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Approaches of the Physicians on COVID-19 Vaccination: An Online Survey from Türkiye

Hekimlerin COVID-19 Aşı Yaklaşımları: Türkiye'den Online Bir Anket

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ABSTRACT

Introduction: *Coronavirus disease 2019 (COVID-19) is caused by a newly discovered coronavirus, SARS-CoV-2. The Turkish government has planned to procure COVID-19 vaccine through multiple agencies and companies in order to vaccinate at least 75% of the population. Physicians' beliefs and attitudes to COVID-19 vaccines are important for the immunization rate of the public. This study aimed to evaluate the vaccination approaches of the Turkish physicians against COVID-19.*

Materials and Methods: *This study was conducted as an online survey between 15.01.2021-12.02.2021, among mainly infectious disease and internal medicine physicians in Türkiye. The survey included questions on the demographics of physicians and their approaches toward vaccination against COVID-19.*

Results: *Among the 486 participants, 34.6% were internal medicine physicians and 17.5% were infectious diseases physicians. Total acceptance rate of the COVID-19 vaccine among physicians was 89.9%. Physicians who stated having sufficient information about COVID-19 vaccines had a higher rate of COVID-19 vaccine recommendation to their patients compared to those who stated not having sufficient information (95.8% vs 86.7%, p= 0.011). Physicians with concerns about adverse effects or efficacy of the COVID-19 vaccine had a lower rate of COVID-19 vaccine recommendation to their patients/relatives/friends (p< 0.001). Female and younger physicians were more concerned about the adverse effects of the COVID-19 vaccine (p< 0.05). Recommendation of COVID-19 vaccine was higher among physicians with confidence in having sufficient information and without concern about efficacy of the vaccine.*

Conclusion: *Since physicians have an important role in providing information and reducing COVID-19 vaccine hesitancy among the community, improvement in the knowledge and concerns of physicians should be considered.*

Key Words: *COVID-19; Vaccines; Physicians; Survey; Türkiye*

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ÖZ

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Giriş: *Koronavirüs hastalığı 2019 (COVID-19), yeni keşfedilen bir koronavirüs olan SARS-CoV-2'den ortaya çıkmıştır. Türk hükümeti, nüfusun en az %75'ini aşılamak için birden fazla kurum ve şirket aracılığıyla COVID-19 aşısı tedarik etmeyi planlamıştır. Hekimlerin COVID-19 aşılarına yönelik inanç ve tutumları, halkın bağışıklama oranı açısından önemlidir. Bu çalışma, Türk hekimlerinin COVID-19'a karşı aşılama yaklaşımlarını değerlendirmeyi amaçlamıştır.*

Materyal ve Metod: *Bu çalışma, 15.01.2021-12.02.2021 tarihleri arasında özellikle Türkiye'de infeksiyon hastalıkları ve dahiliye hekimlerine yönelik olarak online anket şeklinde yapılmıştır. Anket, doktorların demografik özellikleri ve COVID-19'a karşı aşılamaya yönelik yaklaşımları hakkında soruları içermektedir.*

Bulgular: *Dört yüz seksen altı katılımcının %34.6'sı dahiliye hekimi, %17.5'i infeksiyon hastalıkları hekimidir. COVID-19 aşısının doktorlar arasında toplam kabul oranı %89.9'dur. COVID-19 aşıları hakkında yeterli bilgiye sahip olduğunu belirten hekimler, yeterli bilgiye sahip olmadığını belirten hekimlere göre hastalarına COVID-19 aşısı önerme oranlarının daha yüksek olduğunu belirtmişlerdir (%95.8'e karşı %86.7, p= 0.011). COVID-19 aşısının yan etkileri veya etkinliği konusunda endişeli olan hekimler hastalarına/akrabalarına/arkadaşlarına daha düşük COVID 19 aşısı önerme oranına sahipti (p< 0.001). Kadın ve genç doktorlar, COVID-19 aşısının olumsuz etkileri konusunda daha fazla endişeliydiler (p< 0.05). Yeterli bilgiye sahip olduğuna güvenen ve aşının etkinliği konusunda endişe duymayan doktorlar arasında COVID-19 aşı tavsiyesi daha yüksekti.*

Sonuç: *Hekimlerin bilgi sağlamada ve toplumda COVID-19 aşısı tereddütünü azaltmada önemli bir rolü olduğundan, hekimlerin bilgi ve endişelerinde iyileşme göz önünde bulundurulmalıdır.*

Anahtar Kelimeler: *COVID-19; Aşılar; Doktorlar; Anket; Türkiye*

INTRODUCTION

According to the World Health Organization (WHO), the number of infected and dead cases has increased to 163.312.429 and 3.386.825, respectively (18 May 2021) due to Coronavirus Disease 2019 (COVID-19) caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)[1]. Since the beginning of the pandemic, the risk of transmission to healthcare workers has been a concern. The percentage of healthcare workers infected with COVID-19 decreased as the awareness of personal protective equipment usage increased[2]. In Italy, 12% of all COVID-19 cases comprised of healthcare workers at the end of May 2020[3]. This ratio decreased to 3.2% until May 18, 2021 in Italy[4], whereas it was 1.5% in the United States during the same period[5].

No specific antiviral agent has been approved for the treatment of COVID-19 yet. However, some agents are used around the world based on in-vitro, predictive evidence or observational studies[6]. Many of the antiviral agents (e.g., lopinavir/ritonavir, remdesivir, favipiravir, darunavir/cobicistat, camostat mesylate) effective for the treatment of human immunodeficiency virus, hepatitis, and influenza symptoms are currently prescribed off-label in COVID-19 patients. Several immunomodulatory agents such as tocilizumab, sarilumab, baricitinib, hydroxychloroquine, colchicine, and eculizumab, have also been used with aim of treating COVID-19[7].

World Health Organization has invited researchers to develop rapid and effective diagnosis methods, treatment options, and vaccines since the beginning of the pandemic[8]. It is widely accepted that the world will not return to its normal pre-pandemic state until safe and effective vaccines are found and a global vaccination program is successfully implemented. The U.S.A

Food and Drug Administration (FDA) approved the Pfizer-BioNTech® COVID-19 Vaccine for use in individuals 16 aged years and older, the Moderna® COVID-19 Vaccine, and Janssen® COVID-19 Vaccine for use in individuals 18 aged years and older on December 11, 2020, December 18, 2020, and February 27, 2021, respectively[9].

Vaccination is one of the most cost-effective ways to prevent disease. However, due to an increase in vaccination hesitancy, it was identified by WHO as one of the ten biggest global health threats in 2019. Therefore, healthcare professionals continue to be the most trusted advisers and influencers of vaccination decisions and need to be supported to provide reliable information on vaccines[10].

As a priority group, vaccination of healthcare professionals against COVID-19 was started in Türkiye on January 14, 2021. This study aimed to evaluate the physicians' approaches to COVID-19 vaccination and to identify the factors that influence their approaches.

MATERIALS and METHODS

In Türkiye, the administration of COVID-19 vaccines began on January 14, 2021, with healthcare professionals. An anonymous online survey was conducted through the surveymonkey.com platform between January 15 and February 12, 2021 with physicians from Türkiye. The survey link was announced on the websites of the Turkish Society of Internal Medicine (20.157 members) and World of Infection Platform (6.493 members) to invite their physician members. Sample size calculation indicated to include a minimum of 379 physicians for this study with a 95% confidence interval a 5% margin of error[11].

In addition to demographic data (such as age, sex, specialty, duration of work experience, position), the survey consists of 22 questions to identify knowledge and approaches of physicians toward vaccination against COVID-19. Those who volunteered to take part in the study provided informed consent via the survey link. This study was approved by the Hacettepe University Non-Clinical Trials Ethics Committee (No: 2021/02-34).

Only fully completed surveys by the physicians were included in final analysis. Responses to each question were compared according to their specialties in three groups; internal medicine, infectious diseases, and others (general practitioner, family physician, medical microbiology, pulmonologist, physical therapy, and rehabilitation, gynecology, pediatrics, public health, anesthesiology, general surgery, medical biochemistry, cardiology, emergency medicine, radiology, psychiatry, neurology, otorhinolaryngology, orthopedy, ophthalmology, thoracic surgery, cardiac surgery).

Categorical variables were presented in percentages while continuous variables appeared as means and standard deviations (SD). Categorical variables were compared with the use of Fisher's Exact Test or the Chi-square Test, as appropriate, and $p< 0.05$ was considered statistically significant. Statistical Package for the Social Sciences Version 25 for Windows was used for all analyses.

RESULTS

One hundred (17.1%) participants out of 586 were excluded due to incomplete demographic data or being non-physician participants. A total of 486 physicians were included in final analysis. Of those, mean (± SD) age was 44.6 (± 11.64) years, 271 (55.8%) were females and 168 (34.6%) were specialized in internal medicine, 115 (23.7%) were employed in a public hospital, and mean (± SD) duration of working experience was 21.1 (± 11.82) years (Table 1).

A total of 104 (21.4%) physicians had COVID-19 currently or previously, 60 (12.3%) physicians voluntarily participated in COVID-19 vaccine phase-3 trials, and 355 (73.0%) were involved in the treatment and follow-up of COVID-19 patients. In comparison, infectious disease specialists (23.5%), internal medicine specialists (24.4%), and other physicians (18.5%) had a similar history of current or previous COVID-19 infection ($p= 0.328$). Involvement of infectious diseases specialists as volunteers in COVID-19 vaccine phase-3 trials (20.0%, 8.3% and 12.4%, respectively) ($p= 0.030$) and in the treatment and follow-up of COVID-19 patients (90.6%, 79.2% and 62.2%, respectively)

Table 1. Demographic characteristics of the physicians (n= 486)

	n (%)
Sex	
Female	271 (55.8)
Male	215 (44.2)
Age (year), mean ± SD*	44.6 ± 11.64
23-33	107 (22.0)
34-44	139 (28.6)
45-55	148 (30.5)
56-66	80 (16.5)
67-77	12 (2.4)
Duration of working experience (year), mean ± SD	21.1 ± 11.82
1-10	117 (24.0)
11-21	136 (28.0)
22-32	144 (30.0)
33-43	79 (16.0)
44-54	10 (2.0)
Institution of work	
Public hospital	115 (23.7)
University hospital	87 (17.9)
Private hospital	86 (17.7)
Training and research hospital	85 (17.5)
Family health center	44 (9.1)
Other**	69 (14.1)
Type of specialty	
Internal medicine	168 (34.6)
Infectious diseases	85 (17.5)
Other***	233 (47.9)
Position	
General practitioner	67 (13.8)
Resident	61 (12.6)
Specialist	302 (62.1)
Associate professor	19 (3.9)
Professor	37 (7.6)

*SD: Standard deviations
**Private or public laboratories, private doctor's office, dialysis center, any district of the Ministry of Health, pharmaceutical company, social security institution, general directorate of public health, surgical medical center, tuberculosis control dispensary, home care services
***General practitioner, family physician, medical microbiology, pulmonologist, physical therapy and rehabilitation, gynecology, pediatrics, public health, anesthesiology, general surgery, medical biochemistry, cardiology, emergency medicine, radiology, psychiatry, neurology, otorhinolaryngology, orthopedy, ophthalmology, thoracic surgery, cardiac surgery

($p< 0.001$) were significantly higher than internal medicine specialists and other physicians (Table 2).

Of those not vaccinated during the survey period (n= 101), a total of 23 (22.8%) physicians were not planning to get the COVID-19 vaccine and 26 (25.7%) physicians were not sure about getting COVID-19 vaccination. In addition, the response of physicians to this question was not significantly different in terms of specialties ($p= 0.865$) (Table 2). However, majority of the physicians declared that they recommended COVID-19 vaccination to their relatives/friends (n= 448, 92.2%) and their patients (n= 453, 93.2%) (Table 3).

Table 2. Opinions of the physicians on their own vaccination status according to their specialty

Questions	Internal medicine (n= 168), n (%)	Infectious diseases (n= 85), n (%)	Other* (n= 233), n (%)	p	Total (n= 486), n (%)
Have you had COVID-19** or are you currently a COVID-19 patient?					
Yes	41 (24.4)	20 (23.5)	43 (18.5)	0.328	104 (21.4)
No	125 (74.4)	63 (74.1)	181 (77.7)		369 (75.9)
Not sure	2 (1.2)	2 (2.4)	9 (3.8)		13 (2.7)
Have you been involved in the treatment and/or follow-up of COVID-19 patients?					
Yes	133 (79.2)	77 (90.6)	145 (62.2)	<0.001	355 (73.0)
No	35 (20.8)	8 (9.4)	88 (37.8)		131 (27.0)
Are you currently taking part in the treatment and/or follow-up of COVID-19 patients?					
Yes	100 (59.5)	67 (78.8)	120 (51.5)	<0.001	287 (59.1)
No	68 (40.5)	18 (21.2)	113 (48.5)		199 (40.9)
Have you voluntarily participated in any ongoing COVID-19 vaccination phase-3 trials?					
Yes	14 (8.3)	17 (20.0)	29 (12.4)	0.030	60 (12.3)
No	154 (91.7)	68 (80.0)	204 (87.6)		426 (87.7)
If not participated in vaccination studies, are you considering to participate in any COVID-19 vaccination phase-3 trials? (n= 426)					
Yes	37 (24.0)	20 (29.4)	53 (26.0)	0.284	110 (25.8)
No	87 (56.5)	28 (41.2)	109 (53.4)		224 (52.6)
Not sure	30 (19.5)	20 (29.4)	42 (20.6)		92 (21.6)
If not participated in vaccination studies, have you had any of the available COVID-19 vaccines? (n= 426)					
Yes	120 (77.9)	51 (75.0)	154 (75.5)	0.863	325 (76.3)
No	34 (22.1)	17 (25.0)	50 (24.5)		101 (23.7)
If not vaccinated yet, are you planning to have any of the available COVID-19 vaccines? (n= 101)					
Yes	18 (52.9)	10 (58.8)	24 (48.0)	0.865	52 (51.5)
No	9 (26.5)	3 (17.6)	11 (22.0)		23 (22.8)
Not sure	7 (20.6)	4 (23.5)	15 (30.0)		26 (25.7)
Do you think that you have enough information about the vaccines developed for COVID-19?					
Yes	99 (58.9)	60 (70.6)	128 (54.9)	0.122	287 (59.1)
No	28 (16.7)	7 (8.2)	40 (17.2)		75 (15.4)
Not sure	41 (24.4)	18 (21.2)	65 (27.9)		124 (25.5)

Table 2. Opinions of the physicians on their own vaccination status according to their specialty (continue)

Questions	Internal medicine (n= 168), n (%)	Infectious diseases (n= 85), n (%)	Other* (n= 233), n (%)	p	Total (n= 486), n (%)
Are you worried about the adverse effects of the COVID-19 vaccine?					
Yes	35 (20.8)	16 (18.8)	52 (22.3)		103 (21.2)
No	110 (65.5)	52 (61.2)	147 (63.1)	0.708	309 (63.6)
Not sure	23 (13.7)	17 (20.0)	34 (14.6)		74 (15.2)
Are you worried about the efficacy of the COVID-19 vaccine?					
Yes	73 (43.5)	28 (32.9)	91 (39.1)	0.127	192 (39.5)
No	59 (35.1)	41 (48.3)	80 (34.3)		180 (37.0)
Not sure	36 (21.4)	16 (18.8)	62 (26.6)		114 (23.5)

*General practitioner, family physician, medical microbiology, pulmonologist, physical therapy and rehabilitation, gynecology, pediatrics, public health, anesthesiology, general surgery, medical biochemistry, cardiology, emergency medicine, radiology, psychiatry, neurology, otorhinolaryngology, orthopedy, ophthalmology, thoracic surgery, cardiac surgery
**COVID-19: Coronavirus disease 2019

Majority of the physicians stated that patients with a history of COVID-19 (48.8%) and those with a history of COVID-19 with negative test results for antibodies (91.8%) needed COVID-19 vaccine. In addition, 78.6% of the physicians did not think that people without a history of COVID-19 needed an antibody test before vaccination. When specialty groups of physicians were compared, the number of participants that recommended COVID-19 vaccination to healthcare professionals, individuals aged over 18 years, individuals aged over 65 years old, individuals aged over 65 years with at least one chronic disease, individuals aged over 80 years and individuals aged over 80 years with at least one chronic disease was significantly higher in infectious diseases physicians ($p< 0.05$). However, in response to the "which of the following(s) must have COVID-19 vaccination?" question, when responses of specialty groups were compared, a significant difference was detected only in "healthcare professionals" and "not to be mandatory" options ($p< 0.05$). Majority of the physicians stated that individuals under the age of 18 (57.0%), pregnant women (80.2% for the first trimester, 39.5% for the second trimester and 31.9% for the third trimester), individuals with a history of any vaccine allergy (45.9%) and patients with a history of COVID-19 less than 4-6 months ago (48.1%) should not get COVID-19 vaccine (Table 3).

Pfizer-BioNTech® (59.5%) and Sinovac-Coronavac® (57.6%) were the most trusted COVID-19 vaccines among the physicians, and no significant difference was found in comparison of the specialties ($p< 0.05$).

According to the majority of the physicians, administering the COVID-19 vaccine and influenza vaccine on the same day was not a problem (43.2%), but a patient with a positive polymerase chain reaction (PCR) test for COVID-19 should not be vaccinated against influenza (61.5%). In addition, 75.7% of the physicians believed that COVID-19 vaccination studies would have a positive influence on awareness and caring for other vaccinations by the healthcare professionals (Table 3).

Physicians involved in the follow-up of COVID-19 patients had a higher rate of getting COVID-19 than the physicians who did not (26.2% vs 8.4%, $p< 0.001$).

Physicians who stated having sufficient information about COVID-19 vaccines had a higher rate of COVID-19 vaccine recommendation to their patients compared to physicians who stated not having sufficient information (95.8% vs 86.7%, $p= 0.011$).

Table 3. Opinions of the physicians about public vaccination status according to their specialty

Questions	Internal medicine (n= 168), n (%)	Infectious diseases (n= 85), n (%)	Other* (n= 233), n (%)	p	Total (n= 486), n (%)
Would you recommend vaccination against COVID-19** to your relatives/friends?				0.170	
Yes	158 (94.0)	82 (96.4)	208 (89.2)		448 (92.2)
No	1 (0.6)	1 (1.2)	6 (2.6)		8 (1.6)
Not sure	9 (5.4)	2 (2.4)	19 (8.2)		30 (6.2)
Would you recommend vaccination against COVID-19 to your patients?				0.057	
Yes	160 (95.2)	83 (97.6)	210 (90.1)		453 (93.2)
No	0 (0.0)	0 (0.0)	6 (2.6)		6 (1.2)
Not sure	8 (4.8)	2 (2.4)	17 (7.3)		27 (5.6)
Do you think that people who have had the COVID-19 also need the COVID-19 vaccine?				0.521	
Yes	90 (53.6)	42 (49.4)	105 (45.0)		237 (48.8)
No	29 (17.3)	18 (21.2)	47 (20.2)		94 (19.3)
Not sure	49 (29.1)	25 (29.4)	81 (34.8)		155 (31.9)
Do you think that people who have a history of the COVID-19 with negative test results for antibodies need the COVID-19 vaccine?				0.014	
Yes	162 (96.4)	80 (94.1)	204 (87.5)		446 (91.8)
No	2 (1.2)	3 (3.5)	9 (3.9)		14 (2.9)
Not sure	4 (2.4)	2 (2.4)	20 (8.6)		26 (5.3)
Do you think that people without a history of the COVID-19 need an antibody test before the COVID-19 vaccination?				0.884	
Yes	27 (16.0)	10 (11.8)	34 (14.6)		71 (14.6)
No	131 (78.0)	68 (80.0)	183 (78.5)		382 (78.6)
Not sure	10 (6.0)	7 (8.2)	16 (6.9)		33 (6.8)
Which of the following(s) do you recommend the COVID-19 vaccination?					
• I do not recommend getting vaccinated.	3 (1.8)	0 (0.0)	6 (2.6)	0.404	9 (1.9)
• Healthcare professionals	161 (95.8)	84 (98.8)	212 (91.0)	0.015	457 (94.0)
• Individuals under 18 years old	11 (6.5)	11 (12.9)	28 (12.0)	0.141	50 (10.3)
• Individuals over 18 years old	92 (54.8)	61 (71.8)	132 (56.7)	0.023	285 (58.6)
• Adults with at least one chronic disease	142 (84.5)	78 (91.8)	196 (84.1)	0.207	416 (85.6)
• Individuals over 50 years old	123 (73.2)	71 (83.5)	170 (73.0)	0.132	364 (74.9)
• Individuals over 50 years with at least one chronic disease	132 (78.6)	69 (81.2)	166 (71.2)	0.100	367 (75.5)
• Individuals over 65 years old	144 (85.7)	72 (84.7)	171 (73.4)	0.004	387 (79.6)
• Individuals over 65 years with at least one chronic disease	123 (73.2)	69 (81.2)	152 (65.2)	0.015	344 (70.8)
• Individuals over 80 years old	104 (61.9)	65 (76.5)	142 (60.9)	0.031	311 (64.0)
• Individuals over 80 years with at least one chronic disease	95 (56.5)	62 (72.9)	129 (55.4)	0.015	286 (58.8)
• Other	5 (3.0)	2 (2.4)	12 (5.2)	0.426	19 (3.9)

Table 3. Opinions of the physicians about public vaccination status according to their specialty (continue)

Questions	Internal medicine (n= 168), n (%)	Infectious diseases (n= 85), n (%)	Other* (n= 233), n (%)	p	Total (n= 486), n (%)
Which of the following(s) must have COVID-19 vaccination?					
• Vaccination should not be mandatory	58 (34.5)	36 (42.4)	111 (47.6)	0.034	205 (42.2)
• Healthcare professionals	87 (51.8)	38 (44.7)	88 (37.8)	0.020	213 (43.8)
• Individuals under the age of 18	8 (4.8)	4 (4.7)	17 (7.3)	0.511	29 (6.0)
• Individuals over the age of 18	40 (23.8)	20 (23.5)	49 (21.0)	0.776	109 (22.4)
• Adults with at least one chronic disease	51 (30.4)	22 (25.9)	69 (29.6)	0.758	142 (29.2)
• All individuals over the age of 50	39 (23.2)	22 (25.9)	51 (21.9)	0.756	112 (23.0)
• Individuals over 50 years with at least one chronic disease	49 (29.2)	17 (20.0)	63 (27.0)	0.290	129 (26.5)
• All individuals over the age of 65	55 (32.7)	23 (27.1)	70 (30.0)	0.642	148 (30.5)
• Individuals over 65 years with at least one chronic disease	56 (33.3)	20 (23.5)	62 (26.6)	0.190	138 (28.4)
• All individuals over the age of 80	44 (26.2)	16 (18.8)	50 (21.5)	0.346	110 (22.6)
• Individuals over 80 years with at least one chronic disease	40 (23.8)	15 (17.6)	51 (21.9)	0.534	106 (21.8)
• Other	6 (3.6)	0 (0.0)	10 (4.3)	0.164	16 (3.3)
Which of the following(s) should not be vaccinated?					
• Individuals under the age of 18	102 (60.7)	49 (57.6)	126 (54.1)	0.417	277 (57.0)
• Individuals under the age of 40	6 (3.6)	2 (2.4)	11 (4.7)	0.609	19 (3.9)
• Individuals under the age of 50	2 (1.2)	1 (1.2)	3 (1.3)	1.000	6 (1.2)
• Individuals under the age of 65	3 (1.8)	0 (0.0)	4 (1.7)	0.684	7 (1.4)
• Individuals over the age of 65	4 (2.4)	2 (2.4)	14 (6.0)	0.140	20 (4.1)
• Individuals over the age of 80	24 (14.3)	4 (4.7)	28 (12.0)	0.079	56 (11.5)
• Individuals who are allergic to any medication	28 (16.7)	3 (3.5)	32 (13.7)	0.011	63 (13.0)
• Individuals who are allergic to any vaccine	86 (51.2)	35 (41.2)	102 (43.8)	0.210	223 (45.9)
• Pregnant women - 1st trimester	143 (85.1)	77 (90.6)	170 (73.0)	<0.001	390 (80.2)
• Pregnant women - 2nd trimester	80 (47.6)	18 (21.2)	94 (40.3)	<0.001	192 (39.5)
• Pregnant women - 3rd trimester	62 (36.9)	17 (20.0)	76 (32.6)	0.024	155 (31.9)
• Patients who had COVID-19 less than 4-6 months ago	84 (50.0)	43 (50.6)	107 (45.9)	0.646	234 (48.1)
• Patients who had COVID-19 more than 4-6 months ago	5 (3.0)	3 (3.5)	12 (5.2)	0.541	20 (4.1)
• None	2 (1.2)	1 (1.2)	18 (7.7)	0.002	21 (4.3)
• Other	11 (6.5)	4 (4.7)	12 (5.2)	0.807	27 (5.6)
Do you think that anyone can get both COVID-19 and the influenza vaccine on the same day?					
Yes	64 (38.1)	47 (55.3)	99 (42.5)	0.072	210 (43.2)
No	54 (32.1)	20 (23.5)	78 (33.5)		152 (31.3)
Not sure	50 (29.8)	18 (21.2)	56 (24.0)		124 (25.5)

Table 3. Opinions of the physicians about public vaccination status according to their specialty (continue)

Questions	Internal medicine (n= 168), n (%)	Infectious diseases (n= 85), n (%)	Other* (n= 233), n (%)	p	Total (n= 486), n (%)
Do you think that any patient with a positive PCR*** test for the COVID-19 gets vaccinated against influenza?				0.224	
Yes	24 (14.3)	17 (20.0)	46 (19.7)		87 (17.9)
No	106 (63.1)	57 (67.1)	136 (58.4)		299 (61.5)
Not sure	38 (22.6)	11 (12.9)	51 (21.9)		100 (20.6)
Do you think that COVID-19 vaccine studies had a positive influence on healthcare professionals about the awareness/caring of the other vaccines?					
Yes	131 (78.0)	62 (72.9)	175 (75.1)	0.790	368 (75.7)
No	20 (11.9)	12 (14.2)	26 (11.2)		58 (11.9)
Not sure	17 (10.1)	11 (12.9)	32 (13.7)		60 (12.4)

*General practitioner, family physician, medical microbiology, pulmonologist, physical therapy and rehabilitation, gynecology, pediatrics, public health, anesthesiology, general surgery, medical biochemistry, cardiology, emergency medicine, radiology, psychiatry, neurology, otorhinolaryngology, orthopedy, ophthalmology, thoracic surgery, cardiac surgery.
**COVID-19: Coronavirus disease 2019.
***PCR: Polymerase chain reaction.

However, no difference was detected in terms of COVID-19 vaccine recommendation to their relatives/friends (94.4% vs 86.7%, p= 0.074). The percentage of physicians who stated having sufficient information on COVID-19 vaccines and who voluntarily participated in the COVID-19 vaccine phase-3 trials was not different from the ones stated not to have sufficient information (12.2% vs 12.0%, p= 0.980). In terms of getting the COVID-19 vaccine, no significant difference was detected between physicians who stated having and not having sufficient information about COVID-19 vaccines (77.0% vs 69.7%, p= 0.384).

The percentage of COVID-19 vaccinated physicians was lower in physicians concerned about the adverse effects of the COVID-19 vaccine than those without concern (53.1% vs 83.9%, p< 0.001). Furthermore, physicians concerned about the adverse effects of the COVID-19 vaccine had a lower rate of COVID-19 vaccine recommendation to their patients and relatives/friends compared to physicians having no concerns about the adverse effect (75.7% vs 98.4%, p< 0.001 and 70.9% vs 98.4%, p< 0.001, respectively).

Physicians with concerns about the efficacy of the COVID-19 vaccine had a lower percentage of getting the COVID-19 vaccine than those without concerns (68.6% vs 78.8%, p= 0.004). Physicians with concerns about the efficacy of the COVID-19 vaccine had a lower rate of COVID-19 vaccine recommendation to their patients (85.4% and 98.9%, respectively) and relatives/friends (82.8% and 98.9%, respectively) than physicians without concerns (p< 0.001).

The percentage of females who stated having sufficient information about COVID-19 vaccines was less than males (53.5% vs 66%, p= 0.03). Females were more concerned than males about the adverse effects of the COVID-19 vaccine (26.2% vs 14.9%, p< 0.001) and about the efficacy of the COVID-19 vaccine (44.6% vs 33%, p= 0.033).

As age increased (aged between 23-33; 34-44; 45-55; 56-66; 67-77), the percentage of physicians stated having sufficient knowledge on COVID-19 vaccines also increased significantly (41.1%; 51.1%; 63.5%; 82.5%; 100%, respectively) ($p< 0.001$). The percentages of physicians of different age scales concerned about the adverse effects of the vaccine were also different (23.4%; 29.5%; 21.6%; 5.0%; 8.3%, respectively) ($p= 0.003$).

Percentage of the physicians between the ages of 67-77 years who believed in the recommendation of COVID-19 vaccines for "individuals under the age of 18" (25.0%, $p= 0.003$), "individuals over 18 years of age" (83.3%, $p= 0.029$) and "individuals over 65 years of age" (100%, $p= 0.017$) was higher than those in other age groups.

Percentage of the physicians between the ages of 23-33 years who did not want the COVID-19 vaccine to be mandatory was higher than those aged between 67-77 years (48.6% vs 8.3%, $p= 0.009$). In addition, percentage of the physicians between the ages of 67-77 years who believed that "healthcare professionals", "individuals over 18 years of age", "individuals over 65 years of age" and "individuals over 80 years of age" must have COVID-19 vaccination was higher than those aged between 23-33 years (83.3% vs 36.4%, $p= 0.001$; 50.0% vs 15.0%, $p= 0.007$; 58.3% vs 37.4%, $p= 0.020$ and 50.0% vs 29.9%, $p= 0.024$, respectively).

DISCUSSION

Physicians are at high risk of COVID-19 as well as other frontline healthcare workers while caring for their patients. In this study, it was found that physicians involved in the treatment and follow-up of COVID-19 patients had a higher rate of getting COVID-19, except for infectious diseases physicians despite the higher ratio of their involvement in treatment and follow-up of COVID-19 patients. Higher number of voluntary participations of infectious disease physicians in on-going COVID-19 vaccine phase-3 trials might have influenced their protection against COVID-19.

Vaccination is the key to prevent COVID-19 related deaths, case severity, hospitalizations, and transmission, and thus acceptance of getting vaccinated against COVID-19 is important, especially by physicians since they are at high risk[12]. However, vaccine hesitancy is also a concern among physicians[13]. In this study, only 4.7% of the physicians declared that they had no intention of getting vaccinated against COVID-19. However, 12.3% of the physicians voluntarily participated in COVID-19 vaccine phase-3 trials, 66.9% had already had the vaccine, and 10.7% intended to get vaccinated, and therefore, total acceptance rate of COVID-19 vaccine in physicians was high (89.9%). In France, the rate of intention to get vaccinated against COVID-19 has been reported as 92.1% in physicians[14]. Moreover, in Greece, a high vaccination acceptance rate (80%) for COVID-19 has been reported among physicians[15].

Physicians are considered to be a trusted source of vaccine-related information for patients[16]. There is evidence that vaccination is higher among patients if recommended by their physicians[17]. According to our findings, physicians who stated having sufficient information about COVID-19 vaccines had a higher rate of COVID-19 vaccine recommendation to their patients ($p= 0.011$). Therefore, updating physicians' knowledge about COVID-19 vaccination from reliable sources is also important for the vaccination of the community.

Interestingly, in this study, even though 39.5% of the physicians were worried about the efficacy of the COVID-19 vaccine, only 1.9% of the physicians stated that they do not recommend COVID-19 vaccination. However, a lower rate of COVID-19 vaccinated physicians and COVID-19 vaccine recommendation by physicians (to their patients and relatives/friends) were detected when physicians were concerned about the efficacy and adverse effects of the COVID-19 vaccine ($p< 0.001$). Similar to our findings, it was shown that fear of vaccine adverse effects had a negative impact on COVID-19 vaccination acceptance. In addition, increasing age has been

identified as an independent predictor of vaccine acceptance[15]. In this study, it was found that female sex and younger physicians were more concerned about the adverse effects of the COVID-19 vaccine ($p< 0.05$). This higher concern about vaccine adverse effects by female and younger physicians might be due to the fact that percentages of female and younger physicians who stated having sufficient information about COVID-19 vaccines were lower in our study. In addition, due to comorbidities associated with aging and higher risk of severe COVID-19 disease in the elderly especially with comorbidities, less concern was rational among this age group of physicians when considering the risk-benefit ratio of the COVID-19 vaccine. Concern about vaccine safety was one of the most commonly cited reasons for hesitation about accepting vaccination as in this study, consistent with others[18].

In this study, almost one-third of the physicians (31.9%) were not sure about the vaccination of a patient with a history of COVID-19; however, 91.8% of them agreed on the vaccination of a patient with a history of COVID-19 with negative test results for antibodies. Due to limited access to COVID-19 vaccines, prioritization of the candidates for vaccination is also important during the pandemic. According to the availability stages of COVID-19 vaccines, most of the countries already developed plans of distribution and identified priority target groups according to risk criterion, the utility criterion and the desert criterion[19]. In Türkiye, the administration of COVID-19 vaccines began on January 14, 2021, with healthcare professionals. In Türkiye, as of 16 May 2021, a total of 24.918.773 vaccine doses have been administered[20]. In our study, even though a majority of the physicians recommend COVID-19 vaccines to healthcare professionals, adults with at least one chronic disease, individuals aged over 50 years with or without comorbidities, 42.2% of them stated that vaccination should not be mandatory. Vaccination of pregnant women, children (individuals under the age of 18) and patients who had COVID-19 less than 4-6 months ago were not recommended by physicians. At the moment, physicians are not the decision-makers since priority groups have been identified by the Ministry of Health. However, physicians' role as a trusted source of information is still important for the patients.

Vaccination process of the Turkish people started with Sinovac-CoronaVac®, and then towards the end of March, the Pfizer-BioNTech® Vaccine was provided. Pfizer/BioNTech® has announced efficacy of 95%; Moderna® has announced efficacy of 94.5%; AstraZeneca® has announced efficacy of 70%; and efficacy trials of Sinovac-CoronaVac® have announced efficacies of 50%, 65%, 78% and 91%[21]. Despite the efficacy differences in these vaccines, in this study, Pfizer-BioNTech® and Sinovac-CoronaVac® were the most trusted vaccines by physicians (59.5% and 57.6%, respectively), which might be due to the involvement of Türkiye in phase-3 trials of these two vaccines. Majority of the physicians (75.7%) stated that COVID-19 vaccine trials had a positive influence on healthcare professionals about the awareness/caring of the other vaccines as well.

This study has some limitations. First, the response rate was over the sample size calculation; however, since the survey was announced in internal medicine and infectious disease physicians' platforms, we did not achieve a sufficient number of responses from other specialties for comparison. Second, the survey was conducted over a limited period (one month) when the vaccination of healthcare professionals began. Therefore, the approaches of the physicians may have changed about the adverse effects and/or efficacy of the vaccine and may have affected the intention to get vaccinated against COVID-19.

CONCLUSION

Herein, we presented the results of a survey reflecting physicians' perception of COVID-19 vaccination. In summary, we showed that the rate of recommending vaccination against COVID-19 may differ by age, sex and branch of the physicians. Concerns about vaccine adverse effects and efficacy were most common among female and younger physicians. COVID-19 vaccine phase-3 trials had a positive impact on physicians' awareness of other vaccines as

well. Recommendation of COVID-19 vaccine was higher among physicians with confidence in having sufficient information and without concern about the adverse effects and efficacy of the vaccine. Since physicians have an important role in terms of providing information and reducing COVID-19 vaccine hesitancy in the community, the improvement of physicians' knowledge and concerns should be considered.

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ETHICS COMMITTEE APPROVAL

This study was approved by Hacettepe University Non-Invasive Clinical Research Ethics Committee (Date:19.01.2021, Decision no: 2021/02-34).

CONFLICT of INTEREST

The authors declare that they have no know competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

AUTHORSHIP CONTRIBUTIONS

Concept and Design: CZD, KTY, EKK, SÜ

Data Collection or Processing: CZD, EKK, EK, KTY

Analysis/Interpretation: CZD, EKK, EK, KTY

Review and Correction: CZD, KD, SÜ, EK

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