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EVALUATION OF THE EFFECT OF THE COVID-19 PANDEMIC ON THE USE OF SUPPLEMENTS BY INDIVIDUALS OVER THE AGE OF 18 IN THE FERIZAJ DISTRICT

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Abstract

The COVID-19 pandemic had a severe impact on the world's population and still remains a serious health problem. Since the beginning of the pandemic, vitamins, minerals and other products known as dietary supplements have received a lot of attention, given their effects on the anti-inflammatory, antioxidant and immune system.

The aim of this study is to assess the prevalence of taking DSs during the COVID-19 pandemic and to understand its impact on individuals' beliefs about a healthy life.

The paper is a cross-sectional analytical study prepared during April-September 2022. The data were obtained through a questionnaire which was distributed to people aged 18 and older who live in the Ferizaj region.

A survey of 500 people was conducted. Half of those surveyed (50.4%) confirm the claim that all supplements, vitamins, minerals, herbs are safe. 50.8% confirm the claim that the effectiveness of nutritional supplements is based on clinical trials.

The statement that nutritional supplements are tested before being put on the market is confirmed by 45.2%. 30.7% of those surveyed confirm the claim that all dietary supplements in pharmacies are safe. 83.2% of those surveyed took supplements/additives (vitamins and minerals), 15.2% did not.

The largest percentage of 75.6% took vitamin C, followed by 36.8% vitamin D3, 26.2% took group B vitamins, 25.4% Omega 3, 24.0% multi-vitamins and minerals, 21.4% Zinc, 10.6% Potassium and the so-called In total, 53.8% (269) of those surveyed took supplements during the COVID 19 pandemic. According to the dynamics index, a growth rate of 102.3% was registered in relation to the time period before the pandemic with COVID 19.

Source of information through which the respondents heard (met) about food supplements (supplements) in the largest percentage before and during the pandemic is from a doctor, health worker (62.2% and 65.6%). 68.8% answered that during the pandemic they took more supplements, and 28.8% did not.

Dietary supplement consumption among adults has increased during the COVID-19 pandemic.

Keywords: COVID-19, dietary supplements, immunity

Introduction

Coronavirus 19 (COVID-19), an infectious viral disease caused by a coronavirus called SARS-CoV-2, has had a severe impact on the world population, emerging as the highest global health crisis since the pandemic era of the 1918 flu [1,2].

Most people infected with this virus mostly experienced mild to moderate respiratory illness and passed the illness without requiring special treatment. However, some became seriously ill and sought medical attention, while others infected with the virus experienced long-term effects of their infection, known as post-COVID condition (PCC) or prolonged COVID-19 [1,3].

Research shows that the eating habits of a large part of the adult population are not favorable for health [3,4,5]. As recommended by WHO and national health institutions, people should get a wide

variety of nutrients every day [6,7]. According to the European Food Safety Authority, dietary supplements aim to correct nutritional deficiencies, maintain adequate intake of certain nutrients or support specific physiological functions [8].

During the pandemic, there has been an increase in the frequency of seeking information on improving the immune system through food products or dietary supplements [9,10] Dietary supplements have become an area of interest for scientists as well.

The potential use of dietary supplements as a possible measure to stop the spread of SARS-CoV-2 (2019-nCoV) has been analyzed. The immune-enhancing, antiviral, antioxidant or anti-inflammatory effects of dietary supplements have been highlighted [11].

The competent Scientific Panel on Dietary Products, Nutrition and Allergies (NDA) of the European Food Safety Authority (EFSA) has established the importance of maintaining a healthy immune system for vitamin D [12,13] and vitamin C [14] and the mineral zinc [15] necessary for the optimal functioning of the immune system.

Consequently, the EFSA panel assesses that these elements are sufficiently characterized and that the contribution to the normal function of the immune system is a beneficial physiological effect and concludes that there is convincing evidence of a causal relationship between the daily intake of these vitamins and the contribution. for the normal functioning of the immune system [16].

Since the beginning of the COVID-19 pandemic, it has been considered an important issue for people to strengthen their immune system against the virus. One of the main factors influencing the immune status of individuals and the body's response to disease is dietary habits [17].

Diet appears to be an important approach in preventing disease outbreaks along with a healthy lifestyle. Considering the antioxidant, anti-inflammatory, immunomodulatory and neuroprotective effects of various macro- and micronutrients, it is clear that in addition to food, supplements may be useful in preventing infection and/or improving treatment outcome [18].

During the pandemic, sales of dietary supplements increased dramatically despite depressed economic conditions [19].

A study by Thirumdas et al., (2021) showed that during the pandemic, people tried to adopt healthier eating habits against this virus by increasing the consumption of nutritional supplements due to their anti-inflammatory, antioxidant and protective effects in the immune system [20].

The purpose of this study is to assess the prevalence of dietary supplement consumption by focusing on consumption among social and demographic groups during the COVID-19 pandemic compared to the pre-pandemic period, what types of dietary supplements are used, and sources of information access. and to understand the effects of the COVID-19 pandemic on the decisions of individuals to live healthily in the general population of the Ferizaj area.

Material and methods

2.1. Study design and research instrument

Cross-sectional analytical study prepared in the period of 6 months, April-September 2022. The data of the study was collected through a questionnaire consisting of 24 questions. The first part includes demographic and socio-economic data (age, gender, place of residence, education, nature of work, marital status, monthly income), the second part consists of questions about the use of supplements before and during COVID-19. Pandemic, views on vitamins and supplements, source of information on taking supplements.

2.2. Sampling strategy

The research was conducted in the Ferizaj district, which is located in the southeast of Kosovo. The district has five municipalities (Ferizaj, Kacanik, Hani and Elezit, Shtymlje, Shterpc) and 126 smaller settlements and more than 185,806 inhabitants. All participants voluntarily participated in the study and were exposed to the aims and objectives of the study before completing the survey. About 200 survey

questionnaires were sent via Google Forms via social media (WhatsApp, Facebook, Messenger) and another 300 questionnaires were provided in physical form for voluntary self-completion.

Inclusion criteria were: (1) participants aged 18 years or older; (2) residents of the Ferizaj region.

2.3. Sample size

The final sample size included in the analysis is 500 participants.

2.4. Statistical analysis

Data were analyzed using SPSS software, version 25.0. Continuous variables were treated as mean (standard deviation (SD)), median and median interquartile range were determined. Categorical variables were processed as frequencies and percentages.

The difference was determined by the Difference test and the t-test. Dynamics indices were used. Pearson Chi-square was used to determine the association between categorical variables. A 95% confidence interval was applied and the significance level was set at 5% ($p < 0.05$ was considered significant).

Results

The demographic characteristics of the respondents are: 60.0% is represented by the municipality of Ferizaj, followed by Kacanik with 20.0%, and Elezi Han and Shtrpce are represented in the lowest percentage with 6.0%. 60.8% of the respondents are from urban areas, and 39.2% are from rural areas.

A greater percentage of those surveyed are from the female gender, 59.2%, and 40.8% are from the male gender. 66.2% of those surveyed are married, and 32.6% are not 49.4% of the respondents have a higher education, 38.8% of the respondents have completed high school, and 11.8 have a primary education.

The largest percentage of 77.4% have moderate incomes, 10.2% declared that they have high incomes and 12.4% low incomes

More than half of those surveyed 56.8% are employed, 23.6% are not, 14.8% are students and 4.8% are retired.

The age group below 29 is represented in the largest percentage of those surveyed. with -34.4%, followed by age from 40 to 49 years. with 20.0%, with 19.4% the age from 50 to 59 years is represented, and with the smallest percentage the age over 60 years is represented. with 9.4%. The percentage difference is statistically significant between the representation of the age group under 29. versus the other adult modalities for $p<0.05$ (Difference test, p=.0000).

Table 1. Display of the average age of the respondents

age	*N*	*average*	*Me*	*minimum*	*maximum*	*25-Quartile*	*75-Quartile*	*Std.Dev.*
total	500	39.4	39.0	18.0	83.0	25.0	52.0	14.9
men	204	40.3	39.0	18.0	83.0	24.0	53.0	16.2
women	296	38.8	38.0	18.0	80.0	26.0	50.0	13.9

The average age of the respondents is 39.4 ± 14.9 years, minimum 18 years, and maximum 83 years. Fifty percent of the respondents included in the sample are over 39 years old. for Median IQR=39.0(25-52).

The average age of the male respondents is 40.3 ± 16.2 years, minimum 18 years, and maximum 83 years. Fifty percent of the respondents included in the sample are over 39 years old. for Median

IQR=359.0(24-53) The average age of female respondents is 38.8 ± 13.9 years, minimum 18 years, and maximum 80 years. Fifty percent of the respondents included in the sample are over 38 years old. for Median IQR=38.0(26-50).(table 1) According to the t-test, the difference between the age of the respondents according to gender is statistically insignificant for $p>0.05$ (t-test=1.123882, p=0.261605).

The largest percentage of those surveyed does not smoke - 60.4% and do not consume alcohol - 86.4%. The percentage difference is statistically significant between the representation of non-smokers versus smokers and respondents who do not consume alcohol versus those who consume alcohol for $p<0.05$ (Difference test, p=.0000)

More than 50.0% of those surveyed use recommended protective measures for protection against COVID-19, namely social distance -56.6%, 66.4% - protective mask, 87.6% - washing hands and 68.4% avoiding contact with sick or suspicious persons. The percentage difference between the use of protective measures versus sometimes and not for the protective measures of social distance, protective mask, hand washing and avoiding contacts is statistically significant for $p<0.05$ (Difference test, p=.0000).

A significant dependence is registered between the knowledge of using protective measures for COVID-19 - social distance, protective mask, hand washing and avoiding contact with a sick or suspicious person versus place of residence, gender, level of education, economic status and employment for $p<0 .05$ (Pearson Chi-square).

83.2% of the respondents took supplements/additives (vitamins and minerals), 15.2% did not, and 1.6% of the respondents did not give an answer. The percentage difference between those who took versus those who did not is statistically significant for $p<0.05$ (Difference test, p=.0000).

Regarding the question What supplements did the respondents take, the largest percentage of 75.6% took vit.C, followed by 36.8% vit.D3, 26.2% took group B vitamins, 25.4% Omega 3, 24.0% multi-vitamins and minerals ,21.4%-Zinc, 10.6% Potassium, 9.6% Iron and 4.0% Probiotics. Part of the respondents does not give an agreement - 15.0% and 1.4% prefer not to give an answer. The percentage difference between those who took Vit.C versus the other supplements is statistically significant for $p<0.05$ (Difference test, p=.0000).

Before the COVID 19 pandemic, 26.6% (133) of those surveyed took supplements.

In total, 53.8% (269) of those surveyed took supplements during the COVID 19 pandemic. According to the dynamics index, a growth rate of 102.3% is registered in relation to the time period before the pandemic with COVID 19.15.4% did not take supplements, and 4.2% did not give an answer.

The source of information through which the respondents heard (met) about food supplements (supplements) in the largest percentage before and during the pandemic was from a doctor, health worker (62.2% and 65.6%). Then comes information via the internet, social media 21.2% before and 22.6% during the pandemic.

Source of information about supplements 19.6% before and 22.0% during the pandemic are friends and relatives. 11.6% of those surveyed before and 9.6% during the pandemic receive information through electronic media. Pharmacists are the source of information about supplements according to 9.0% of those surveyed before and 11.0% during the pandemic. 25.0% of the respondents do not give an answer about the use of supplements before and 16.0% during the pandemic

The answer to the question Can you say that you took more supplements during the pandemic than before the start of the pandemic?, 68.8% answered that they took more supplements during the pandemic, and 28.8% did not. The percentage difference between those who took more supplements during the pandemic versus the rest who did not is statistically significant for $p<0.05$ (Difference test, p=.0000).

Before the COVID-19 pandemic, 23.8% of the respondents took the drug for the longest time, followed by 21.6% who took it for three months and 11.4% who took it for more than 6 months.

During the COVID-19 pandemic, 57.0% of respondents took more than six months for the longest time, followed by 15.4% who took it for three months and 6.4% who took it for one month. According to the dynamics index, a growth rate is registered among those surveyed, who take supplements for more than 6 months by 400%.

When we asked about the doses of individual vitamins taken by most of the respondents, 99.8% did not give an answer for potassium, 63.4% did not give an answer for zinc, 55.4% for Omega 3, 47.8% for vitamin D and 19.4% for vitamin C.

Part of the respondents show ignorance about the doses for vitamin C 8.4%, 13.0% for vitamin D,

Questions and answer	*n*	*%*	*p*

20.2% for Omega 3, and 21.0% for zinc. 72.2% of the respondents know the dose for vitamin C, of which 43.8% are for a dose of 500mg and 26.2% for a dose of 1000mg. 39.2% of those surveyed know the dose of vitamin D, of which 20.6% are for a dose of 1000-4000IU and 16.8% for a dose <1000IU. 78 respondents know the dose for zinc, i.e. 15.6%.

The dosage for Omega 3 11.6% of those surveyed are for 500mg, 7.0% for 1000mg, and 5.8% for 250mg.

As shown in Table 2, Half of the respondents (50.4%) confirm the statement that - All supplements, vitamins, minerals, herbs are safe, 29.8% do not know, and 17.0% believe that the statement is false. The percentage difference between the correct answer vs. other modalities is statistically significant for $p<0.05$ (Difference test, p=.0000)

There is no correlation between the response of the respondents with the demographic data - place of residence, gender, marital status and work status for $p>0.05$. There is a correlation between the response of the respondents with the level of education, economic status for $p<0.05$.

Half of the respondents (50.8%) confirm the statement that - The effectiveness of nutritional supplements is based on clinical trials, 41.8% do not know, and 6.0% believe that the statement is false.

The percentage difference between the correct answer versus the other modalities is statistically significant for $p< 0.05$ (Difference test, p=.00).

There is no correlation between the answer of the respondents with the demographic data - place of residence, gender, marital status for $p>0.05$.

There is a correlation between the answer of the respondents with the level of education, economic status, work status for $p<0.05$.

Organizations control dietary supplements (DS)			
correct	246	49.2	
incorrect	35	7.0	.0309
I don't know	212	42.4	
are missing	7	1.4	
All supplements, vitamins, minerals, herbs are safe			
correct	252	50.4	
incorrect	85	17.0	.0000
I don't know	149	29.8	
are missing	14	2.8	
The efficacy of dietary supplements (DS) is based on clinical trials			
correct	254	50.8	
incorrect	30	6.0	
I don't know	209	41.8	.00
are missing	7	1.4	
Dietary supplements (DS) are tested before they are put on the market			
correct	226	45.2	
incorrect	46	9.2	.6106
I don't know	218	43.6	
are missing	10	2.0	
Dietary supplements (DS) may be labeled as drugs			
correct	203	40.6	
incorrect	101	20.2	.0000
I don't know	190	38.0	
are missing	6	1.2	
All dietary supplements (DS) in pharmacies are safe			
correct	185	30.7	
incorrect	108	21.6	.00
I don't know	200	40.0	
are missing	7	1.4	
Dietary supplements (DS) can interact with medications			
correct	149	29.8	
incorrect	62	12.4	.000
I don't know	282	56.4	
are missing	7	1.4	

Table 2. Distribution of respondents according to knowledge and claims about nutritional

45.2% of those polled confirm the claim that - Nutritional supplements are tested before being put on the market, 43.6% do not know, and 9.2% consider the claim to be incorrect.

The percentage difference between the correct answer versus the unknown is statistically insignificant for p>0.05 (Difference test, p=.6106).

There is no correlation between the answer of the respondents with the demographic data - place of residence, gender, marital status for p>0.05.

There is a correlation between the answer of the respondents with the level of education, economic status, work status for p<0.05.

45.2% of those polled confirm the claim that - Nutritional supplements are tested before being put on the market, 43.6% do not know, and 9.2% consider the claim to be incorrect. The percentage difference between the correct answer versus the unknown is statistically insignificant for p>0.05 (Difference test, p=.6106).

There is no correlation between the answer of the respondents with the demographic data - place of residence, gender, marital status for p>0.05. There is a correlation between the answer of the respondents with the level of education, economic status, work status for p<0.05.

20.3% of those surveyed confirm the claim that - Dietary supplements can be labeled as drugs, 38.0% do not know, and 20.2% believe that the claim is incorrect.

The percentage difference between the inaccuracy of the claim versus the non-knowledge modality is statistically significant for p<0.05 (Difference test, p=.0000), and the difference between the inaccuracy of the claim versus the accuracy of the claim is statistically insignificant for p>0.05 (Difference test, p=.9686)

There is no correlation between the responses of the respondents and the demographic data - place of residence, gender, marital status, level of education, employment for p>0.05. A correlation was registered between the answer of the respondents and the economic situation, for p<0.05

30.7% of those surveyed confirm the claim that - All dietary supplements in pharmacies are safe, 40.0% do not know, and 21.6% believe that the claim is incorrect.

The percentage difference between ignorance versus the modalities is statistically significant for p<0.05 (Difference test, p=.00), and the difference between incorrectness of the claim versus the correctness of the claim is statistically significant for p<0.05 (Difference test, p=.0011).

There is no correlation between the answer of the respondents and the demographic data - place of residence, marital status, level of education, economic situation, employment for p>0.05.

Discussion

The spread of the new corona virus (SARS-Cov-2) required changes in people's lifestyles, affecting food choices and health conditions.

This paper reflects the assessment of the impact of the COVID-19 pandemic on the behavior of individuals to protect themselves from infection with the virus through the use of nutritional supplements as an effective measure to strengthen the immune system [21].

Such an aspect was evaluated by many authors among different populations, and among them we refer to the study by Savarese et al., which showed that in Italy, most believed that strengthening the immune defense through nutritional elements increases the function of the immune system for reduce the risk of infection with COVID-19 [22].

Until, the result of the study conducted by Louca et al. (2021) in 372,720 UK participants (175,652 supplement users and 197,068 non-users) in 2021 is a study investigating the effect of dietary 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 [23].

From the analysis of the data of our study, the results show that the consumption of dietary supplements is widespread among the majority of the members of the surveyed group.

This cross-sectional study was developed in response to the objective, among 500 adult residents of 5 municipalities of the Ferizaj region, which provided representative information on the consumption of nutritional supplements during the COVID-19 pandemic.

The municipality of Ferizaj is represented with 60.0%, then Kaçanik with 20.0%, and in a smaller percentage are Elezi Han and Shtrpca with 6.0%. 60.8% of respondents are from an urban environment, and 39.2% from a rural environment.

The statistical analysis of the sociodemographic characteristics offered us the main elements for understanding the structure of the research group necessary for comparisons between other research groups from works published in the scientific literature.

The profile of the respondents are mainly female, 59.2%, with an average age of 39 years, with a high professional level, living with their spouse, all with an average monthly income and more than half of the respondents, 56.8% , are employed. The age group under 29 is represented in the largest percentage of respondents, statistically significant among other age groups (p=.0000).

While the questions about the assessment of social habits, specifically the status of smoking and alcohol, showed the highest percentage of respondents who do not smoke - 60.4% and do not consume alcohol - 86.4%, which in fact reflected individual behavior with little probability to the possible occurrence of complications from COVID-19 during the pandemic [24-26].

For the realization of this study, it was therefore of interest to understand the level of compliance with personal protective measures, as a reason for knowing protective knowledge against infection. Specifically, the indirect measurement of behaviors as actions from the impact of COVID-19, in raising awareness for protection from virus infection, to then lead towards positive changes.

Through defined questions about knowledge of behaviors towards protective health recommendations [27], we assessed compliance with standards of protection against SarsCov 2 virus infection, specifically the occurrence of Covid-19 disease [27].

To understand the adherence to recommended public health practices as preventive protective measures according to the ECDS, our results revealed that more than 50.0% of respondents use the recommended protective measures to protect against COVID-19, namely social distancing -56.6 % , 66.4% - protective mask, 87.6% - washing hands and 68.4% avoiding contact with sick or suspicious persons. These findings are further supported by another study [28,29] which revealed complete non-compliance with these protective standards in preventing viral infection. Thus, the findings in this study will provide valuable information for public health experts to promote education at the population level to promote individual and public health.

The question of "use of dietary supplements" was an indicator of prevalence in our study. In the answers given to this question, it was found that more than half of the study group (83.2%) took nutritional supplements. This result was consistent with findings on DDS use observed in other countries during this pandemic, which highlight a significant increase in demand for dietary supplements compared to pre-pandemic figures.

A similar prevalence of supplement use during the COV-19 pandemic was shown in a study conducted in Lithuania by Arlauskas et al (2022) including 1600 adult subjects. The study found that dietary supplement consumption was prevalent at 78.1% among respondents.[30]

While another cross-sectional study conducted among the United Arab Emirates (UAE) population to investigate the pattern and determinants of DDS use for the prevention and treatment of COVID-19 showed that the majority of study participants (95.5%) reported increased taking at least one special food (natural medicine) for the prevention or treatment of COVID-19, which was the most common practice of supplementary diets.

The use of nutritional supplements was reported by 56.6%. [31].

Reports from Poland [32] also highlighted a dramatic increase in the proportion of people who started using DDS during the pandemic (Hamulka et al., 2021). A population-based cross-sectional study also showed widespread use of nutritional supplements, natural remedies, vitamins and minerals during the first three months of the pandemic among the majority of the population in the Netherlands (59.4%), Sweden. (50%) and Norway (72.8%) [33, 32].

Another finding of our study that yielded a statistically significant result was the higher frequency of receiving DS among those in the university education group than in the other groups ($p<0.05$).

In accordance with this, Puścion-Jakubik et al. (2021) assessed knowledge and acceptance of dietary supplements during the COVID-19 pandemic in Poland. They reported that dietary supplements were used more by highly educated individuals (59.0%)[34].

For this result as a possible reason, it can be said that people with higher education may have more access to information tools and may have used supplements for protection against the pandemic.

Further, the results of our study showed that before the COVID 19 pandemic, 26.6% (133) of respondents were taking supplements. In total, 53.8% (269) of respondents received supplements during the COVID 19 pandemic. According to the dynamics index, an increase of 102.3% was observed in relation to the time period before the COVID 19 pandemic.

Data reported by the study [32] from an online survey conducted in Poland during the first and second wave of the pandemic showed that the majority of DS users took all supplements before the COVID-19 pandemic (34% and 45%), reflecting the percentages of respondents who started supplementation during the second wave of the COVID-19 pandemic [32].

Our study through the question "Would you say you took more supplements during the pandemic than before the pandemic began?" showed that 68.8% answered that they took more supplements during the pandemic and 28.8% did not (p= .0000).

Duration of taking supplements for respondents during the COVID-19 pandemic was 57.0% for more than 6 months, followed by 15.4% who took three months and 6.4% who took one month. According to the dynamism index, a 400% increase was recorded among respondents taking supplements for more than 6 months.

Our results showed a significant increase in use compared to the reference results of the study conducted in Lithuania by Arlauskas et al (2021), the majority (78.1%) of respondents indicated the consumption of nutritional supplements: daily consumption - 24.0%, 6 - monthly consumption - 9.8%, consumption from 4 to 6 months - 10.3%. , consumption from 2 to 3 months—16.2%, one-month consumption—4.9%. [30]

Furthermore, when asked what supplements respondents took, the highest percentage of 75.6% took vitamin C, followed by 36.8% vitamin D3, 26.2% took B vitamins, 25.4% omega 3, 24.0% multivitamins and minerals, 21.4% - zinc. , 10.6% potassium, 9.6% iron and 4.0% probiotics. (p =.0000). Referring to the 2021 study (Lithuania), vitamin C, vitamin D, omega-3 fatty acids, magnesium and dietary supplements for general body strengthening were among the most commonly used dietary supplements highlighted in the responses to the question which of the supplements diet has been consumed more under the influence of the COVID-19 pandemic.[30]

A similar study conducted in the city of Benha, Egypt during COVID-19, reported the use of vitamin C (27%), vitamin D (17.7%), immune-boosting drinks (39.3%), honey (32.2%) and garlic (37.2). %) among participants [35].

Until Radwan et al., in their study in Arabia, found that the most reported supplements were vitamin C (84.5%), vitamin D (31.6%) and multivitamins (17%). Other supplements used were omega 3 (11.7%), calcium (9.9%), B complex (9.4%), zinc (8%), protein supplements (5.6%), probiotics (4.4%), iron (6.4%) and folic. acid (2%). [31].

Our findings showed that the source of information through which respondents heard (met) about supplements in a higher percentage before and during the pandemic was from a doctor, health worker (62.2% and 65.6%). This is followed by information via the Internet, social media 21.2% before and 22.6% during the pandemic.

The source of information about supplements 19.6% before and 22.0% during the pandemic are friends and relatives. 11.6% of respondents before and 9.6% during the pandemic receive information through electronic media. Pharmacists are the source of information about supplements according to 9.0% of respondents before and 11.0% during the pandemic. 25.0% of the respondents do not answer about the use of supplements before and 16.0% during the pandemic.

In the United Arab Emirates, 40% of the study population depended on social media as the main source of information regarding the use of DDS for COVID-19, about 30% depended on information from family members and friends, and only 21% relied in information from health workers [31]

In the United States, health care professionals were reported as the most trusted source of information about COVID-19, although less than half of the population relied on them for information (38%), and more people reported relying on friends instead (64%) [36, 31]

Such reports differed from our findings, which showed that more than half of respondents (65.6%) relied on health professionals for information about nutrition and the use of nutritional supplements to prevent or treat COVID-19. and 22% or one fifth of people relied on their family members and friends.

Furthermore, our analysis of these indicators of information and advice, with these findings, is partially consistent with research conducted by El Khoury, Chiba et al [37,38]

Finding knowledge and claiming that supplements are safe (50.4%), effective and due to clinical evidence (50.8%), testing supplements before they go on the market (45.2%) were confirmed by studies conducted by Webb in general [39] and El Khoury [37].

Almost half of the participants (40.6%) agreed that DSs can be labeled as drugs, and 37.0% stated that all products available in pharmacies are considered safe.

In conclusion, the use of dietary supplements (DS) has been steadily increasing all over the world, and moreover, the sales of DS have increased dynamically after the coronavirus disease (COVID-19) in 2019 in most countries [40].

This study has provided important information on the prevalence and determinants of DDS use in the Ferizaj region during the COVID-19 pandemic. Our findings showed widespread use of DDS for the prevention and treatment of COVID-19, with the most common practice being vitamin C followed by other vitamins. The control of this pandemic has been and continues to be largely dependent on public awareness and adherence to recommended preventive measures, as well as their responsible behavior regarding the use of dietary supplements and the sharing of information.

Conclusion

Our study showed the effect of COVID-19 on behaviors related to the use of dietary supplements. During the COVID-19 pandemic, there has been increased interest and use of immune-related supplements such as vitamins C and D, zinc, Omega 3, and B vitamins.

Additionally, since there is a risk of increased intake of certain nutrients due to popularity of DSs, effective consumer education on rational use of DSs and protective health behaviors against COVID-19 should be developed.

Planning educational strategies during the current public health crisis remain essential issues to be developed and presented at the local level and national.

References

1. World Health Organization WHO Coronavirus (COVID-19) Overview; [(accessed on 20 Jun 2022)]; Available online: https://www.who.int/health-topics/coronavirus
2. Marco Cascella; Michael Rajnik; Abdul Aleem; Scott C. Dulebohn; Raffaela Di Napoli; Features, Evaluation, and Treatment of Coronavirus (COVID-19); (2022) Available online: https://www.ncbi.nlm.nih.gov/books/NBK554776/
3. Centers for Disease Control and Prevention; Long COVID or Post-COVID Conditions (2022) Available online: https://www.cdc.gov/coronavirus/2019-ncov/
4. Kałucka S., Kaleta D., Makowiec-Dabrowska T. Prevalence of Dietary Behavior and Determinants of Quality of Diet among Beneficiaries of Government Welfare Assistance in Poland. Int. J. Environ. Res. Public Health. 2019;16:501
5. Barzda A., Bartkevičiūtė R., Baltušytė I., Stukas R., Bartkevičiūtė S. Actual nutrition and nutrition habits of adults and elderly of Lithuania. Visuomenės Sveik. 2016;1:85–94.
6. World Health Organization Healthy Diet. [(accessed on 13 June 2022)]. Available online: https://www.who.int/news-room/fact-sheets/detail/healthy-diet

7. Bartkevičiūtė R., Barzda A., Bulotaitė G., Miliauskė R., Drungilas V., Česnakauskienė I. Sveikos ir Tvarios Mitybos Rekomendacijos. 2nd ed. Sveikatos Mokymo ir Ligų Prevencijos Centras; Vilnius, Lithuania: 2020. pp. 1–10. [Google Scholar]
8. European Food Safety Authority (EFSA) Dietary Supplements. [(accessed on 13 June 2022)]. Available online: https://www.efsa.europa.eu/en/topics/topic/food-supplements
9. Hamulka J., Jeruszka-Bielak M., Górnicka M., Drywień M.E., Zielińska-Pukos M.A. Dietary supplements during COVID-19 outbreak. Results of Google Trends analysis supported by PLifeCOVID-1 online studies. Nutrients. 2021;13:54. [PMC free article] [PubMed] [Google Scholar]
10. Lee J., Kwan Y., Lee J.Y., Shin J.I., Lee K.H., Hong S.H., Han Y.J., Kronbichler A., Smith L., Koyanagi A., et al. Public interest in immunity and the justification for intervention in the early stages of the COVID-19 pandemic: Analysis of Google Trends data. J. Med. Internet Res. 2021;23:e26368. [PMC free article] [PubMed] [Google Scholar]
11. Mrityunjaya M., Pavithra V., Neelam R., Janhavi P., Halami P.M., Ravindra P.V. Immune-Boosting, Antioxidant and Anti-inflammatory Dietary supplements Targeting Pathogenesis of COVID-19. Front. Immunol. 2020;11:570122. [PMC free article] [PubMed] [Google Scholar]
12. Panel E., Nda A. Scientific opinion on the substantiation of a health claim related to vitamin D and contribution to the normal function of the immune system pursuant to Article 14 of Regulation (EC) No 1924/2006. EFSA J. 2015;13:1–7. doi: 10.2903/j.efsa.2015.4096.
13. Panel E., Nda A. Scientific Opinion on the substantiation of health claims related to vitamin D and normal function of the immune system and inflammatory response (ID 154, 159), maintenance of normal muscle function (ID 155) and maintenance of normal cardiovascular functi. EFSA J. 2010;8:1–17. doi: 10.2903/j.efsa.2010.1468
14. Panel E., Nda A. Scientific opinion on the substantiation of a health claim related to vitamin C and contribution to the normal function of the immune system pursuant to Article 14 of Regulation (EC) No 1924/2006. EFSA J. 2015;13:1–7. doi: 10.2903/j.efsa.2015. 4298.
15. Opinion S. Scientific opinion on the substantiation of health claims related to zinc and function of the immune system (ID 291, 1757), DNA synthesis and cell division (ID 292, 1759), protection of DNA, proteins and lipids from oxidative damage (ID 294, 1758), mainte. EFSA J. 2009;7:1229. doi: 10.2903/j.efsa.2009.1229. https://www.efsa.europa.eu/en/efsajournal/pub/4096
16. Aman, F. and Masood, S. (2020). How nutrition can help to fight against COVID-19 pandemic. Pakistan Journal of Medical Sciences, 36(COVID19-S4), S121-123. https://doi.org/10.12669/pjms.36.COVID19-S4.2776
17. Ozenoglu, A. and Gulbahar, G. (2020). Nutrition and micronutrients for the protection of physical and mental health in the COVID-19 pandemic. In N. Alkanli, A. Ay and S. S. Alkanli (Eds.), [COVID-19 treatment predictors] (pp. 35-125).
18. Mullin G.E., Limektkai B., Wang L., Hanaway P., Marks L., Giovannucci E. Dietary Supplements for COVID-19. In: Rezaei N., editor. Coronavirus Disease—COVID-19. Volume 1318. Springer International Publishing; Cham, Switzerland: 2021. pp. 499–515. [PubMed] [Google Scholar]
19. Thirumdas, R., Kothakota, A., Pandiselvam, R., Bahrami, A. and Barba, F. J. (2021). Role of food nutrients and supplementation in fighting against viral infections and boosting immunity: A review. Trends in Food Science & Technology, 110, 66-77. https://doi.org/10.1016/j.tifs.2021. 01.069
20. Mohammed Iddir at all; (2020) Strengthening the Immune System and Reducing Inflammation and Oxidative Stress through Diet and Nutrition: Considerations during the COVID-19 Crisis; https://doi.org/10.3390/nu12061562; Available online: https://www.mdpi.com/2072-6643/12/6/1562#B77-nutrients-12-01562
21. M. Savarese, G. Castellini, L. Morelli, G. Graffigna;(2021) COVID-19 disease and nutritional choices: How will the pandemic reconfigure our food psychology and habits? A case study of the Italian population;DOI: 10.1016/j.numecd.2020.10.013

22. Louca, P., Murray, B., Klaser, K., Graham, M. S., et al. (2021). Modest effects of dietary supplements during the COVID19 pandemic: Insights from 445850 users of the COVID-19 symptom study app. BMJ Nutrition, Prevention & Health,4(1), 149-157. https://doi.org/10.1136/bmjnph-2021-000250
23. WHO Statement: Tobacco Use and COVID-19. [(accessed on 22 September 2022)]; Available online: https://www.who.int/news/item/11-05-2020-who-statement-tobacco-use-and-covid-19 [Ref list]
24. E. Melinda Mahabee-Gittens, Angelico Mendy, Ashley L. Merianos: (2021) Assessment of Severe COVID-19 Outcomes Using Measures of Smoking Status and Smoking Intensity; NIH, doi: 10.3390/ijerph18178939; PMID: 34501529; Available online: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8431679/
25. Grundy E.J., Suddek T., Filippidis F.T., Majeed A., Coronini-Cronberg S. Smoking, SARS-CoV-2 and COVID-19: A review of reviews considering implications for public health policy and practice. Tob. Induc. Dis. 2020;18:58. doi: 10.18332/tid/124788.
26. ECDC Prevention and contol: How to protect yourself and others; [(accessed on 22 September 2022)] Available online: https://www.ecdc.europa.eu/en/covid-19/prevention-and-control/protect-yourself
27. Nadim Sharif at all; (2021) Protective measures are associated with the reduction of transmission of COVID-19 in Bangladesh: A nationwide cross-sectional study; NIH; doi:10.1371/journal.pone.0260287;PMID:34807962 Available online: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8608304/
28. Gülsün Ayran, Semra Köse, Arzu Sarıalioğlu, Ayda Çelebioğlud; (2022) Hand hygiene and mask-wearing behaviors and the related factors during the COVID 19 pandemic: A cross-sectional study with secondary school studentsinTurkeydoi:10.1016/j.pedn.2021.10.001;PMID:34688528;Availableonline:https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8491930/#bb0120
29. Rokas Arlauskas, Donatas Austys, and Rimantas Stukas;(2022); COVID-19 Pandemic and Consumption of Dietary Supplements among Adult Residents of Lithuania;PMCID:PMC9368138PMID: 35954945 Published online 2022 Aug 4.;https:// doi: 10.3390/ijerph19159591
30. Hadia Radwan ay all; (2022) , Diets and dietary supplements used during the COVID-19 pandemic in the United Arab Emirates: A cross-sectional survey; Saudi Pharmaceutical Journal; https://doi.org/10.1016/j.jsps.2022.01.019Available,online https://www.sciencedirect.com/science/article/pii/S1319016422000263 1
31. Jadwiga Hamulka, Marta Jeruszka-Bielak, Magdalena Górnicka, Małgorzata E. Drywień, and Monika A. Zielinska-Pukos*; (2021) Dietary Supplements during COVID-19 Outbreak. Results of Google Trends Analysis Supported by PLifeCOVID-19 Online Studies; doi: 10.3390/nu13010054 PMID: 3337542
32. Kristoffersen, A.E., van der Werf, E.T., Stub, T., Musial, F., Wider, B., Jong, M.C., Wode, K., Danell, J.B., Busch, M., Hoenders, H., & Nordberg, J.H. (2021). Consultations with health care providers and use of self-management strategies for prevention and treatment of COVID-19 related symptoms. A population based cross-sectional study in Norway, Sweden and the Netherlands. Complementary therapies in medicine, 64, 102792. Advance online publication. https://doi.org/10.1016/j.ctim.2021.10279.
33. Puścion-Jakubik, A., Bielecka, J., Grabia, M., Mielech, A., et al. (2021). Consumption of food supplements during the three COVID-19 waves in Poland—Focus on zinc and vitamin D. Nutrients, 13(10), 3361. https://doi.org/10.3390/nu13103 361
34. O.F. Khabour, S.F.M. Hassanein; (2021) Use of vitamin/zinc supplements, medicinal plants, and immune boosting drinks during COVID-19 pandemic: a pilot study from Benha city, Egypt
35. Heliyon, 7 (2021), p. e06538, 10.1016/j.heliyon.2021.e06538

36. Teske, K., Tsirigotis, J., Riba, M., Platt, J., Udow-Phillips, M., 2020. Health professionals are the most trusted source of information on COVID-19.
37. El Khoury, G.; Ramadan,W.; Zeeni, N. Herbal Products and DSs: A Cross-Sectional Survey of Use, Attitudes, and Knowledgeamong the Lebanese Population. J. Community Health **2015**, 41, 566–573.
38. Chiba, T.; Kobayashi, E.; Okura, T.; Sekimoto, M.; Mizuno, H.; Saito, M.; Umegaki, K. An educational intervention improvedknowledge of dietary supplements in college students. BMC Public Health **2020**, 20, 1–12.
39. Webb, A.D. Dietary Supplement Use and Attitudes among College Students Enrolled in an Introductory Nutrition Course.Available online: https://trace.tennessee.edu/utk_gradthes/67/
40. Self-Prescribing Supplements? Here's Why You Should Think Again. Henry Ford LiveWell. Available online: https://www.henryford.com/blog/2021/01/self-prescribing-supplements