Original Article

DOI: 10.4274/haseki.galenos.2023.8418
Med Bull Haseki 2023;61:14-22

Nutritional Supplement Use Influencing by Cyberchondria and E-Health Literacy During the COVID-19 Outbreak in Turkey

Melike Mercan Baspinar

University of Health Sciences Turkey, Gaziosmanpasa Training and Research Hospital, Clinic of Family Medicine, Istanbul, Turkey

Abstract

Aim: "We're not just fighting an epidemic; we're fighting an infodemic," said World Health Organization Director-General Tedros Adhanom Ghebreyesus at the Munich Security Conference. In this context, we examined vitamin-mineral use frequency as influenced by cyberchondria, or E-health literacy level, and related factors during the coronavirus disease-2019 outbreak.

Methods: In this cross-sectional study, participants who were admitted to the outpatient clinics in a tertiary hospital between March 2021 and April 2021 were asked questions on socio-demographic data, the presence of vitamin and mineral use, and knowledge. The cyberchondria scores by the cyberchondria severity scale and the E-health literacy scores by the electronic health literacy scale were assessed based on nutrition type choice. The use of vitamins and minerals was compared between regular and non-regular supplement users. Factors related to the presence of nutritional supplement use were assessed through logistic regression analysis.

Results: A total of 417 participants, including those aged 39.3±12.09 years, were found to be regular nutritional supplement users at a rate of 52.99% during the outbreak. The most commonly used supplements were vitamin D (62.8%), vitamin C (54.4%), vitamin B12 (39.6%), zinc (37.9%), magnesium (35.7%), and iron (33.60%). The least used supplement was melatonin (5.30%). Iron, calcium, and vitamin A users had a higher cyberchondria score than non-users (p=0.002, p=0.044, and p=0.030, respectively). However, zinc, selenium, magnesium, calcium, vitamin B6, vitamin C, omega-3 fish oil, and probiotic users had a higher E-health literacy score than non-users (p<0.001, p=0.018, p<0.001, p=0.009, p=0.047, p=0.018, p=0.002, p=0.002, respectively). Logistic regression analyses identified higher E-health literacy [odds ratio (OR)=1.077; 95% confidence interval (CI): 1.042-1.115; p<0.001], female sex (OR=1,659; 95% CI: 1,005-2,737; p=0.048), graduated from university (OR=2,536; 95% CI: 1,009-6,374; p=0.048), presence of health professional's advice (OR=3,716; 95% CI: 2,260-6,119; p<0.001) and chronic disease presence (OR=2,755; 95% CI: 1,420-5,347; p=0.003) were predictors of supplement usage during the outbreak.

Conclusions: Higher E-health literate women with comorbidities were likely nutritional supplement users during the outbreak, regardless of cyberchondria severity or age generation differences.

Keywords: Vitamin C, vitamin D, minerals, health literacy, cyberchondria

Introduction

The immune system is a defense system consisting of various biological structures and activities and has a strong relationship with macro, micro, or other nutritional supplements (1). Vitamin supplements have previously been advised to reduce the severity of flu and acute respiratory distress syndrome and boost the immune system through their antioxidant properties (2). Additionally, based on some study results, such as analyses showing that patients with vitamin D and selenium deficiencies are more likely to experience coronavirus disease-2019 (COVID-19) mortality, it has been suggested to use some vitamins to suppress the adverse effects of COVID-19 (2).

Seasonal variation and COVID-19 influence the popularity of vitamins both worldwide and in Turkey (3). Public interest in vitamins can be investigated using Google Trends (3). Interest in vitamins has increased since the initiation of the COVID-19 pandemic. Especially, the largest online search related to all "vitamin" search terms was determined to be in March 2020 (3). Internet

Address for Correspondence: Melike Mercan Baspinar, University of Health Sciences Turkey, Gaziosmanpasa Training and Research Hospital, Clinic of Family Medicine, Istanbul, Turkey
Phone: +90 212 945 30 00 E-mail: drmelikemercan@gmail.com ORCID: orcid.org/0000-0003-3183-3438
Received: 21.04.2022 **Accepted:** 29.01.2023

usage has become an important resource for research and informational health. This situation has caused the term "E-health literacy", which is an online form of health literacy, to gain importance. Electronic health literacy (E-health literacy) is a concept for health information in electronic resources. Many issues, such as which dose of a drug should be taken, what the test results mean, what the numbers in blood pressure and sugar measurement mean, and being aware of the risks brought by some habits, are closely related to health literacy (4). The concept of e-Health literacy is defined as the ability to seek, find, and understand health information from electronic sources and apply the knowledge to solve health problems (5). Cyberchondria is another concept that is described as exacerbated health anxiety because of repeated online searches for medical information. An interesting possible consequence of social media use during COVID-19, which may be connected to the spread of misinformation, is cyberchondria (6). It was concluded that the significant associations between impulsivity, fear of COVID-19, and cyberchondria were indirectly contributed by health-related cognition and metacognition (7).

"We're not just fighting an epidemic; we're fighting an infodemic," said World Health Organization Director-General Tedros Adhanom Ghebreyesus at the Munich Security Conference (8). In our study, the frequency and variety of nutritional supplement use, especially vitamin and mineral supplements, were questioned during the pandemic period. The effect of cyberchondria and E-health literacy was evaluated between those who regularly use supplements and those who do not. An answer was sought to the question of "whether exacerbated health anxiety or a conscious choice considering e-literacy were at the forefront of pandemic nutritional supplement use".

Materials and Methods

Compliance with Ethical Standards

This study was designed as an observational (cross-sectional) study between March 2021 and April 2021 at the University of Health Sciences Turkey, Gaziosmanpasa Training and Research Hospital. The Clinical Research Ethics Committee of University of Health Sciences Turkey, Gaziosmanpasa Training and Research Hospital accepted the study protocol by March 17, 2021, with approval number 241. Participants were informed about the procedure, and their written consent was obtained.

Sample Size

It was calculated that at least 317 people should be studied when the average frequency of use of vitamin and mineral supplements was taken as 29% and put into the formula $n=1.96^2* (0.29*0.81)/0.05^2$.

Participants

It was tried to determine the factors affecting the nutritional vitamin and mineral usage preferences of a sample group of 417 participants representing the outpatient clinics in a training hospital in Istanbul. The subjects participating in the study were selected by a random sampling method using a validated web-based "Research Randomizer" (https://www.randomizer.org/) based on the daily clinic application number list and were asked to answer questions about the topic through face-to-face interviews. Patients aged 18 years and older without any cognitive, psychological, or neurological problems were included. All participants were asked, "Did you intake any kind of nutritional supplements here in the last three months of the pandemic?" Responses were divided into two groups: those who received them regularly and those who received them occasionally or not. Additionally, respondents were asked, "How useful do you think the internet is when making decisions about your health?" and secondly, "How important is it to you to access health resources on the Internet?" Socio-demographic data were evaluated on the basis of age, generation, marriage, education, COVID-19 disease history, smoking presence, and additional diseases. Additionally, cyberchondria severity scale (CSS) scores and E-health literacy scale scores were calculated.

Scales in the Questionnaire

Cyberchondria is related to health anxiety, problematic Internet use, and symptoms of obsessive-compulsive disorder (9). The CSS is a 5-point Likert-type assessment tool that includes 33 items that can directly evaluate cyberchondria with a score range between minimum 33 and maximum 165 points. It was developed by McElroy and Shevlin (10) with university students. Fergus (11) and Norr et al. (12) have shown that the CSS is a valid and reliable scale for adults. In the Turkish validation of CSS by Utku et al. (13), the Cronbach alpha coefficient of CSS was 0.89 and had adequate psychometric properties of validity to assess cyberchondria.

The E-health literacy scale is an electronic health tool developed by Norman and Skinner to assess the information level of the users as an essential source of data (5). It was culturally adapted into Turkish by Tamer Gencer (14) with a 0.915 Cronbach alpha coefficient. It has a one-dimensional structure with 5-point Likert scales and eight items in the score range between minimum 8 and maximum 40 points (14).

Statistical Analysis

Normality control for the measurement variables was evaluated by drawing a single sample Kolmogorov-Smirnov test, histogram. Basic demographic details were

analyzed using descriptive statistics and expressed as mean, standard deviation, median, minimum, maximum, frequency, and percentage. The participants were divided into two clusters based on whether they were regular supplement users or non-users. The CSS and E-health literacy scores obtained were compared between the two clusters using Mann-Whitney tests according to the distribution of normality. A chi-square test was applied to compare groups. A p-value of <0.05 was considered statistically significant. Analyses were performed using the SPSS 22.0 software.

Results

A total of 417 participants, including those aged 39.3±12.09 years, were questioned about using 20 types of supplements in the last three months of the outbreak. In our results, 61.42% (n=256) of the participants found the internet useful for health searches, and accessing health information on the internet was important for 68.60% (n=286). Cyberchondria severity scale score and E-health literacy score scores were 73.91±21.13 and 28.01±7.17 indicating a low CSS level and moderate E-health literacy. The regular supplement use rate was 52.99%. As shown in Figure 1, the six most commonly used supplements were vitamin D (62.8%), vitamin C (54.4%), zinc (37.9%), vitamin B12 (39.6%), magnesium (35.7%), and iron (33.6%). The least used supplements were melatonin (5.3%) and Panax ginseng (5.5%). According to group differences, the use of nutritional supplements is presented in Table 1. In the age groups, 11.50% of the participants were baby boomers, 31.70% were X generation, 51.1% were Y generation, and 5.7% were Z generation. There was no statistically significant difference between the generations' supplement use rates (p=0.005). In terms of sex (p=0.026), presence of additional disease (p=0.006), and knowledge resource (p<0.001), regular supplement users differed significantly from occasional or non-users.

Table 2 compares nutritional supplement type intake differences between regular supplement users, occasional supplement users, and non-users. The use of all kinds of vitamins and minerals was observed at a higher rate in the regular supplement user group in the last three months of the outbreak compared with the occasional supplement user group.

Table 3 compared supplement users versus non-users based on CSS and E-health literacy scores. The CCS scores of supplement users (median=74) and non-users (median=74) were statistically similar (p=0.368). However, the E-health literacy score of regular supplement users (median=31) was significantly higher than that of the occasional or non-user group (median=26) (p<0.001).

An evaluation of cyberchondria and E-health literacy in the nutritional supplement type choice during the pandemic period is presented in Table 4. It was found that iron, calcium, and vitamin A users had a higher cyberchondria score than non-users (p=0.002, p=0.044, and p=0.030, respectively). However, zinc, selenium, magnesium, calcium, vitamin B6, vitamin C, omega-3 fish oil, and probiotic users had a higher E-health literacy score than non-users (p<0.001, p=0.018, p<0.001, p=0.009, p=0.047, p=0.018, p=0.002, p=0.002, respectively).

Table 5 shows the independent factors associated with regular supplement use. Logistic regression analyses revealed that higher E-health literacy [odds ratio (OR)=1.077; 95% confidence interval (CI): 1,042-1,115; p<0.001], female sex (OR=1,659; 95% CI: 1,005-2,737;

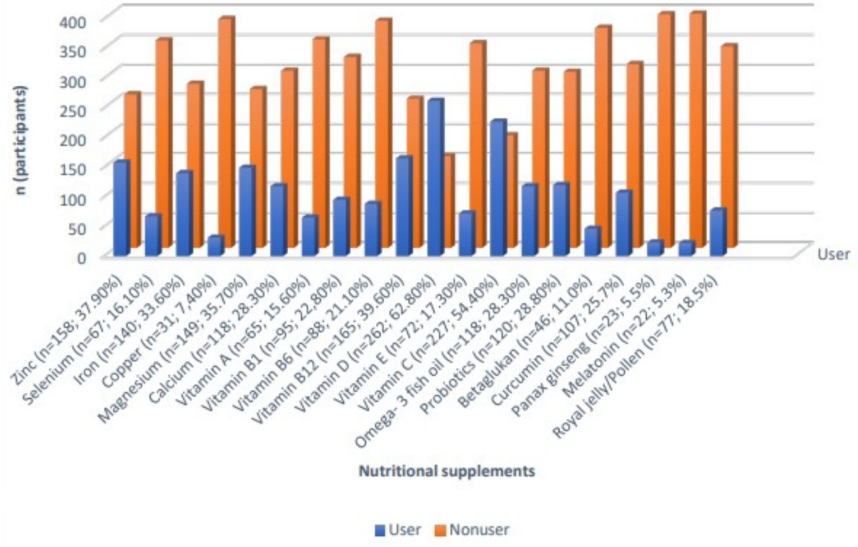

Figure 1. Distribution of vitamin-mineral use during outbreak

p=0.048), graduated from university (OR=2,536; 95% CI: 1,009-6,374; p=0.048), health professional's advice (OR=3,716; 95% CI: 2,260-6,119; p<0.001) and chronic disease presence (OR=2,755; 95% CI: 1,420-5,347; p=0.003) were predictors of pandemic supplement usage. Approximately, vitamin-mineral use was found to be 1.7 times higher in women, 2.5 times higher in university graduates, 2.8 times higher in those with comorbidities, and approximately 4 times higher if there was a recommendation from a healthcare professional.

Discussion

Considering this study, pandemic nutritional supplement use was observed as a conscious choice, with increased E-health literacy and health professionals' advice, especially in women and those with chronic disease, regardless of severity or age differences. Vitamin D (62.8%), vitamin C (54.4%), zinc (379.9%), vitamin B12 (39.5%), magnesium (35.7%), and iron (33.6%) were the most commonly used supplements, while melatonin (5.3%) was the least commonly used supplement.

Google Trends can be a beneficial tool for following public interest in identifying outbreak-related misinformation and scientific studies. For example, based on the relative search volumes for "coronavirus" and "COVID-19" in the USA and UK, there were strong correlations for the words "vitamin C" and "zinc" (15). In our study sample, the vitamin C, zinc, selenium, magnesium, calcium, vitamin B6, omega-3 fish oil, and probiotic users had a significantly higher E-health literacy score than the non-users of supplements.

It has been shown that the known anti-inflammatory and antiviral effects of serum levels of 25(OH)D, vitamin B12, and zinc at admission can affect clinical outcomes

Table 1. Evaluation of the characteristics of the participants according to their use of nutritional supplements

Details	Groups	Number of participants n (%)	Regular supplement users n (%)	Occasional or non-users n (%)	Test value* (p)
Generation	Babyboomers (1946-1964)	48 (11.50%)	33 (15.30%)	15 (7.40%)	**p=0.050**
	X generation (1965-1979)	132 (31.70%)	69 (32.10%)	63 (31.20%)	
	Y generation (1980-1999)	213 (51.10%)	104 (48.40%)	109 (54.00%)	
	Z generation (2000-2021)	24 (5.70%)	15 (7.40%)	9 (4.20%)	
Sex	Female	290 (69.5%)	160 (74.40%)	130 (64.40%)	**p=0.026**
	Male	127 (30.50%)	127 (25.60%)	72 (35.60%)	
Marital status	Married	259 (62.10%)	137 (63.70%)	122 (60.40%)	p=0.437
	Single	127 (30.50%)	60 (27.90%)	67 (33.20%)	
	Divorced	31 (7.40%)	18 (8.40%)	13 (6.40%)	
Education	Primary/secondary school	29 (7.00%)	11 (5.10%)	18 (8.90%)	p=0.118
	High school	83 (19.90%)	38 (17.70%)	45 (22.30%)	
	University	305 (73.10%)	166 (77.20%)	139 (68.80%)	
Occupation	Private sector/self-employed	174 (41.70%)	85 (39.50%)	89 (44.15%)	p=0.226
	Government sector	141 (33.80%)	81 (37.70%)	60 (29.7%)	
	Unemployed	102 (24.50%)	49 (22.80%)	53 (26.2%)	
Income	Low	98 (23.50%)	47 (21.20%)	51 (25.2%)	p=0.063
	Medium	215 (51.60%)	104 (48.40%)	111 (55.00%)	
	High	104 (24.90%)	64 (29.80%)	40 (19.80%)	
Additional disease	Positive	76 (18.20%)	50 (23.30%)	26 (12.90%)	**p=0.006**
	Negative	341 (81.80%)	165 (76.70%)	176 (87.10%)	
Smoking	Never use	197 (47.20%)	99 (46.00%)	98 (48.50%)	P=0.717
	Ex-smoker	81 (19.40%)	45 (20.9%)	36 (17.80%)	
	Smoker	139 (33.30%)	71 (33.0%)	68 (33.70%)	
Covid disease history	Positive	62 (14.90%)	34 (15.80%)	28 (13.90%)	0.575
	Negative	355 (85.10%)	181 (84.20%)	174 (86.10%)	
Resource of vitamin-mineral knowledge	Health professional	234 (56.10%)	159 (74.00%)	75 (37.10%)	**p<0.001**
	Friend/family	58 (13.90%)	15 (7.00%)	43 (21.30%)	
	Written/visual media	125 (30.00%)	41 (19.10%)	84 (41.60%)	

*Chi-square test

Table 2. Comparison of nutritional supplement type intake differences between regular supplement users versus occasional or non-users

Supplement type (n=total user; total use rate%) N=417	Supplement use	Regular users n (%)	Occasional or non-users n (%)	Test value* (p)
Zinc (n=158; 37.9%)	(+)	134 (62.30%)	24 (11.90%)	**p<0.001**
	(–)	81 (37.70%)	178 (88.10%)	
Selenium (n=67; 16.1%)	(+)	58 (27.00%)	9 (4.50%)	**p<0.001**
	(–)	157 (73.00%)	193 (95.50%)	
Iron (n=140; 33.6%)	(+)	108 (50.20%)	32 (15.80%)	**p<0.001**
	(–)	107 (49.80%)	170 (84.20%)	
Copper (n=31; 7.4%)	(+)	24 (11.20%)	7 (3.50%)	**p=0.003**
	(–)	191 (88.80%)	291 (96.50%)	
Magnesium (n=149; 35.7%)	(+)	124 (57.70%)	25 (12.40%)	**p<0.001**
	(–)	91 (42.30%)	177 (87.60%)	
Calcium (n=118; 28.3%)	(+)	95 (44.20%)	23 (11.40%)	**p<0.001**
	(–)	120 (55.80%)	179 (88.60%)	
Vitamin A (n=65; 15.6%)	(+)	47 (21.90%)	18 (8.90%)	**p<0.001**
	(–)	168 (78.10%)	184 (91.10%)	
Vitamin B1 (n=95; 22.8%)	(+)	79 (36.70%)	16 (7.90%)	**p<0.001**
	(–)	136 (63.30%)	186 (92.10%)	
Vitamin B6 (n=88; 21.1%)	(+)	74 (34.40%)	14 (6.90%)	**p<0.001**
	(–)	141 (65.60%)	188 (93.10%)	
Vitamin B12 (n=165; 39.6%)	(+)	136 (63.30%)	29 (14.40%)	**p<0.001**
	(–)	79 (36.70%)	173 (85.60%)	
Vitamin D (n=262; 62.8%)	(+)	190 (88.40%)	72 (35.60%)	**p<0.001**
	(–)	25 (11.60%)	130 (64.40%)	
Vitamin E (n=72; 17.3%)	(+)	60 (27.90%)	12 (5.90%)	**p<0.001**
	(–)	155 (72.10%)	190 (94.10%)	
Vitamin C (n=227; 54.4%)	(+)	174 (80.90%)	53 (26.20%)	**p<0.001**
	(–)	41 (19.10%)	149 (73.80%)	
Omega- 3 fish oil (n=118; 28.3%)	(+)	99 (46.00%)	19 (9.40%)	**p<0.001**
	(–)	116 (54.00%)	183 (90.60%)	
Probiotics (n=120; 28.8%)	(+)	89 (41.40%)	31 (15.30%)	**p<0.001**
	(–)	126 (58.60%)	171 (84.70%)	
Beta glucan (n=46; 11.0%)	(+)	37 (17.20%)	9 (4.50%)	**p<0.001**
	(–)	178 (82.80%)	193 (95.50%)	
Curcumin (n=107; 25.7%)	(+)	73 (34.00%)	34 (16.80%)	**p<0.001**
	(–)	142 (66.00%)	168 (83.20%)	
Panax ginseng (n=23; 5.5%)	(+)	19 (8.80%)	4 (2.00%)	**p=0.002**
	(–)	196 (91.20%)	198 (98.00%)	
Melatonin (n=22; 5.3%)	(+)	16 (7.40%)	6 (3.00%)	**p=0.041**
	(–)	199 (92.60%)	196 (97.00%)	
Royal jelly/pollen (n=77; 18.5%)	(+)	57 (26.50%)	20 (9.90%)	**p<0.001**
	(–)	158 (73.50%)	182 (90.10%)	

*Chi-square test

Table 3. Comparison of supplement users versus non-users based on cyberchondria score and E-health literacy score			
Scales	**Regular supplement users Mean±SD Median (min.-max.)**	**Occasional or non-users Mean±SD Median (min.-max.)**	**Test value***
CSS score	75.11±20.54 74 (33-148)	72.63±21.73 74 (33-151)	P=0.368 Z=-0.901
E-health literacy score	29.86±6.06 31 (8-40)	26.05±7.73 26 (8-40)	**P<0.001** Z=-3,895
*Mann-Whitney U test, CSS: Cyberchondria severity scale, min.-max.: Minimum-maximum, SD: Standard deviation			

Table 4. Evaluation of cyberchondria score versus E-health literacy score in the nutritional supplement use rates during the pandemic period					
Nutritional supplement types CSS score Mean±SD (Median)		**Scale scores**			
		p-value	**E-health literacy score Mean±SD (Median)**	**p-value***	
Zinc	(+)	75.39±29.73 (74.00)	p=0.368	29.74±6.36 (31.00)	**p<0.001**
	(–)	73.01±26.97 (74.00)		26.97±7.44 (27.00)	
Selenium	(+)	75.43±20.60 (73.00)	p=0.549	29.72±6.08 (32.00)	**p=0.018**
	(–)	73.62±21.25 (74.00)		27.69±7.32 (28.00)	
Iron	(+)	78.79±21.56 (77.00)	**p=0.002**	28.70±6.50 (29.00)	p=0.222
	(–)	71.44±20.52 (72.00)		27.67±7.47 (29.00)	
Copper	(+)	79.55±24.45 (73.00)	p=0.240	31.52±6.42 (32.00)	p=0.002
	(–)	73.46±20.81 (74.00)		27.73±7.16 (28.00)	
Magnesium	(+)	74.29±21.38 (73.00)	p=0.995	29.79±6.44 (31.00)	**p<0.001**
	(–)	73.69±21.03 (75.00)		27.03±7.38 (27.00)	
Calcium	(+)	78.25±22.91 (76.00)	**p=0.044**	29.35±6.76 (30.50)	**p=0.009**
	(–)	72.19±20.17 (76.00)		27.49±7.27 (28.00)	
Vitamin A	(+)	80.23±23.50 (77.00)	**p=0.030**	28.51±7.15 (30.00)	p=0.439
	(–)	72.74±20.49 (73.00)		27.92±7.18 (29.00)	
Vitamin B1	(+)	77.76±22.54 (77.00)	p=0.085	28.95±6.44 (29.00)	p=0.215
	(–)	72.77±20.60 (73.00)		27.74±7.36 (29.00)	
Vitamin B6	(+)	75.34±20.63 (73.50)	p=0.493	29.40±6.50 (30.50)	**p=0.047**
	(–)	73.53±21.28 (74.00)		27.64±7.30 (28.00)	
Vitamin B12	(+)	76.40±21.93 (76.00)	p=0.112	28.84±6.72 (30.00)	p=0.059
	(–)	72.29±20.48 (73.00)		27.47±7.41 (28.00)	
Vitamin D	(+)	73.52±21.35 (73.00)	p=0.455	28.66±7.01 (30.00)	p=0.007
	(–)	74.57±20.81 (76.00)		26.92±7.32 (26.00)	
Vitamin E	(+)	77.78±21.11 (76.00)	p=0.101	29.35±6.25 (31.00)	p=0.068
	(–)	73.10±21.07 (73.00)		27.74±7.32 (28.00)	
Vitamin C	(+)	74.90±21.03 (75.00)	p=0.393	28.69±7.02 (30.00)	**p=0.018**
	(–)	72.72±21.25 (73.00)		27.21±7.28 (27.00)	
Omega-3 fish oil	(+)	75.82±20.72 (74.50)	p=0.351	29.79±6.21 (30.00)	**p=0.002**
	(–)	73.16±21.28 (74.00)		27.31±7.41 (28.00)	
Probiotics	(+)	74.69±20.34 (72.50)	p=0.777	29.50±6.90 (31.00)	**p=0.002**
	(–)	73.59±21.47 (76.00)		27.41±7.19 (28.00)	
Beta glucan	(+)	77.94±21.68 (77.50)	p=0.174	29.54±6.51 (30.50)	p=0.134
	(–)	73.41±21.04 (73.00)		27.83±7.23 (29.00)	
Curcumin	(+)	76.25±21.69 (75.00)	p=0.223	28.88±7.04 (31.00)	p=0.075
	(–)	73.10±20.91 (73.50)		27.72±7.20 (28.00)	
Panax ginseng	(+)	75.35±27.79 (73.00)	p=0.889	29.04±5.68 (31.00)	p=0.552
	(–)	73.82±20.72 (74.00)		27.95±7.25 (29.00)	
Melatonin	(+)	75.55±18.22 (70.50)	p=0.725	28.95±8.28 (32.00)	p=0.295
	(–)	73.82±21.29 (75.00)		27.96±7.11 (29.00)	
Royal jelly/pollen	(+)	76.71±20.59 (77.00)	p=0.216	29.26±6.63 (31.00)	p=0.071
	(–)	73.27±21.23 (73.00)		27.73±7.27 (28.00)	
*Mann-Whitney U test, SD: Standard deviation					

in COVID-19 patients (16). It has been thought that vitamins D and C are central to determining the results of COVID-19 in many studies conducted to assess the efficacy of vitamins in the prognosis of COVID-19 (17,18). The fact that the most used supplements in our study were vitamin D and vitamin C shows that the health literacy of the patients and the physician's advice are followed.

Electronic health information seeking on the internet has many advantages, such as interaction with other patients, the amount of available information, social support, and cost-effectiveness (13,19). Cyberchondria was introduced in the context of the early days of the Internet, a revolutionary information and communication medium (9). In fact, cyberchondria was not taken seriously by academics for the first decade because it was considered a piece of magazine news (9,10). A report by the Microsoft company on health searches on the internet attracted the attention of medical academics. The main sign of cyberchondria is a repetitive pattern of problematic online health-related research (20). In 2014, the first instrument for assessing cyberchondria, the CSS, was introduced, as reflected in many research, review, and theoretical articles since then (9,20).

No conceptualization of cyberchondria includes a disease or diseases that drive online health searches. This is most likely due to the shifting focus of online search between individuals, and possibly even within a single individual, over time (9). A study examined how cyberchondria is related to changes in levels of COVID-19 concern and safety behaviors over two visits in Croatia (21). Results demonstrated that cyberchondria plays a moderating role in high levels of concern about COVID-19 and avoidance behaviors (21). According to another study, the people had practiced self-care measures like wearing a face mask, avoiding touching their faces, disinfecting the things they used as well as their home, and switching over to a healthy diet (22); Nutritional vitamin and mineral use as a part of a healthy diet is a self-care behavior; 85% of consumers seek relevant information before buying dietary supplements on the Internet as a primary source of information, and only a few consult with a health professional (23).

We do not know how healthy or necessary the use of electronic health resources is. Therefore, in our study, we determined a range between the E-health literacy score on the positive side and the CSS score on the negative side. We found that there is no difference in CSS scores between supplement users and non-users. However, some differences were observed for some vitamin and mineral supplement types. Calcium users had higher scores on both CSS and E-health literacy versus non-users in our study. Inadequate dietary calcium, particularly in a vitamin D-deficient environment, may predispose an individual to

Table 5. Presentation of effective factors in regular nutritional supplement use possibility in logistic regression

Details		Regular nutritional supplement use OR (95% CI)	p-value
E-health literacy	**Total score**	1,077 (1,042-1,115)	**<0.001**
Age generation	Babyboomer (1946-1964)	1,763 (0.506-6,146)	0.373
	X generation (1965-1979)	1,101 (0.377-3,218)	0.860
	Y generation (1980-1999)	0.797 (0.283-2,241)	0.667
	Z generation (2000-2021)	Ref	0.373
Sex	Female	1,659 (1,005-2,737)	**0.048**
	Male	Ref	-
Education	Primary/secondary school	Ref	-
	High school	2,075 (0.738-5,834)	0.166
	University	2,536 (1,009-6,374)	**0.048**
Income level	Low	Ref	-
	Moderate	1,120 (0.643-1,952)	0.688
	High	1,873 (0.983-3,571)	0.056
Supplement information source	Health professional	3,716 (2,260-6,119)	**<0.001**
	Friends/neighbours/family members	0.812 (0.381-1,729)	0.590
	Social media/internet	Ref	-
Additional chronic disease	Presence	2,755 (1,420-5,347)	**0.003**
	Absence	Ref	-

Cox & Snell R square: 0.220; Nagelkerke R square: 0.294; Model estimation percentage: 71.5%
OR: Odds ratio, CI: Confidence interval

osteoporosis (24). Another study revealed that, although they can easily access the most accurate information about health due to their occupation and working environment, healthcare professionals search for health information on the Internet. To ensure access to reliable health information, there is a need to create websites based on evidence-based, filtered sources (25). Calcium intake is important for bone structure, such as during growth, and for chronic diseases such as osteoporosis, renal disease, and dialysis patients. It is likely that there was more electronic searching for calcium in our study, as those with additional chronic diseases used nearly three times as much as others. The other CSS score differences were obtained for iron and vitamin A. The fear of calcium toxicity due to a higher cardiovascular risk (26), the fear of iron toxicity due to a higher risk of certain cancers, liver and heart disease, diabetes, and hormonal abnormalities (27), and the fear of vitamin A toxicity due to side effects such as elevated serum transaminases and skin irritation (28), may cause more health anxiety than other vitamin and mineral supplements. A higher CSS score may explore this fear of some vitamins and minerals that we mention.

Older age is typically associated with worse health, higher healthcare use, and increased healthcare costs (29). In a cross-sectional study, it was found that the point prevalence of E-Health literacy among older adults is moderate to high, which is a positive finding. However, there are differences among older adults based on factors such as being female, younger than 75 years, highly educated, in good health, and without psychological distress (30). Having adequate eHealth literacy will improve older adults' ability to manage their chronic conditions and minimize the negative effects on their health (31). Although baby boomers are often avid consumers of health information and are more willing to try new treatments than other generations (29,32), the boomers in our study are almost twice as likely to take nutritional supplements as those who don't. Studies on increased healthy life behaviors, such as healthy eating tendencies, have been observed in individuals over 50 years of age, those using vitamin supplements, and women (33). Older generations are more likely to develop multiple chronic additional diseases, necessitating more healthcare services and healthy lifestyles (29,34).

Study Limitations

The study's strengths are the use of each vitamin and mineral supplement and the comparison of E-health literacy and cyberchondria scores. Our study is the first to provide aggregated data specific to the supplement type. However, the use of supplements in the study was determined according to the patient declaration, so the lack of access to prescription information is a limitation of our study.

Conclusion

We found that women and those with additional chronic diseases had higher rates of using regular supplements than non-users. Regardless of the pandemic period, age generation, and cyberchondria level, it has been observed that one in every two people uses vitamin D or vitamin C based on higher E-health literacy. Using vitamin minerals may be a part of a longer life expectancy in triggering conditions.

Acknowledgment: Thanks to all participants participating in this study and Professor Okcan Basat.

Ethics

Ethics Committee Approval: The Clinical Research Ethics Committee of University of Health Sciences Turkey, Gaziosmanpasa Training and Research Hospital accepted the study protocol by March 17, 2021, with approval number 241.

Informed Consent: Participants were informed about the procedure, and their written consent was obtained.

Peer-review: Externally and internally peer-reviewed.

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

References

1. Önal HY, Demirci Z. İmmün Sistemin Gelişmesinde ve Desteklenmesinde Besin Desteklerinin Rolü. J Pro Health Res 2020;2:137-47.
2. Doustmohammadian A, Clark CC, Amini M. The effectiveness of nutritional interventions on COVID-19 outcomes: A protocol for systematic review and meta-analysis. Nutr Health 2022;28:213-7.
3. Çimke S, Yıldırım Gürkan D. Determination of interest in vitamin use during COVID-19 pandemic using Google Trends data: Infodemiology study. Nutrition 2021;85:111138.
4. Deniz S. A Study on the e-Health Literacy and Cyberchondria Levels of Individuals. İnsan ve İnsan 2020;7:84-96.
5. Norman CD, Skinner HA. eHealth Literacy: Essential Skills for Consumer Health in a Networked World. J Med Internet Res 2006;8:e9.
6. Laato S, Islam AKMN, Islam MN, Whelan E. What drives unverified information sharing and cyberchondria during the COVID-19 pandemic? Eur J Inf Syst 2020;29:288-305.
7. Eşkisu M, Çam Z, Boysan M. Health-Related Cognitions and Metacognitions Indirectly Contribute to the Relationships Between Impulsivity, Fear of COVID-19, and Cyberchondria. J Ration Emot Cogn Behav Ther 2023:1-23.
8. Zarocostas J. How to fight an infodemic. Lancet 2020;395:676.
9. Starcevic V, Berle D, Arnáez S. Recent Insights Into Cyberchondria. Curr Psychiatry Rep 2020;22:56.
10. McElroy E, Shevlin M. The development and initial validation of the cyberchondria severity scale (CSS). J Anxiety Disord 2014;28:259-65.

11. Fergus TA. The Cyberchondria Severity Scale (CSS): an examination of structure and relations with health anxiety in a community sample. J Anxiety Disord 2014;28:504-10.
12. Norr AM, Allan NP, Boffa JW, Raines AM, Schmidt NB. Validation of the Cyberchondria Severity Scale (CSS): replication and extension with bifactor modeling. J Anxiety Disord 2015;31:58-64.
13. Uzun SU, Zencir M. Reliability and validity study of the Turkish version of cyberchondria severity scale. Curr Psychol 2021;40:65-71.
14. Tamer Gencer Z. Analysis Of Validity And Reliability Of Norman And Skinner's E- Health Scale Literacy For Cultural Adaptation. Istanbul University Journal of Communication Sciences 2017;52:131-45.
15. Günalan E, Cebioğlu İK, Çonak Ö. The Popularity of the Biologically-Based Therapies During Coronavirus Pandemic Among the Google Users in the USA, UK, Germany, Italy and France. Complement Ther Med 2021;58:102682.
16. Shakeri H, Azimian A, Ghasemzadeh-Moghaddam H, et al. Evaluation of the relationship between serum levels of zinc, vitamin B12, vitamin D, and clinical outcomes in patients with COVID-19. J Med Virol 2022;94:141-6.
17. Grant WB, Lahore H, McDonnell SL, et al. Evidence that Vitamin D Supplementation Could Reduce Risk of Influenza and COVID-19 Infections and Deaths. Nutrients 2020;12:988.
18. Milani GP, Macchi M, Guz-Mark A. Vitamin C in the Treatment of COVID-19. Nutrients 2021;13:1172.
19. Lustria MLA. Can interactivity make a difference? Effects of interactivity on the comprehension of and attitudes toward online health content. JASIST 2007;58:766-76.
20. Starcevic V. Cyberchondria: Challenges of Problematic Online Searches for Health-Related Information. Psychother Psychosom 2017;86:129-33.
21. Jokic-Begic N, Lauri Korajlija A, Mikac U. Cyberchondria in the age of COVID-19. PLoS One 2020;15:e0243704.
22. TJ AG, Prakash M. Cyberchondria and its Impact on Self-Medication and Self Care in Covid-19 Pandemic–A Cross Sectional Study. BPJ 2021;14:2235-44.
23. Nathan JP, Kudadjie-Gyamfi E, Halberstam L, Wright JT. Consumers' Information-Seeking Behaviors on Dietary Supplements. Int Q. Community Health Educ 2020;40:171-6.
24. Hosking SM, Pasco JA, Hyde NK, Williams LJ, Brennan-Olsen SL. Recommendations for dietary calcium intake and bone health: the role of health literacy. J Nutr Sci 2016;6:1-3.
25. Savkin R, Guven I, Buker N. Health Literacy and Cyberchondria Levels in Healthcare Workers and Their Relationship with Body Awareness and Physical Activity. Med Bull Haseki 2022;60:351-7.
26. Li K, Kaaks R, Linseisen J, Rohrmann S. Associations of dietary calcium intake and calcium supplementation with myocardial infarction and stroke risk and overall cardiovascular mortality in the Heidelberg cohort of the European Prospective Investigation into Cancer and Nutrition study (EPIC-Heidelberg). Heart 2012;98:920-5.
27. Fraga CG, Oteiza PI. Iron toxicity and antioxidant nutrients. Toxicology 2002;180:23-32.
28. Olson JM, Ameer MA, Goyal A. Vitamin A toxicity. In: StatPearls [Internet]. 2021.
29. Canizares M, Gignac M, Hogg-Johnson S, Glazier RH, Badley EM. Do baby boomers use more healthcare services than other generations? Longitudinal trajectories of physician service use across five birth cohorts. BMJ Open 2016;6:e013276.
30. Ghazi SN, Berner J, Anderberg P, Sanmartin Berglund J. The prevalence of eHealth literacy and its relationship with perceived health status and psychological distress during Covid-19: a cross-sectional study of older adults in Blekinge, Sweden. BMC Geriatr 2023;23:5
31. Castarlenas E, Sánchez-Rodríguez E, Roy R, et al. Electronic Health Literacy in Individuals with Chronic Pain and Its Association with Psychological Function. Int J Environ Health Res 2021;18:12528.
32. Pruchno R. Not your mother's old age: Baby Boomers at age 65. OUP 2012;52:149-52.
33. Pökön M, Başpınar MM, Basat O. Prevalence of Orthorexia Nervosa Tendency in Non-obese Population: A Cross-sectional Study. Anatol J Family Med 2021;4:252-6.
34. Crimmins EM, Beltrán-Sánchez H. Mortality and morbidity trends: is there compression of morbidity? J Gerontol B Psychol Sci Soc Sci 2011;66:75-86.