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Physicians' Approach to Vaccination Against COVID-19 Infection and Factors Affecting Vaccine Acceptance

Tuğçe Eşkazan[1], Selçuk Candan[1], Oğuz Kağan Bakkaloğlu[2], Süleyman Yıldırım[3], İbrahim Hatemi[1]

[1]Division of Gastroenterology, Department of Internal Medicine, İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine, İstanbul, Türkiye
[2]Division of Gastroenterology, Department of Internal Medicine, Kartal Koşuyolu High Specialization Training and Research Hospital, İstanbul, Türkiye
[3]Division of Gastroenterology, Department of Internal Medicine, Başakşehir Çam and Sakura High Specialization Training and Research Hospital, İstanbul, Türkiye

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Abstract

Objective: Healthcare professionals play a pivotal role in shaping society's attitudes towards vaccines. The aim of this study is to assess vaccine hesitancy and acceptance among physicians toward COVID-19 vaccines and to identify the factors influencing their attitudes.

Methods: This cross-sectional, web-based survey study, which involved physicians, was designed using Google Forms, and all questions were developed by researchers. The survey consists of two parts, including participants' sociodemographic characteristics and opinions regarding COVID-19 and the vaccine.

Results: The study comprised 602 participants, with 67.6% reporting providing healthcare to COVID-19 patients. Among them, 82.9% perceived COVID-19 as highly dangerous, and 98% recommended vaccination to their patients. There were 25 individuals (4.1%) who had never been vaccinated. Among this group, 60% expressed concerns about the vaccine's safety and were afraid of potential future side effects.

Vaccine supporters (VS) were more likely to perceive COVID-19 as "very dangerous" compared to the anti-vaccine group (AVG). Additionally, the VS showed higher support for vaccination and had a higher rate of receiving the influenza vaccine. The AVG believed the vaccine to be effective but not safe. Factors associated with being in the AVG included not receiving the influenza vaccine, not perceiving vaccines as safe and effective, and not considering the pandemic to be dangerous.

Conclusion: Despite the concerns, healthcare professionals, particularly physicians, had the highest vaccination rates. The high vaccination rates and confidence in the vaccines among healthcare workers are positive findings that support the effectiveness of vaccination strategies targeted at this group.

Keywords: COVID-19, healthcare professionals, vaccine acceptance, vaccine hesitancy

Introduction

Vaccination stands out as one of the most effective methods for managing infectious diseases.[1] Nonetheless, despite widespread adherence to vaccination recommendations, there exists a subset of individuals who opt to postpone or reject vaccinations due to their reservations.

Vaccine hesitancy encompasses a diverse range of individuals, spanning from those who readily accept all vaccines to those who adamantly reject them.[2] This phenomenon is more pronounced within specific subgroups. Various studies have highlighted that even individuals who have received vaccinations may harbor uncertainties and reservations regarding the vaccination process.[3-8]

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Corresponding author: İbrahim Hatemi, Division of Gastroenterology, Department of Internal Medicine, İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine, İstanbul, Türkiye
e-mail: ihatemi@yahoo.com
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Healthcare professionals' perspectives wield significant influence in molding societal views on vaccines. The support, confidence, and proactive communication of healthcare professionals regarding the safety and efficacy of vaccines can profoundly affect individual decisions and overall vaccine acceptance.[9] A high vaccination rate among healthcare professionals can indeed exert a positive influence on vaccine acceptance within the general population.

Throughout the SARS-CoV-2 pandemic, healthcare workers played a pivotal role in providing care for COVID-19 patients, exposing them to an elevated risk of infection. The introduction of multiple COVID-19 vaccine options marked a significant stride in protecting healthcare workers. Nevertheless, vaccine hesitancy remains variable, contingent on the specific vaccines in question. Limited research has delved into the perspectives of healthcare professionals regarding COVID-19 vaccines.

The objective of this study is to evaluate vaccine hesitancy and acceptance among physicians concerning COVID-19 vaccines, aiming to identify the factors that influence their attitudes toward vaccination. The study seeks to provide insight into the reasons underlying their reservations about the vaccine and to explore the determinants contributing to vaccine hesitancy within this specific group.

Methods

Participants and Procedure

This is a cross-sectional, web-based survey study that included physicians. The study was designed using Google Forms, and all the questions were developed by researchers. A Google account ''https://forms.gle/XDZhFFyd2ZPm2xBn7'' was set up and managed to collect survey responses. The questionnaire was divided into two parts, covering inquiries about sociodemographic characteristics and opinions regarding the vaccine. The contact details of volunteers were obtained through collaboration with healthcare professionals with whom the researchers worked.

Participants were clearly informed that their involvement was entirely voluntary, and consent was considered implicit upon completion of the questionnaire. An invitation letter, detailing the nature of the study, was dispatched to participants via social media twice, with a 2-week interval for each individual, spanning from August 1, 2021 to August 30, 2021. Prior to initiating the survey, participants' consent was obtained within the system, and the process was conducted anonymously. Those interested in participating in the survey signaled their approval by clicking on the study link provided to them. The anticipated time required to complete the survey ranged between 15 and 20 minutes.

Measures

The survey encompassed a range of questions designed to evaluate participants' demographic background, self-perceived health status, COVID-19 experiences, perceptions of COVID-19, intention to receive a COVID-19 vaccine, and vaccine confidence and preferences.

For healthcare employees, the questionnaire included specific queries about their occupation, the location of their work (e.g., hospital, ambulatory, or community setting), medical discipline (e.g., internal medicine, general surgery, intensive care unit, etc.), and whether they were directly involved in the diagnosis, treatment, or healthcare provision to patients with SARS-CoV-2.

Statistical Analysis

Categorical data were presented as numbers and percentages. Data for continuous variables are presented as mean and standard deviation. The Shapiro–Wilk test was used to determine whether the distributions of continuous variables were normal. Mean differences between two independent groups of normally distributed data were compared with an independent sample *t*-test while the Mann–Whitney U-test was used to compare non-normally distributed data. The frequencies of categorical variables were compared using Pearson's chi-square, or Fisher's exact test, when appropriate. Statistical significance was considered when P value was $< .05$.

Ethical Considerations

The study was approved by the local ethics committee of İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine (Approval no: 149201; Date: July 30, 2021). In addition, the Republic of Türkiye Ministry of Health's COVID-19 study approval was received.

All procedures were in accordance with the ethical standards of the institutional and/or national research committee and the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Results

The study included 602 participants with a mean age of 43 ± 12.3 years, ranging from 23 to 85 years. Among the participants, 59.1% were male, and 71.8% were married. Approximately 67.6% of the participants indicated that they provided healthcare to COVID-19 patients in both outpatient and inpatient services. Furthermore, 24.8% of the participants reported having experienced COVID-19 infection.

Approximately 34.3% of the participants reported having at least one chronic disease. In terms of geographic distribution, 71.3% of the participants resided in the Marmara Region. Regarding their specialization, 62.6% were internal medicine specialists. The majority (63.8%) had more than 10 years of work experience, and 37.2% worked in third-level health institutions. Please refer to Table 1a for a detailed overview of the participants' sociodemographic characteristics.

Table 1a. Sociodemographic Data and Clinical Characteristics of Patients

Number of patients (n)	602
Mean age ± SD, years.	43.0 ± 12.3
Median (Range)	42 (23-85)
Sex, n (%)	
Male	246 (40.9)
Female	356 (59.1)
Education, n (%)	
Postgraduate doctorate	461 (76.6)
University	141 (23.4)
Marital status, n (%)	
Single	121 (20.1)
Married	432 (71.8)
Divorced	49 (8.1)
Living region, n (%)	
Marmara Region	429 (71.3)
Aegean Region	69 (11.5)
Other	104 (17.3)
Comorbidities, n (%)	202 (33.6)
Receiving immunosuppressive treatment, n (%)	14 (2.3)
Number of living people at home, n (%)	
Alone	86 (14.3)
2-4	467 (77.6)
> 4	49 (8.1)
Living with a someone under 18, n (%)	287 (47.7)
Living with a someone over 65, n (%)	64 (10.6)
Living with a someone with chronic disease, n (%)	143 (23.8)
Employed institution, n (%)	
Retired	32 (5.3)
Primary health care services	63 (10.5)
Secondary health care services	220 (36.5)
Tertiary health care services	224 (37.2)
Private clinic	7 (1.2)
Other	56 (9.3)
Job experience, n (%)	
< 1 year	25 (4.0)
1-5 years	91 (15.1)
6-10 years	103 (17.1)
> 10 years	384 (63.8)
Did you provide health care to COVID-19 patients in the outpatient and/or inpatient clinics? n (%)	407 (67.6)

For insights into participants' perspectives on COVID-19 and vaccines, please refer to Table 1b in the study, where their comments are detailed and analyzed.

According to the study findings, a significant majority, 82.9% of the participants, perceived COVID-19 as highly dangerous. Regarding vaccination, 73.8% of the participants had completed the recommended vaccination regimen, consisting of 2 doses of Sinovac and 1 dose of BioNTech, as advised by the Ministry of Health. Moreover, the study noted that a substantial 98% of participants recommended vaccination to their patients, with 55.5% specifically endorsing the use of BioNTech.

When expressing their opinions on Sinovac, most participants (83.4%) regarded it as reliable but not effective enough. Conversely, opinions on BioNTech were predominantly positive, with 58.5% of participants considering it both safe and effective.

Regarding the influenza vaccine, 20.8% of participants reported receiving it annually, while 40.4% mentioned having received it only a few times.

Concerning alternative treatments for COVID-19, a small percentage of participants (0.8%) recommended their use. In contrast, a significant majority (51.7%) strongly advised against the use of such treatments.

Anti-vaccine Group

The participants included 25 individuals (4.1%) who had never been vaccinated. This subgroup had an average age of 40.5 ± 14 years, with 72% being women. Among them, 60% were married, and 32% had a chronic disease. Additionally, 12 individuals (48%) had children under the age of 18, and 3 individuals (12%) had relatives over the age of 65.

Concerning the reasons for not getting vaccinated, 36% of those who were unvaccinated believed that vaccination did not completely prevent the disease but rather provided a milder form of it. Additionally, 32% stated that they had no information about the vaccine, indicating a lack of knowledge or information regarding its effectiveness or safety.

In this group, when asked about the reasons for not getting vaccinated, it was observed that 60% expressed concerns about the safety of the vaccine and were afraid of potential future side effects. Additionally, 16% reported not being vaccinated due to having recently been infected with COVID-19.

In the anti-vaccine group, 60% advised their patients to receive the vaccine, signifying their acknowledgment of the importance of vaccination. Nevertheless, 20% mentioned that they left the decision regarding vaccination up to their patients.

Among those who advocated for vaccination, 48% indicated that individuals could receive both vaccines, suggesting an openness to the idea of receiving different COVID-19 vaccines.

Comparison of 2 Groups

When comparing the two groups (vaccine supporters and the anti-vaccine group), similarities were observed in terms of age, gender, marital status, region of residence, presence of chronic diseases, working status, working hours, and workplace.

However, significant differences were noted between the groups in their attitudes towards vaccination. Vaccine supporters were more likely to perceive COVID-19 as "very dangerous" compared to the anti-vaccine group (84.4% vs. 48%, $P < .001$).

The vaccine supporters also exhibited stronger support for vaccination compared to the anti-vaccine group (99.7% vs. 60%, $P < .001$). Conversely, the anti-vaccine group tended to defer the decision about vaccination to their patients (20% vs. 0.3%, $P < .001$). Interestingly, it was observed that the anti-vaccine group recommended vaccination if the patient was older.

Table 1b. The Comments of Participants on COVID-19 and Vaccines

Variables	n (%)
Have you been diagnosed with COVID-19?	149 (24.8)
Have you been hospitalized due to COVID-19?	25 (4.2)
Did anyone in your family have COVID-19?	402 (66.8)
Has anyone in your family died due to COVID-19?	100 (16.6)
Where do you get information about COVID-19?	
My friends and people at work	14 (2.3)
Scientific publications and meetings	189 (31.4)
Tv and social media	18 (3.0)
All of them	379 (63)
Ministry of health guidelines	2 (0.3)
How important do you think COVID-19 is?	
It is overrated.	4 (0.7)
Partly dangerous.	99 (16.4)
Very dangerous.	499 (82.9)
Have you had the COVID-19 vaccine as recommended?	
I am not vaccinated.	16 (2.7)
Only one dose	2 (0.3)
Two doses of Sinovac	52 (8.6)
Two doses of BioNTech	31 (5.1)
Three doses of Sinovac	28 (4.7)
Two doses of Sinovac and one dose of BioNTech	444 (73.8)
3 doses of different vaccines	9 (1.5)
Two doses of Sinovac and two doses of BioNTech	20 (3.3)
Participants who have never been vaccinated	25 (4.2)
Reasons for not getting vaccinated.	
I recently had COVID-19	4 (16)
I'm afraid of side effects.	2 (8)
I don't think the vaccine is safe.	15 (60)
I am pregnant/I have an autoimmune disease.	2 (8)
Other	2 (8)
Which option best describes your view on COVID-19 vaccines?	
I have not been vaccinated; I have no comment about it.	8 (1.3)
Vaccination should be mandatory for everyone.	38 (6.3)
Vaccination reduces the likelihood of severe disease.	269 (44.9)
Vaccination should be mandatory for everyone and reduces the likelihood of severe disease.	58 (9.7)
Vaccination reduces the likelihood of severe disease and contagion.	94 (15.7)
Vaccination should be mandatory for everyone, reduces the likelihood of severe disease and reduces contagion.	100 (16.7)
Vaccination be mandatory for health workers, reduces the likelihood of severe disease and reduces contagion.	8 (1.3)
Vaccination reduces the likelihood of severe disease and contagion and provides full protection.	7 (1.2)
I think the vaccine is not 100% effective; vaccination just reduces the likelihood of severe disease.	3 (0.5)
Vaccination be mandatory for health workers, reduces the likelihood of severe disease.	8 (1.3)
Vaccination reduces the likelihood of severe disease and provides full protection.	6 (1.0)
Do you recommend getting vaccinated when asked?	
No	2 (0.3)
Yes	590 (98.0)
I leave it to one's own will.	7 (1.2)
I recommend it to the geriatric population.	3 (0.5)

(*Continued*)

Table 1b. The Comments of Participants on COVID-19 and Vaccines (Continued)

Variables	n (%)
Which vaccine do you recommend when asked?	
I do not recommend getting vaccinated.	2 (0.3)
BioNTech	335 (55.6)
Sinovac	12 (2.0)
Both of BioNTech and Sinovac	250 (41.5)
The patient's own decision	3 (0.5)
Which of the following is your opinion about inactivated vaccines?	
Not effective and safe enough	20 (3.3)
Safe but not effective enough	502 (83.4)
Safe and effective	72 (12.0)
Effective but not safe enough	3 (0.5)
No idea	5 (0.8)
Which of the following is your opinion about mRNA vaccines?	
Not effective and safe enough	15 (2.5)
Safe but not effective enough	15 (2.5)
Safe and effective	352 (58.5)
Effective but not safe enough	203 (33.7)
No idea	17 (2.8)
What do you think about using alternative medicine (phytotherapy, acupuncture, cupping, ozone) in the treatment of COVID-19?	
I do not use or recommend.	496 (82.5)
I think it is effective.	5 (0.8)
I recommend using it as a supplement.	92 (15.3)
No idea.	8 (1.3)
Do you get the flu vaccine regularly?	
I have never done.	228 (37.9)
I got it once.	4 (0.7)
I got it a few times.	243 (40.4)
I got it for the first time this year.	2 (0.3)
Yes, I get it every year.	125 (20.8)

Furthermore, the vaccine supporters had a higher rate of receiving the influenza vaccine compared to the anti-vaccine group (84% vs. 35.9%, $P < .001$).

We discovered that the anti-vaccine group believed the vaccine to be effective but not safe, with 56% holding this view ($P < .001$) (Table 2). Conversely, the vaccine supporters considered the vaccine to be both effective and safe, with 60.5% expressing this belief ($P < .001$). Please refer to Table 2 for a detailed comparison of the two groups.

In the univariate analysis, several factors were identified as significantly associated with belonging to the anti-vaccine group. These factors included not receiving the influenza vaccine [odds ratio (OR), 9.38; 95% confidence interval (CI), 3.178-27.708], perceiving mRNA vaccines as unsafe or ineffective (OR, 9.8; 95% CI, 2.881-33.346), perceiving inactivated vaccines as unsafe or ineffective (OR, 12.69; 95% CI, 4.400-36.655), and underestimating the danger of the pandemic (OR, 25; 95% CI, 3.371-185.427). Refer to Table 3 for detailed information on these factors. In the multivariate analysis conducted on these parameters, it was demonstrated that all these factors remained significant, significantly increasing the likelihood of belonging to the anti-vaccine group.

Discussion

Healthcare workers have played an indispensable role in the fight against the pandemic, delivering care to infected patients while exposing themselves to the risk of contracting the virus. Unfortunately, many healthcare workers have lost their lives in this battle. Considering their direct experience with the severe consequences of COVID-19, it is reasonable that healthcare workers would exhibit an increased desire to safeguard themselves through vaccination.

As trusted sources of information, healthcare workers are frequently consulted regarding vaccination, and their recommendations carry substantial influence in shaping public perceptions and attitudes.

Our study holds the potential to enhance our comprehension of how healthcare professionals perceive and approach COVID-19 vaccination, providing valuable insights for initiatives aimed at promoting vaccine acceptance and addressing vaccine hesitancy within this pivotal population.

Encouragingly, our findings indicate that a substantial portion of the participants adhered to the vaccination programs recommended by the Ministry of Health of Türkiye. Additionally, it is noteworthy that all participants, including 60% of the anti-vaccine group, emphatically recommended vaccination to their patients. These observations underscore the importance of healthcare professionals in advocating for vaccination despite varying individual perspectives.

Our study findings also highlight certain beliefs and characteristics within the anti-vaccine group. Members of this group tend to perceive COVID-19 infection as less serious, harbor doubts about the effectiveness and reliability of commercially available vaccines, and exhibit a lower rate of receiving seasonal flu vaccines. A significant majority of vaccine opponents in our study were women (72%), and approximately one-third of them had chronic diseases.

It is crucial to acknowledge the historically positive impact of vaccines on public health. Vaccines have played a pivotal role in reducing disease transmission and preventing serious illnesses such as polio, smallpox, diphtheria, hepatitis, and many others.[10]

Understanding these factors is crucial for developing effective strategies to address vaccine hesitancy and promote widespread immunization. The topic of vaccines and vaccine hesitancy gained substantial attention worldwide, including in Türkiye, in 2021. Various studies have investigated the prevalence of vaccine hesitancy and opposition in different countries. Discussions revolved around the potential effects and side effects of vaccines, as well as the reasons behind vaccine hesitancy.

In a study from Ireland, a vaccine hesitancy rate of 26% and a vaccine opposition rate of 9% were reported.[11] Similarly, in the United Kingdom, the vaccine indecision rate was found to be 25%, while the vaccine opposition rate stood at 6%.[11] These statistics underscore the presence of varying degrees of vaccine hesitancy and opposition among different populations.

Understanding the prevalence and factors contributing to vaccine hesitancy is crucial for designing effective interventions and communication strategies. By addressing concerns, providing accurate information, and promoting vaccine confidence, public health authorities can work towards increasing vaccine acceptance and protecting individuals and communities from vaccine-preventable diseases. Education, open dialogue, and evidence-based communication play pivotal roles in building trust and fostering a positive attitude towards vaccination.

Specialists and scientists play a crucial role in providing the public with current, evidence-based information about COVID-19 vaccines. Their involvement is essential for dispelling misinformation, fostering vaccine confidence, and promoting informed decision-making.[12] In Türkiye, a significant portion of the population

Table 2. Comparison of 2 Groups

Variables	Non-Vaccinated	Vaccinated	*P*
	n (%)	n (%)	
Number of patients	25 (4.1)	577 (95.9)	
Mean age ± SD, years	40.5 ± 14.0	43.1 ± 12.3	.305*
Sex			
Male	7 (28)	239 (41.4)	.181#
Female	18 (72)	338 (58.6)	
Education			
Postgraduate doctorate	17 (68)	444 (76.9)	.301#
University	8 (32)	133 (23.1)	
Marital status			
Single	8 (32)	113 (19.6)	.310#
Married	15 (60)	417 (72.3)	
Divorced	2 (8)	47 (8.1)	
Living region			
Marmara Region	18 (72)	411 (71.2)	.656&
Aegean Region	2 (8)	67 (11.6)	
Other	5 (20)	99 (17.2)	
Comorbidities	8 (32)	194 (33.6)	.866#
Receiving immunosuppressive treatment	2 (8)	12 (2.1)	.111&
Number of living people at home			
Alone	5 (20)	81 (14)	.659%
2-4	18 (72)	449 (77.8)	
> 4	2 (8)	47 (8.1)	
Living with a someone under 18	12 (48)	275 (47.7)	.973#
Living with a someone over 65	3 (12)	61 (10.6)	.741&
Living with a someone with chronic disease	3 (12)	140 (24.3)	.158#
Employed institution			
Retired	2 (8)	30 (5.2)	.982#
Primary health care services	2 (8)	61 (10.6)	
Secondary health care services	9 (36)	211 (36.6)	
Tertiary health care services	11 (44)	213 (36.9)	
Private clinic	0 (0)	17 (2.9)	
Other	1 (4)	45 (7.8)	
Job experience			
< 1 year	1 (4)	23 (4)	.116#
1-5 years	7 (28)	84 (14.6)	
6-10 years	6 (24)	97 (16.8)	
> 10 years	11 (44)	373 (64.6)	
Did you provide health care to COVID-19 patients in the polyclinic or service? (yes)	18 (72)	389 (67.4)	.632#
Have you been diagnosed with COVID-19?	8 (32)	141 (24.4)	.391#
Have you been hospitalized due to COVID-19?	1 (4)	24 (4.2)	1.000&
Did anyone in your family have COVID-19?	18 (72)	384 (66.6)	.571#
Has anyone in your family died due to COVID-19?	3 (12)	97 (16.8)	.783&
Where do you get information about COVID-19?			
My friends and people at work	0 (0)	14 (2.4)	.178&
Scientific Publications and meetings	7 (28)	182 (31.5)	
Tv and social media	1 (4)	17 (2.9)	
All of them	16 (64)	363 (62.9)	
Ministry of health guidelines	1 (4)	1 (0.2)	

(*Continued*)

Table 2. Comparison of 2 Groups (Continued)

Variables	Non-Vaccinated	Vaccinated	*P*
How important do you think COVID-19?			< .001[&]
It is overrated (0)	2 (8)	2 (0.3)	0 vs. 1 .077
Partly dangerous (1)	11 (44)	88 (15.3)	0 vs. 2 .004
Very dangerous (2)	12 (48)	487 (84.4)	1 vs. 2 < .001
Have you had the COVID-19 vaccine as recommended?			< .001[&]
No (0)	2 (8)	0	0 vs. 1 < .001
Yes (1)	15 (60)	575 (99.7)	0 vs. 2 .58
I leave it to one's own will (2)	5 (20)	2 (0.3)	1 vs. 2 < .001
I recommend it to the geriatric population (3)	3 (12)	0 (0)	1 vs. 3 < .001
			2 vs. 3 .467
Which vaccine do you recommend when asked?			
I do not recommend getting vaccinated (0)			< .001[&]
BioNTech (1)	1 (4)	1 (0.2)	0 vs. 1 .047
Sinovac (2)	7 (28)	328 (56.8)	0 vs. 2 1.000
Both of them (3)	5 (20)	7 (1.2)	0 vs. 3 .101
The patient's own decision (4)	12 (48)	238 (41.2)	0 vs. 4 .400
	0 (0)	3 (0.5)	1 vs. 2 < .001
			1 vs. 3 .097
			1 vs. 4 1.000
			2 vs. 3 < .001
			2 vs. 4 .505
			3 vs. 4 1.000
Which of the following is your opinion about inactivated vaccines?			
Not effective and safe enough (0)	6 (24)	14 (2.4)	< .001[&]
Safe but not effective enough (1)	16 (64)	486 (84.2)	0 vs. 1 < .001
Safe and effective (2)	2 (8)	70(12.1)	0 vs. 2 < .001
Effective but not safe enough (3)	0 (0)	3 (0.5)	0 vs. 3 .539
No idea (4)	1 (4)	4 (0.7)	0 vs. 4 1.000
			1 vs. 2 1.000
			1 vs. 3 1.000
			1 vs. 4 .157
			2 vs. 3 1.000
			2 vs. 4 .185
			3 vs .4 1.000
Which of the following is your opinion about mRNA vaccines?			
Not effective and safe enough (0)	4 (16)	11 (1.9)	< .001[&]
Safe but not effective enough (1)	0 (0)	15 (2.6)	0 vs. 1 .100
Safe and effective (2)	3 (12)	349 (60.5)	0 vs. 2 < .001
Effective but not safe enough (3)	14 (56)	189 (32.8)	0 vs. 3 .025
No idea (4)	4 (16)	13 (2.3)	0 vs. 4 1.000
			1 vs. 2 1.000
			1 vs. 3 .606
			1 vs. 4 .104
			2 vs. 3 < .001
			2 vs. 4 < .001
			3 vs. 4 .038
What do you think about using alternative medicine (phytotherapy, acupuncture, cupping, ozone) in the treatment of COVID-19?			
I do not use or recommend.	19 (76)	477 (82.8)	.052[&]
I think it is effective.	1 (4)	4 (0.7)	
I recommend using it as a supplement.	4 (16)	88 (15.3)	
No idea.	1 (4)	7 (1.2)	
Are you getting the influenza (flu) vaccine?			< .001[&]
I have never done (0)	21 (84)	207 (35.9)	0 vs. 1 1.000
I had it once (1)	0 (0)	4 (0.7)	0 vs. 2 < .001
I've had it done a few times (2)	4 (16)	239 (41.4)	0 vs. 3 1.000
I made it for the first time this year (3)	0 (0)	2 (0.3)	0 vs. 4 < .001
Yes, I do it every year (4)	0 (0)	125 (21.7)	1 vs. 2 1.000
			2 vs. 3 1.000
			2 vs. 4 .304

*Independent sample *t* test.
[#]Pearson's chi-square test.
[&]Fisher's exact test.

Table 3. Univariate and Multivariate Analysis of the Factors that are Effective in Predicting Vaccine Hesitancy

	Univariate			Multivariate		
	OR	**95% CI**	***P***	**OR**	**95% CI**	***P***
Not being vaccinated against influenza	9.384	3.178-27.708	< .001	10.145	3.187-32.296	< .001
Thinking that the mRNA vaccine is not safe and effective	9.801	2.881-33.346	< .001	5.533	1.093-28.015	.039
Thinking that the inactive vaccine is not safe and effective	12.699	4.400-36.655	< .001	6.803	1.910-24.231	.003
Not recommending getting COVID-19 vaccines	24.000	1.457-395.352	.026	7.209	0.011-4837.017	.552
Thinking that the COVID-19 pandemic is not dangerous	25.000	3.371-185.427	.002	14.714	1.062-203.853	.045

expresses trust in science (75%) and doctors (73%).[13] This aligns with global findings that show a positive correlation between vaccine acceptance and trust in science and doctors.[14] Yilmaz et al. 's study[15] revealed that a substantial number of participants (76.6%) considered advice from authorities influential in their decision to get vaccinated. Among the preferred sources of advice, family doctors or physicians (71.9%) and the Ministry of Health (56.3%) were prominently mentioned.

Various survey-based studies have explored the perspectives of healthcare professionals on COVID-19 vaccines and their willingness to be vaccinated. These investigations have uncovered differing rates of vaccine hesitancy among healthcare workers, with reported figures ranging up to 35%.[16] In a separate study involving a substantial sample of 76,471 participants, the prevalence of vaccine hesitancy among healthcare professionals was determined to be 22.5%.[17]

An Italian survey-based study delved into the attitudes of healthcare professionals toward SARS-CoV-2 vaccination. Results indicated that 67% of the surveyed healthcare professionals were considering vaccination, while 26% expressed vaccine hesitancy, and 7% refused to get vaccinated.[18]

The rapid development of vaccines and concerns about side effects were reported as the most common reasons for vaccine hesitancy among healthcare professionals. Other contributing factors included concerns about the speed and completeness of vaccine testing and fear of potential side effects. Despite these concerns, the study found that healthcare professionals, particularly physicians, exhibited high vaccination rates, with 95% of physicians and 75% of nurses being vaccinated.[19]

Remarkably, our study revealed an even higher vaccination rate among physicians, reaching 97.3%. This suggests a strong inclination toward vaccination within the physician group. Additionally, the majority of participants acknowledged the severity of COVID-19 and followed the recommended vaccination schedule. Notably, a significant proportion recommended BioNTech as the preferred vaccine option to their patients.

It is noteworthy that in another study, male healthcare workers were more than two and a half times more likely to express hesitation about receiving the COVID-19 vaccine.[20] In a study among young doctors in Ghana, it was found that men were less likely to receive COVID-19 vaccines.[21] This finding aligns with some other studies indicating lower vaccine acceptance rates among men. However, it's essential to recognize that these findings can vary across different populations. Studies conducted among healthcare professionals in the United Kingdom have reported that vaccine hesitancy is more common in women.[22]

The study by Halbrook et al. demonstrated that although women exhibited higher levels of hesitation, they had statistically significantly higher rates of vaccine acceptance compared to men.[23] Similarly, in an examination of gender across eleven studies on vaccine hesitancy, it was found that women tended to display higher levels of hesitation compared to men.[24] While most vaccine opponents in our study were women, gender was not identified as a significant parameter in terms of vaccine opposition. This suggests that other factors, such as socio-economic characteristics and educational status, may play a more prominent role in vaccine hesitancy among healthcare professionals. These varying findings may be influenced by cultural, social, and contextual factors impacting vaccine hesitancy.

Certainly, previous research has demonstrated that socio-economic factors, such as income, education level, and occupation, can influence vaccine hesitancy among both the general population and healthcare workers.[25,26] Lower educational levels have consistently been linked to higher levels of vaccine hesitancy, as observed in studies investigating the impact of educational status on vaccine attitudes.[23,27-29]

Furthermore, our study specifically concentrated on physicians engaged in patient care during the pandemic. It's important to note that differences in opinions among medical personnel with diverse areas of duty were not assessed. This underscores the necessity for additional research to investigate potential variations in vaccine attitudes and hesitancy among healthcare professionals based on their specific roles and responsibilities.

The relationship between personal experiences with COVID-19 and vaccine acceptance can vary across different studies. Some research has reported a positive association between personal experiences with COVID-19 and vaccine acceptance, while others have not found a significant correlation.[14,27]

In a study, individuals who had been diagnosed with COVID-19 themselves or had family members affected by the disease were more likely to respond positively to the vaccine. Furthermore, being married was associated with a more positive response to vaccination.[30] Similarly, in our study, marital status and the experience of being diagnosed with COVID-19, whether personally or in a family member, were not identified as determinants of vaccination hesitancy. Another study in Türkiye did not find a relationship between participants' decision to get vaccinated and their personal experience of being diagnosed with COVID-19 or the death of their relatives due to COVID-19.[15]

The reasons most strongly associated with vaccine hesitancy include concerns about safety, worries about side effects, and the belief that the risks of COVID-19 are lower than those associated with the vaccine. In a study conducted by the European Commission through Gallup in 27 countries, 59.5% of EU citizens believed that vaccines are developed too quickly to be safe.[31] Similarly, in our study, when participants were asked about

the reasons for not getting vaccinated, 60% expressed concerns about the safety of the vaccine and feared potential future side effects.

Previous immunization habits were associated with support for COVID-19 vaccination, particularly in relation to influenza vaccines.[26,32] In one study, the rate of COVID-19 vaccination was found to be three times higher in individuals who received the seasonal flu vaccine.[32] In our study, supporters of COVID-19 vaccination had a higher rate of receiving the influenza vaccine compared to the anti-vaccine group (84% vs. 35.9%).

The potential bias introduced by the questionnaire design and the self-reporting nature of the study is a valid concern. Self-reported attitudes and behaviors may be susceptible to social desirability bias, and there's a possibility that they may not accurately reflect actual behavior. It's essential to acknowledge that participants who responded to the survey might possess different characteristics or attitudes compared to non-responders, impacting the generalizability of the findings.

The timing of the survey during the early phase of COVID-19 vaccination is a factor worth considering. Attitudes and behaviors towards vaccination may have changed over time as more information became available and vaccination campaigns progressed. Conducting follow-up studies would be valuable to assess any shifts in vaccine acceptance and hesitancy among healthcare professionals as vaccination efforts continue.

The fact that more than half of the participants in our survey are internal medicine specialists may have influenced the survey results. During the pandemic, physicians specializing in internal medicine, infectious diseases, pulmonology, and anesthesiology were primarily assigned to frontline duties. Consequently, they anxiously anticipated the production of the vaccine, recognizing it as the primary solution to end the pandemic and enable a return home to embrace their families comfortably. As a result, when the vaccine became available, many of them chose to get vaccinated without hesitation. Additionally, the high number of internal medicine specialists in our country could have contributed to the elevated participation rates in the survey.

Nevertheless, our study offers valuable insights into the attitudes and behaviors of healthcare professionals during the initial phase of COVID-19 vaccination in Türkiye. The high vaccination rates and confidence in the vaccines among healthcare workers are positive findings that support the effectiveness of vaccination strategies targeted at this group. While the high education level of the participants may contribute to their positive attitudes toward vaccination, it's important to note that the results may not be fully representative of the general population.

Overall, our study contributes to the understanding of vaccine acceptance among healthcare professionals and can help inform future vaccination strategies and interventions. Continuous research in this area is essential to monitor and address vaccine hesitancy, ensuring high vaccination coverage not only for COVID-19 but also for other infectious diseases.

Continued research and monitoring of vaccine acceptance and hesitancy are crucial for shaping effective public health measures. Future studies, by addressing the limitations and building on the findings of our study, can further explore the factors influencing vaccine acceptance, track changes in attitudes and behaviors over time, and evaluate the effectiveness of interventions aimed at promoting vaccine acceptance.

Overall, our study contributes to the existing knowledge on vaccine acceptance and can guide efforts to encourage vaccination among healthcare professionals and the broader population.

Availability of Data and Materials: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine (Approval no: 149201; Date: July 30, 2021).

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