



## Evaluation of the Therapy Protocols and Vaccines Applied in the COVID-19 Pandemic

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### Abstract

Despite a plethora of research on vaccine developments and the adverse effects of the vaccine worldwide, there are several research studies on COVID-19 vaccine hesitancy or rejection. The objectives of this study were to investigate the impact of the COVID-19 vaccine on treatment and the factors that contributed to the vaccine concerns. Methods: After one month of being approved by the ethics committee, a descriptive cross-sectional research was conducted using online resources. Samples were randomly selected from the study population. The current study included adults (>18 years old) who were randomly selected from different provinces of Turkey. Results: Most participants were young adults 18–23 years old (47.9%), female (64.8%), married (36.1%), with university education (70.4%), and without medical illness (60.9%) (mean age = 28 years old). Both vaccination doses were given to 53% of the individuals. The most frequent symptom was discomfort at the injection site (0.14%), followed by asthenia muscle pain (0.01%) and edema (24.5%) at the injection site. More symptoms were reported by women than by men. Social media accounts and websites of professional organizations, namely the Dental Association, the Ministry of Health, and the World Health Organization (WHO), were the main sources of COVID-19 information. Hesitancy was induced by concerns about side effects (67.7%), safety (69.7%), lack of information (43.1%), inadequate data on the vaccine clinical trials (55.9%), lack of information on how long protective and effectiveness of vaccines (69.4%), lack of information on how effectiveness against variants (74.8%), think COVID-19 is not dangerous (69.7%), not effectiveness (22.6%) of the vaccine, not safe (32.6%), change my genetic make-up and cause it reproductive sterility (20.2%), high number of deaths due to COVID-19 (60.8%), the presence of dangerous materials such as aluminum, mercury and others in the content of vaccines, concerns about the country producing the vaccine (38.2%), being afraid of the injection (22%), being against vaccination in general (11%), negative news in the press and social media (38.6%), being risky for only people over 60 (15.9%), having a strong immune system (38.4%), religious (4.7%) and cultural factors (7.4%), believing in natural and traditional medicine (25.4%), and being influenced by friends or family members (19.6%). Hesitancy to accept the COVID-19 vaccine was observed in subjects with hypercholesterolemia and diabetes mellitus. In conclusion, Vaccine hesitancy was primarily related to safety apprehensions. Educational and demographic traits were associated with vaccine admissibility.

### Keywords:

Therapy;  
Vaccine;  
COVID-19.

### Article History:

<b>Received:</b>	04	June	2023
<b>Revised:</b>	28	August	2023
<b>Accepted:</b>	11	September	2023
<b>Available online:</b>	01	October	2023

## 1- Introduction

The coronavirus disease 2019 (COVID-19) first emerged in Wuhan, China, and was declared a pandemic by the World Health Organization (WHO) in March 2020 because of its rapid transmission and high infection rate on a global scale [1, 2]. According to the WHO, approximately 2.5 million laboratory-reported cases of COVID-19 have been found

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**DOI:** <http://dx.doi.org/10.28991/ESJ-2023-07-05-022>

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in Turkey, with more than 22 thousand mortalities by January 14, 2022 [3]. To date, a recommended therapeutic regimen for COVID-19 is not available. While in vitro studies have demonstrated the antiviral activity of many drugs against SARS-CoV-2, their safety and efficacy in humans have not been determined. Drugs such as lopinavir-ritonavir, chloroquine, hydroxychloroquine, ribavirin, and interferon-alpha and - $\beta$  are being tested in trials [4, 5].

To prevent the COVID-19 infection, which contributes to a high economic and medical burden, a safe and effective prophylactic vaccine is urgently needed [6]. Furthermore, there is no effective treatment for coronavirus infection [7–9]. Currently, there are nine COVID-19 vaccines that have been developed and approved for emergency use [10–12]. These vaccines are AstraZeneca/Oxford Vaccine, COVAXIN, Covovax, Moderna, Pfizer/BionTech, Johnson & Johnson, Sinopharm, Sinovac, and Nuvaxovid [13]. Pfizer-BioNTech announced that their mRNA vaccine was 90% effective in November 2020, and since then, the UK and the USA have immediately authorized the emergency use of the vaccine. WHO then approved the vaccine for emergency use [14, 15].

Turkey aims to immunize more than 70% of its population to end the pandemic using low-cost, safe, effective, and accessible vaccines. China initiated phase III clinical trial of COVID-19 vaccine with inactivated virus in Turkey starting from September 2020 and vaccination strategies have been determined [16]. The willingness of the public to get vaccinated is essential for the success of vaccination programs. The problems in vaccination strategies that need to be addressed include limited doses of vaccine supply, vaccine storage, targeted subjects who will receive the vaccine first, and whether the public is willing to get vaccinated or not [17]. Worldwide, immunization programs cost billions of dollars [18]. Three million of the 50 million inactivated vaccine shots Turkey ordered have already arrived [17]. It is intended to vaccinate eligible adults over the age of 18 following the emergency use authorization, commencing with healthcare professionals and the elderly [16].

Worldwide, more than 6 billion doses of the COVID-19 vaccine have been administered [3]. Unfortunately, particularly in nations in Africa and Southeast Asia, vaccination rates are much lower than what would be required to contain the pandemic. Due to logistical and financial limitations, vaccination regimens widely vary around the world, which has an immediate influence on the frequency of COVID-19 infections. A growing concern for the success of vaccination programs is also the public's acceptance of vaccines and vaccine reluctance. The public's acceptance of vaccines depends on knowledge of their efficacy, safety, and side effects. Uncertainty regarding the COVID-19 vaccine's length of protection or the need for a booster dose also contributes to vaccination resistance [19]. The rates of vaccination against many diseases that can be prevented, however, are lower than anticipated. Even if the most effective vaccination is given, if people refuse to take it, it will have no effect on the transmission of a disease [20, 21]. For instance, outbreaks of measles and seasonal influenza have been observed in the USA and other countries, although they are preventable with vaccination [22, 23]. Vaccine hesitancy has hampered the target of achieving herd immunity as it requires high vaccination rates. Knowledge, attitude, and perception of the general population toward vaccination are pertinent to vaccine strategy. However, insights of the Turkish general public into vaccination are lacking, in particular which demography favors vaccination and which does not. In the age of social media, the dissemination of fast and unreliable information through social media aids in misunderstanding the importance of vaccination, especially before and after the COVID-19 pandemic. Understanding public perception and acceptance of information from social media can help in designing accurate and easy-to-understand materials that can be disseminated from a health agency social media account to the public. To what extent can vaccine hesitancy amongst Turkish citizens help policymakers implement strategies to reach out to Turkish citizens to improve their understanding and importance of vaccination to prevent severe diseases. Assessment of vaccine perspectives among Turkish citizens on their willingness to accept the COVID-19 vaccine can fill the research gaps on the knowledge, attitude, and perception of the citizens on vaccination and its importance.

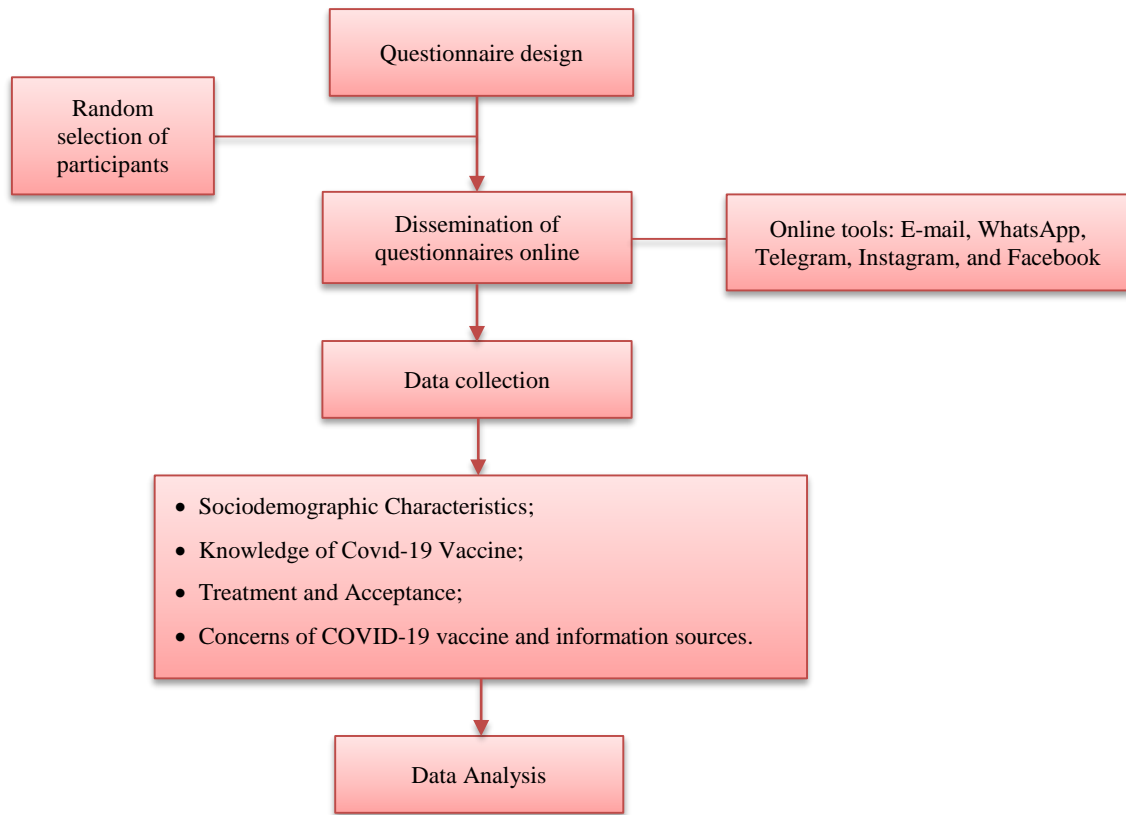
Currently, the perception and acceptance of COVID-19 vaccine among Turkish citizens is unknown. Questionnaires on their perception of vaccines can be disseminated through social media to unravel how adequate their knowledge of vaccines is, as well as their perception of vaccines, which can either be negative or positive. Furthermore, the questionnaires can also identify demography that is hesitant to receive vaccinations for mitigation strategies from respective bodies to address this issue. We designed this questionnaire-based study to investigate Turkish citizens' perspectives on the COVID-19 vaccine's effects on treatment and vaccine types, as well as its side effects and acceptance for any future COVID-19 vaccines.

## 2- Methods

### 2-1- Study Design and Participants

This descriptive cross-sectional online investigation was conducted after one month of being approved by the ethics committee. Subjects were selected from the population using a random sampling method. The current study included adults who were randomly selected from different provinces of Turkey. The questionnaires were created using Google Forms in electronic format. The access link was then disseminated online via email, WhatsApp, Telegram, Instagram, and Facebook, among other services.

Every Turkish citizen who was older than 18 and had access to social media platforms and the internet was qualified to participate as long as they agreed to take part in the study. The questionnaire asked questions on the participants' sociodemographic traits, their knowledge of the COVID-19 vaccine and its therapy, as well as their acceptance and concerns about the vaccine. Individuals who responded to the survey through social media platforms for one month were included in the study. Figure 1 indicates the flowchart of the study methodology.



**Figure 1. Flowchart of the methodology utilised in our study**

### 2-2- Ethical Issue

This study was conducted in compliance with the Declaration of Helsinki. The ethics committee of Firat University of Medical Sciences approved the study protocol (FU 2022/32). The first page of the online form contained informed consent. Participants were allowed to fill out the questionnaire after being informed of the study's goals and its confidentiality and anonymity policies.

### 2-3- Questionnaires

A questionnaire was prepared in accordance with earlier published studies with modifications [18, 24-30] to evaluate the level of knowledge of the COVID-19 vaccine and the treatment, acceptance, and concerns of the COVID-19 vaccine. Those questionnaires were designed by a group of experts to ensure the questionnaires given to the targeted populations were unbiased, easy to understand, and unambiguous. Data were collected from four parts of the questionnaires: sociodemographic characteristics, knowledge of the COVID-19 vaccine and treatment, acceptance and concerns about the COVID-19 vaccine, and information sources. In the first part of the sociodemographic questionnaire prepared by the researchers based on the literature, variables included age, gender, family type, marital status, educational status, monthly income status, any disease, presence of chronic disease, smoking and alcohol use status, and nutritional status. The participants' knowledge of COVID-19 and its vaccinations is tested in the second section of the questionnaire. The third section of the questionnaire asks participants about their knowledge and attitudes towards the COVID-19 vaccine, therapy, effectiveness, side effects, and safety. The survey's final section asks questions on COVID-19 vaccination acceptance and safety concerns.

### 2-4- Study Variables

**Dependent variables:** COVID-19 knowledge; Acceptance to COVID-19 vaccine; Concern to COVID-19 vaccine.

**Independent variables:** Living with someone who has a higher risk of developing severe COVID-19, such as an elderly relative or a family member who has comorbid conditions, is undergoing long-term medical treatment, or is

taking chronic medication, is one risk factor. Other risk factors include age, gender, level of education, household income, the presence of any chronic or allergic diseases, a history of COVID-19 infection, and the presence of any chronic or allergic diseases.

### 2-5- Statistical Analyses

We utilized the statistical program International Business Machines (IBM) Statistical Package for Social Sciences (SPSS) version 22 to evaluate the results of a study (SPSS, Inc., Chicago, IL). Categorical variables of participant properties were defined using descriptive statistics, percentages n(%). According to the features of the variables, percentage, mean, and chi-square tests are used in statistical analyses. The relationships between the demographic information and the survey items were assessed using the chi-square test. The standard deviation was provided together with the means (mean±SD). Statistics were considered significant at  $P < 0.05$ .

## 3- Results

A total of 1003 respondents participated in the survey, and 944 of them completed the online questionnaire. Table 1 indicates the baseline properties and attitude towards COVID-19 of this study population, containing 612 female participants (64.8%). Approximately half (47.9%) of the participants were 18–23 years old. In total, 65 individuals who were not vaccinated with the COVID-19 vaccine joined in the survey. A large majority of participants were female, and the mean age of participants was 28 years old. The majority of the participants were young adults (18–23 years old) (47.9%), female (64.8%), single (61.1%), with university education (70.4%), and without medical illness (60.9%). 53% of the participants have received two doses of the vaccine.

**Table 1. Socio-demographic properties of participants**

<b>Age (years)</b>	<b>n</b>	<b>%</b>
18 - 23	452	47.9
24 - 28	88	9.3
29 - 33	42	4.5
34 - 38	75	7.9
39 - 43	77	8.2
44 - 48	73	7.7
49 - 53	77	8.2
54 - 58	33	3.5
59 - 63	16	1.7
64 - 68	8	0.8
69 and more	3	0.3
<b>Sex/ratio</b>	<b>n</b>	<b>%</b>
Female	612	64.8
Male	332	33.2
<b>Marital status</b>	<b>n</b>	<b>%</b>
Married	341	36.1
Single	577	61.1
Divorced	21	2.2
Widow	5	0.5
Other	0	0
<b>Educational background</b>	<b>n</b>	<b>%</b>
Illiterate	2	0.2
Only literate	4	0.4
Primary school graduate	16	1.7
Master's/PhD	191	20.2
High school/equivalent school graduate	66	7.0
University	665	70.4

<b>Educational status of your spouse</b>		
Illiterate	2	0.2
Only literate	7	0.7
Primary school graduate	19	2.0
Master's/PhD	88	9.3
High school/equivalent school graduate	53	5.6
University/High school	172	18.2
Other	603	63.9
<b>Occupation</b>	<b>n</b>	<b>%</b>
Student	443	46.9
Academician	53	5.6
Teacher	65	6.9
Public servant	38	4.0
Medical doctor	61	6.5
Housewife	31	3.3
Private sector	11	1.2
Self-employment	11	1.2
No working	29	3.1
Engineer	31	3.3
Retired	23	2.4
Health employee	27	2.8
Employee	11	1.2
Nurse	18	1.9
Pharmacist	1	0.1
Farmer	1	0.1
Veterinarian	30	3.2
Other	60	6.4
<b>Family type</b>	<b>n</b>	<b>%</b>
Nuclear family	821	87.0
Extended family	122	12.9
Large family	1	0.1
<b>Close relatives (father / mother / grandfather / grandmother) over 70 years old</b>	<b>n</b>	<b>%</b>
Yes, living together	126	13.3
Yes, not living together	580	61.4
No	238	25.2
<b>Ever smoked cigarettes</b>	<b>n</b>	<b>%</b>
Yes	530	56.1
No	413	43.9
<b>What age do you start smoking cigarettes</b>	<b>n</b>	<b>%</b>
7-15	99	10.5
16-25	315	33.4
26-39	19	2.0
40-60	3	0.3
No answer	508	53.8
<b>Do you drink alcohol</b>	<b>n</b>	<b>%</b>
Yes	105	11.1
No	839	88.9

<b>Chronic/allergic diseases</b>	<b>n</b>	<b>%</b>
Obesity	12	1.3
Cancer	6	0.6
Hypertension	21	2.2
High Cholesterol	14	1.5
Diabetes (type 1 or 2)	17	1.8
Chronic lung disease (asthma, chronic obstructive airway disease)	25	2.6
Chronic kidney disease	10	1.0
Cardiovascular disease	16	1.7
Rheumatological disease	18	1.9
No disease	575	60.9
Several diseases (2 and more)	230	24.4
<b>Have a psychiatric illness</b>	<b>n</b>	<b>%</b>
Yes	36	3.8
No	908	96.2
Other	0	0
<b>Use any medication for chronic/psychiatric disease</b>	<b>n</b>	<b>%</b>
Yes	58	6.1
No	884	93.6
Other	2	0.2
<b>Had the COVID 19 infection</b>	<b>n</b>	<b>%</b>
Yes, no symptoms/mild symptoms	272	28.8
Yes, with severe symptoms	117	12.4
I suspected the symptoms but I did not confirm with a doctor and/or private examinations	103	10.9
No	452	47.9
<b>Take any precautions until your test result came out</b>	<b>n</b>	<b>%</b>
Yes	314	33.3
No	150	15.9
Other	480	50.8
<b>Which symptom(s) (fever, cough, headache, loss of smell, loss of taste, shortness of breath, etc.) did you occur during isolation?</b>	<b>n</b>	<b>%</b>
fever	14	1.5
cough	18	1.9
headache	14	1.5
loss of taste	5	0.5
loss of smell	12	1.3
shortness of breath	4	0.4
Several symptoms	861	91.2
No symptoms	16	1.7
<b>What was the process like</b>	<b>n</b>	<b>%</b>
I slept in the hospital COVID 19 service	11	1.2
I was hospitalized in the COVID intensive care unit	2	0.2
I had outpatient follow-up/treatment at home	439	46.5
Other (didn't receive any treatment, didn't make a test, don't know)	492	52.1
<b>Get COVID-19 because of your workplace</b>	<b>n</b>	<b>%</b>
Yes	76	8.1
No	340	36.0
I don't know	527	55.8

<b>Get COVID 19 from someone close to you? (spouse, relative, neighbor, etc.)</b>	<b>n</b>	<b>%</b>
Yes	249	26.4
No	105	11.1
I don't know	590	62.5
<b>Did you have contacted / patient due to you</b>	<b>n</b>	<b>%</b>
Yes	129	13.7
No	341	36.1
Other	474	50.2
<b>Lost your job or increased/decreased in income due to the COVID-19 pandemic</b>	<b>n</b>	<b>%</b>
Yes, I lost my job	7	0.7
Yes, had an income increased due to restraint measures	56	5.9
No, unchanged	336	35.6
No answer	545	57.7
<b>Have any changes been made in your institution related to COVID -19</b>	<b>n</b>	<b>%</b>
Working suspended	41	4.3
Working remotely	151	16
Laid off	8	0.9
No answer	546	57.8
Did not any change	157	16.6
Other	41	4.3
<b>Has there been any change in your hand-washing behavior after the COVID-19 outbreak</b>	<b>n</b>	<b>%</b>
Increased	704	74.6
Decreased	7	0.7
Unchanged	188	19.9
No answer	45	4.8
<b>Use any vitamins etc. to prevent COVID 19 infection</b>	<b>n</b>	<b>%</b>
Yes	238	25.2
No	643	68.1
Other	63	6.7
<b>What are the individual precautions in your daily life related to COVID 19?</b>	<b>n</b>	<b>%</b>
Wearing gloves	154	16.3
Wearing masks	23	2.4
Washing hand frequently	43	4.6
Use cologne, wet wipes, hand sanitizer	11	1.2
No enter public areas	9	0.9
No physical contact (shaking hands, kissing, etc.)	3	0.3
Ventilating the environment frequently	5	0.5
Don't take any extra precautions	17	1.8
Combination of several precautions	658	69.7
No answer	21	2.2

Less than half of the participants had completed a high level of education (n=238, 25.5%), and was classified to have a middle income. Married participants represented 36.1% of the sample. One third of the participants mentioned to be concerned for a close family member getting infected, with women stating more often to be concerned than men. Pain on the site of injection was the most prevalent symptom, followed by asthenia, muscle pain, and swelling on the site of vaccine administration. Females complain of more symptoms than males. Primary sources, i.e., websites and social media accounts, that majority of the participants (68.6%) obtained information from included the WHO, the Ministry of

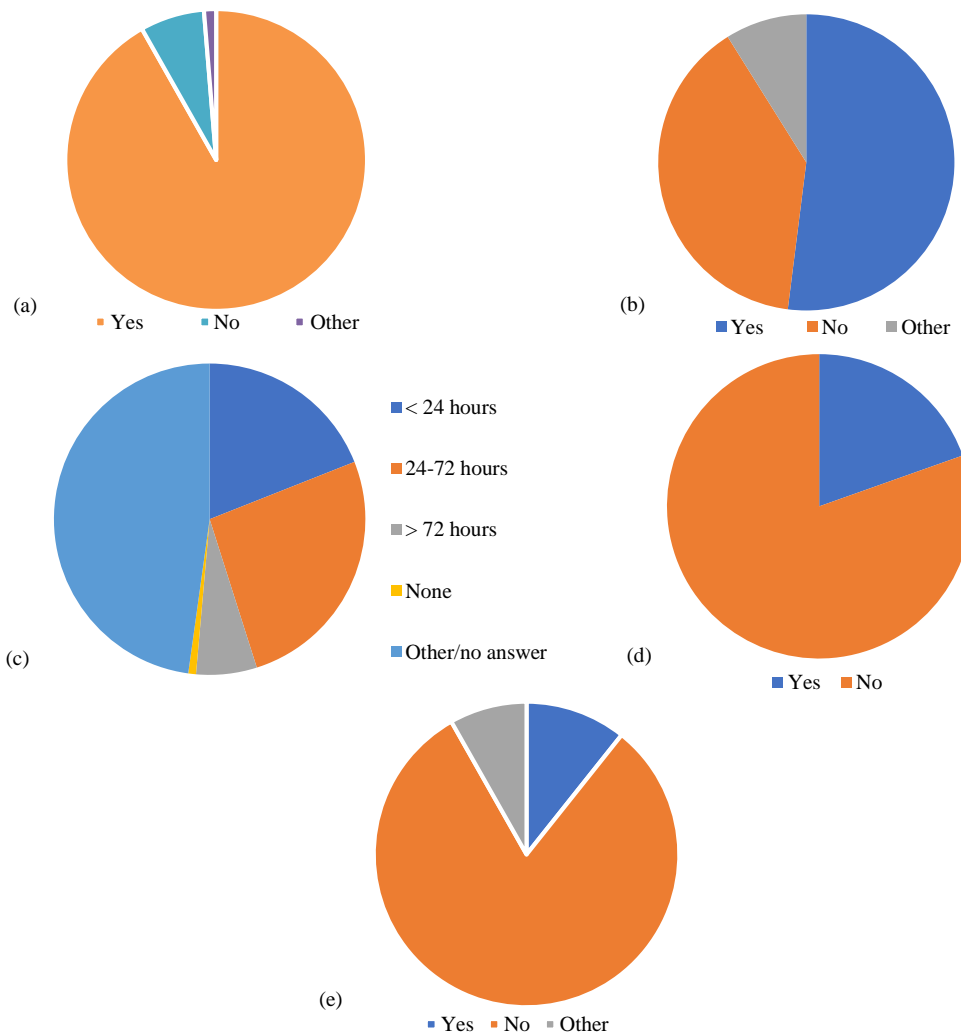
Health, and the Dental Association. Informational gatherings held in institutions, medical professionals' personal websites or social media accounts, friends, family, and neighbours, among other sources, as well as scientific articles published on COVID-19, communication groups such as WhatsApp, Telegram, BIP, SMS, newspapers or magazines, and electronic media (TV, Radio). (see Table 2 and Figure 3).

**Table 2. The participants' knowledge about COVID-19 and its vaccines**

<b>Where do you get information about COVID-19, vaccine and treatment?</b>	<b>n</b>	<b>%</b>
Social media platforms or websites of professional organizations i.e., the World Health Organization (WHO), the Ministry of Health, and the Dental Association	648	68.6
From information meetings organized in institutions	39	4.1
From physicians' individual websites or social media accounts	48	5.1
From scientific articles published on COVID-19	37	3.9
From communication groups such as WhatsApp, Telegram, bip, SMS	22	2.3
From newspaper or magazine, From electronic media (TV, radio)	62	6.6
From social media (Facebook, Twitter, Instagram)	43	4.5
From friends, family, neighbors, etc.	2	0.2
I did not learn	43	4.6
<b>COVID-19 is a disease caused by the Coronavirus</b>	<b>n</b>	<b>%</b>
True	851	90.1
False	13	1.4
I don't know	80	8.5
<b>COVID-19 can be transmitted by touching nose, mouth and eyes with contaminated hands (unwashed hands)</b>	<b>n</b>	<b>%</b>
True	875	92.7
False	21	2.2
I don't know	48	5.1
<b>COVID-19 can be transmitted via respiratory droplets, sneezing or coughing</b>	<b>n</b>	<b>%</b>
True	913	96.7
False	4	0.4
I don't know	27	2.9
<b>Hand sanitizers (alcohol-based) do not protect against transmission of COVID-19</b>	<b>n</b>	<b>%</b>
True	121	12.8
False	662	70.1
I don't know	161	17.1
<b>There is a drug to treat COVID-19</b>	<b>n</b>	<b>%</b>
True	164	17.4
False	459	48.6
I don't know	321	34.0
<b>Traditional herbal remedies are effective for COVID-19</b>	<b>n</b>	<b>%</b>
True	261	27.6
False	322	34.1
I don't know	361	38.2
<b>The COVID-19 vaccine is free</b>	<b>n</b>	<b>%</b>
True	911	96.5
False	6	0.6
I don't know	27	2.9
<b>The COVID-19 vaccine ensures good protection against coronavirus infection after several weeks</b>	<b>n</b>	<b>%</b>
True	571	60.5
False	83	8.8
I don't know	290	30.7



<b>Persons who have been vaccinated should also wear masks in public places after vaccination</b>	<b>n</b>	<b>%</b>
True	772	81.8
False	90	9.5
I don't know	82	8.7
<b>Is it true that the COVID-19 vaccine is not suggested for those under the age of 18 and pregnant women</b>	<b>n</b>	<b>%</b>
True	285	30.2
False	354	37.5
I don't know	305	32.3
<b>The COVID-19 vaccine causes mild side effects</b>	<b>n</b>	<b>%</b>
True	797	84.4
False	61	6.5
I don't know	86	9.1
<b>Vaccination suitability ( i.e., frequency, method, distance to vaccination sites, etc.) is an essential factor in the vaccination decision</b>	<b>n</b>	<b>%</b>
True	672	71.2
False	100	10.6
I don't know	172	18.2
<b>Travel is an essential factor in deciding on vaccination</b>	<b>n</b>	<b>%</b>
True	636	67.4
False	173	18.3
I don't know	135	14.3



**Figure 2. The participants' knowledge attitude towards COVID-19 vaccine and treatment, and effectiveness, side effects, safety of COVID-19 vaccine. A) Have you been vaccinated? B) Were there any side effects after vaccination? C) How long did the symptoms of the side effects of the COVID-19 vaccine? D) Have you caught COVID 19 after vaccination? E) Have you been vaccinated other than the COVID 19 vaccine?**

Hesitancy was induced by concerns about side effects (67.7%), safety (69.7%), lack of information (43.1%), insufficient of the clinical phase studies of the COVID-19 vaccine (55.9%), lack of information on how long protective and effectiveness of vaccines (69.4%), lack of information on how effectiveness against variants (74.8%), thinking of COVID-19 is not dangerous (69.7%), ineffective vaccine (22.6%), not safe (32.6%), change my genetics make up and cause reproductive sterility (20.2%), high number of deaths due to COVID-19 (60.8%), the presence of the harmful materials such as aluminum, mercury, etc. in the vaccine's content, concerns about the country producing the vaccine (38.2%), afraid of the injection (22%), against vaccination in general (11%), negative news in the press and social media (38.6%), high risk for people over 60 years old (15.9%), strong immune system (38.4%), religious (4.7%) and cultural factors (7.4%), believe in natural and traditional medicine (25.4%), influenced by friends or family members (19.6%). Participants with diabetes mellitus (0.04%) and hypercholesterolemia (0,04%) were more hesitant to accept the COVID-19 vaccine (Table 3). Vaccine hesitancy was primarily related to safety apprehensions. Educational and demographic traits were associated with vaccine admissibility.

**Table 3. Acceptance and concerns of COVID-19 vaccine**

Concerns about the COVID 19 vaccine	Yes	No
I have a lack of information about the COVID-19 vaccine	43.1%	44.3%
I think that there is not enough data from the COVID-19 vaccine's clinical phase research	55.9%	33.3%
Lack of information on how long vaccines will be protective and effective	69.4%	21.7%
Lack of information on how effective the vaccine will be against variants	74.8%	16.1%
I think COVID-19 is not dangerous	16.9%	69.7%
The side effects of the vaccine	67.7%	21.5%
I think the vaccine is not effective	22.6%	63.9%
I think the vaccine is not safe	32.6%	54.7%
I think the vaccine will alter my genetics make up and cause it reproductive sterility	20.2%	65.5%
High number of deaths due to COVID-19	60.8%	23.3%
The inclusion of dangerous materials in vaccines, such as aluminum, mercury, and others	33.0%	49.9%
I have concerns about the country producing the vaccine	38.2%	46.9%
I'm afraid of the injection	22.0%	62.1%
I am against vaccination in general	11.0%	72.9%
Negative news in the press and social media	38.6%	45.4%
I think only people over 60 are risky	15.9%	67.3%
My immune system is strong	38.4%	46.1%
Religious reasons	4.7%	76.9%
Cultural reasons	7.4%	74.2%
I believe in natural and traditional medicine	25.4%	57.8%
I am influenced by friends or family members	19.6%	63.6%

#### 4- Discussion

The goal of the current study was to assess Turkish citizens' awareness of COVID-19 treatment, their behavior and attitudes towards sharing information about COVID-19 treatment, and the causes of COVID-19 vaccine concerns. Our findings revealed that the knowledge of the Turkish population on COVID-19 was adequate. While they were willing to take the COVID-19 vaccine, some of them were hesitant to get vaccinated because of certain factors that included uncertainty on the efficacy of the vaccine, the vaccine side effects, and the lack of clinical data on the safety and effectiveness of the vaccine. These findings provide insights on how receptive the Turkish population is to the COVID-19 vaccine and illuminate the future management of a new emerging infectious disease that has the potential to become a pandemic.

We found that most subjects surveyed were worried to receive the COVID-19 vaccine because of the uncertainty of the side effects associated with the vaccine. There is currently little research being undertaken to evaluate the effects of COVID-19 on therapy and the level of knowledge among the Turkish population regarding COVID-19 vaccination, vaccine types, and COVID-19 vaccine side effects. Available studies assessed treatment use among healthcare workers, and even fewer were focused on treatments and vaccines as a preventive measure among the general public. Lack of knowledge of vaccinations may be caused by inadequate educational preparation, a low socioeconomic level, or reliance on peer laypeople for information [31,32]. The majority of Malaysians surveyed on acceptance of the COVID-19 vaccine demonstrated insufficient knowledge of the vaccine [27]. In Turkey, the COVID-19 vaccine acceptance rate was 66%

based on an early research carried out online in May 2020 with a sample size of 3936. Meanwhile, the rate was higher among Turkish healthcare workers in a study conducted in December 2020. A global vaccine acceptance survey from 23000 participants in 23 countries conducted in 2022 revealed that the acceptance rate has increased from 75.2% to 79.1%. Nevertheless, the hesitancy to get vaccinated has been observed to increase in eight countries, with South Africa and the UK showing the highest trend (52.1%). The respondents surveyed also reported COVID-19 illnesses (36.6%), while 24% reported that they received treatment that included monoclonal antibodies, ivermectin, Paxlovid, and molnupiravir [33].

Apprehensions on safety, effectiveness, and side effects were represented as three major causes of COVID-19 immunization hesitation among healthcare workers in the great majority (> 75%) of studies [34-37]. Among the other reasons for COVID-19 vaccination apprehensions were a lack of knowledge about the vaccines, the idea that the disease does not exist or is not a serious one, vaccine development speed, policies on vaccine development, unfavorable news from social media, previous COVID-19 infections or health conditions, and the advice not to trust authorities, medical professionals, or pharmaceutical companies [35-38]. In a study performed in Turkey, 50% of healthcare professionals had complications due to the COVID-19 vaccine, and 51.4% of healthcare professionals indicated that they did not rely on the statements of the Ministry of Health and the WHO on COVID-19 vaccines [38].

Another important source of vaccination worry is the COVID-19 vaccine, which is the subject of numerous disputes and unfavorable press (35.7%) [39]. Social media channels have been especially effective at spreading concerns about vaccinations [40]. Unverified claims from the media that the virus was created in laboratory and the vaccine contained non-halal porcine materials as well as caused diseases such as autism, cerebral palsy, and infertility have influenced public perception towards getting vaccinated [41]. This has subsequently facilitated the emergence of the anti-vaccination movement. Although earlier studies suggested that the use of mass media, which included scholarly journals, newspapers, and medical websites, can help improve health-risk behaviors in the community, many people currently prefer to obtain information from social media [42]. Verified health information shared on social media transmits fast and successful spread of information [27, 43]. Moreover, excess knowledge can cause misinformation, media fatigue, and the spread of false news [27, 44]. Health literacy is also a crucial aspect of defining the efficacy of understanding and evaluating knowledge [27, 30].

A study performed in Canada with 2,761 respondents found that the most important reasons for vaccine rejection were that the vaccine was new and wanting to see other people's vaccination results. 74% of healthcare professionals who refused to vaccinate reported that they would agree to vaccinate in the future [45]. As healthcare professionals are frontiers in the management and treatment of patients, the percentage of them who refuse to get vaccinated aids in the transmission of nosocomial infections to immunocompromised patients.

## 5- Conclusion

In conclusion, our study revealed that knowledge of the Turkish population on COVID-19 was adequate. Nevertheless, vaccine hesitancy was noted in some individuals surveyed that were amplified by misinformation from social media accounts and uncertainty regarding the safety and effectiveness of the vaccine. Our results are insightful for the dissemination of accurate, creative, and informative information from the respective bodies to tackle vaccine hesitancy among the Turkish population. The government will be able to develop strategies to increase public awareness and demand for the COVID-19 vaccine with the help of the study's findings.

### 5-1- Limitations of the Study

This study has some limitations. Half of the participants in this study were young subjects because we adopted online tools for data collection that are more easily accessible to the younger generation than those of the older generation. This demographic distribution may not mirror the demography of the Turkish population. Thus, the demography of subjects in future studies should be distributed accordingly to reflect the Turkish population. Another limitation is the cross-sectional study, and the cause-and-effect link could not be established. Recall bias amongst participants for self-reporting of diseases might also occur during the survey. However, a survey is the most common approach for data collection in epidemiology studies as it is convenient and cost-effective. Finally, we only collected declarative data and were unable to control answer accuracy.

## 6- Declarations

### 6-1- Author Contributions

Conceptualization, G.O. and A.H.; methodology, A.S.; software, J.A.; validation, G.O. and F.Z.; formal analysis, F.Z.; investigation, G.O.; resources, G.O. and A.H.; data curation, J.A.; writing—original draft preparation, G.O.; writing—review and editing, G.O. and F.Z.; visualization, G.O.; supervision, A.S.; project administration, G.O.; funding acquisition, F.Z. All authors have read and agreed to the published version of the manuscript.

### 6-2-Data Availability Statement

The data presented in this study are available on request from the corresponding author.

### 6-3-Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

### 6-4-Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of Firat University of Medical Sciences, protocol (FU 2022/32).

### 6-5-Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

### 6-6-Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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