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Increased Use of Dietary Supplements and Herbal Products in Adults During COVID-19: A Cross-Sectional Study

COVID-19 Pandemi Döneminde Erişkinlerde Besin Takviyeleri ve Bitkisel Ürünlerin Artan Kullanımı: Kesitsel Bir Araştırma

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ABSTRACT Objective: The aim of the study is to determine the use of dietary supplements and herbal products in the coronavirus disease-2019 (COVID-19) pandemic, which has affected the whole world and has not had a fully effective treatment method yet. **Material and Methods:** The study was conducted with 395 adults aged between 19-65 years. The general characteristics of the individuals, nutritional habits, use of dietary supplements, and herbal products before and during the pandemic period were questioned via a web-based questionnaire. **Results:** During the pandemic, 46.1% of the participants used dietary supplements and 57.0% the participants used herbal products. It was determined that vitamin C, multivitamins, and vitamin D were the most preferred dietary supplement. It was seen that individuals consumed garlic, ginger, and turmeric as fresh herbs, and green tea and other herbal teas (linden, chamomile, sage) during the pandemic period, although they did not use them before. The majority of individuals who used dietary supplements (75.8%) and herbal products (86.2%) during the pandemic stated that they used these products to avoid COVID-19 and strengthen the immune system **Conclusion:** To support the immune function, individuals should be encouraged to maintain a healthy&balanced diet that will meet their daily energy and nutrients needs. Micronutrient supplements should be used under the control of a doctor and dietician by determining deficiencies in individuals who do not have adequate and balanced nutrition, are vegan, or have chronic diseases.

Keywords: COVID-19; dietary supplements; herbal products

ÖZET Amaç: Araştırmanın amacı, tüm dünyayı etkileyen ve henüz tam etkili bir tedavi yöntemi olmayan koronavirüs hastalığı-2019 [coronavirus disease-2019 (COVID-19)] pandemisinde besin takviyeleri ve bitkisel ürünlerin kullanımının belirlenmesidir. **Gereç ve Yöntemler:** Çalışma 19-65 yaş arası 395 erişkinle yürütülmüştür. Bireylerin genel özellikleri, beslenme alışkanlıkları, pandemi dönemi öncesinde ve sırasında besin takviyesi ve bitkisel ürün kullanımları web tabanlı bir anket aracılığıyla sorgulanmıştır. **Bulgular:** Pandemi sırasında bireylerin %46,1'i besin desteği ve %57,0'ı ise bitkisel destek kullanmıştır. C vitamini, multivitaminler, D vitamini ve çinkonun en fazla tercih edilen besin destekleri olduğu belirlenmiştir. Salgın döneminde bireylerin daha önce kullanmadıkları hâlde taze bitki olarak sarımsak, zencefil ve zerdeçal, yeşil çay ve diğer bitki çaylarını (ıhlamur, papatya, adaçayı) tükettikleri görülmüştür. Pandemi sırasında besin takviyeleri (%75,8) ve bitkisel ürünleri (%86,2) kullananların çoğunluğu, bu ürünleri COVID-19'dan korunmak ve bağışıklık sistemini güçlendirmek için kullandıklarını belirtmişlerdir. **Sonuç:** Bağışıklık fonksiyonunu desteklemek için bireyler, günlük enerji ve besin ihtiyaçlarını karşılayacak sağlıklı ve dengeli bir diyet sürdürmeye teşvik edilmelidir. Besin takviyeleri yeterli ve dengeli beslenemeyen, vegan veya kronik hastalığı olan bireylerde eksiklikler tespit edilerek, doktor ve diyetisyen kontrolünde kullanılmalıdır.

Anahtar Kelimeler: COVID-19; besin takviyeleri; bitkisel ürünler

Coronaviruses (CoVs) are single-stranded, positive-polarity, enveloped RNA viruses that target the respiratory tract in humans and animals. They can cause mild infections such as the common cold to more serious infections such as Middle East Respiratory Syndrome (MERS) and severe acute respiratory syndrome (SARS).[1,2] For the first time in December 2019, after the detection of pneumonia cases of unknown etiology in the Wuhan, Hubei province, China, it was identified that the cause of the disease

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was a new CoV which was not previously detected in humans. The disease was named COVID-19 by the World Health Organization (WHO).[2,3] Coronavirus disease-2019 (COVID-19) is seen in more than 200 countries, and it is reported in the WHO data that there are currently more than one hundred million cases all over the world.[4] The first COVID-19 case in Turkey was detected in March 2020 and as of January 2020, there were two million four hundred thousand confirmed cases and over twenty five thousand deaths.[5]

The most characteristic feature of COVID-19 infection is that it is an inflammatory condition that causes a cytokine storm. Increasing proinflammatory cytokines and chemokines and reactive oxygen species can cause pulmonary fibrous, respiratory distress, and mortality.[6] It is known that having a healthy immune system protects individuals against the risk of COVID-19 infection.[7] It is stated that taking sufficient amounts of energy and macro/micronutrients (sufficient protein, antioxidant vitamins, and minerals, etc.) can be effective in defense against infections, including COVID-19, or will have an effect on improving immune system functions.[6,8,9] In addition, some herbs are known to have antibacterial, antiviral, or anti-inflammatory and therapeutic effects due to the phytochemicals, essential oil, and phenolic compounds they contain.[10,11] Herbal products were used to prevent SARS in China in 2003 and influenza A infections in 2009, and guidelines for herbal products were published for the Chinese and Korean to support the current COVID-19 epidemic prevention and treatment process.[12-14] In Turkey, because of the popular belief that "herbal products are naturally sourced, have no harmful or side effects", these products are in high demand.[11] With the appearance of COVID-19 cases, there has been an increase in the demands for dietary supplements and herbal products, and individuals have sought natural methods to prevent the disease and improve the severity of the disease. In a cross-sectional study conducted in Saudi Arabia (n=5,258), 15.7% of individuals think that consuming of nutritional and herbal supplements prevents the spread of COVID-19 more than social distance.[15]

This study was conducted to determine the orientation of adults to dietary supplements and herbal products in the COVID-19 pandemic, which has affected the whole world and has not had a fully effective treatment method yet.

MATERIAL AND METHODS

This descriptive, cross-sectional study was conducted with 395 adults aged 19-65 years between May and June 2020, when the number of COVID-19 cases increased significantly in our country, Turkey. Before the initiation of the study, permissions required were obtained from the Republic of Turkey Ministry of Health COVID-19 Scientific Research Platform Commission (Project number: 2020-05-05T21_13_59) and Akdeniz University Clinical Research Ethics Committee (356/2020). The study was conducted according to the guidelines laid down in the Declaration of Helsinki. Informed consent forms were also obtained from the paticipants with the online form before conducting this study.

The general characteristics of the adults (gender, age, education, etc.), nutritional habits (number of main meals and snacks), their use of dietary supplements, and herbal products before and during the pandemic period, and the products they used were questioned via a web-based questionnaire. A total of 30 herbal products and their use were questioned. The body weight and height of the individuals were recorded in the questionnaire based on the statements of the individuals. Body mass index (BMI) were calculated by the formula [body weight (kg)/height $(m)^2$]. The WHO criteria were used for body mass index classification, and those whose BMI was under 18.5 kg/m^2 were evaluated as underweight, 18.5-24.9 kg/m^2 as normal, 25.0-29.9 kg/m^2 as pre-obesity, and 30.0 kg/m^2 and above as obese.[16]

STATISTICAL ANALYSIS

SPSS (Statistical Package for Social Sciences) version 22.0 (Inc., Chicago, IL, USA) packaged software was used for all statistical analyzes. Numbers and percentage values were used to evaluate qualitative data.

RESULTS

The socio-demographic characteristics of the individuals are given in Table 1. It was determined that

TABLE 1: Socio-demographic characterics of individuals.

	n	%
Gender		
Male	127	32.2
Female	268	67.8
Age (years)		
18-29	165	41.8
30-39	140	35.4
40-49	66	16.7
50 and above	24	6.1
Education level		
High school	24	6.1
Graduate	259	65.6
Postgraduate	112	28.3
Obesity classification		
Underweight	20	5.1
Normal	226	57.2
Overweight	100	25.3
Obese	49	12.4
Presence of chronic diseases	77	19.5

TABLE 2: Nutrition habits during the pandemic period (last one month).

Number of main meals		
2	248	62.8
3	147	37.2
Number of snacks		
1	179	45.3
2	155	39.2
≥3	61	15.4
Nutrition habits changed during pandemic		
Positively	147	37.2
Negatively	122	30.9
Not change	126	31.9
Thinking that adequate and balanced nutrition is effective in preventing COVID-19	342	86.6

COVID-19: Coronavirus disease-2019.

the majority of the individuals participating in the study were women (67.8%), between the ages of 18-29 (41.8%) and undergraduate (65.6%). While more than half of the individuals had normal body weight, 12.4% of them were obese.

It was determined that approximately one-third of the individuals had three main meals and two snacks a day during the pandemic period. While more than half of the individuals stated that their eating habits changed during the pandemic, 30.9% of them stated that their eating habits were negatively affected. Almost all of the individuals (86.6%) stated that adequate and balanced nutrition was effective for protection against COVID-19 (Table 2).

During the pandemic, 61.8% of the individuals found dietary supplementation necessary and half of them (46.1%) used dietary supplements. Similarly, 59.4% of them thought that the use of herbal products was necessary and 57.0% stated that they used herbal products (Figure 1). The majority of individuals who used dietary supplements and herbal products during the pandemic (75.8% and 86.2% respectively) stated that they used these products to avoid COVID-19 and strengthen the immune system (Table 3).

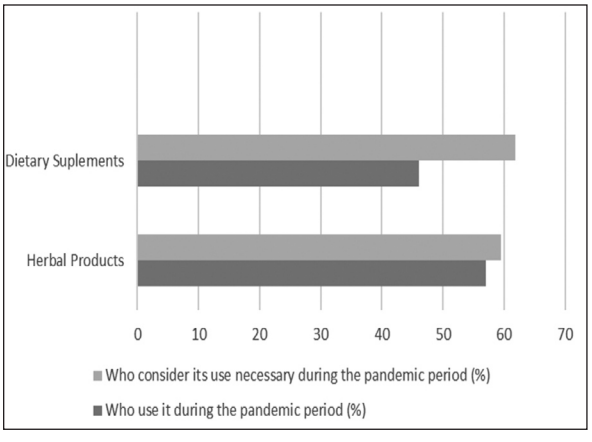


FIGURE 1: Individuals' thoughts on dietary supplements and herbal products use during the pandemic period.

TABLE 3: Reasons for using dietary suplementation and herbal products during the pandemic period.

	Dietary suplementation n (%)	Herbal products n (%)
Use	182 (46.1)	225 (57.0)
Reasons for using		
To avoid COVID-19 and strengthen the immune system	138 (75.8)	194 (86.2)
To lose weight	-	5 (2.2)
Tiredness	19 (10.4)	-
To treat diseases	25 (13.7)	-
Mental health	-	13 (5.8)
Bowel health	-	13 (5.8)

COVID-19: Coronavirus disease-2019.

TABLE 4: Dietary supplements and herbal products frequently used during the pandemic period.

Dietary suplements	Not use n (%)	Use before pandemic period n (%)	Start to use during the pandemic period n (%)
Multivitamin	328 (83.0)	45 (11.4)	22 (5.6)
Vitamin D	320 (81.0)	57 (14.4)	18 (4.6)
Vitamin C	349 (90.6)	22 (5.6)	24 (6.1)
Vitamin B_{12}	369 (93.4)	21 (5.3)	5 (1.3)
Zinc	373 (94.4)	15 (3.8)	7 (1.7)
Herbal products			
Ginger	206 (52.2)	153 (38.7)	36 (9.1)
Turmeric	230 (58.2)	130 (32.9)	35 (8.9)
Green tea	208 (52.7)	157 (39.8)	30 (7.6)
Garlic	59 (14.9)	273 (69.1)	63 (16.0)
Herbal teas (linden, chamomile, sage)	131 (33.2)	223 (56.5)	41 (11.2)
Cinnamon	138 (34.9)	231 (58.5)	26 (6.6)
Clove	234 (59.3)	140 (35.4)	21 (5.3)

Table 4 shows dietary supplements and herbal products that individuals started to use during the pandemic. It was found that those who used dietary supplements during the pandemic period, although they did not use them before, used vitamin C, multivitamin, vitamin D and zinc. It was seen that individuals consumed garlic, ginger, and turmeric as fresh herbs, and green tea and other herbal teas (linden, chamomile, sage) during the pandemic period, although they did not use them before.

DISCUSSION

Considering the antioxidant, anti-inflammatory, immunomodulatory and neuroprotective effects of macro and micronutrients, immune homeostasis cannot be modulated and infection rates increase as a result of inadequate and unbalanced nutrition. To create an effective immune response against infections, it is necessary to take macro and micronutrients in sufficient quantity, ratio, and variety.[17] The vast majority of individuals (87%) participating in this study also reported that they thought adequate and balanced nutrition had protective effects against COVID-19. An insufficient number of daily meals and irregular meal times cause obesity. Obesity caused by increased adipose tissue is a condition in which low-level chronic inflammation is seen. The resulting inflammation negatively affects the function of leukocytes and macrophages, changing the immune response and reducing the body's resistance to infections.[18,19] It was observed that one-third of the individuals participating in our study changed their eating habits negatively during the pandemic, and the majority of them had 2 main meals (63%) and 1 (45%) or 2 (39%) snacks per day during this period. Also, one out of every four adult individuals was found to be overweight. Similar to this study, a study conducted in Italy found that 23.5% of individuals skipped at least 1 main meal during the COVID-19 pandemic.[20] In Poland, the eating habits of the individuals before and during the pandemic were evaluated and it was determined that the majority of them did not have difficulty in accessing food and 34% had a higher intake of food.[21]

Vitamins such as A, C, D vitamins, and minerals such as zinc, selenium are known to be protective against viral infections due to their antioxidant and anti-inflammatory effects. Also, these micronutrients can play a protective role against increased intrapulmonary oxidative load in viral infections.[17] Although there is little evidence specifically showing the exact role of dietary supplements in the fight against COVID-19, it is known that supplements of vitamins A, C, D, zinc, and selenium have positive effects on immune response and are protective against viral infections.[6,22,23] In addition, it is stated that phenolic compounds such as quercetin and vitamins co-administration can increase the antiviral and immunomodulatory effect by showing a synergistic effect. Data

from further randomized controlled trials are required to demonstrate their effects.[24,25] In a study conducted in Turkey, it was stated that 20.5% (n=99) of individuals started to use dietary supplements during the pandemic period.[26] In another study, approximately one-third (36.1%) of individuals reported that they started using dietary supplements, mainly vitamin D (56.9%), vitamin C (50.4%) and zinc (27.6%).[27] In this study, more than half of the participants stated that they used dietary supplements during the pandemic to mostly avoid COVID-19. Besides, dietary supplements that were frequently preferred during the COVID-19 pandemic period were vitamin D, multivitamin, vitamin C, and zinc. Although the use of some vitamins and minerals such as vitamin D, vitamin C, and zinc in pharmacological doses in the fight against COVID-19 has come to the fore, studies on this subject have just begun to be conducted. Their efficiency in terms of COVID-19 and potential adverse/negative effects due to their use in high doses is not known yet.[6,22] In addition, care should be taken in terms of hypervitaminosis when using dietary supplements to strengthen immunity. It should be kept in mind that a micronutrient intake in excessive amounts may cause/adversely affect the absorption of another micronutrient element, and its use alongside other drugs may cause pharmacokinetic or pharmacodynamic interactions.[21,28,29] Optimal nutrition is essential for strengthening the immune system in defense against infections. For this reason, we think that individuals at risk for COVID-19 infection (old age, male, chronic disease, smoking, etc.) should be screened for micronutrient deficiency/insufficiency, and nutritional supplements should be prescribed if needed.

Herbal products are generally regarded as safe because of their natural origin and are used for therapeutic and preventive purposes. It has been reported that approximately 80% of the world population uses herbal products in basic health practices.[30] People in Turkey frequently use herbal products within the scope of traditional and complementary medicine methods. Based on the analysis of 81 studies evaluating the use of herbal supplements in Turkey, it was determined that the most commonly used herbal supplements for protection against influenza were from the *Lamiaceae* family. Plants such as mint, thyme, and sage belong to the *Lamiaceae* family. These plants can show antiviral effects due to the essential oils and phenolic compounds they contain.[31] Also, it is stated that the allicin compound in ginger has anti-influenza cytokines, while garlic has antibacterial, antiviral, and immunity-supporting effects.[32] In a systematic review, it is suggested that echinacea, garlic, and ginger can be used as immunostimulants in cold and common cold.[33] In a study conducted with pregnant women, it was found that they frequently preferred linden, mint-lemon, and ginger for protection against influenza.[34] In the study conducted in Saudi Arabia, it was determined that 14.9% of the individuals used nutritional supplements or herbal products during the pandemic period. 13.3% of individuals believe drinking turmeric tea, 19.5% of individuals believe drinking ginger tea, 34.4% of individuals believe eating garlic increase the immunity and reduce the chance of developing COVID-19.[15] On the other hand, Erişen et al. found that approximately half of the subjects (n=207, 42.8%) who participated in their study consumed herbal products such as garlic and sumac, which were reported to strengthen immunity.[26] In this study, it was reported that 59.4% of individuals started using herbal products during the COVID-19 pandemic and almost all (86%) of the individuals who started using herbal products used them to strengthen their immunity and avoid COVID-19 infection. Similar to other studies conducted, this study shows that individuals started to use garlic, ginger, etc. as fresh herbs and linden, sage, etc. as a tea during the pandemic for protection against COVID-19, although they did not use them before this period.

As far as we know, this study is the first to evaluate the use of dietary supplements and herbal products by adults during the COVID-19 pandemic. The results of this study are similar to those of other studies on the use of dietary supplements and herbal products in viral infections conducted before and during the pandemic period. Considering the results of the study, it is seen that vitamins, minerals, and herbal products, which are frequently used for protection against infections, continue to be used during the pandemic period. The main limitation of our study is that the data were collected by a web-based questionnaire (self-reported) due to the onset of restrictions with the COVID-19 pandemic. Due to the large sample size of this study, we think that it is a guide for prospective studies in which the quantities of the supplements used are questioned.

CONCLUSION

In conclusion, there are many macro/micronutrients and foods that strengthen the immune system. To support the immune function, individuals should be encouraged to maintain a healthy, balanced diet that will meet their daily energy and nutrient needs. Micronutrient supplements should be used under the control of a doctor/specialist physician and dietician by determining deficiencies or insufficiencies in individuals who do not have adequate and balanced nutrition, are vegan, or have chronic diseases. No food or nutrient has superior properties compared to others and none has miraculous effects on its own. Therefore, care should be taken when using herbal products, and they should be used following the recommendations of healthcare professionals who are knowledgeable about the side effects and drug-plant interactions. Although the use of dietary supplements and herbal products has increased during the pandemic period, the effects of each of them on the prevention of COVID-19 and reducing the symptoms of the disease need to be evaluated and randomized clinical studies are needed.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Hülya Kamarlı Altun, Merve Şeyda Karaçil Ermumcu, Nilgün Seremet Kürklü;* ***Design:*** *Hülya Kamarlı Altun, Nilgün Seremet Kürklü, Merve Şeyda Karaçil Ermumcu;* ***Control/Supervision:*** *Hülya Kamarlı Altun, Nilgün Seremet Kürklü, Merve Şeyda Karaçil Ermumcu;* ***Data Collection and/or Processing:*** *Hülya Kamarlı Altun, Nilgün Seremet Kürklü, Merve Şeyda Karaçil Ermumcu;* ***Analysis and/or Interpretation:*** *Hülya Kamarlı Altun, Nilgün Seremet Kürklü, Merve Şeyda Karaçil Ermumcu;****Literature Review:*** *Hülya Kamarlı Altun, Nilgün Seremet Kürklü, Merve Şeyda Karaçil Ermumcu;* ***Writing the Article:*** *Nilgün Seremet Kürklü;* ***Critical Review:*** *Hülya Kamarlı Altun, Nilgün Seremet Kürklü, Merve Şeyda Karaçil Ermumcu.*

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