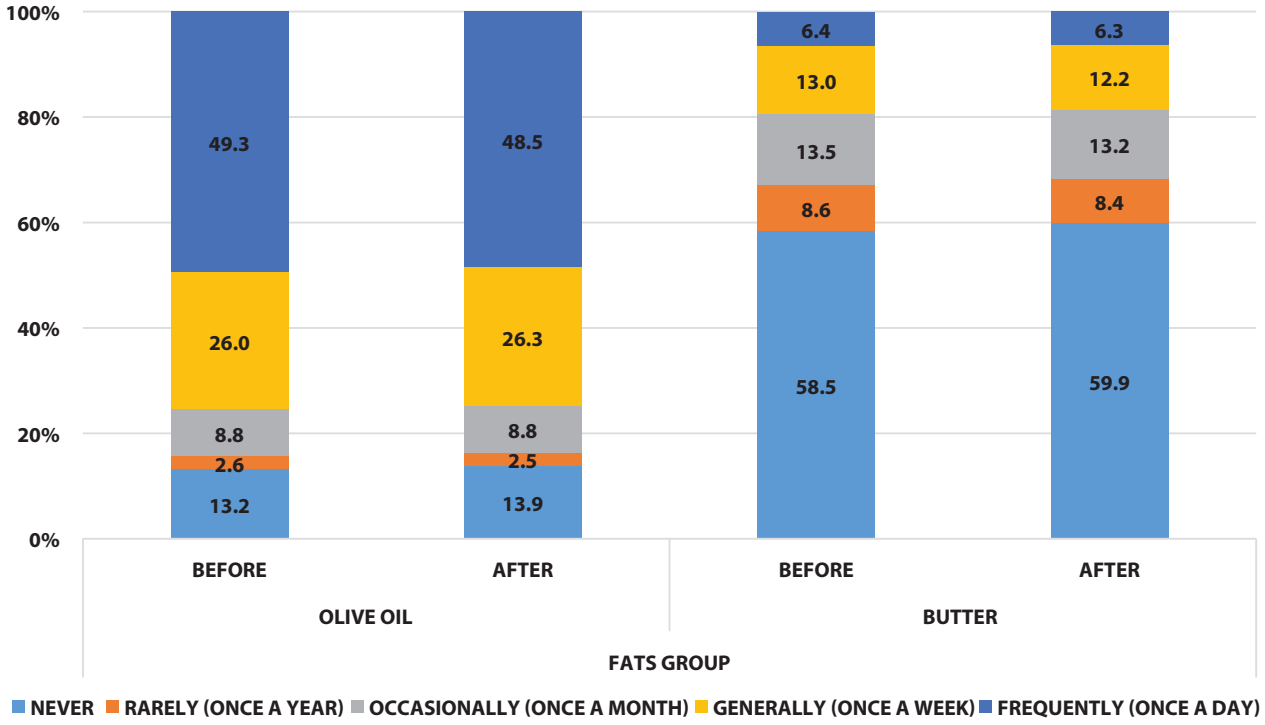


Figure 4. Consumption Frequencies of The Fats Group

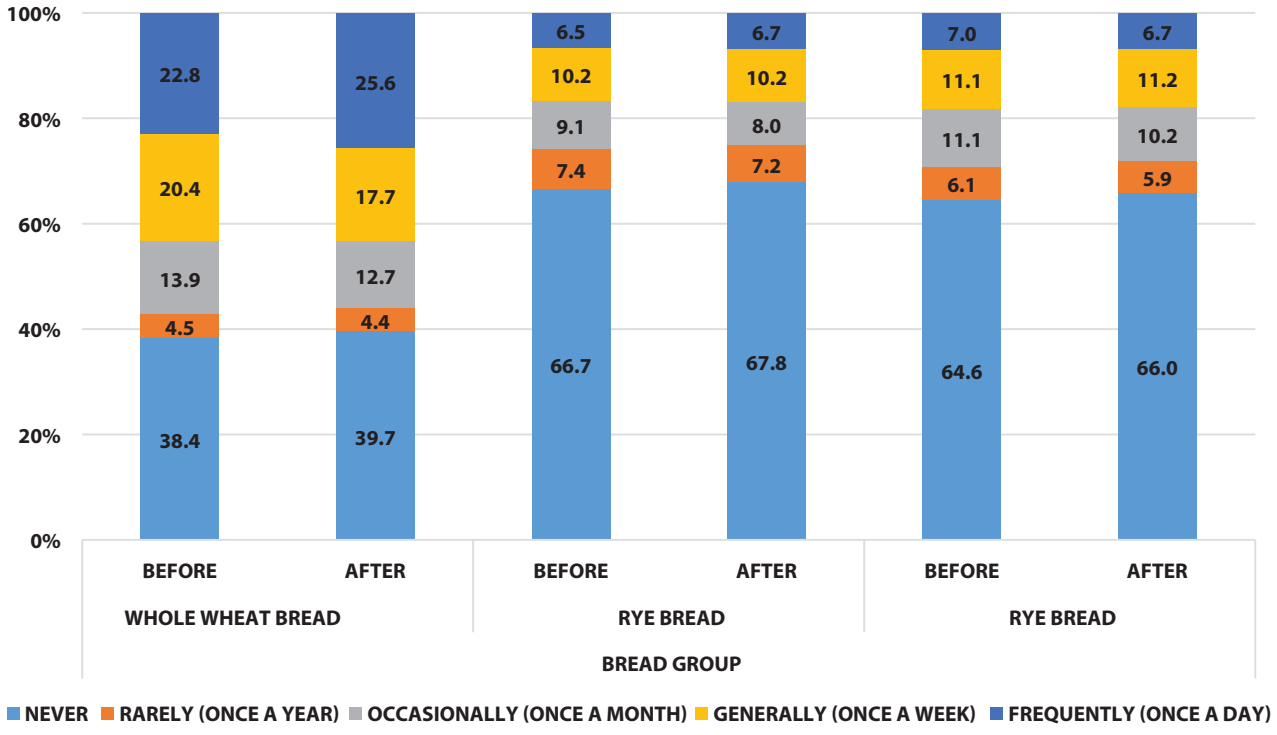


Figure 5. Consumption Frequencies of The Bread Group

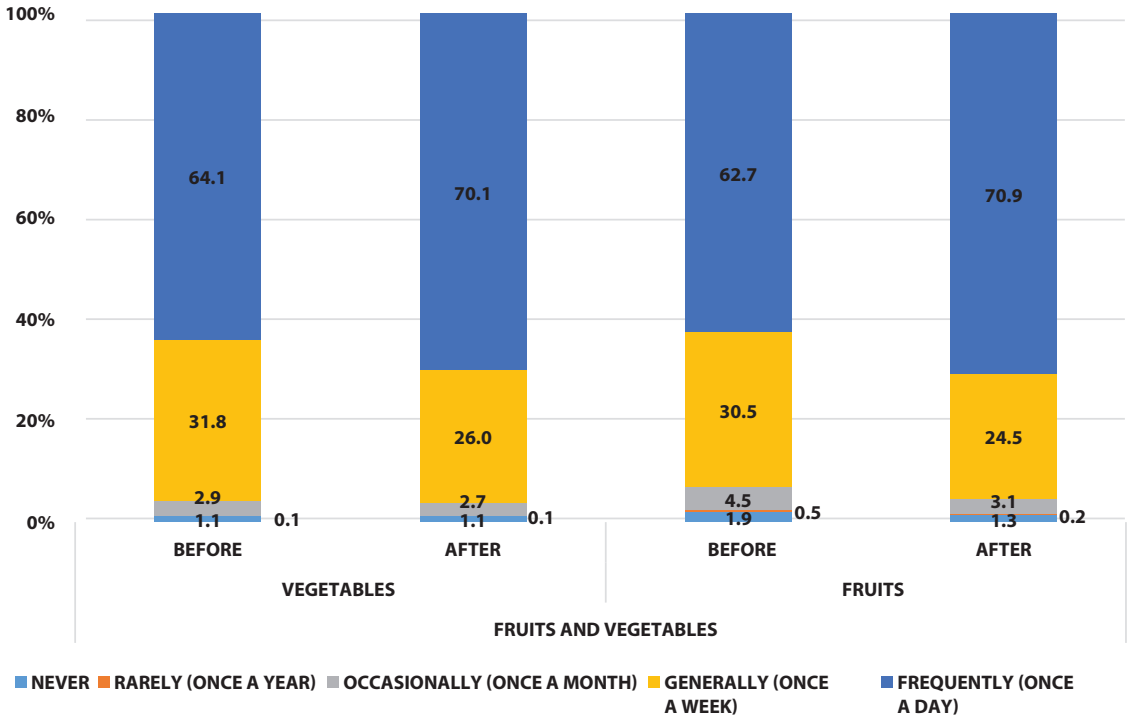


Figure 6. Consumption Frequencies of Fruits and Vegetables

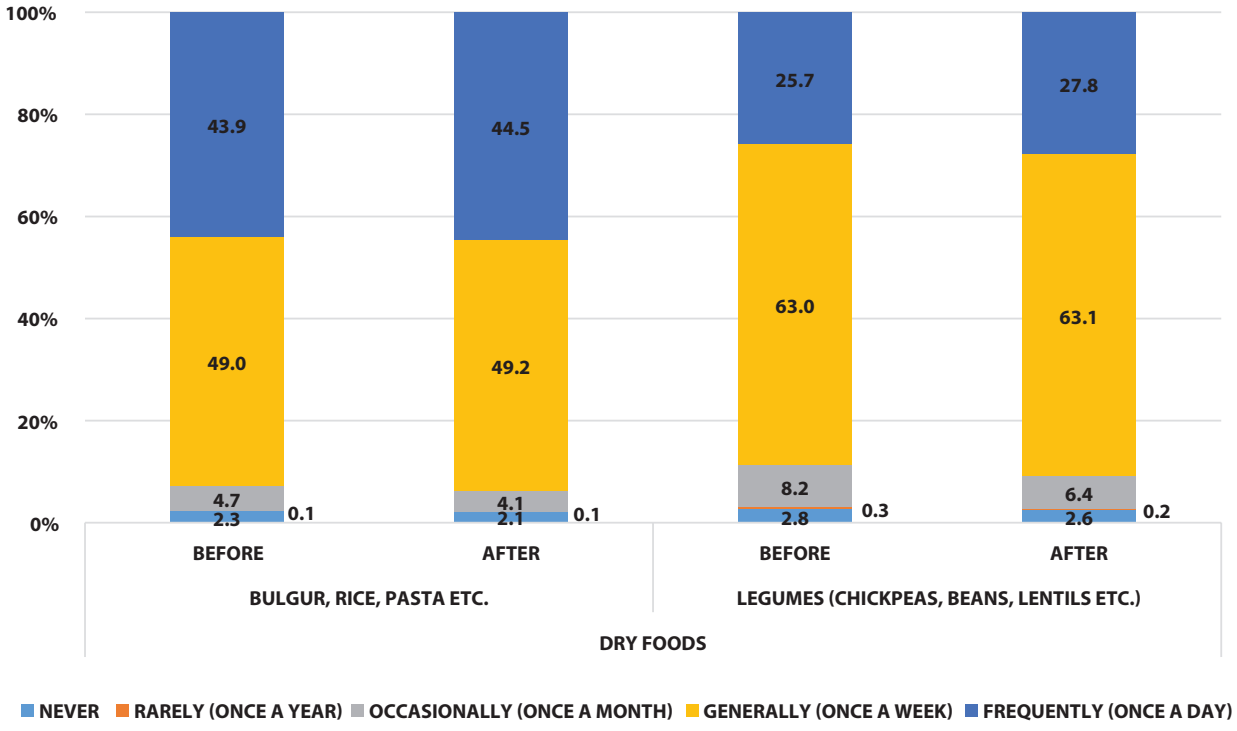


Figure 7. Consumption Frequencies of Dry Foods

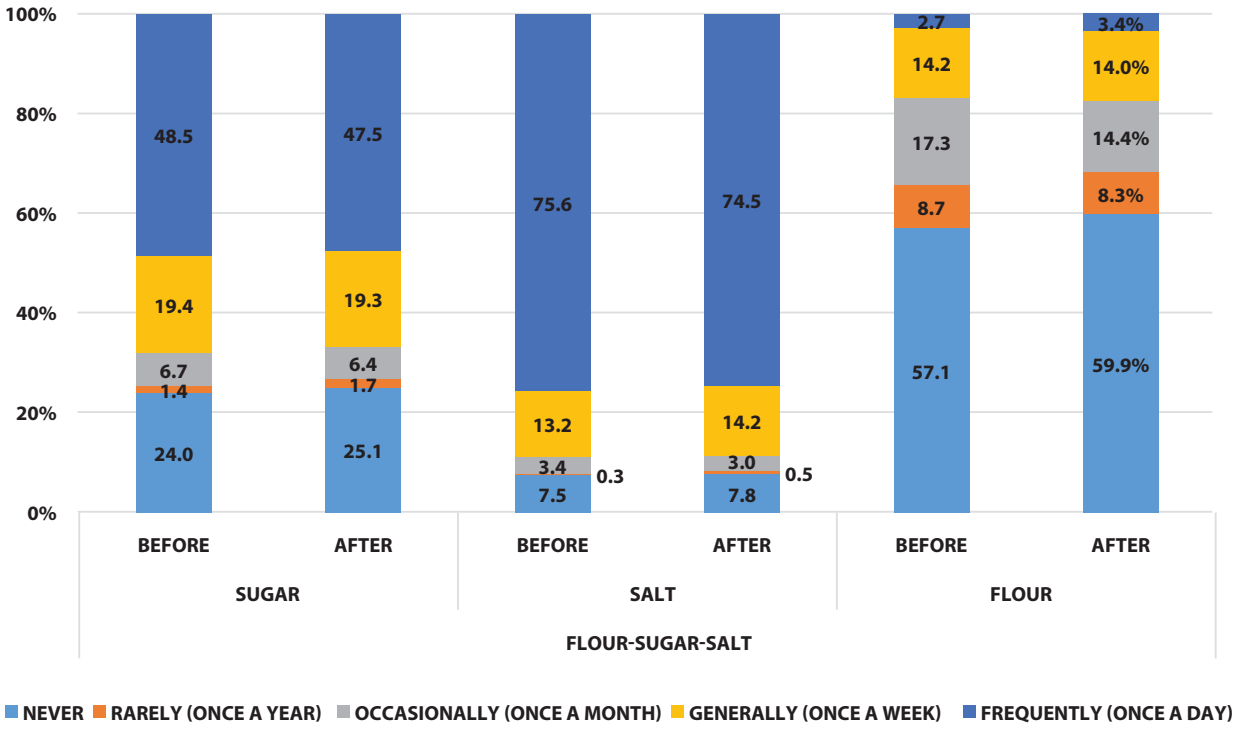


Figure 8. Consumption Frequencies of Flour, Sugar, and Salt

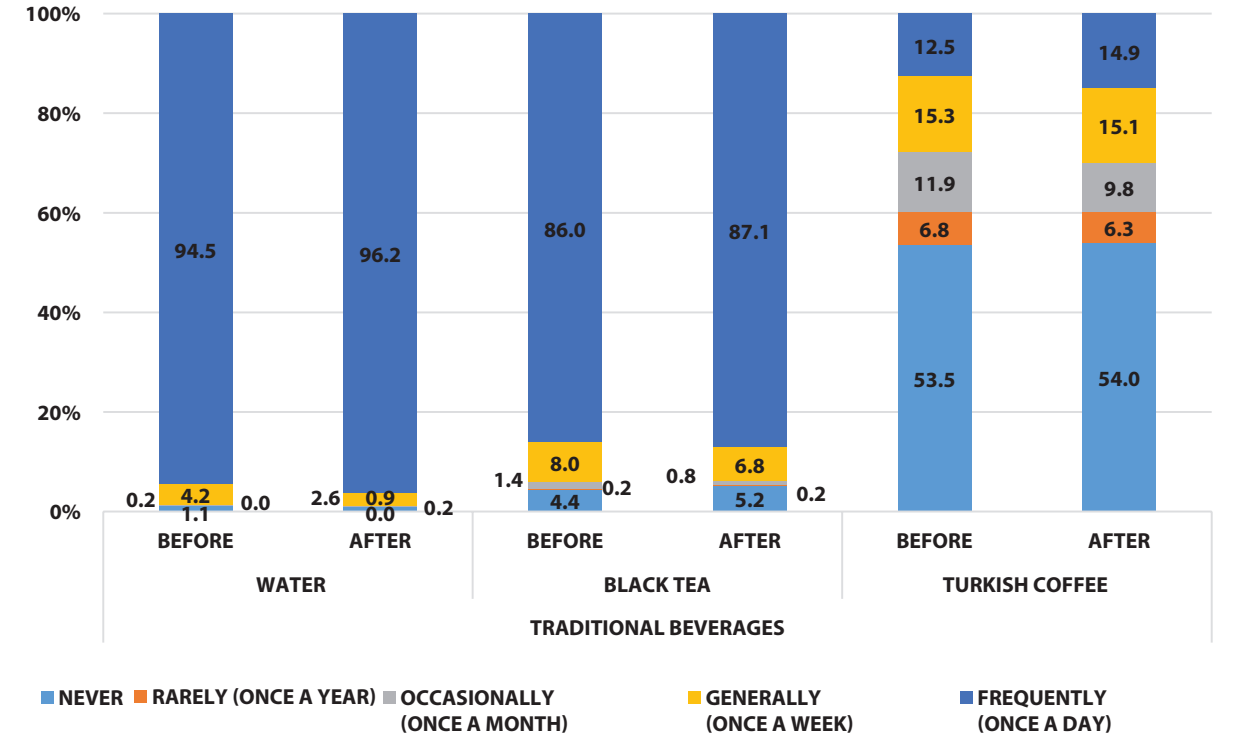


Figure 9. Consumption Frequencies of Traditional Beverages

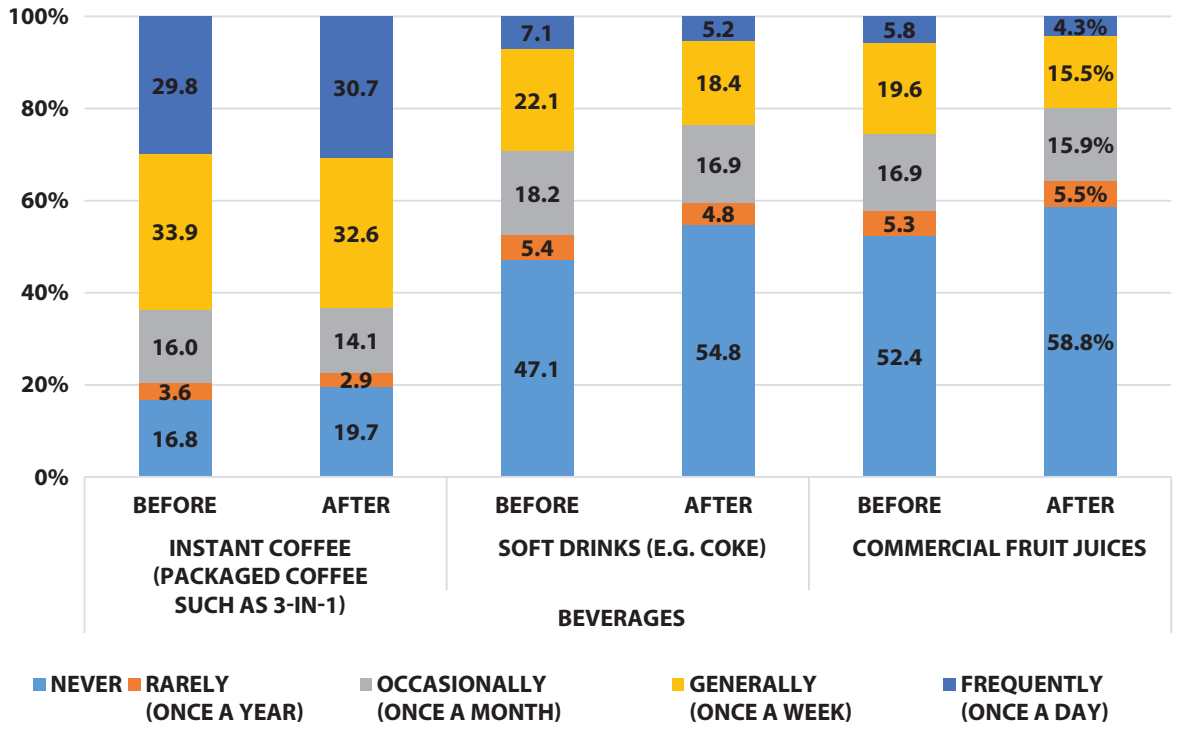


Figure 10. Consumption Frequencies of Beverages

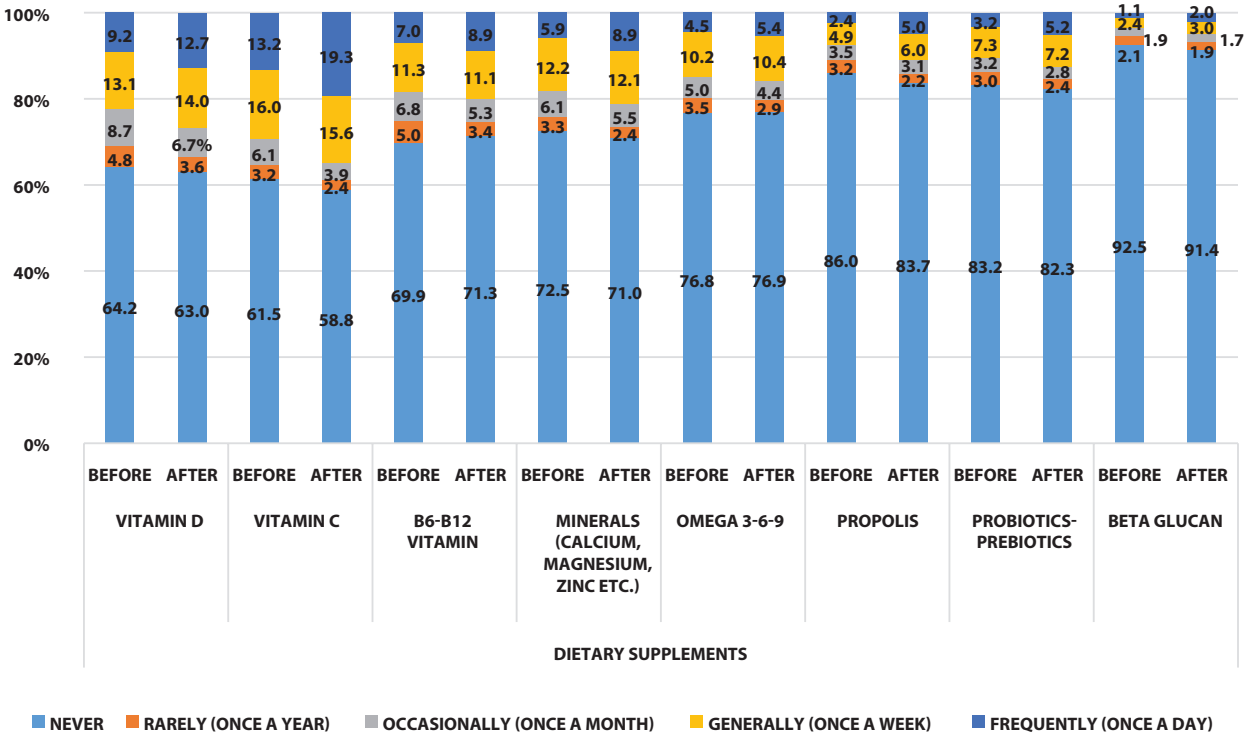


Figure 11. Consumption Frequencies of Dietary Supplements

The consumption of foods rich in micronutrients such as A (*sweet potatoes, carrots, leafy greens etc.*), B_6 (*wheat flour, rice, legumes, meat and meat products, bananas, avocados, spinach etc.*), B_{12} (*milk and dairy products, meat and meat products*) C (*oranges, broccoli, lemons and many other fruits and vegetables*), D (*fish, liver, egg yolks*), E (*vegetable oils, hazelnuts, walnuts, broccoli etc.*) Zn (*meat and meat products, hazelnuts, lentils etc.*) Se (*meat and meat products*), Fe (meat and meat products) and polyunsaturated fatty acids of omega-3 and 6 (*vegetable oils, walnuts, almonds, soybeans, avocados etc.*) supports immune systems and prevents bacterial and viral infections including COVID-19 while mitigates the potential negative impacts of the disease and strengthening the therapeutic impact of the treatment (39-48). Vitamin A has been reported to reduce morbidity and mortality in various diseases such as measles, diarrhoea, and HIV/AIDS infection (49, 50). Therefore, it is described as "anti-infective" in the defence of the body against the infection [20]. A derivative of vitamin A, isotretinoin has been shown to contribute to the down-regulation of angiotensin-converting enzyme 2 (*ACE2*), a known prerequisite of the entry of COVID-19 into a cell (51). Each type of vitamin B has a special function in human metabolism. Additionally, these vitamins support the immune system against many bacterial and viral infections including MERS-CoV (20, 52). Vitamin C is an essential antioxidant; it both reinforces the immune system and protects the individual against infections caused by the coronavirus (39, 53-54). Like other vitamins, vitamins D and E play an effective role in many bodily functions. Many patients diagnosed with COVID-19 were reported to suffer from vitamin D deficiency. Vitamin E has been revealed to be effective against certain coronaviruses. Therefore, the intake of vitamins D and E is recommended in the fight against COVID-19 (20). Some bioactive lipids are indicated to be helpful with the treatment of COVID-19 (46). The generally low rate of micronutrient intake is associated with negative clinical results in viral infections (49). The adequate and balanced intake of micronutrients like vitamins and minerals is recommended particularly for at-risk individuals suffering from malnutrition to maximise immune system defence during the COVID-19 pandemic (19).

The Turkish Dietetic Association (TDA) published certain recommendations about nutrition during the COVID-19 pandemic. It was indicated that during these times, the consumption of foods rich in protein, fibres, vitamins, minerals, and antioxidants is crucial. According to the Healthy Food Plate prepared by the association; it was recommended in each main meal one-quarter of the plate must include vegetables, another quarter should have full grains while the remaining half must contain three equal parts of fruits, high-protein foods (legumes, meat, eggs, fish, chicken, oily seeds etc.), and dairy products (milk, yoghurt, ayran, cheese etc.). Additionally, adequate water consumption and the daily use of olive oil are also underlined in the recommendations (55).

Barazzoni and colleagues (2020) made a comprehensive assessment of the dietary habits of individuals infected with COVID-19 based on the studies of Gomes et al. (2018) and Volkert et al. (2019) (17,19,56). The study recommends dietary treatment in cases of COVID-19 infection should be started in the early stage within 24 to 48 hours after hospital admission. Dietary adjustments to the patient's daily life must be considered to be an integral part of the treatment because a comprehensive approach in which nutrition is linked to the treatment has the potential to improve clinical results. Taking criteria such as one's nutritional status, physical activity levels, and, if any, existing diseases into consideration, it was stated that the ideal total energy intakes should be adjusted to 27 kcal/ b.w. kg-day, 30 kcal/b.w. kg-day, and 30 kcal/b.w. kg-day for polymorbid patients aged over 65 years, polymorbid overweight patients, and the elderly, respectively. The same study recommends that protein intakes of elderly patients must be 1 g/b.w. kg-day while it should be $\geq$1 g/b.w. kg-day for polymorbid in-patients to prevent weight loss and to reduce the risk of complications. Ultimately, fat and carbohydrate needs should be adapted considering an energy ratio from fat and carbohydrates between 30:70 per cent for patients without respiratory deficiency to 50:50 per cent for ventilated patients.

In cases where patients do not have access to adequate nutrition, the intake of propolis, probiotics/ prebiotics, or various vitamins and minerals as dietary supplements should be considered. Since exposure

to sunlight is limited particularly in quarantine conditions, the consumption of foods rich in vitamin D must be encouraged. If vitamin D intake is not possible through one's diet, dietary supplements must be considered as an option (24). Propolis is a natural edible residue produced by honeybees that has been used since antiquity to treat various illnesses; it also supports the immune system (57). Due to its antimicrobial, antiviral, and antioxidant properties (58), propolis is indicated as an effective agent against COVID-19 (59-60). The results of an increasing number of studies demonstrated that probiotic and prebiotic micro-organisms support the immune system and may be used to treat or even to prevent certain diseases (61-64). Even though the question of whether probiotics and prebiotics have a direct impact on COVID-19 infection (65) has been discussed by some researchers, there are also other researchers claiming that they have a partially therapeutic impact on viral respiratory tract infections (66-68) and that they can even improve the treatment of COVID-19 infection (69-70). B-glucans are one of the most studied types of micronutrients. Many research studies indicate that B-glucans support the immune system and have anti-inflammatory, anticarcinogenic, antibacterial, and antiviral properties, therefore they might be used as an active agent to prevent and treat upper respiratory tract infections including COVID-19 (71-77). Barazzoni et al. (2020) stated that if a patient infected with COVID-19 does not have the access to ideal dietary conditions, their diet must be enhanced with dietary supplements to the maximum extent possible and the effectiveness of this approach must be evaluated once a month. This is because dietary supplements are one of the best alternatives to reach the dietary goals of the patient with their content rich in micronutrients, proteins, and energy density (19).

Conclusions

The present study examined the changes in food consumption frequencies among individuals living in Turkey before and during the COVID-19 pandemic. To this end, the "Food Consumption Frequency Change Scale" was prepared and used for an extensive population (3017 participants). The study revealed statistically significant changes in food consumption frequencies before and during the contagion in 9 out of 10 sub-groups, the exception being the bread group. The overall scale did not display any statistically significant differences. Turkey did not go to a nation-wide lockdown during the COVID-19 outbreak like Italy, Spain, or France. Weekend curfews were imposed only in 31 cities and not in the remaining 50 cities. Early precautions enabled the country to control the outbreak in a short amount of time. From 11 March 2020, the date of the first case reported in Turkey, to the present day, there were no obstructions in the food supply chain and people were able to access food without difficulties. Therefore, the main reason for the changes in food consumption frequencies might be indicated as the willingness of individuals to reinforce their immune systems. The surge in the consumption of dietary supplements as well as fruits and vegetables and the decrease in the consumption of flour, sugar, and salt during the outbreak might be particularly considered as a supporting argument for this claim. Economic concerns brought about by the pandemic and the low per-capita income might have affected the reduction in the consumption of meat and meat products, which are relatively more expensive than other types of food.

With no vaccine or a scientifically proved treatment, COVID-19 forced/forces millions of people from many countries to live under quarantine. Under such conditions, nutrition comes to the forefront owing to both concerns of survival and novel psychological factors. Many people going out of their homes during certain times for their essential needs find it difficult to access fresh and adequate food due to a plethora of reasons, primarily the disruptions in the food supply chain, one of the sectors that have been hit the hardest by the pandemic. Even though people want to consume foods rich in vitamins and minerals, pandemic conditions create an obstacle. Another factor playing a role in the lack of a balanced diet in terms of macro and micronutrients is the differences between the dietary habits of individuals. Despite the lack of evidence showing that nutrition will protect the individual from COVID-19 or improve clinical results in COVID-19 cases, it is known that an adequate and balanced diet has a positive impact on the

immune system while a strong immune system is good for preventing viral infections. Therefore, one has to strengthen one's immune system against viral pandemics. Within this scope, the study proposes some recommendations for the present day and the days to come.

- In quarantine conditions, people can either be influenced in a positive way towards a healthy diet or gain weight and make themselves susceptible to other chronic diseases because of an unhealthy diet stemming from factors such as stress and fear. In addition to these possibilities, individuals might also place certain limits on their diets based on true or false information. Particularly under the present circumstances, individuals with dietary problems seeking professional help or authorities drafting a specific action plan against the pandemic are considered to be significant steps in the maintenance of the existing dietary conditions.
- There should be no obstacles to access to sufficient food for individuals to have healthy diets during the pandemic. The smooth functioning of the food supply chain is critical, particularly during these extraordinary circumstances, for individual, social, and public safety. Thus, during occurrences affecting large masses such as pandemics, authorities are obliged to formulate an action plan for a safe and unobstructed food supply chain.
- The scientific community should focus more on comprehensive studies concerning ideal dietary habits for the present situation and future pandemics. This would facilitate for individuals to take the necessary precautions to protect themselves against viral pandemics, eliminating the risk of substantial pressure on healthcare systems as it is the case during the current pandemic crisis. Furthermore, this would also provide a solution for societies without adequate healthcare infrastructures or access to medicine or vaccines, allowing an inclusive approach that leaves no one behind during viral pandemics.
- In the new stage of the COVID-19 outbreak, it is estimated that consumers will gravitate towards healthy diets to reinforce their immune systems and seek for novel products in this respect. Many sectors should mobilise to rapidly design and produce novel healthy products or to enrich and strengthen existing products to meet this demand.

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