

ARAŞTIRMA / RESEARCH

Comparison of The Nutritional Habits of Individuals With and Without a COVID-19 Diagnosis: An Online Cross-Sectional Study From Türkiye

COVID-19 Tanısı Alan ve Almayan Bireylerin Beslenme Alışkanlıklarının Karşılaştırılması: Türkiye'den Çevrimiçi Kesitsel Bir Çalışma

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Abstract

Objective: Türkiye, which is located in the European Region of the World Health Organization (WHO) has been also affected by the Coronavirus Disease-2019 (COVID-19) pandemic. This study was conducted between January and April 2021, in which the number of daily COVID-19 cases increased from an average of 8,500 to 50,000. This cross-sectional online study aimed to compare the dietary habits of individuals with and without a COVID-19 diagnosis.

Material and Method: The study included a total of 1,448 individuals aged 18-64 years. Study data were collected through the Google platform using a questionnaire that included sociodemographic characteristics, COVID-19 status, anthropometric measurements, physical activity status, and nutritional characteristics.

Results: Those with COVID-19 had higher Body Mass Index (BMI) than those without COVID-19. The rates of those who had regular physical activity, considered nutrition important for protection from COVID-19, and ordered food online were lower among those participants with COVID-19 than those without COVID-19. The rates of those who lost appetite and weight, used nutritional supplements, increased their nutritional budget during the pandemic, and shopped for food from online marketplaces were higher too among those with COVID-19. Those with COVID-19 were found to consume red meat, fruit, and herbal tea more frequently and soft drinks less frequently than those without COVID-19.

Conclusion: In line with these results, it may be considered that those with COVID-19 try to comply with healthy nutrition recommendations. Our results can be used to prepare appropriate nutritional guidelines for pandemic and quarantine periods.

Keywords: COVID-19, pandemics, dietary habits, physical activity.

Öz

Amaç: Dünya Sağlık Örgütü'nün (DSÖ) Avrupa Bölgesi'nde yer alan Türkiye de Coronavirüs Hastalığı-2019 (COVID-19) pandemisinden etkilenmiştir. Bu çalışma, günlük COVID-19 vaka sayısının ortalama 8.500'den 50.000'e çıktığı Ocak ve Nisan 2021 arasında gerçekleştirildi. Bu kesitsel çevrimiçi çalışma, COVID-19 tanısı alan ve almayan bireylerin beslenme alışkanlıklarını karşılaştırmayı amaçladı.

Gereç ve Yöntem: Çalışmaya 18-64 yaş arası toplam 1.448 kişi dahil edildi. Çalışma verileri, sosyodemografik özellikler, COVID-19 durumu, antropometrik ölçümler, fiziksel aktivite durumu ve beslenme özelliklerini içeren bir anket kullanılarak Google platformu aracılığıyla toplandı.

Bulgular: COVID-19 tanısı alanların Beden Kütle İndeksi (BKİ) tanımayanlara göre daha yüksekti. Düzenli fiziksel aktivite yapan, beslenmeyi COVID-19'dan korunmak için önemli bulan ve internetten yemek siparişi verenlerin oranları COVID-19 tanısı alan katılımcılar arasında daha düşüktü. Pandemi sürecinde iştah ve ağırlığını kaybedenlerin, besin takviyesi kullananların, beslenmeye ayırdıkları bütçeyi artıranların, online marketlerden alışveriş yapanların oranları COVID-19 tanısı alanlar arasında daha yüksekti. COVID-19 tanısı alanların tanı almayanlara göre kırmızı et, meyve ve bitki çaylarını daha sık, alkolsüz içecekleri daha az tükettikleri tespit edildi.

Sonuç: Bu sonuçlar doğrultusunda COVID-19 hastalarının sağlıklı beslenme önerilerine uymaya çalıştıkları düşünülebilir. Sonuçlarımız pandemi ve karantina dönemleri için uygun beslenme kılavuzlarının hazırlanmasında kullanılabilir.

Anahtar Kelimeler: COVID-19, pandemi, beslenme alışkanlıkları, fiziksel aktivite.

1. Introduction

The coronavirus disease-2019 (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and was declared a pandemic by the WHO in March 2020 (1). COVID-19 is a respiratory disease that generally spreads through respiratory droplets or human contact (2). In addition to its common symptoms such as fever, dry cough, and fatigue, it has diverse symptoms such as loss of appetite, insufficient food intake, and loss of taste and smell, affecting patients' nutritional status. COVID-19 progresses more severely in the older adults and individuals with health problems such as diabetes and hypertension. Its treatment aims to relieve the symptoms (3).

Guidelines for the nutritional treatment of individuals with COVID-19 recommend evaluating COVID-19 patients using malnutrition screening tools and providing oral nutritional support to those who cannot meet their nutritional needs by considering their protein needs (especially in the older adults and those with sarcopenia), assessing the need for multi vitamin-mineral supplementation and providing 400 IU/day vitamin D support (especially for those who live indoors for a long time), coupled with dietitian consultation (4).

The stress caused by social isolation, one of the most appropriate methods for protection from COVID-19 during the pandemic plus the longer times spent at home changed people's eating habits (5). During the pandemic, the consumption of fast foods and packaged foods increased, while the consumption of vegetables and fruits decreased, causing people to gain weight (2). Unhealthy nutrition accelerates inflammation and weakens the immune system, lowering the body's defense against the virus (6). Infection triggers the activation of proinflammatory cytokines, increasing cell apoptosis. The virus also increases the apoptosis of lymphocytes. Then, hypercytokinemia, known as "cytokine storm," occurs as a result of lymphocytopenia and lymphocyte dysfunction. When added proinflammatory cytokines due to dysfunctional hypertrophic adipocytes in obesity, the result is exacerbated inflammation in patients with obesity (7). Therefore, a healthy diet is crucial to protect against COVID-19 or to support the immune system once infected (8). During the pandemic, the WHO developed a number of healthy eating recommendations for adults such as consuming fruits, vegetables, and cereals daily and red meat 1-2 times a week, preferring fresh vegetables and fruits rather than snacks that are high in sugar, fat, and salt, not overcooking vegetables to prevent loss of vitamins, drinking 8-10 glasses of water every day, preferring unsaturated fats rather than saturated fats, and limiting salt and sugar intake (9). The recommendations also include regular physical activity and avoiding smoking during the pandemic (8). However, it may be difficult to follow these recommendations due to the psychological, economic, and social problems brought about by COVID-19. This study aimed to compare the nutritional habits of individuals with and without a COVID-19 diagnosis and thus make a Turkish contribution to the literature.

2. Material and Methods

2.1. Study design and participants

This cross-sectional study was conducted between January and April 2021 with participated individuals aged 18-64 years.

With effect size=0.10, $\alpha=0.05$, and $1-\beta=0.95$, it was found that the sample size should be at least 1084 people by using the G*Power 3.1 program. 1448 individuals who were able to use social media and volunteered to participate in the study were included in the study.

2.2. Data collection

The researchers collected the data using a questionnaire created on the Google platform and sending its link to participants via social media. The questionnaire consisted of five parts: 1. Sociodemographic characteristics, COVID-19 status (COVID-19 diagnosis at any time between January and April) (14 questions), 2. Height and weight values and change in weight during the pandemic (3 questions), 3. Physical activity (5 questions), 4. Nutrition (number of meals, change in appetite, use of nutritional supplements, nutritional budget during the pandemic, etc.) (14 questions) 5. Food Frequency Questionnaire (FFQ).

BMI was calculated using the formula $\text{weight}(\text{kg})/[\text{height}(\text{m})]^2$, and their BMI values were grouped as underweight ($<18.5 \text{ kg/m}^2$), normal ($18.5-24.9 \text{ kg/m}^2$), overweight ($25-29.9 \text{ kg/m}^2$), and obesity ($\geq 30 \text{ kg/m}^2$) (10). Regular physical activity status was defined according to the frequency of physical activity based on the statements of the participants. Those who do physical activity "once in 15 days or more" are included in the group of those who do regular physical activity, and those who say "I do not do any physical activity" are included in the group of those who do not do regular physical activity. Participants were asked to fill in an unstructured FFQ, including 33 foods/food groups in eight categories and ranging between "every meal" and "none" according to their dietary habits over the past month. The frequency ranges of food groups were based on Turkish Dietary Guidelines (11). Those with COVID-19 reported that they were diagnosed by healthcare professionals by taking respiratory tract samples. Pregnant and lactating women were not included in the study.

2.3. Statistical Analysis

The data were analyzed using the "Statistical Package for Social Sciences" (SPSS) 23 statistical program. The qualitative variables were presented by number (n), percent (%), and the quantitative variables by median (M) and interquartile range (IQR). The Kolmogorov-Smirnov test was used to examine the normality of distribution of the qualitative data, the Mann-Whitney U test (Z) to compare the medians of two independent groups, and Pearson's Chi-Square (χ^2) or Fisher's Exact Chi-Square (χ^2) tests to compare ratios. The statistical significance level was accepted as $p < 0.05$.

2.4. Ethical Aspect of the Research

Ethics committee approval (2020/215) was obtained from the Social and Human Sciences Ethics Committee at Erciyes University to conduct the study. Participants were informed about the study via the Google platform, and their consent was obtained through an informed consent form.

3. Results

A total of 1,448 participants aged 18-64 years were included in the study, and 68.4% of them were female. Those without COVID-19 (23.0 year) had a lower median age than those with COVID-19 (26.0 year) ($p<0.05$). In addition, the rates of being married, living in urban areas, and quitting smoking during the pandemic were significantly higher in those with COVID-19 (41.7%, 94.6%, 3.9%, respectively) than those without COVID-19 (32.6%, 87.2%, 1.8%, respectively) ($p<0.05$). Those with COVID-19 had significantly higher median BMI (24.4-6.21 kg/m²) than those without COVID-19 (22.9-5.9 kg/m²) ($p<0.001$, Table 1).

In addition, the rates of the participants in those with COVID-19 with overweight (28.9%) and obesity (14.7%) were approximately 6% higher than in participants without COVID-19 ($p=0.002$, Figure 1).

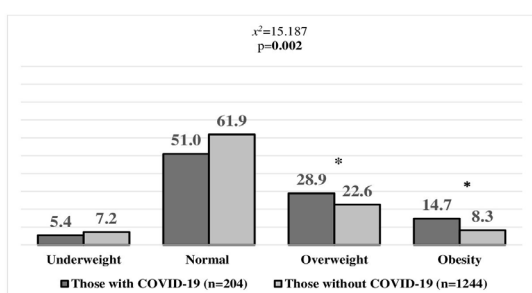


Figure 1. Classification of Groups According to BMI Values (%)

*There is statistically significant difference between the groups.

The rates of those with decreased weight (29.9%) and appetite (36.8%) during the pandemic were higher in those with COVID-19, while the rate of doing regular physical activity (78.9%) was higher in those without COVID-19 ($p<0.05$). The rate of those who considered nutrition important for protection from COVID-19 was significantly lower in those with COVID-19 (87.7%) than in those without COVID-19 (93.9%) ($p<0.05$). The rate of those who used nutritional supplements was approximately 2.4 times higher in those with COVID-19 (55.4%) than in those without COVID-19 (23.0%). The rate of those who increased their nutritional budget during the pandemic was approximately 1.3 times higher in those with COVID-19 (52.9%) than in those without COVID-19 (39.2%) ($p<0.001$). The rate of those who shopped from online markets was higher in those with COVID-19 (34.8%) than in those without COVID-19 (25.3%), while the rate of those who ordered food online was significantly higher in those without COVID-19 (63.7%) than in those with COVID-19 (51.5%) ($p<0.001$, Table 2).

The rates of those who consumed red meat 3-4 times a week or more, fruits 5-6 times a week or more, and herbal tea 5-6 times a week or more were higher in those with COVID-19 (50.5%, 73.0%, 42.6%, respectively) than in those without COVID-19 (38.7%, 64.3%, 30.8%, respectively), while the frequency of olive oil consumption was lower in those with COVID-19 than in those without COVID-19 ($p<0.05$). The rate of those who did not consume soft drinks was significantly lower in those with COVID-19 (22.4%) than in those without COVID-19 (34.3%) ($p<0.001$, Table 3).

Table 1. Sociodemographic Characteristics of the Groups

| Characteristics | Those with COVID-19 (n=204) | Those without COVID-19 (n=1244) | Test statistics |
|--|-----------------------------|---------------------------------|----------------------------|
| Age (year) M (IQR) | 26.0 (13.0) | 23.0 (13.0) | Z=-2.211 p=0.027 |
| Gender (Male) n (%) | 75 (36.8) | 382 (30.7) | $\chi^2=2.977$ p=0.084 |
| Marital status (married) n (%) | 85 (41.7) | 405 (32.6) | $\chi^2=11.239$ p=0.004 |
| Education level (college and higher) n (%) | 165 (80.9) | 1060 (85.2) | $\chi^2=4.924$ p=0.295 |
| Place of residence (city) n (%) | 193 (94.6) | 1085 (87.2) | $\chi^2=8.536$ p=0.003 |
| Having income equivalent to expenses n (%) | 119 (58.3) | 796 (64.0) | $\chi^2=3.536$ p=0.171 |
| Smoking n (%) | 42 (20.6) | 227 (18.2) | $\chi^2=.656$ p=0.721 |
| Quit smoking during the pandemic n (%) | 8 (3.9) | 16 (1.3) | $\chi^2=15.029$ p=0.010 |
| Regular physical activity n (%) | 145 (71.1) | 981 (78.9) | $\chi^2=6.135$ p=0.013 |
| BMI (kg/m ²) M (IQR) | 24.4 (6.21) | 22.9 (5.9) | Z=3.799 p=<0.001 |

Abbreviations: BMI, Body Mass Index

Table 2. Nutritional Characteristics of the Groups during the Pandemic

| Characteristics | Those with COVID-19 (n=204) | Those without COVID-19 (n=1244) | Test statistics |
|---|-----------------------------|---------------------------------|-----------------------------|
| | n (%) | n (%) | |
| Those who consider nutrition important for protection from COVID-19 | 179 (87.7) | 1168 (93.9) | $\chi^2=9.276$ p=0.002 |
| Nutritional supplements | 113 (55.4) | 286 (23.0) | $\chi^2=92.174$ p=<0.001 |
| Change in weight | | | |
| Increased | 42 (20.6) ^a | 434 (34.9) ^b | $\chi^2=21.059$ p=<0.001 |
| Decreased | 61 (29.9) ^a | 239 (19.2) ^b | |
| Unchanged | 101 (49.5) | 571 (45.9) | |
| Change in appetite | | | |
| Increased | 43 (21.1) ^a | 433 (34.8) ^b | $\chi^2=78.290$ p=<0.001 |
| Decreased | 75 (36.8) ^a | 156 (12.5) ^b | |
| Unchanged | 86 (42.2) ^a | 655 (52.7) ^b | |
| Nutritional budget | | | |
| Increased | 108 (52.9) ^a | 488 (39.2) ^b | $\chi^2=15.004$ p=0.001 |
| Decreased | 15 (7.4) | 84 (6.8) | |
| Unchanged | 81 (39.7) ^a | 672 (54.0) ^b | |
| Ordering food online | | | |
| 1-2 times/week or more | 35 (17.2) | 166 (13.3) | $\chi^2=18.212$ p=<0.001 |
| 1-2 times/month or less | 70 (34.3) ^a | 627 (50.4) ^b | |
| None | 99 (48.5) ^a | 451 (36.3) ^b | |
| Shopping from online markets | | | |
| 1-2 times/week or more | 39 (19.1) ^a | 81 (6.5) ^b | $\chi^2=36.688$ p=<0.001 |
| 1-2 times/month or less | 32 (15.7) | 234 (18.8) | |
| None | 133 (65.2) ^a | 929 (74.7) ^b | |

^{a,b} There is a statistically significant difference between the groups' values.

Table 3. Food Consumption Frequencies of the Groups

| Food/Food Group | Those with COVID-19 (n=204) | Those without COVID-19 (n=1244) | x ² | p |
|--|-----------------------------|---------------------------------|----------------|--------|
| | n (%) | n (%) | | |
| Milk 5-6 times/week or more | 50 (24.5) | 259 (20.8) | 1.422 | 0.233 |
| Yogurt 5-6 times/week or more | 103 (50.5) | 636 (51.1) | 0.028 | 0.866 |
| Cheese 5-6 times/week or more | 149 (73.0) | 933 (75.0) | 0.357 | 0.550 |
| Kefir 5-6 times/week or more | 15 (7.4) | 88 (7.1) | 0.000 | 1.000 |
| Egg Every other day or more | 153 (75.0) | 933 (75.0) | 0.000 | 1.000 |
| Red meat | | | | |
| 3-4 times/week or more | 103 (50.5) ^a | 482 (38.7) ^b | 10.424 | 0.005 |
| 1-2 times/week | 57 (27.9) | 403 (32.4) | | |
| Less often | 44 (21.6) ^a | 359 (28.9) ^b | | |
| Chicken/Turkey 1-2 times/week | 68 (33.3) | 379 (30.5) | 3.523 | 0.172 |
| Fish 1-2 times/week or more | 66 (32.4) | 389 (31.3) | 0.095 | 0.757 |
| Legumes 3-4 times/week or more | 68 (33.3) | 419 (33.7) | 0.010 | 0.922 |
| Nuts/Oilseeds 5-6 times/week or more | 74 (36.3) | 464 (37.3) | 0.079 | 0.779 |
| White bread 5-6 times/week or more | 113 (55.4) | 732 (58.8) | 0.859 | 0.354 |
| Whole grain bread 5-6 times/week or more | 53 (26.0) | 335 (26.9) | 0.080 | 0.777 |
| Pasta/Rice Every other day or more | 108 (52.9) | 677 (54.4) | 0.155 | 0.694 |
| Green leafy vegetables 5-6 times/week or more | 73 (35.8) | 441 (35.5) | 0.009 | 0.926 |
| Other vegetables 5-6 times/week or more | 65 (31.9) | 439 (35.3) | 0.907 | 0.341 |
| Onion/Garlic 5-6 times/week or more | 106 (52.0) | 629 (50.6) | 0.137 | 0.711 |
| Fruits 5-6 times/week or more | 149 (73.0) | 800 (64.3) | 5.915 | 0.015 |
| Dried fruits Every other day or more | 109 (53.4) | 622 (50.0) | 0.826 | 0.364 |
| Olive oil 5-6 times/week or more | 93 (45.6) | 692 (55.6) | 7.115 | 0.008 |
| Pastries 1-2 times/month or less | 88 (43.1) | 471 (37.9) | 2.058 | 0.151 |
| Pastry desserts 1-2 times/month or less | 111 (54.4) | 606 (48.7) | 2.276 | 0.131 |
| Milk desserts 1-2 times/week or more | 102 (50.0) | 629 (50.6) | 0.022 | 0.882 |
| Packaged products such as chocolate 5-6 times/week or more | 54 (26.5) | 333 (26.8) | 0.008 | 0.929 |
| Tea 5-6 times/week or more | 162 (79.4) | 985 (79.2) | 0.006 | 0.940 |
| Coffee 5-6 times/week or more | 105 (51.5) | 660 (53.1) | 0.176 | 0.674 |
| Herbal tea 5-6 times/week or more | 87 (42.6) | 383 (30.8) | 11.243 | 0.001 |
| Soft drinks None | 70 (34.3) | 279 (22.4) | 13.535 | <0.001 |
| Alcohol 1-2 times/week or more | 24 (11.8) | 139 (11.2) | 0.064 | 0.968 |

^{a,b} There is a statistically significant difference between the groups' values.

4. Discussion

This study found that the rate of those who considered nutrition important for protection from COVID-19 was significantly lower in those with COVID-19 than in those without COVID-19. By contrast, those with COVID-19 increased their monthly budget for nutrition during the pandemic and consumed red meat, fruits, and herbal tea more often and soft drinks less often than those without COVID-19. They also had higher rates of using nutritional supplements over the past month. It is thought that in fact, they pay attention to what they eat after getting sick. They also reported losing appetite and weight during the pandemic. However, the higher rates of being overweight and obese in those with COVID-19 can be explained by the lower rates of regular physical activity among them. In addition, the rate of quitting smoking during the pandemic was higher in those with COVID-19. Based on all these results, we can say that those with COVID-19 made an effort to improve their generally unhealthy lifestyles. However, the motto of public health nutrition is "prevention rather than cure."

Social isolation during the pandemic disrupted daily routines and caused stress in people. Stress is associated with an unhealthy diet rich in fat and sugar, and higher energy intake combined with high alcohol consumption, which can lead to weight gain and increased risk of obesity (12, 13). Excessive ectopic fat accumulation may increase immune dysregulation and proinflammatory response, decrease cardiorespiratory capacity and have detrimental effects on lung function (14, 15). Several studies have shown that obesity increases the risk of contracting COVID-19 and hospitalization, the severity of the disease, and mortality (16-20). A case-control study conducted in South Korea found that the mean BMI value and obesity rate of COVID-19 patients were higher than those in the control group (21). Similarly, our study found that those with COVID-19 had higher median BMI and rates of being overweight/obese than those without COVID-19. A cross-sectional study conducted in Poland reported that 43.5% of the participants ate more during the quarantine period, and determined that individuals with high BMI consumed more food (22). A study used a web survey to determine the lifestyle, nutritional habits, and compliance of an Italian population with the Mediterranean Diet during the pandemic and found that 34.4% of the participants increased their appetite, 17.7% decreased their appetite, 13.9% lost weight, and 48.6% gained weight (23). In a study evaluating the nutritional habits of healthcare workers during the pandemic process in Türkiye, 51.4% of the participants reported that they gained weight, 17.8% lost weight and 30.9% reported that there was no change in their weight (24). Another study conducted in Lithuania collected the data through a web-based questionnaire and determined that the rate of gaining weight was higher in individuals with overweight and obesity than in those with a normal weight (25). In this study, the rate of losing appetite and weight was higher in those with COVID-19 than in those without COVID-19 diagnosis. In line with the results of all these studies, we consider that those who had COVID-19 had higher BMI values before the pandemic. This may be evidence of the higher incidence of COVID-19 in individuals with obesity. In addition, the higher rate of those who considered nutrition important for protection from COVID-19 in the participants without COVID-19 may be because they were protected from both obesity and COVID-19 by following healthy nutrition recommendations before the pandemic.

A study conducted to determine the effects of the above-mentioned quarantine on both the diet and physical activity habits of Lithuanians found that the physical activity levels of more than half of the participants decreased during the quarantine period, and this decrease was higher in those who gained weight than in those whose weight did not change (25). Studies conducted in Italy and Spain reported that the rate of those who did not exercise did not change before and during quarantine, but the rate of those who exercised five times a week or more frequently increased during quarantine (23, 26). A descriptive study evaluated the data of 187 countries from different parts of the world and found a 27.3% reduction in the average daily step count of people worldwide within 30 days of the declaration of the pandemic by the WHO (27). Another study reported that the number of days of upper respiratory tract infection in the 12 weeks decreased by 43% in those who did five or more moderate physical activities per week compared with those who had sedentary lifestyles (28). Studies have shown that individuals with low physical activity levels or exercise capacity have a higher risk of hospitalization due to COVID-19 and that physically active COVID-19 patients have a faster recovery time than inactive ones (29, 30). In this study, the rate of regular physical activity was lower in those with COVID-19 than in those without COVID-19. Similar to our study, a community-based case-control study conducted in South Korea reported that COVID-19 patients had lower physical activity levels (21). Cho et al. (21) also showed that as the level of physical activity increases, the risk of COVID-19 morbidity and mortality decreases. By contrast, a hospital-based case-control study conducted in Iran found that those in the case group had higher physical activity levels than those in the control group (31). Moderate regular exercise supports the immune system and protects against viral infections. It also reduces the risk of contracting COVID-19 by suppressing inflammation and reducing the risk of obesity (32, 33).

As a result of a study conducted to determine the interest in the use of vitamins during the COVID-19 pandemic using Google Trends data, the trend towards vitamins reached its peak in March 2020, when COVID-19 was declared a pandemic, and vitamins C and D have been the most sought-after types of vitamins in the world (34). Sales of vitamin C, multivitamins, and zinc supplements increased dramatically in the United Kingdom and the United States during the pandemic. The risk of contracting COVID-19 decreases in those who take multivitamins and vitamin D supplements, particularly women (35). The significance of micronutrients was emphasized once again during the pandemic as they support the immune system, protect against oxidative stress (e.g., zinc, vitamin C), limit excessive inflammatory responses, and have anti-viral effects (e.g., zinc, vitamin D, selenium). In particular, insufficient levels of vitamins D and C, zinc, and selenium are associated with increased risk of COVID-19 and a more severe prognosis of the disease. Therefore, supplementing a balanced diet with micronutrients is a safe, effective, and low-cost strategy especially for at-risk groups during the COVID-19 pandemic. Further studies are needed for concrete evidence in this regard (36, 37). A cross-sectional study conducted online via the Spanish Society of Community Nutrition website and social media reported that approximately one-fifth of the participants used nutritional supplements during the pandemic.

They mostly used multivitamins and mineral supplements, followed by vitamin D and vitamin C supplements; also, the use of nutritional supplements was higher in women and those aged 35-54 years (38). In another study, it was determined that 53.6% of health workers used nutritional supplements and the most frequently used nutritional supplements were vitamins D and C, respectively (24). There is one study suggesting that the risk of contracting COVID-19 infection is reduced in those who use nutritional supplements (35). However, no study compares the use of nutritional supplements in those with and without COVID-19. Our study found that the rate of using nutritional supplements during the pandemic was significantly higher in those with COVID-19 than in those without COVID-19. This result is congruent with the one suggesting that those with COVID-19 have a higher budget for nutrition and consume more fruits and less soft drinks than those without COVID-19. Based on these data, it may be concluded that some healthy nutrition recommendations are applied by people after they are diagnosed with COVID-19.

A study reported that about half of Lithuanian adults ate more snacks and meals and more than half of them cooked more often at home during the quarantine period than before it (25). In another cross-sectional study that collected data online in the capital of Saudi Arabia, 35.6% of the participants reported cooking at home every day before the pandemic, while this rate increased to 85.6% during the pandemic (39). In addition, a study conducted in the city of Guelph in Wellington country, Ontario, Canada, found that families spent more time cooking and ate out less during the pandemic (40). Another study conducted in Italy reported that consumption of homemade recipes increased during the quarantine period, and that most of the participants (75.8%) purchased food from supermarkets with only 9% of them purchasing food online (23). Another study conducted in Riyadh found that the proportion of people who buy food online increased from 3% to 28.6% after the pandemic (39). It has been shown that 8.4% of healthcare professionals in Türkiye increase their food orders from outside and 16% do their grocery shopping online (24). In our study, the rate of online food purchases during the pandemic was higher in those with COVID-19 (34.8%) than in those without COVID-19 (25.3%) ($p < 0.05$). In addition, the rate of ordering food online was higher in those without COVID-19 (63.7%) than in those with COVID-19 (51.5%). This may be because those with COVID-19 were quarantined for a certain period (1-2 weeks) and avoided the risk of infection, so they preferred to shop for food in online markets and prepare healthy meals at home. The fact that 48.7% of Polish people are afraid of contracting SARS-CoV-2 when grocery shopping supports our idea of avoiding the risk of infection (22). In addition, the fact that those without COVID-19 in this study were younger and single may be one reason for the higher rate of ordering food online.

Different changes were detected in people's nutritional habits between countries during quarantine during the pandemic. For example, among Spanish people, while one group was reported as having an increased consumption of vegetables, fruits, legumes, and fish, other groups were observed with diverse dietary patterns where alcohol, sugary beverages, and processed food products rich in fat, salt and sugar were consumed (38).

In Poland, the daily consumption of vegetables, fruits, and legumes was found to be lower among individuals with high BMI, especially in individuals with obesity, while their consumption of meat, sweet, savory snacks and fast food was found to be higher (22). A study conducted in Lithuania reported that individuals who gained weight during the quarantine period consumed more red meat, soft drinks, fast food, pastries, and fried food than those who did not (25). It was determined that the consumption of homemade desserts, pizza and bread, cereals, legumes, white meat, and hot beverages increased in Italians, while their consumption of fresh fish, packaged foods and alcohol decreased (23). Another study conducted in Iran found no significant difference in the dietary habits of those in the case and control groups over the past year and suggested that consuming ayran and yogurt helped protect against COVID-19 (31). Approximately 15% of Germans consumed more nuts/seeds and fish and 20% of more eggs while approximately 40% of consumed less fast food, and 13-20% of fewer desserts, pastries, and alcoholic beverages (41). In this study, according to the results regarding food consumption frequencies over the past month, the rates of consuming fruits and herbal tea 5-6 times a week or more, red meat 3-4 times a week or more, and no sugary/carbonated beverages were found to be higher in those with COVID-19 than in those without COVID-19. In addition, it was determined that about one-quarter of Polish people consumed more than one fruit and vegetable per day during the quarantine period, and nearly half of them consumed meat and meat products more than once a week (22); approximately one-fifth of Italian people decreased their fruit consumption, the majority of them did not change their red meat consumption, and approximately 20% increased their consumption of hot beverages (23); one-fifth of Lithuanian people increased their fruit consumption, and the majority of them did not change their red meat consumption (25); the rate of Spanish people adhering to the Mediterranean diet slightly increased, and the rate of those consuming red meat and products three times a week or more, and the rate of those consuming carbonated-sweetened beverages and fruits twice a week or more increased (26); Canadian families consumed approximately four servings of fruit and vegetables per day (40); also, at least 20% of Germans consumed more fruits and vegetables, approximately %16 to less meat, and approximately %10 fewer sugary soft drinks (41). The WHO recommends consuming fruits and vegetables daily and red meat 1-2 times a week during the pandemic, and choosing fresh vegetables and fruits instead of snacks with high sugar, fat, and salt content. It can be seen from the results of studies from different countries that the recommended consumption of five portions of fruits and vegetables a day is not being met. Fruits and vegetables with vitamins C and A and meat and products with high-quality protein at recommended levels must be consumed during times of infectious disease due to their positive effects on the immune system and antioxidant capacity. The higher frequency of red meat and fruit consumption in those with COVID-19 in this study may be evidence that those who have had COVID-19 follow the dietary recommendations.

4.1. Limitations

Similar to this study, the other studies mostly used online surveys during the COVID-19 pandemic. As the rate of internet use is higher among young people and the majority of participants in our study were young and women, the dietary and lifestyle habits of the older adults, men, and those without internet access may not have been reflected in the study. Since the participants self-reported their height and weight data, the BMI values may not have fully reflected the correct ones. As another limitation, the food consumption frequency form used in the study contained a limited variety of food groups and did not include a quantity variable to reduce the possibility of participants leaving the study. Also, in this study, since the dietary habits of the people before the diagnosis of COVID-19 were not questioned, the cause and effect relationship could not be determined whether there was a change in their diet due to the COVID-19 disease.

5. Conclusions and Recommendations

To our knowledge, this is the first study conducted in Türkiye to compare the dietary habits of those with and without a COVID-19 diagnosis. The rates of using nutritional supplements, consuming red meat, fruits, and herbal tea more often, and avoiding sugary/carbonated beverages were higher in those with COVID-19. In line with these results, it may be considered that those with COVID-19 try to comply with healthy nutrition recommendations.

6. Contribution to the Field

Since the beginning of the COVID-19 pandemic, studies showing the effects of pandemic and quarantine on the nutritional habits of individuals from different countries have been published, but in Türkiye, ours is the first study with a wide sample that compares the nutritional habits of individuals with and without COVID-19 diagnosis. Thus, this study will make a significant contribution to international literature from Türkiye. Our results can be used to prepare appropriate nutritional guidelines for pandemic and quarantine periods.

Ethical Aspects of the Research

Ethics committee approval (2020/215) was obtained from the Social and Human Sciences Ethics Committee at Erciyes University to conduct the study. Participants were informed about the study via the Google platform, and their consent was obtained through an informed consent form.

Conflict of Interest

This article did not receive any financial fund. There is no conflict of interest regarding any person and/or institution.

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Authorship Contribution

Concept: TAK, MY; **Design:** TAK, MY; **Supervision:** TAK, MY; **Funding:** TAK, MY; **Materials:** TAK, MY; **Data Collection/Processing:** TAK, MY; **Analysis/ Interpretation:** TAK, MY; **Literature Review:** TAK, MY; **Manuscript Writing:** TAK, MY; **Critical Review:** TAK, MY.

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