


Evaluation of the Effect of the COVID-19 Pandemic on the Use of Food Supplements in Individuals Aged 18 and Over

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ABSTRACT

Introduction: Worldwide, the COVID-19 epidemic remains a serious as an important health problem. Vitamins, minerals, probiotics, and other products that we know as nutritional supplements have received a lot of attention since the beginning of the pandemic, considering their anti-inflammatory, antioxidant, and immune system effects. The aims of this study are to evaluate the reasons and prevalence of the take of nutritional supplements in addition to the normal diet during the COVID-19 pandemic and to observe the effects of the COVID-19 pandemic on individuals' efforts to live a healthy life.

Material-Method: This study is a descriptive cross-sectional study. The data of the study was obtained through an online questionnaire containing 24 questions. The application of the questionnaire was carried out between August 1, 2021 and August 31, 2021. The online survey was delivered to people aged 18 and over living in Turkey by snowball method. Statistical evaluation was done with SPSS (statistical packet for the social science) 20.0 package program. Chi-square analysis was taken in the evaluation of categorical data.

Results: The study group was formed with 513 people. While 225 (43.9%) participants in the study received nutritional supplements, 288 (56.1%) individuals reported that they did not take nutritional supplements. The frequency of using nutritional supplements was higher in women (50.9%) than in men (29.6%) ($p < 0.001$). The frequency of taking nutritional supplements in the undergraduate-graduate education group was higher than in the other groups ($p < 0.05$). The frequency of taking nutritional supplements was found to be higher in the high monthly income group (4,001 ₺ and above) than in the other groups ($p < 0.05$). The frequency of taking nutritional supplements (67.0%) was higher in those who had COVID-19 infection (38.9%) than in those who did not ($p < 0.05$). Multivitamin was the most common combination of nutritional supplement taken in those taking nutritional supplements (10, 4.4%). Those who took nutritional supplements believed more than the other group that nutritional supplements taken in appropriate doses protected against COVID-19 infection ($p < 0.01$).

Conclusion: For the study group, it is recommended that family physicians provide counseling on the correct take of other nutritional supplements other than multivitamins.

Keywords: COVID-19 pandemic, nutritional supplement, adults

INTRODUCTION

Coronavirus disease-2019 (COVID-19) is an emerging infectious respiratory disease caused by severe acute respiratory syndrome coronavirus2 (SARS-Cov2), first detected in Wuhan, China in early December 2019 (Pan and Zhang, 2020).

In March 2020, the COVID-19 outbreak was declared a global epidemic by the World Health Organization (WHO). As of 1 October 2021, more than 233,500,000 confirmed cases have been diagnosed in more than 130 countries and territories, resulting in approximately 4,700,000 deaths (WHO, 2020).

Worldwide, the COVID-19 epidemic still maintains its seriousness as an important health problem. A lot of scientific research has been done in the nearly two years since its emergence. The disease pathogenesis of this new species, which emerged in the coronavirus family, was tried to be understood and treatment plans were created for it. With the developing technology, vaccination studies have accelerated. As a result of vaccine studies around the world, more than one type of vaccine created against COVID-19 has been started to be implemented in order to end the pandemic and provide immunization. In addition to all these treatment and vaccination studies, the pandemic also caused changes in people's daily lifestyles (Cihan, 2021). Many individuals have experienced the stress of the pandemic very intensely, as well

as the anxiety of the socioeconomic consequences of the quarantine process. Evidence is reported that anxiety and stress affect people's food choices and dietary habits. At the same time, the quarantine process brought with it less physical activity and a sedentary lifestyle as a result of being confined to homes. This lack of physical activity and accompanying psychological problems during the pandemic were associated with disturbances in people's sleep patterns, changes in eating habits, and reduced exposure to sunlight (Pérez-Rodrigo et al., 2021).

Since the beginning of the COVID-19 pandemic, it has been considered an important issue for people to strengthen their immune systems against the virus. One of the main factors affecting the immune status of individuals and the body's response to disease is dietary habits. More than 2,500 years ago, Hippocrates said: "Let food be your medicine, and medicine your food" (Aman and Masood, 2020).

Nutrition seems to be an important approach in the prevention of disease epidemics together with a healthy lifestyle, including regular physical activity, quality sleep, and stress management. Considering the antioxidant, anti-inflammatory, immunomodulatory and neuroprotective effects of various macro and micronutrients, it is clear that in addition to nutrition, it may be useful to prevent infection and/or improve treatment outcomes (Ozenoglu and Gulbahar, 2020).

Since ancient times, people have used plants not only as food but also as a medicine against viral infections, thanks to some of the substances in them, although the exact mechanism is not understood. These plants, also known as medicinal plants, and the products obtained from them are produced and taken as nutritional supplements in the commercial sense today (Guler et al., 2021).

Vitamins, which we know as nutritional supplements, from A to K, minerals, probiotics, and prebiotics, omega-3 fatty acids, basic protein structures such as beta carotene, propolis, ginseng, glucosamine, herbal products such as green tea, selenium, turmeric have been around since the beginning of the pandemic. It has received much attention due to its anti-inflammatory, antioxidant, and immune system effects. It has been observed that people try to acquire healthier eating habits against this virus, which has not yet been cured, and increase their consumption of nutritional supplements. This study was planned to learn the reasons for people's tendency to nutritional supplements in this process compared to the pre-pandemic period, what kind of nutritional supplements they use and the sources of access to information (Thirumdas et al., 2021).

The aims of this study are to evaluate the reasons and prevalence of the take of nutritional supplements taken in addition to the normal diet during the COVID-19 pandemic, which has been going on for more than one year, and to observe the effects of the COVID-19 pandemic on the individuals' efforts to live healthily.

MATERIAL-METHOD

This study is a descriptive cross-sectional study. The data of the study was collected through an online questionnaire containing 24 questions and based on the literature (Adekola et al., 2021; Cencic and Chingwaru, 2010; Dundar and Argun, 2021; Guler et al., 2021; Kanak et al., 2021; Samur, 2008; Thirumdas et al., 2021; Turkish Food Codex Supplementary Foods Communiqué, 2013; WHO, 2020) and an online questionnaire containing 24 questions. The application of the questionnaire was carried out between August 1, 2021 and August 31, 2021.

In the first part of the questionnaire, some sociodemographic characteristics (age group, gender, marital status, how many children they have, education level, occupation, monthly income, residence, and who they reside with during the pandemic) were questioned.

Job status is coded as not working, a civil servant, blue-collar, student, and private sector. "Other" code has been opened for those who do any other business.

In this study, monthly income distribution was accepted as very low (below 849 ₺), low (850-2,000 ₺), medium (2,001-4,000 ₺), and high (4,001 ₺ and above). The place of residence was asked as "provincial center, district center, and village/town".

In the questionnaire, smoking and alcohol habits were taken into consideration together and questioned. They were asked about the history of COVID-19 and the course of COVID-19 in those who did. Any history of chronic disease was questioned. An open-ended response was obtained from those with a history of chronic disease.

The second part of the questionnaire included questions about nutritional supplements. A "yes/no" answer was requested to the question about "using nutritional supplements during the pandemic", which was the dependent variable of our study. Those who answered "yes" to this question also answered the following questions of the survey:

"Has there been a change in your take of nutritional supplements compared to pre-pandemic? How often do you take nutritional supplements? Please indicate which nutritional supplements you take? From which source do you get information about nutritional supplements? Where do you get nutritional supplements from? What are your reasons for using nutritional supplements? Have you seen the benefits of nutritional supplements?"

To those who do not take nutritional supplements, "What is the reason for not using nutritional supplements? (You can mark more than one option)" was asked. The following options are offered:

"I do not know what it is.; I find the price expensive; I don't believe it's healthy; There is a risk of an allergic reaction."

As the last question of the survey to all participants, "Do you agree with the idea that nutritional supplements taken in

appropriate doses are protective against COVID-19 infection?" was asked.

The population of the study is voluntary individuals aged 18 and over. With at least 10 volunteers for each question of the survey, it was aimed to reach at least 240 people. The online survey was delivered to people aged 18 and over living in Turkey by snowball method. A total of 513 people answered the questionnaire during the study period. After controlling the responses and data quality of these questionnaires, it was decided to include all of them in the study. Thus, the working group was formed with 513 people.

At the beginning of the *online* survey, it was ensured that the participants read the information letter for the research and were included in the study voluntarily by pressing the "yes" button even though they gave their consent.

The study was approved by the Izmir Katip Celebi University Non-Interventional Clinical Research Ethics Committee (Date: August 26, 2021 and Decision no: 0372). This study was presented as a medical specialization thesis (Dr. Pelin Gurhan, Department of Family Medicine) at Izmir Katip Celebi University.

Statistical evaluation was done with SPSS (*statistical packet for the social science*) 20.0 package program. The obtained frequency values were presented as (n, %). Chi-square analysis was used in the evaluation of categorical data. A value of $p < 0.05$ was accepted to decide on statistical significance.

RESULTS

In the study, 29.4% of the study group were in the 51-65 age group, 67.1% were female, and 70.0% were married. While 179 (34.9%) of the study participants had no children, 182 (35.5%) had two children. There were 420 (81.9%) individuals with undergraduate and graduate education levels. Those who were civil servants had a rate of 40.7% ($n=209$). It was found that there were 412 (80.3%) people whose monthly family income was over 4,001 ₺. And 423 (82.5%) people lived in the

city center. During the COVID-19 pandemic, 367 (71.5%) people were with their spouses and/or children.

The rate of those who did not use either cigarettes or alcohol in the study group was 66.1% ($n=339$). The rate of those who had COVID-19 disease during the pandemic was 17.7% ($n=91$). Of these 91 people, 51.6% ($n=47$) declared that they had the disease as "severe symptoms, home-medicated treatment" and 30.8% ($n=28$) as "mild symptoms, no drug treatment".

The rate of those with any chronic disease was 35.1% ($n=180$). The three most common diseases among 180 people with any chronic disease were hypertension in 31 (17.2%), diabetes mellitus in 26 (14.4%), and thyroid disease in 25 (13.9%). While 225 (43.9%) participants in the study took nutritional supplements, 288 (56.1%) individuals reported that they did not take nutritional supplements.

Those who do not take nutritional supplements and those who take them; There was no statistically significant difference in terms of age group, marital status, how many children they had, occupation, residence, who they lived with during the pandemic, smoking, and alcohol use, and chronic disease characteristics ($p > 0.05$ for each).

The frequency of taking nutritional supplements was higher in women (50.9%) than in men (29.6%) ($p < 0.001$). The frequency of taking nutritional supplements in the university education group was higher than in the other groups ($p < 0.05$). The frequency of taking nutritional supplements was found to be higher in the high monthly income group (4,001 ₺ and above) than in the other groups ($p < 0.05$). The frequency of taking nutritional supplements (67.0%) in those who had COVID-19 infection was higher than in those who did not (38.9%) ($p < 0.05$).

There was no significant difference in the course of the disease in 91 people who had COVID-19 infection, according to the status of taking or not taking nutritional supplements ($p > 0.05$).

The comparison of those who did and did not take nutritional supplements according to some characteristics is presented in **Table 1**.

Table 1. Comparison of those who do and do not take nutritional supplements according to some characteristics

| Characteristics | Those who do not take nutritional supplements (N: 288) | | Those who take nutritional supplements (N: 225) | | Statistical analyses | |
|--|--|------|---|------|----------------------|--------|
| | n | % | n | % | X ² | p |
| Age group (year) | | | | | | |
| 18-30 | 68 | 57.6 | 50 | 42.4 | 7.348 | 0.119 |
| 31-40 | 49 | 48.5 | 52 | 51.5 | | |
| 41-50 | 61 | 52.6 | 55 | 47.4 | | |
| 51-65 | 90 | 59.6 | 61 | 40.4 | | |
| 65 and upper | 20 | 74.1 | 7 | 25.9 | | |
| Gender | | | | | | |
| Male | 119 | 70.4 | 50 | 29.6 | 20.854 | <0.001 |
| Female | 169 | 49.1 | 175 | 50.9 | | |
| Marital status | | | | | | |
| Single | 71 | 54.6 | 59 | 45.4 | 0.229 | 0.892 |
| Widow, divorced, lost spouse | 13 | 54.2 | 11 | 45.8 | | |
| Married | 204 | 56.8 | 155 | 43.2 | | |
| Presence of any chronic disease | | | | | | |
| No | 184 | 55.3 | 149 | 44.7 | 0.302 | 0.583 |
| Yes | 104 | 57.8 | 76 | 42.2 | | |

Table 1 (Continued). Comparison of those who do and do not take nutritional supplements according to some characteristics

| Characteristics | Those who do not take nutritional supplements (N: 288) | | Those who take nutritional supplements (N: 225) | | Statistical analyses | |
|---|--|------|---|------|----------------------|------------------|
| | n | % | n | % | X ² | p |
| How many children does she/he have | | | | | | |
| 1 | 51 | 54.3 | 45 | 45.7 | 7.494 | 0.112 |
| 2 | 114 | 62.6 | 68 | 37.4 | | |
| 3 | 26 | 55.3 | 21 | 44.7 | | |
| 4 and upper | 8 | 72.7 | 3 | 27.3 | | |
| No | 89 | 49.7 | 90 | 50.3 | | |
| Educational level | | | | | | |
| Primary education | 5 | 71.4 | 2 | 28.6 | 6.251 | 0.044 |
| University | 225 | 53.6 | 195 | 46.4 | | |
| High school | 58 | 67.4 | 28 | 32.6 | | |
| Job | | | | | | |
| No job | 33 | 60.0 | 22 | 40.0 | 3.702 | 0.593 |
| Civil servant | 113 | 54.1 | 96 | 45.9 | | |
| Other | 40 | 59.7 | 27 | 40.3 | | |
| Blue collar | 7 | 77.8 | 2 | 22.2 | | |
| Student | 17 | 63.0 | 10 | 37.0 | | |
| Private sector | 78 | 53.4 | 68 | 46.6 | | |
| Family monthly income | | | | | | |
| Below 850 Turkish Lira (₺) | 9 | 69.2 | 4 | 30.8 | 10.825 | 0.013 |
| 850-2,000 ₺ | 17 | 89.5 | 2 | 10.5 | | |
| 2,001-4,000 ₺ | 41 | 59.4 | 28 | 40.6 | | |
| 4,001 ₺ and above | 221 | 53.6 | 191 | 46.4 | | |
| Place of residence | | | | | | |
| Provincial center | 233 | 55.1 | 190 | 44.9 | 2.180 | 0.336 |
| District center | 46 | 59.0 | 32 | 41.0 | | |
| Village/town | 9 | 75.0 | 3 | 25.0 | | |
| Who resides in the pandemic | | | | | | |
| Mother, father, and siblings | 50 | 60.2 | 33 | 39.8 | 4.504 | 0.342 |
| Friends | 5 | 71.4 | 2 | 28.6 | | |
| Other | 4 | 66.7 | 2 | 33.3 | | |
| Spouse and/or children | 207 | 56.4 | 160 | 43.6 | | |
| Single | 22 | 44.0 | 28 | 56.0 | | |
| Cigarette and alcohol habits | | | | | | |
| Both | 25 | 54.3 | 21 | 45.7 | 0.484 | 0.922 |
| None | 194 | 57.2 | 145 | 42.8 | | |
| Only alcohol | 29 | 53.7 | 25 | 46.3 | | |
| Only cigarette | 40 | 54.1 | 34 | 45.9 | | |
| History of being positive for COVID-19 | | | | | | |
| Yes | 30 | 33.0 | 61 | 67.0 | 24.126 | <0.001 |
| No | 258 | 61.1 | 164 | 38.9 | | |
| Disease course of those who have COVID-19 infection (N: 91) | | | | | | |
| Severe symptoms, home medicated | 12 | 25.5 | 35 | 74.5 | 4.564 | 0.325 |
| Asymptomatic | 4 | 50.0 | 4 | 50.0 | | |
| COVID-19 intensive care hospitalization | 2 | 66.7 | 1 | 33.3 | | |
| Mild symptoms, no medication | 11 | 39.3 | 17 | 60.7 | | |
| COVID-19 service hospitalization in hospital | 1 | 20.0 | 4 | 80.0 | | |
| Total | 288 | 56.1 | 225 | 43.9 | | |

The distribution of the answers given by a total of 225 people who take nutritional supplements to the questions about the take of nutritional supplements is presented in **Table 2**.

It was observed that a total of 225 people who took nutritional supplements took nutritional supplements in different combinations. Among these, the most common nutritional supplement usage combinations were 10 (4.4%)

people multivitamin, 9 (4.0%) vitamin D-other vitamins, 8 (3.6%) people only vitamin D, 8 (3.6%) people multivitamin-vitamin D and 7 (3.1%) only vitamin C.

It was questioned from which sources the nutritional supplement intake was decided in those who took nutritional supplements. The most frequent answers to this question are as follows: 50 (22.2%) doctors, 26 (11.6%) television-newspapers and similar media, 19 (8.4%) doctors-pharmacists,

Table 2. Distribution of answers given to the questions about the use of food supplements by those using nutritional supplements

| Questions and answers | n | % |
|---|-----|------|
| Has there been a change in the take of nutritional supplements compared to before the pandemic? | | |
| I've never used. | 2 | 0.9 |
| I used it for the first time with the pandemic. | 77 | 34.2 |
| I was already using it, no change. | 59 | 26.2 |
| I started taking it more with the pandemic. | 87 | 38.7 |
| How often do you take nutritional supplements? | | |
| One day per week | 39 | 17.3 |
| 2-5 days a week | 82 | 36.4 |
| Every day | 72 | 32.0 |
| 1 day per month | 11 | 4.9 |
| Other | 20 | 8.9 |
| What are your reasons for taking nutritional supplements? | | |
| Strengthen the immune system | 202 | 89.8 |
| For iron and vitamin deficiencies | 10 | 4.4 |
| For bone health-osteoporosis | 1 | 0.4 |
| To protect health and prevent diseases | 10 | 4.4 |
| Have you seen the benefits of nutritional supplements? | | |
| Yes | 214 | 95.1 |
| No | 11 | 4.9 |

Table 3. Distribution of reasons for not taking nutritional supplements in a total of 288 people who did not take nutritional supplements

| Answers | n | % |
|--|-----|------|
| I find the price expensive. | 32 | 11.1 |
| I find the price expensive and I do not believe that it is healthy | 16 | 5.6 |
| I do not know what it is. | 109 | 37.8 |
| I do not know what it is and I find the price expensive | 9 | 3.1 |
| I do not know what it is and I don't believe it's healthy | 16 | 5.6 |
| I do not believe it is healthy. | 106 | 36.8 |

Table 4. Comparison of the groups that use and do not take nutritional supplements in terms of their responses to the idea that "Nutritional supplements used in appropriate doses are protective against COVID-19 infection"

| Answers | Those who do not take nutritional supplements (N: 288) | | Those who take nutritional supplements (N: 225) | | Statistical analyses | |
|----------------------|--|------|---|------|----------------------|--------|
| | n | % | n | % | X ² | p |
| I never agree | 45 | 91.8 | 4 | 8.2 | 121.776 | <0.001 |
| I partially disagree | 61 | 66.3 | 31 | 33.7 | | |
| I'm undecided | 92 | 81.4 | 21 | 18.6 | | |
| I partially agree | 71 | 44.1 | 90 | 55.9 | | |
| I agree | 19 | 19.4 | 79 | 80.6 | | |

16 (7.1%) internet, 15 (6.7%) books -television-newspaper and similar media, 13 (5.8%) pharmacists, and 10 (4.4%) doctors-the Internet.

It was questioned from where those who took nutritional supplements obtained the nutritional supplement. The most frequent answers to this question are, as follows: 132 (58.7%) pharmacies, 30 (13.3%) pharmacies-herbalists, 21 (9.3%) pharmacy-websites, 11 (4.9%) pharmacies-markets, and 9 (4.9%) the Internet site.

Among those who did not take nutritional supplements, the most common answers given for the reasons for not using nutritional supplements were "I don't know what it is" with 109 (37.8%) and "I don't believe it is healthy" with 106 (36.8%). The distribution of reasons for not taking nutritional supplements in a total of 288 people who did not take nutritional supplements is presented in **Table 3**.

The comparison of the groups that took and did not take nutritional supplements in terms of their responses to the

statement "Nutritional supplements taken in appropriate doses are protective against COVID-19 infection" is presented in **Table 4**.

Those who took nutritional supplements believed more than the other group that nutritional supplements taken in appropriate doses protected against COVID-19 infection (χ^2 : 121.176; $p < 0.05$).

DISCUSSION

Approximately 70% of the study group consisted of women and married people. Those with university education levels also had a frequency of approximately 80%. A face-to-face survey, is expected to reach mostly married women and women in households. Our online survey study also yielded similar results. However, our study group does not reflect the education level of the general population aged 18 and over, as

accessing an *online* survey requires computer use and mastery of technological knowledge. The study was carried out in a group with a very high education level. Depending on the higher education level, the study group consisted of approximately 40% civil servants and 80% high-income people. We should be interpreted by thinking that the results of our study were obtained from a group with higher education and high income and predominantly female. During the COVID-19 pandemic, those who were with their spouse and/or children were approximately 70%. This result suggests that the study group mainly has a nuclear family type of home life and therefore they will have regular eating habits.

The question that was the independent variable of our study was “using nutritional supplements”. In the answers given to this question, it was determined that less than half of the study group (43.9%) took nutritional supplements. Thus, our study group was divided into two categories, and the responses of those who took nutritional supplements and those who did not were compared. It was seen that approximately 70% of the group that took nutritional supplements were married and female. Those in this group had a very high frequency of higher education and high income (86.7% and 84.9%, respectively). About 70% of them were with their spouse and/or children during the COVID-19 pandemic, which indicates a regular family life and eating habits.

The study group was compared in terms of some characteristics according to the status of “taking food supplements”. In this study, it was determined that food supplements were taken at a higher frequency (50.9%) in women than in men ($p < 0.001$). When the literature was searched, no study was found that gave a similar result to ours. However, the result of the study conducted by Louca et al. (2021) in 372,720 UK participants (175,652 nutritional supplement users and 197,068 non-users) in 2021 is a study that reveals the effect of food supplements on COVID-19. In their study, a weak but significant association was observed between the use of probiotics, omega-3 fatty acids, multivitamins, or vitamin D supplements in women and a lower risk of testing positive for SARS-CoV-2. The presence of such literature information may cause women to turn to food supplements.

Another finding of our study that gave a statistically significant result was the frequency of taking food supplements was higher in those in the undergraduate-graduate education group than in the other groups ($p < 0.05$). For a possible reason for this result, it can be said that people with higher education levels may have more access to information tools and may have turned to food supplements to protect themselves from the pandemic. In a study by Ogundijo et al. (2021) in England, 792 people aged between 18 and 91 responded to the online survey. The effects of the pandemic on purchasing healthier food were reported to be greater among younger generations and participants working full-time or part-time. In addition, participants with higher educational qualifications were more affected by the pandemic. The younger generations in their study can also be considered higher education students. Puścion-Jakubik et al. (2021) evaluated the knowledge and intake of dietary supplements during the COVID-19 pandemic in Poland. They reported that

food supplements were used more by the highly educated (59.0%).

It can be thought that it will be easier for high-income people to reach food supplements than other groups. In this study, the frequency of taking food supplements was found to be higher in the high monthly income group (4,001 ₺ and above) than in the other groups ($p < 0.05$). We could not find any study in the literature in which we could discuss this finding.

In this study, the frequency of taking food supplements (67.0%) was higher in those who had COVID-19 infection than in those who did not (38.9%) ($p < 0.05$). We could not find any study investigating this finding in the literature, and this result suggests that the group, which was insensitive to protection before the COVID-19 infection, increased their sensitivity to preventive measures after they became ill.

In our study, we found that taking food supplements in patients with COVID-19 infection did not affect the course of the disease ($p > 0.05$). Despite our finding that being infected with COVID-19 is effective in turning to food supplements, it can be thought that those in our study group with COVID-19 do not have enough knowledge about the effective and appropriate use of food supplements. In addition, there are research reports that provide evidence that food supplements are not effective in COVID-19 infection. One of them is the study of Adams et al. (2020). They reviewed the theoretical mechanisms and evidence regarding the efficacy and safety of certain supplements in the COVID-19 setting, including vitamin C, vitamin D, zinc, elderberry, and silver. They stressed that the evidence evaluating these supplements in COVID-19 patients is still lacking and that providers and patients should not rely on dietary supplements to prevent or treat COVID-19. Hamulka et al. (2021) reported dietary supplements in 2020, using Google Trends (GT) tool in Poland, to reveal an increased interest in foods such as vitamins C and D, zinc, omega-3, garlic, ginger, and turmeric. Survey respondents tended to start food fortification during the first wave of COVID-19. However, they also emphasized that there are no clear and convincing studies supporting the role of dietary supplements in the prevention and treatment of COVID-19. Alyami et al. (2020) investigated information on COVID-19 preventive measures and beliefs regarding the consumption of herbal products for the prevention of COVID-19 infection in 5,258 people in Saudi Arabia. Approximately 22.1% ($n = 1,161$) of the participants reported that they used herbal products or nutritional supplements to prevent disease during the pandemic period. Social media and the internet (39.4%, $n = 372$) were the main motivations for the participants to try herbal products. Vitamin C was the most widely used food supplement to boost immunity and reduce the chance of contracting COVID-19. Researchers also emphasized that the use of herbal products should be evidence-based to ensure patient safety.

In our study, the most common food supplement use combinations in the food supplement group were multivitamin, vitamin D-other vitamins were only vitamin D, multivitamin-vitamin D, and only vitamin C. When the literature is examined, it is observed that most studies have been done on vitamin D. We can summarize the results of these studies, as follows:

Cangiano et al. (2020) examined the two-month mortality rate after the spread of SARS-CoV-2 among 157 residents (aged 60-100 years) of a nursing home in Italy and reported that the mortality rate was inversely proportional to vitamin D supplementation. Galanakis et al. (2020) suggest that vitamin D levels may be linked to COVID-19 transmission and severity. They report that many theoretical studies also point to polyphenols and especially flavonoids as potential inhibitors of SARS-CoV-2 infection. de Faria Coelho-Ravagnani et al. (2021) emphasized the importance of minerals and vitamins such as zinc and vitamins C, A, and D to maintain a well-functioning immune system. Dietary supplementation is not just linked to the prevention of COVID-19. However, it reports that supplementing with vitamins C and D, as well as zinc and selenium, is potentially beneficial for people who are at risk for respiratory viral infections or who have been identified as nutrient deficient. According to Kohlmeier's (2020) study, in order to avoid vitamin D deficiency, people with excess body fat, dark skin color, or older age, especially those living in high altitudes, exposed to low ultraviolet B exposure need to take a moderate daily dose of vitamin D supplements, generally. It showed a greater disparity in the extreme COVID-19 mortality of African-Americans in the US by the state than in northern states in southern states. It can be thought that vitamin D adequacy prevents the easy bases of the virus and thus slows down the spread of the infection. Griffin et al. (2021) report that there is increasing evidence linking vitamin D deficiency with the risk of COVID-19. Serum 25(OH)D concentrations in the UK typically fall by around 50% during the winter. This is why the study by Griffin et al. (2021) suggested that the Government should urgently recommend supplementation of 20-25 micrograms (800-1,000 IU) per day. Ferder et al. (2020) reported that vitamin D suppresses the actions of the renin-angiotensin system, which has a decisive role in the pathophysiology of the inflammatory response related to COVID-19 presented evidence that it could be a therapeutic measure. Žmitek et al. (2021) planned a study to investigate vitamin D supplementation practices before (n=602) and during (n=606) the COVID-19 pandemic in Slovenia. Study results showed a significant increase in vitamin D supplementation in the population. The average daily intake of vitamin D in supplement users was 25 µg, and approximately 95% of supplement users had safe vitamin D levels below 100 µg/day. Grant et al. (2020), evidence supporting the role of vitamin D in reducing the risk of COVID-19 suggests that the outbreak occurred in winter when 25-hydroxyvitamin D (25(OH)D) concentrations were lowest. In the Southern Hemisphere, the number of cases is low towards the end of summer; vitamin D deficiency has been found to contribute to acute respiratory distress syndrome; and reported that case fatality rates, both associated with lower 25(OH)D concentration, increase with age and chronic disease comorbidity. In their study, Selcuk and Sahin (2021), from Turkey, aimed to determine the factors associated with the use of food supplements in 424 adult individuals during the COVID-19 epidemic. They reported that 29.7% of adults used food supplements, and the three most commonly used food supplements were vitamin D (51.6%), multivitamin (31.0%), and vitamin C (27.0%), respectively.

The results of some studies on food supplements other than vitamin D are, as follows:

Mohsen et al. (2021) planned a study on 2,966 people to evaluate the use, knowledge, and attitudes towards dietary supplement use among Lebanese people before and during the COVID-19 pandemic. It has shown that attitudes towards food supplements change as the pandemic unfolds, and people believe that food supplements can improve their health and strengthen their immunity. Study results showed increased weekly or daily estimated intake of antioxidants, vitamin C, vitamin D, vitamin E, zinc, and other vitamins during the pandemic compared to pre-pandemic. Celik et al. (2021) from Turkey reported that curcuminoids and zinc, which are classified as nutraceuticals by the FDA, can provide complementary therapy for COVID-19 patients with their immune-enhancing and antiviral properties. Razzaque (2021) reports that zinc can reduce viral replication and increase immune responses. It emphasizes that consumption of zinc (within recommended upper safety limits) may provide an additional shield against the onset and progression of COVID-19. It has been reported that even after vaccination, low zinc status may affect vaccine responses. Wróbel et al. (2021) conducted a study to check how the COVID-19 pandemic in Poland affected the composition of dietary supplements and other functional food products introduced until March 2021 compared to 2019.

The results of the study showed that the pandemic has changed the ingredients used in functional foods. The highest proportional increase in its use in dietary supplements was noted for potassium. Lange (2021) states that while no food, single nutrient, or nutritional supplement can prevent COVID-19 infection, a balanced diet containing adequate amounts of macronutrients and various micronutrients is a prerequisite for an optimally functioning immune system. Oyagbemi et al. (2021) report that zinc will be beneficial against the COVID-19 pandemic by improving the immune response, minimizing infection and inflammation, and preventing lung damage. However, zinc inhibits viral replication. Veyisoglu and Mendes (2021) from Turkey focused on the fact that the need for micronutrients in nutrition may increase in COVID-19. They concluded that the use of some mineral supplements may be necessary for COVID-19 to meet the increasing need. However, they reported that there is no guide on mineral supplementation for the treatment of COVID-19 because the disease is very new yet.

In our study group, the most frequent source of information for food supplementation was doctors. Considering that there will be information pollution in sources such as television-newspaper-internet, it is seen that the working group has turned to the most reliable source. It should be emphasized in the training that family physicians serving in primary care have an important duty in this regard, and political studies should be carried out to enable family physicians to take part in this issue. There is no literature that can be discussed on this subject.

Among those who did not take dietary supplements, the two most common answers given for the reasons for not taking supplements were "I don't know what it is" and "I don't believe it is healthy". As discussed above, these answers are in line with the scientific data, which states that there is not yet sufficient

evidence for food supplementation in COVID-19 infection. However, it is clear that many studies also provide evidence that food supplements are effective, as presented above. In this regard, it is important that they provide training at a level that can answer the questions of citizens, especially family physicians, especially in primary care institutions.

Another finding of our study was that those who took food supplements believed that food supplements used in appropriate doses protected against COVID-19 infection more than those who did not ($p < 0.05$). This result was one that we expected to appear at the beginning of the study. In addition, a finding indicating the consistency of the answers given by the participants in the study was reached. The literature results presented above provide evidence for the beliefs of people who take food supplements about protection from COVID-19 infection. What needs to be done in this regard may be to increase the level of evidence by contributing more to the literature. In addition, public education should focus on the appropriate dosage and use of food supplements.

Limitations

The most important limitation of this study is that it is a cross-sectional study. Although a total of 513 people were reached, there is no national representation. Results can only be generalized to the study group.

It has been observed that the research that presents findings on many independent variables of the study has not been found in the literature. Therefore, this study contributes to filling an important gap in the literature on a subject that deals with the importance of nutritional supplements during the rapidly advancing COVID-19 pandemic.

CONCLUSION

The study has shown that those who took food supplements believed that food supplements used in appropriate doses were protective against COVID-19 infection according to the others. In addition to all protective measures related to the COVID-19 pandemic, it is important that physicians provide counseling for positive health behaviors, especially nutrition, during the pandemic. For the study group, it is recommended that family physicians provide counseling on the correct take of other nutritional supplements other than multivitamins.

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Availability of data and materials: All data generated or analyzed during this study are available for sharing when appropriate request is directed to corresponding author.

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