



Applications of Dietary Supplements and Aromatherapy for Prophylactic and Treatment Purposes During COVID-19 Pandemic

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ABSTRACT

Objectives: The lack of a specific proven treatment for coronavirus disease-2019 (COVID-19) has led individuals to use different treatment options. Although their effects on COVID-19 have not been proven, interest in dietary supplements and aromatherapy has increased during the pandemic period. In this study, use of dietary supplements and aromatherapy was investigated for COVID-19 among individuals living within the borders of Türkiye.

Materials and Methods: This cross-sectional survey study was conducted among 310 individuals. The questionnaire was prepared using online Google Forms and communicated to the participants *via* social media platforms. The data obtained from the study were analyzed with the statistical program.

Results: The analyzes of the survey revealed that participants increased the usage of supplements mostly prophylactic and for treatment purposes during COVID-19 pandemic, 31.9% individuals declared that they consumed herbal tea/products, 38.1% of them used vitamin/mineral supplements (multivitamin-mineral, vitamins B1, B6, B12, C, D, calcium, coenzyme Q10, iron, magnesium, selenium, and zinc), and 18.4% of the individuals applied aromatherapy (meaning treatment with essential oils). As a result of the study, the most commonly used supplement was vitamin D, the most commonly consumed tea was green tea, the essential oil was thyme oil, and the most eaten vegetable was garlic. Moreover, other frequently used herbal products were found to contain ginger and onion as food and peppermint and eucalyptus oils as aromatherapeutics. Participants often reported that they found it safe to use elevated levels of herbs or herbal products against COVID-19.

Conclusion: Among the individuals participating in this study, it has been observed that the use of dietary supplements has increased during the COVID-19 pandemic period. The study revealed that vitamin D is prominent in self-medication use. Moreover, interest in aromatherapy and dietary supplements has increased. Among aromatherapeutics, thyme stood out over the applied essential oils.

Key words: COVID-19, dietary supplements, Türkiye, herbal, essential oil

INTRODUCTION

New coronavirus disease-2019 (COVID-19), which appeared in December 2019, was declared as a pandemic by World Health Organization (WHO) on March 11, 2020,¹ following days, Türkiye's first cases were detected.² With the epidemiological update published by WHO on March 30th, 2021, the weekly number of cases exceeded 3.8 million worldwide. More than

64,000 new deaths have been reported. At the beginning of the pandemic, the number of patients infected with COVID-19 has been more than 126 million, and unfortunately, close to 3 million deaths have been reported. In Türkiye, the number of weekly cases was almost 190 thousand, and the number of weekly deaths was almost 1000. From the beginning of the pandemic in Türkiye, the number of patients infected with COVID-19 virus

This manuscript was presented at the 13th International Symposium on Pharmaceutical Sciences (ISOPS) -Ankara on June 22, 2021-June 25, 2021.

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Received: 17.05.2022, Accepted: 15.09.2022



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surpassed 3 million and more than 30 thousand deaths were recorded.³

Since there are no proven complete treatment options for COVID-19, compliance with wearing masks, hygiene rules, keeping distance, and a balanced food intake is the most effective approach so far. Healthy eating guidelines have been published to strengthen immunity and prevent COVID-19 contamination. Recommendations on optimal nutrition, good hygiene practices, and the use of dietary supplements have been reported.^{4,5} The vitamins; A, B6, B12, C, D, and E as well as the minerals, *e.g.* selenium and zinc, have been shown to support immunity by affecting the production and function of antibodies and B and T-cells.⁶ Dietary supplements such as cinnamaldehyde, curcumin, lactoferrin, probiotics, quercetin, vitamin D, vitamin C, zinc, and selenium have immune-boosting, antiviral, antioxidant, and anti-inflammatory effects.⁷ This has increased the interest in dietary supplements during pandemic. Increasing their advertisements in the media caused unconscious selection and use.⁸ High doses of dietary supplements can cause side and even toxic effects.^{9,10} Moreover, they may interact with drugs taken together.^{10,11}

Based on the scientific evidence, essential oils have antiviral, anti-inflammatory, immunomodulatory, and bronchodilatory activities. Due to their lipophilic nature, it has been suggested that essential oils (*e.g.* eucalyptus, garlic) can easily penetrate viral membranes, inhibit viral replication, and be used for COVID-19¹² for treating respiratory tract infections essential oils are applied topically, orally, and by inhalation. In the topical application, diluted essential oil is applied to the back, chest, and soles of the feet. Application to the chest and back area provides sinus drainage and relaxation of sputum. Because of the application to soles of the feet, essential oils can be absorbed into the bloodstream, followed by a pharmacological effect, only with poor absorption. The oral intake of essential oils is not usually recommended for safety reasons; additionally, if taken orally, they are diluted in water or developed by encapsulation. When essential oils are administered by inhalation, they are distributed to the lungs with 50.0% effective bioavailability and reach the smallest cavities.¹³ Aromatherapy has been used in the prevention of plague throughout history. Different forms of aromatherapy application are used in traditional Chinese medicine and have also been used during COVID-19. Given China's position in epidemic prevention, aromatherapy has been suggested to boost immunity, prevent and control COVID-19.¹⁴

Dietary supplement and aromatherapy applications of individuals against COVID-19 have been investigated in many countries. In Poland, during the COVID-19 pandemic, increased use of immune-related nutrients and foods such as vitamins C and D, zinc, garlic (*Allium sativum* L.- Alliaceae), ginger (*Zingiber officinale* Roscoe- Zingiberaceae) or turmeric (*Curcuma longa* L.- Zingiberaceae) has been reported.¹⁵ In Bangladesh, a study revealed that 57.6% of the individuals used herbal food/products and 11.2% both drugs and herbal food/products as preventive measures against COVID-19. Black seed (*Nigella sativa* L.-Ranunculaceae), clove (*Syzygium*

aromaticum L.) (Merr. & L.M.Perry-Myrtaceae), ginger (*Zingiber officinale* Roscoe-Zingiberaceae), and honey are among the herbal food/products used, and *Arsenicum album* (homeopathic drug), vitamins, and zinc supplements were the most used food supplements.¹⁶ Vitamin C was used in Saudi Arabia and Egypt,^{17,18} ginger (47.2%) and turmeric (31.6%) were often used in Egypt. The application of these herbs during COVID-19 was associated with age and fear score.¹⁸ In an observational study with participants from three countries, Sweden, UK, and the USA, it was found that the use of probiotics, omega-3 fatty acids, multivitamins, and vitamin D reduced the risk of being infected with COVID-19. On the other hand, it was not associated with the consumption of zinc, vitamin C, and garlic supplements.¹⁹ In West Nusa Tenggara region, use of essential oils, the use of eucalyptus (*Eucalyptus* sp.-Myrtaceae), lemon (*Citrus limonum* Risso-Rutaceae), lemongrass (*Cymbopogon flexuosus* Stapf-Poaceae), lavender (*Lavandula* L. sp.-Lamiaceae) oils were determined during the pandemic period.²⁰

The goal of the study was to evaluate the use of dietary supplements and aromatherapeutics used against COVID-19 and the frequency of use. To analyze in more detail the use of dietary supplements, the use of herbals, vitamins, and minerals was questioned separately. The application of essential oils in terms of both oral and other usage methods was also questioned. This study is a comprehensive study that questions both dietary supplements and aromatherapy applications. It is important since it is one of the rare studies, in which the use of essential oils is also questioned.

MATERIALS AND METHODS

The research was conducted as a cross-sectional survey, in which a questionnaire was prepared using online Google Forms, between March 1st and March 10th 2021, and was held in various provinces of Türkiye. Approval was obtained from Gazi University Ethics Committee (22.02.2021-E.33174) for the study. Three hundred ten voluntarily participated individuals aged 18 and older working-living in the borders of Türkiye have been included. It has been communicated to the participants that meet the inclusion criteria through social media platforms such as WhatsApp. The questionnaire form was prepared by scanning the present literature. Overall 26 questions that questioning the descriptive characteristics of individuals, the use of herbs/herbal products, vitamins/minerals, and aromatherapy applications against COVID-19. In the first 14 questions of the survey, the descriptive characteristics of the individuals, whether they were infected with COVID-19 and whether they had influenza and/or pneumonia vaccines during the COVID-19 pandemic were asked. Herbal products, vitamins/minerals, aromatherapy applications, essential oils, and frequency of their use have been researched. Individuals were asked in a separate question, whether there are any herbs/herbal products that they consume as food or not. In this survey, whether individuals found the use of herbs/herbal products safe for COVID-19 was questioned. Scoring was done on a scale of 1 to 5 in which 1 point "I never find it reliable"; 5 points corresponds to "I find it reliable".

Statistical analysis

The data obtained from the study were analyzed with the Statistical Package for the Social Sciences (SPSS) statistical program. The frequency of participant responses is shown in tables and figures. Cross tables were created to correlate the responses and chi-square tests were conducted. The significance for the statistical analysis were set as $p < 0.05$. Cramér's V (ϕ_c) value was calculated to determine the strength of the relationship between variables. It takes on values between 0 and 1 (inclusive), in which 0 corresponds to no relationship between the variables, while 1 corresponds to one variable being completely determined by the other.

RESULTS

Characteristics of participants

Characteristics of the participants are shown in detail in Table 1, in which 310 individuals, 223 (71%) of whom were women, participated in this survey study. The province with the highest participation rate was Ankara followed by Bursa and Hatay, where the participants lived. Majority of the individuals were between the ages of 30 and 44. The most involved occupational groups were healthcare professionals, of whom 61.3% were pharmacists. Majority of the participants (79%) declared that they do not consume alcohol, while 22.6% of the participants still smoke, only 6.5% have smoked and quit in a period of their lives, while 21% of the participants were having chronic illnesses. Among the participants, 48 individuals (15.5%) had COVID-19 previously, and only one of them was hospitalized. Most of the participants did not have influenza or pneumonia vaccines during the pandemic period.

Dietary supplement consumption and aromatherapy applications

A graphic regarding the consumption of herbs is shown in Figure 1. Among the participants, 123 (39.7%) of them reported that they did not increase the consumption of vegetables in their diet during the COVID-19 pandemic. On the other hand, among the rest of the participants, garlic followed by onion was the most consumed food.

The frequency of drinking herbal tea, vitamin-mineral supplements, and aromatherapy for COVID-19 is shown in Table

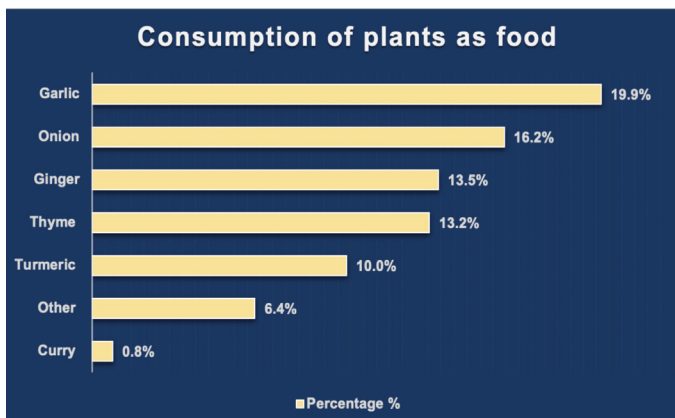


Figure 1. Edible plants and their products that the participants increased their consumption as a food during the pandemic

Table 1. Characteristics of participants (n: 310)

Characteristics	Number of participants (n)	Percentage (%)
Gender		
Female	223	71.9
Male	87	28.1
Age		
18-29	105	33.9
30-44	128	41.3
45-59	61	19.7
≥60	16	5.2
Marital status		
Married	202	65.2
Unmarried	108	34.8
Smoking		
Yes	70	22.6
No	220	71.0
Quit smoking	20	6.5
Alcohol consumption		
Yes	20	6.5
No	245	79.0
Sometimes	45	14.5
Profession		
Healthcare professionals	75	24.2
Civil servant	72	23.2
Housewife	33	10.6
Student	32	10.3
Self-employment	26	8.4
Retired	12	3.9
Other	60	19.4
Healthcare professionals		
Pharmacist	46	61.3
Doctor	15	20.0
Nurse	4	5.3
Dentist	3	4.0
Physiotherapist	2	2.7
Other	5	6.7
Chronic disease		
Yes	65	21.0
No	245	79.0
Infected with COVID-19		
Yes	48	15.5
No	262	84.5
Hospital treatment for COVID-19		
Yes	1	0.3
No	309	99.7
Influenza (flu) vaccine during COVID-19 pandemic process		
Yes	13	4.2
No	297	95.8
Pneumonia vaccine during COVID-19 pandemic process		
Yes	21	6.8
No	289	93.2

COVID-19: Coronavirus disease-2019

2. The vast majority (81.8%) of individuals who used herbal tea or herbal products to protect themselves from COVID-19 during the pandemic period were not infected with COVID-19. Moreover, 81.6% of people who used and stopped consuming herbal tea or herbal products for a while were not infected with COVID-19.

Among these applications, mostly green tea and herbal products containing ginger were used to protect against COVID-19; detailed results of using herbal tea or herbal products for

protection from COVID-19 are shown in Table 3. Individuals who were infected with COVID-19 consumed mostly thyme hydrosol and herbal products containing ginger during their healing stage at home. However, because of the statistical analysis, no significant relationship was found between the use of herbal tea or herbal products and the state of infection with COVID-19 ($p>0.05$). The herbal tea/product was mostly used by individuals between the ages of 30-44 to protect against COVID-19 (33.3%). A significant relationship was found between the use of herbal tea/product and age ($p<0.05$).

Table 2. Usage frequency of herbal tea/product, vitamin/mineral supplements and aromatherapy

Variables	Number of participants (n)	Percentage (%)
Do you use herbal tea or herbal product to protect against COVID-19?		
Yes	99	31.9
No	162	52.3
I used and stopped	49	15.8
Do you use vitamin/mineral supplements to protect against COVID-19?		
Yes	118	38.1
No	129	41.6
I used and stopped	63	20.3
Do you apply aromatherapy (treatment with essential oils) for COVID-19?		
Yes	57	18.4
No	235	75.8
I applied and stopped	18	5.8

COVID-19: Coronavirus disease-2019

Table 3. Herbal tea or herbal product use among the participants

Herbal tea/ herbal product	I do not use *n (%)	I use it to protect against COVID-19 *n (%)	I only used it during my COVID-19 disease *n (%)	I have used it during my COVID-19 disease and I use it to protect against COVID-19 *n (%)
Herbal product containing ginger	227 (73.2%)	74 (23.9%)	5 (1.6%)	4 (1.3%)
Herbal product containing turmeric	247 (79.7%)	57 (18.4%)	3 (1.0%)	3 (1.0%)
Herbal product containing curcumin	287 (92.6%)	22 (7.1%)	0	1 (0.3%)
Elderberry (Sambucol®)	255 (82.3%)	52 (16.8%)	2 (0.6%)	1 (0.3%)
South African Geranium (Umca®)	288 (92.9%)	20 (6.5%)	2 (0.6%)	0
Green tea	223 (71.9%)	79 (25.5%)	5 (1.6%)	3 (1.0%)
Thyme hydrosol	247 (79.7%)	51 (16.5%)	9 (2.9%)	3 (1.0%)
Thyme oil	275 (88.7%)	28 (9.0%)	6 (1.9%)	1 (0.3%)
Herbal product containing thyme	263 (84.8%)	41 (13.2%)	4 (1.3%)	2 (0.6%)
Herbal product containing carvacrol	291 (93.9%)	16 (5.2%)	2 (0.6%)	1 (0.3%)
Black cumin essential oil	251 (81.0%)	53 (17.1%)	4 (1.3%)	2 (0.6%)
Peppermint essential oil	282 (91.0%)	25 (8.1%)	3 (1.0%)	0
Eucalyptus essential oil	285 (91.9%)	24 (7.7%)	1 (0.3%)	0
Echinacea	295 (95.2%)	13 (4.2%)	2 (0.6%)	0
Ginseng	299 (96.5%)	6 (1.9%)	4 (1.3%)	1 (0.3%)

*n (%): Number (percentage), COVID-19: Coronavirus disease-2019

In order to protect themselves from COVID-19 infection, 33.9% of the participants responded the use of herbs or herbal products to be very reliable, whereas 4.8% never found it reliable. Among the participants, 30% found herbs and herbal products very reliable, whereas 6.8% never found reliable, while having COVID-19 infection (Figure 2).

People who filled the questionnaire (38.1%) reported that they used vitamin/mineral supplements to be protected against COVID-19, and 20.3% used and quit for a period. Vitamins D and C were the most commonly used vitamins by individuals to protect against COVID-19 (Table 4). Individuals infected with COVID-19 also reported that they used vitamins D and C the most, respectively. 80.5% of individuals who used vitamin/mineral supplements to be protected against COVID-19 during the pandemic period were not infected with COVID-19. Also, 85.7% of individuals who used and stopped taking vitamin/mineral supplements for a while were not infected with COVID-19. However, because of the statistical analysis, no significant relationship was found between the use of vitamin/

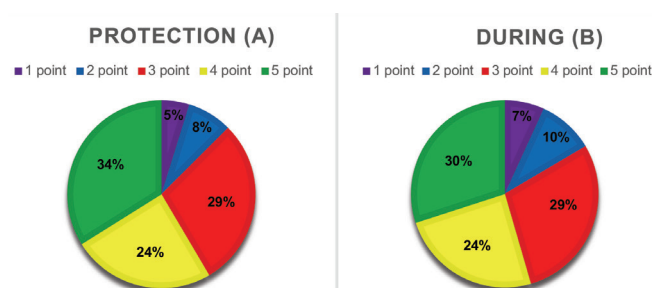


Figure 2. (A) The percentage of participants find the use of herbal products safe for protection COVID-19; (B) The percentage of participants find the use of herbal products safe during COVID-19
COVID-19: Coronavirus disease-2019

mineral supplements and the state of infection with COVID-19 ($p>0.05$). Similar to the use of herbal tea/product, a significant relationship was found between the use of vitamin/mineral supplements and age, and they were mostly used in individuals between the ages of 30-44 (46.6%, $p=0.01$).

The essential oils used by entities in aromatherapy applications and their usage rates are shown in Figure 3. Only 24.2% of the individuals participating in the study practice aromatherapy during the pandemic. Individuals who used aromatherapy reported that they mostly consumed thyme (*Thymus* L. sp. or *Origanum* sp., Lamiaceae), peppermint (*Mentha* L. sp., Lamiaceae), and eucalyptus (*Eucalyptus* sp., Myrtaceae) oils; among them, 80.7% of individuals were not infected with COVID-19; moreover, 83.3% of the individuals who applied and stopped the aromatherapy application for a while were not infected with COVID-19. However, no statistically significant relationship was found between aromatherapy applications and COVID-19 infection status ($p>0.05$). The individuals who applied aromatherapy were mostly in the 30-44 age group (36.8%); consequently, a significant relationship between aromatherapy practice and age ($p<0.05$) was determined.

As for the information gathered by the participating individuals,

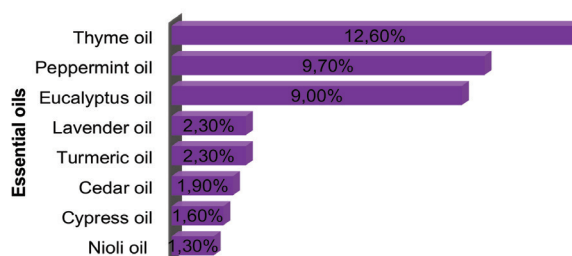


Figure 3. Use of essential oils during pandemic

Table 4. Vitamin/mineral supplements use

Vitamins/minerals	I do not use *n (%)	I use it to protect against COVID-19 *n (%)	I only used it during my COVID-19 disease *n (%)	I have used it during my COVID-19 disease and I use it to protect against COVID-19 *n (%)
Multivitamin-mineral	237 (76.5%)	64 (20.6%)	8 (2.6%)	1 (0.3%)
Vitamin B12	237 (76.5%)	66 (21.3%)	5 (1.6%)	2 (0.6%)
B1 + B6 + B12	260 (83.9%)	43 (13.9%)	5 (1.6%)	2 (0.6%)
Vitamin C	156 (50.3%)	144 (46.5%)	6 (1.9%)	4 (1.3%)
Vitamin D	142 (45.8%)	153 (49.4%)	10 (3.2%)	5 (1.6%)
Iron	265 (85.5%)	41 (13.2%)	3 (1.0%)	1 (0.3%)
Zinc	239 (77.1%)	63 (20.3%)	4 (1.3%)	4 (1.3%)
Magnesium	257 (82.9%)	52 (16.8%)	0	1 (0.3%)
Calcium	274 (88.4%)	33 (10.6%)	3 (1%)	0
Selenium	287 (92.6%)	23 (7.4%)	0	0
Coenzyme-Q10	279 (90.0%)	28 (9.0%)	3 (1.0%)	0

*n (%): Number (percentage), COVID-19: Coronavirus disease-2019

in order to use dietary supplements or aromatherapy, 30% of the individuals responded *via* the internet and television (Figure 4), whereas individuals who stated that they received advice from healthcare professionals who were pharmacists the most.

Cross tabulation was made to determine the relationship between the information sources and the use of herbal teas and products (Table 5). Because of the statistical analysis, a significant relationship was obtained between the individuals using herbal tea/products and the information sources they relied. Further analysis showed that there was a significant correlation between learning the use of herbals from pharmacists, academic articles, social media, neighbors, friends, relatives, and family elders ($p < 0.05$).

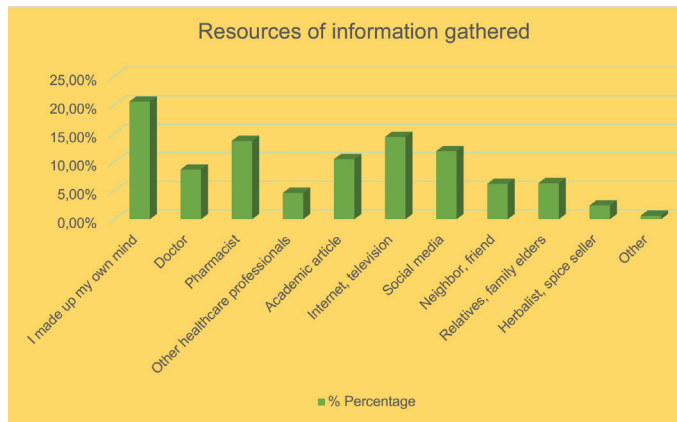


Figure 4. Information resources of participants using herbs

DISCUSSION

At the beginning of the COVID-19 pandemic, studies have accumulated in the literature about investigating the use of dietary supplements. As far as we know, there were no studies questioning the use of aromatherapy and essential oils in addition to dietary supplements in the same questionnaire. In this study, we investigated the use of dietary supplements and aromatherapy in Türkiye for COVID-19. In our study, the province with the highest participation rate was Ankara, the capital of Türkiye, and the highest participation rate of individuals was healthcare workers. Among the participants who smoke and consume alcohol was significantly low, which might suggest that the participants of this survey are particularly conscious about their health. On the other hand, although most of them were healthcare professionals, it is surprising that most participants neither had flu nor pneumonia vaccine during the period that we questioned them. This may be because the Turkish Ministry of Health gives priority to the elderly people over a certain age in vaccination, since most of the participants were between the ages of 30-44 and the number of vaccines was insufficient.

In this study, less than half of the participants who were mostly between the ages of 30-44 used dietary supplements for COVID-19 (31.9% herbal tea/products, 38.1% vitamin/mineral supplements); fewer participants (18.4%) practiced aromatherapy. Additionally, the participants used and quit using herbal tea/products, vitamin/mineral dietary supplements, and aromatherapy applications were 15.8%, 20.3%, 5.8%,

Table 5. The relationship between information sources and use cases of herbal tea/products

	Do you use herbal tea or herbal products to protect yourself from COVID-19 during the pandemic period?			Significance
	Yes *n	No *n	I used and quit *n	
I made up my own mind	43	67	20	$p > 0.05$
Pharmacist	39	30	17	$p = 0.001$ $X^2 = 14.762$ $\phi_c = 0.218$
Academic article	32	23	11	$p < 0.01$ $X^2 = 12.094$ $\phi_c = 0.198$
Internet, television	31	45	15	$p > 0.05$
Doctor	21	21	13	$p > 0.05$
Social media	21	29	25	$p < 0.001$ $X^2 = 23.205$ $\phi_c = 0.274$
Neighbor, friend	13	14	12	$p < 0.05$ $X^2 = 8.631$ $\phi_c = 0.167$
Other healthcare professionals	12	10	7	$p > 0.05$
Relatives, family elders	10	18	12	$p < 0.05$ $X^2 = 7.008$ $\phi_c = 0.150$
Herbalist, spice seller	6	4	5	$p > 0.05$

*n: Number, X^2 : Chi-square, ϕ_c : Cramér's V, COVID-19: Coronavirus disease-2019

respectively. Consequently, the most commonly used dietary supplements were vitamins D and C, green tea, and herbal products containing ginger, and zinc have been highlighted for immune support,⁶ and our findings are consistent with that reported. Recent studies have suggested that vitamin D is effective in protecting from COVID-19 infection and reducing the severity of existing symptoms.²¹ Meta-analysis showed that vitamin D has a slight effect on protection from acute respiratory infections.²² Findings show garlic and onion to be the most consumed foods. It has been suggested that garlic has antiviral and anti-inflammatory effects, strengthens immunity, and is effective in preventing COVID-19.^{23,24} Although some compounds derived from garlic and onions are effective for COVID-19 in *in silico* studies, their usability for COVID-19 has not been proven.²⁵ Mhatre et al.²⁶ suggested that green tea polyphenols can be used in the prophylaxis and treatment of COVID-19 due to their antiviral activity. In a previous randomized controlled study, taking capsules containing green tea catechins and theanine prophylactically prevented influenza infection among healthcare professionals.²⁷ Based on these studies, green tea polyphenols may be an option for protection from COVID-19. However, the amount of catechin in the content of green tea prepared and consumed as tea may not be sufficient for the dose required for COVID-19 prophylaxis. As a matter of fact, according to the results of the research, there was no significant relationship between the consumption of dietary supplements and protection from COVID-19.

This study demonstrated that participants applying aromatherapy mostly used thyme, peppermint, and eucalyptus oils. This result is not surprising as these essential oils are effective against respiratory system pathogens.¹³ In addition to all these, essential oils are used in aromatherapy for stress and sleep control.²⁸ Application of aromatherapy might be useful for controlling stress in individuals caused by COVID-19 pandemics. Interestingly, our findings showed that lavender oil, which is known to have an anxiolytic effect,²⁹ was used at a low rate by the study participants (2.3%). In our study, we questioned the use of different forms of thyme and its components. Under the title of herbal tea/products, in any period of the pandemic, the rate of use of thyme juice was 20.3%, oregano oil was 11.3%, herbal product containing thyme was 15.2%, and carvacrol-containing herbal product usage rate was 6.1%. The rate of thyme oil usage was determined as 12.6%, which might be the result of previous studies, which demonstrated the antiviral effect of thyme and its components in previous and *in silico* studies against COVID-19.^{30,31} It has been shown that different thyme preparations and thymol can be used in respiratory system disorders due to its antispasmodic, antitussive, mucolytic, and expectorant properties.³² In a randomized clinical study on patients having COVID-19, oral intake of thyme essential oil significantly reduced the severity of symptoms such as fever, cough, shortness of breath, dizziness, muscle pain, anorexia, weakness, lethargy, and fatigue.³³ In a randomized controlled clinical trial, inhaled thyme essential oil improved the respiratory tract condition of patients under mechanical ventilation. Because of the

study, thyme essential oil reduced the concentration of airway secretions, facilitated the evacuation of mucous secretions, and had bronchodilator effect.³⁴ Besides *in vitro* studies, clinical studies also demonstrated that thyme has a potential effect on COVID-19 and its symptoms; however, further studies should focus on choosing appropriate thyme species, the preparation of the product, and the route of administration.

Individuals were asked, if they found the use of herbal tea/products safe for prophylactic usage or for treating COVID-19 infection. More than half of the individuals found the use of the herbal tea/product safe in both situations. Participants marked the option "I made my own decision" (20.6%) as the source from where they obtained information about the usage of the non-pharmaceutical products. Apart from that, they gathered this information mostly through the internet and television (14.4%). Total number of those who acquired information through healthcare professionals such as doctors and pharmacists and academic articles is 37.5%, while the rest gathered the information from unreliable sources. Moreover, the relationship between the source from which the information is learned and the use of herbal teas and products was evaluated. There was a significant relationship between herbal tea/product use and attaining information about the supplements from pharmacists, academic articles, social media, neighbors, friends, relatives, and family elders.

Study limitations

The number of participants was limited to 310 as it was planned as a quick study. The participation rate of the elderly population was low as the research was conducted online.

CONCLUSION

Interest in dietary supplements has increased during the pandemic period, and non-medical information sources have been more effective in deciding on dietary supplements to use. Before the use of the recommended dietary supplements, their protective effects, side effects, and drug interactions should be identified and the public should be informed about these issues. Studies have shown that essential oils have potential effects on COVID-19; therefore, essential oils should be included in published guidelines, and further randomized studies on essential oils should be the focus. Besides dietary supplements and aromatherapy application, the public should be cautious about nutrition, exercise, and hygiene to overcome the COVID-19 pandemic.

Ethics

Ethics Committee Approval: Approval was obtained from Gazi University Ethics Committee (22.02.2021-E.33174) for the study.

Informed Consent: The study was conducted with volunteer individuals who met the inclusion criteria and agreed to participate in the study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: M.M., U.K.Ç., Concept: M.M., U.K.Ç., Design: M.M., U.K.Ç., Data Collection or Processing: M.M., U.K.Ç., Analysis or Interpretation: M.M., U.K.Ç., Literature Search: M.M., U.K.Ç., Writing: M.M., U.K.Ç.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

REFERENCES

- World Health Organization. Listings of WHO's response to COVID-19. <https://www.who.int/news/item/29-06-2020-covidtimeline>
- World Health Organization. (2020). Turkey's response to COVID-19: First impressions. Ankara, Turkey. 11 July 2020 (no. WHO/EURO: 2020-1168-40914-55408). World Health Organization. Regional Office for Europe. <https://apps.who.int/iris/bitstream/handle/10665/335803/WHO-EURO-2020-1168-40914-55408-eng.pdf?sequence=1&isAllowed=y>
- World Health Organization. (2021). Weekly epidemiological update on COVID-19-30. <https://www.who.int/publications/m/item/weekly-epidemiological-update-on-covid-19---31-march-2021> (Accessed October 4, 2021).
- de Faria Coelho-Ravagnani C, Corgosinho FC, Sanches FFZ, Prado CMM, Laviano A, Mota JF. Dietary recommendations during the COVID-19 pandemic. *Nutr Rev*. 2021;79:382-393.
- Dickinson A, Blatman J, El-Dash N, Franco JC. Consumer usage and reasons for using dietary supplements: report of a series of surveys. *J Am Coll Nutr*. 2014;33:176-82.
- Gombart AF, Pierre A, Maggini S. A review of micronutrients and the immune system-working in harmony to reduce the risk of infection. *Nutrients*. 2020;12:236.
- Mrityunjaya M, Pavithra V, Neelam R, Janhavi P, Halami PM, Ravindra PV. Immune-boosting, antioxidant and anti-inflammatory food supplements targeting pathogenesis of COVID-19. *Front Immunol*. 2020;11:570122.
- Adams KK, Baker WL, Sobieraj DM. Myth busters: dietary supplements and COVID-19. *Ann Pharmacother*. 2020;54:820-826.
- Hamishehkar H, Ranjdoost F, Asgharian P, Mahmoodpoor A, Sanaie S. Vitamins, are they safe? *Adv Pharm Bull*. 2016;6:467-477.
- Ronis MJJ, Pedersen KB, Watt J. Adverse effects of nutraceuticals and dietary supplements. *Annu Rev Pharmacol Toxicol*. 2018;58:583-601.
- Rogovik AL, Vohra S, Goldman RD. Safety considerations and potential interactions of vitamins: should vitamins be considered drugs? *Ann Pharmacother*. 2010;44:311-324.
- Asif M, Saleem M, Saadullah M, Yaseen HS, Al Zarzour R. COVID-19 and therapy with essential oils having antiviral, anti-inflammatory, and immunomodulatory properties. *Inflammopharmacology*. 2020;28:1153-1161.
- Leigh-de Rapper S, van Vuuren SF. Odoriferous therapy: a review identifying essential oils against pathogens of the respiratory tract. *Chem Biodivers*. 2020;17:e2000062.
- Zhang Q, Zhang K, Zhang M, Liu X. Application of traditional chinese aromatherapy in the prevention and treatment of COVID-19. *Int J Clin Exp Med*. 2021;5:83-88.
- Hamulka J, Jeruszka-Bielak M, Górnicka M, Drywień ME, Zielinska-Pukos MA. Dietary supplements during COVID-19 outbreak. Results of Google Trends Analysis Supported by PLifeCOVID-19 online studies. *Nutrients*. 2020;13:54.
- Ahmed I, Hasan M, Akter R, Sarkar BK, Rahman M, Sarker MS, Samad MA. Behavioral preventive measures and the use of medicines and herbal products among the public in response to COVID-19 in Bangladesh: a cross-sectional study. *PLoS One*. 2020;15:e0243706.
- Alyami HS, Orabi MAA, Aldhabbah FM, Alturki HN, Aburas WI, Alfayez AI, Alharbi AS, Almasuood RA, Alsuhailani NA. Knowledge about COVID-19 and beliefs about and use of herbal products during the COVID-19 pandemic: a cross-sectional study in Saudi Arabia. *Saudi Pharm J*. 2020;28:1326-1332.
- Khabour OF, Hassanein SFM. Use of vitamin/zinc supplements, medicinal plants, and immune boosting drinks during COVID-19 pandemic: a pilot study from Benha city, Egypt. *Heliyon*. 2021;7:e06538.
- Louca P, Murray B, Klase K, Graham MS, Mazidi M, Leeming ER, Thompson E, Bowyer R, Drew DA, Nguyen LH, Merino J, Gomez M, Mompeo O, Costeira R, Sudre CH, Gibson R, Steves CJ, Wolf J, Franks PW, Ourselin S, Chan AT, Berry SE, Valdes AM, Calder PC, Spector TD, Menni C. Dietary supplements during the COVID-19 pandemic: insights from 1.4 M users of the COVID symptom study app-a longitudinal app-based community survey. *medRxiv*. 2020.
- Hariadi P, Haritani H, Febriani Y, Rahim A, Yuliana TP, Ikhsan EA. Analysis of essential oils utilization in enhancing immune systems in the pandemic era. In 4th International Conference on Sustainable Innovation 2020-Health Science and Nursing (ICoSIHSN 2020). Atlantis Press. 2021;33:504-509.
- Brenner H. Vitamin D supplementation to prevent COVID-19 infections and deaths-accumulating evidence from epidemiological and intervention studies calls for immediate action. *Nutrients*. 2021;13:411.
- Jolliffe DA, Camargo CA Jr, Sluyter JD, Aglipay M, Aloia JF, Ganmaa D, Bergman P, Bischoff-Ferrari HA, Borzutzky A, Damsgaard CT, Dubnov-Raz G, Esposito S, Gilham C, Ginde AA, Golan-Tripto I, Goodall EC, Grant CC, Griffiths CJ, Hibbs AM, Janssens W, Khadilkar AV, Laaksi I, Lee MT, Loeb M, Maguire JL, Majak P, Mauger DT, Manaseki-Holland S, Murdoch DR, Nakashima A, Neale RE, Pham H, Rake C, Rees JR, Rosendahl J, Scragg R, Shah D, Shimizu Y, Simpson-Yap S, Trilok-Kumar G, Urashima M, Martineau AR. Vitamin D supplementation to prevent acute respiratory infections: a systematic review and meta-analysis of aggregate data from randomised controlled trials. *Lancet Diabetes Endocrinol*. 2021;9:276-292.
- Donma MM, Donma O. The effects of *Allium sativum* on immunity within the scope of COVID-19 infection. *Med Hypotheses*. 2020;144:109934.
- Rouf R, Uddin SJ, Sarker DK, Islam MT, Ali ES, Shilpi JA, Nahar L, Tiralongo E, Sarker SD. Antiviral potential of garlic (*Allium sativum*) and its organosulfur compounds: a systematic update of pre-clinical and clinical data. *Trends Food Sci Technol*. 2020;104:219-234.
- Pandey P, Khan F, Kumar A, Srivastava A, Jha NK. Screening of potent inhibitors against 2019 novel coronavirus (Covid-19) from *Allium sativum* and *Allium cepa*: an *in silico* approach. *Biointerface Res Appl Chem*. 2021;11:7981-7993.
- Mhatre S, Srivastava T, Naik S, Patravale V. Antiviral activity of green tea and black tea polyphenols in prophylaxis and treatment of COVID-19: a review. *Phytomedicine*. 2021;85:153286.

27. Matsumoto K, Yamada H, Takuma N, Niino H, Sagesaka YM. Effects of green tea catechins and theanine on preventing influenza infection among healthcare workers: a randomized controlled trial. *BMC Complement Altern Med.* 2011;11:15.
28. Lee MK, Lim S, Song JA, Kim ME, Hur MH. The effects of aromatherapy essential oil inhalation on stress, sleep quality and immunity in healthy adults: randomized controlled trial. *Eur J Integr Med.* 2017;12:79-86.
29. Karan NB. Influence of lavender oil inhalation on vital signs and anxiety: a randomized clinical trial. *Physiol Behav.* 2019;211:112676.
30. Lelešius R, Karpovaitė A, Mickienė R, Drevinskas T, Tiso N, Ragažinskienė O, Kubilienė L, Maruška A, Šalomska A. *In vitro* antiviral activity of fifteen plant extracts against avian infectious bronchitis virus. *BMC Vet Res.* 2019;15:178.
31. Kumar A, Choudhir G, Shukla SK, Sharma M, Tyagi P, Bhushan A, Rathore M. Identification of phytochemical inhibitors against main protease of COVID-19 using molecular modeling approaches. *J Biomol Struct Dyn.* 2021;39:3760-3770.
32. Salehi B, Mishra AP, Shukla I, Sharifi-Rad M, Contreras MDM, Segura-Carretero A, Fathi H, Nasrabadi NN, Kobarfard F, Sharifi-Rad J. Thymol, thyme, and other plant sources: health and potential uses. *Phytother Res.* 2018;32:1688-1706.
33. Sardari S, Mobaiend A, Ghassemifard L, Kamali, K, Khavasi N. Therapeutic effect of thyme (*Thymus vulgaris*) essential oil on patients with COVID19: a randomized clinical trial. *J Adv Med Biomed.* 2021;29:83-91.
34. Ghahremani-Chabok A, Bagheri-Nesami M, Shorofi SA, Mousavinasab SN, Gholipour-Baradari A, Saeedi M. The effects of *Thymus vulgaris* inhalation therapy on airway status and oxygen saturation of patients under mechanical ventilation: a randomized clinical trial. *Adv Integr Med.* 2021;8:92-100.