



Acceptance of COVID-19 Vaccine Among Healthcare Workers: Experiences from a Reference Hospital in Türkiye

Sağlık Çalışanlarının COVID-19 Aşı Kabulü: Türkiye’de Bir Referans Hastane Deneyimi

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ABSTRACT

Introduction: The acceptance of the COVID-19 vaccine by healthcare professionals is crucial for several reasons. Firstly, they face an elevated risk of infection due to their close contact with COVID-19 patients. Secondly, they play a pivotal role in offering guidance to the public regarding vaccination. This study aimed to examine the acceptance of the COVID-19 vaccine by healthcare professionals and to identify situations that cause hesitation.

Materials and Methods: In this study, healthcare workers at Ankara City Hospital were surveyed between April 1st and July 1st, 2021, using a printed questionnaire to determine whether they had received the COVID-19 vaccine. Additionally, the survey aimed to understand their reasons for either receiving or not receiving the vaccine. In the study, the survey results of 1096 healthcare professionals were evaluated.

Results: The mean age of the participants was 33.2 ± 8.9 , 71.7% were women, 49.4% were married, and 42.9% were nurses or midwives. Thirty point six percent of participants reported being diagnosed with COVID-19, while 46.1% indicated that individuals they lived with had been diagnosed with the virus. The percentage of COVID-19 vaccination among all healthcare workers was 81%. By profession, the rate of COVID-19 diagnosis was 92% for doctors, 76% for nurses/midwives, 81% for allied health personnel, and 77% for technical/administrative personnel. The most common reasons for receiving the COVID-19 vaccine include concerns about transmitting the virus to loved ones, awareness of the vaccine’s protective benefits, confidence in its safety, and fear of contracting the illness. The most common reasons cited for not receiving the COVID-19 vaccine included concerns about its effectiveness, fear of potential side effects, and having previously contracted COVID-19.

Conclusion: High vaccine acceptance percentages were associated with several factors, including being older than 30 years old, having children, not being pregnant, having pursued medical residency education or holding a doctorate/master’s degree, working as a doctor, having three or more years of work experience, and having received at least one flu vaccine. Providing ample and compelling information about the COVID-19 vaccine to both society and healthcare workers is essential. Factors that enhance vaccine acceptance, as well as reasons contributing to vaccine hesitancy or refusal, should be thoroughly analyzed and incorporated into vaccination studies. Moreover, solutions should be offered to address these factors in the field.

Key Words: Healthcare workers; COVID-19; Vaccine; Vaccine acceptance; Vaccine hesitancy

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ÖZ

Sağlık Çalışanlarının COVID-19 Aşısı Kabulü: Türkiye’de Bir Referans Hastane Deneyimi

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Giriş: Sağlık çalışanlarının COVID-19 aşısını kabulü, hem COVID-19 tanısı alan hastaları ile yakın temasta bulunmaları ile artmış enfeksiyon riski taşımalarından dolayı hem de aşılanma konusunda topluma rehberlik etmelerinden dolayı oldukça önemlidir. Bu çalışma ile sağlık çalışanlarının COVID-19 aşısını kabulünün irdelenmesi, tereddüde sebep olan durumların tespit edilmesi amaçlanmıştır.

Materyal ve Metod: Bu araştırmada 1 Nisan-1 Temmuz 2021 tarihleri arasında Ankara Şehir Hastanesinde görev yapan sağlık çalışanlarının COVID-19 aşısı yaptırap yaptırmamaları, aşısı yaptıрма/yaptırmama nedenleri basılı bir anketle sorgulanmıştır. Çalışmada 1096 sağlık çalışanının anket sonuçları değerlendirilmiştir.

Bulgular: Katılımcıların yaş ortalaması 33.2 ± 8.9 , %71.7’si kadın, %49.4’ü evli, %42.9’u hemşire veya ebe idi. Çalışmaya katılan sağlık çalışanlarından %30.6’sı kendisinin, %46.1’i birlikte yaşadığı kişilerin COVID-19 tanısı aldığını belirtti. Tüm sağlık çalışanlarında COVID-19 aşısı olma yüzdesi %81, doktorlarda %92, hemşire/ebelerde %76, yardımcı sağlık personelinde %81, teknik/idari personelde %77 olarak tespit edildi. Yakınlarını hasta etmekten korkmak, aşının koruyucu etkileri hakkında bilgilendirilmek, aşısı güvenilir bulmak ve hasta olmaktan korkmak en sık COVID-19 aşısı olma nedenlerinden iken; etkinliği konusunda endişe, yan etki korkusu, COVID-19 geçirme ise en sık aşı olmama nedeni olarak belirtilmiştir.

Sonuç: COVID-19 aşısının kabulünde 30 yaşından büyük olmak, çocuk sahibi olmak, hamile olmamak, tıpta uzmanlık/doktora/yüksek lisans sahibi olmak, doktor olmak, üç yıl ve üzeri çalışma yılında olmak, en az bir defa grip aşısı olmuş olmak daha yüksek aşı kabul yüzdesi ile ilişkili bulunmuştur. Toplumda ve tüm sağlık çalışanlarında aşı ile ilgili yeterli ve ikna edici bilgilendirmeler yapılması ve oluşan tereddütlerin iyi analiz edilip çözüm önerileri ile birlikte sahaya yansıtılabilmesi önemli bir gerekliliktir.

Anahtar Kelimeler: Sağlık çalışanları; COVID-19; Aşı; Aşı kabulü; Aşı tereddüdü

INTRODUCTION

Coronavirus disease-2019 (COVID-19) was first identified in Wuhan, China, and has since spread to different countries outside China. On March 11, 2020, the World Health Organization (WHO) declared COVID-19 a pandemic, and the first case of COVID-19 was reported in Türkiye^[1]. From the onset of the disease to March 15, 2023, 759.408.703 confirmed cases and 6.866.434 deaths related to COVID-19 were reported across the world. WHO received reports of 17.004.677 confirmed cases of COVID-19 and 101.419 deaths from Türkiye for the period between January 2020 and March 2023^[2]. At the outset of the pandemic, non-pharmaceutical interventions such as social distancing, wearing face masks, and contact tracing were implemented, forming the cornerstone of health policy strategies aimed at reducing viral transmission and alleviating healthcare burdens. However, due to the absence of an effective antiviral therapy, vaccination was presented as the only option

for preventing the disease and stopping the pandemic^[3]. With the implementation of the COVID-19 vaccination, there has been a decrease in the rates of hospitalization and fatalities attributable to COVID-19. However, vaccination hesitancy and refusal have hindered efforts in combating the disease^[4,5].

As of April 8, 2022, ten COVID-19 vaccines met the necessary safety and efficacy criteria, according to the evaluation of the WHO. As of February 2023, there were 180 preclinical and 199 clinical-phase trials for COVID-19 vaccines^[6]. In Türkiye, following the approval of the CoronaVac vaccine for emergency use, nationwide vaccination commenced on January 14, 2021. During this process, healthcare workers (HCWs) were given priority due to their increased risk of transmission through direct contact with patients and intense working conditions^[7]. However, despite vaccination being considered the most important solution to end the pandemic, the desired vaccination rates have

not been achieved due to increasing vaccine hesitancy. Before the COVID-19 pandemic, there were reports on vaccine-hesitant behaviors among HCWs, especially concerning seasonal influenza vaccinations, which have also been found to influence acceptance of vaccination against COVID-19^[8].

HCWs play a key role in the success of COVID-19 immunization programs. They are reliable sources of information on vaccines, and their attitudes can affect patients and other individuals in the community. Therefore, examining situations that affect HCWs' acceptance or hesitation concerning COVID-19 vaccination can guide further attempts to encourage positive attitudes and increase the success of vaccination programs^[9]. To gather information on this topic, a study was designed to assess healthcare workers' attitudes toward vaccination following the approval of the CoronaVac (Sinovac Life Sciences, China) vaccine for emergency use in Türkiye. At the time of the study, the first two doses of this vaccine had been administered to HCWs.

An assessment of vaccination attitudes can be undertaken using different methods, such as health record analysis, qualitative research, surveys, interviews, focus groups, social media analysis, and behavioral experiments. Each of these methods, employed under different conditions with different strengths and limitations, can be used to determine the response of communities or groups to vaccination. In the current study, the survey method was preferred.

This study aimed to determine the COVID-19 vaccine acceptance rate among HCWs working at Ankara City Hospital and to examine the factors that influenced HCWs' vaccine acceptance, hesitancy, or rejection. It is considered that the data obtained will guide further strategies in the fight against the pandemic and enlighten the vaccine decision dynamics among HCWs, hence expediting other adult immunization efforts.

MATERIALS and METHODS

This single-center cross-sectional study was carried out with HCWs working at Ankara City Hospital, a tertiary referral hospital, during the

pandemic period. Informed consent was obtained from all participants. Approval was obtained from the Number 1 Clinical Research Ethics Committee of Ankara City Hospital (approval date: March 17, 2021, number: E-21-1666). The principles of the Declaration of Helsinki were followed.

Ankara City Hospital provides service in eight separate buildings with a capacity of 3810 beds and has more than 9000 staff. On March 11, 2020, the Ministry of Health designated Ankara City Hospital as a pandemic hospital for the hospitalization of COVID-19 patients. The vaccine was offered to priority groups, those who accepted were vaccinated, but it was not mandatory. The study began on April 1 and was completed on July 1, 2021. Therefore, the vaccination status of HCWs and the factors influencing their vaccination-related decisions were examined 2.5 months after the initiation of COVID-19 vaccination among HCWs as a priority group. The distribution of occupational groups within the sample reflected their distribution across the entire hospital. The sample size of the study was calculated with a sample size calculator^[10]. At a 3% margin of error and a 95% confidence level, the required sample size was 955. Questionnaires were delivered to a total of 1111 HCWs. After the forms with missing data were excluded, analyses were performed on the responses of 1096 HCWs.

A printed survey was prepared using 28 questions. For survey questions, the literature on the subject was reviewed^[11-13]. Using information from the websites of the Turkish Ministry of Health and the WHO, various factors affecting vaccine decisions were included in the survey as separate options. A preliminary study was conducted with a group of 25 individuals from various positions, including physicians, nurses, assistant personnel, and administrative personnel. The survey included questions on i) demographics, ii) previous encounters with COVID-19 and risk factors for the disease, iii) COVID-19 vaccination status and related decisions and their justifications, iv) recommendations of COVID-19 vaccination, history of influenza vaccination, and

attitudes toward childhood vaccination, and v) anxiety levels related to contracting COVID-19 or transmitting it to family members.

In this study, more than 20 occupations (medical doctors, research assistants, nurses, midwives, health technicians, biologists, pharmacists, physiotherapists, nutritionists, administrative staff, technical or cleaning personnel, etc.) were categorized into four main groups: doctors, nurses/midwives, allied health personnel, and technical/administrative staff. Educational level was evaluated in three groups: post-graduate or higher (medical specialization/PhD/Master's), college (associate or bachelor's degree), and high school or lower.

In the survey, the anxiety levels of the HCWs related to contracting COVID-19 and infecting their families with COVID-19 were rated on a scale of 1 to 10. Self-reported scores were analyzed according to vaccination status.

The Statistical Package for the Social Sciences (SPSS) version 22.0 (IBM) and Microsoft Excel were used to perform descriptive analyses using number, percentage, mean, and standard deviation values. Pearson's Chi-squared test and t-tests were used. Statistical significance was assessed using the two-tailed test and $p < 0.05$.

RESULTS

Of the 1.096 HCWs, 786 (71.7%) were female. The mean age was 33.2 years. Approximately half ($n = 541$, 49.4%) of the participants were married, 2.2% ($n = 17$) were pregnant, and 42.3% ($n = 464$) had at least one child. Regarding household composition, 20.2% ($n = 221$) of the participants lived alone, and 39.8% ($n = 436$) lived with their children. Only 4.6% ($n = 50$) of the participants lived with their parents or grandparents over 65 years of age. The demographics of the HCWs are summarized in Table 1.

Of the respondents, 84.3% ($n = 924$) had a college or higher degree. Nurses and midwives constituted the largest occupational group (42.9%). In terms of professional experience, the participants with less than two years and those with 11 years or more experience were in the majority (61.5%). Due to intense working

conditions during the pandemic, the HCWs were assigned to more than one clinic or workplace; therefore, multiple options were selected for the related question. Of the HCWs, 34.7% ($n = 380$) stated that they worked in various departments of the hospital, such as the operating room, laboratory, emergency room, vaccination unit, blood bank, and catheter-intervention unit. Some participants also worked in more than one clinic.

COVID-19 Vaccine Acceptance Rates and Related Factors

In this study, we found that most participants ($n = 891$, 81.2%) had been vaccinated against COVID-19. Of the non-vaccinated participants, 24.3% ($n = 50$) stated that they were planning to receive COVID-19 vaccination later, 33.1% ($n = 68$) were not willing to be vaccinated, 9.2% ($n = 19$) stated that they would consider getting vaccinated once more people were vaccinated, and 32.1% ($n = 66$) were hesitant. In the non-vaccinated group, 35.1% ($n = 72$) of the HCWs reported having negative views concerning vaccination before the COVID-19 pandemic, while 64.8% ($n = 133$) stated that they had never had any negative views on vaccination.

The vaccinated and non-vaccinated participants were compared in terms of age, sex, marital status, pregnancy, parental status, educational level, occupation, professional experience, place of work, previous encounters with COVID-19 and risk factors, vaccination decisions and justifications, and recommendations of COVID-19 vaccination (Table 1). As a result of the analyses, there were no significant differences between the two groups in terms of sex, marital status, number of children, and household members ($p > 0.05$). However, the vaccine acceptance rates of individuals aged 30 years or older, those who had children, and non-pregnant women were determined to be higher ($p < 0.05$).

The effects of educational level on COVID-19 vaccination were also examined. The difference in educational levels between the vaccinated and non-vaccinated HCWs was significant. The vaccine acceptance rate was higher in the post-graduate group ($p < 0.001$). Similar to this finding, the percentage of HCWs who had been

Table 1. Demographics and vaccine acceptance of the participant HCWs

		n (%)	Vaccine acceptance (%)	OR (95% CI)	p
Sex	Male	310 (28.3)	83	1.1 (0.8-1.6)	0.493
	Female	786 (71.7)	81		
Age Mean 33.2, SD 8.9 Median 30, IQR= 19-66	<25	123 (11.2)	≥30 85% <30 77%	1.7 (1.3-2.3)	0.001
	25-29 years	394 (36.0)			
	30-40 years	331 (30.2)			
	41-50 years	205 (18.7)			
	>50	43 (3.9)			
Marital Status	Married	541 (49.4)	82	1.2 (0.9-1.6)	0.337
	Single	555 (50.6)	80		
Parenting status ^a Mean 1.7, SD 0.7 Median 2, IQR= 1-4	Parent	464 (42.3)	86	1.7 (1.2-2.3)	0.002
	Non-parent	632 (57.7)	78		
Pregnancy ^b	Not pregnant	769 (97.8)	82	6.2 (2.4-17.0)	<0.001
	Pregnant	17 (2.2)	41		
Household members	Lives alone	221 (20.2)	82	1.1 (0.7-1.5)	0.796
	Spouse	518 (47.3)	82	1.1 (0.8-1.4)	0.747
	Children	436 (39.8)	85	1.5 (1.1-2.0)	0.023
	>65 years	50 (4.6)	90	2.1 (0.8-5.4)	0.106
	Friend	54 (4.9)	54	0.8 (0.4-1.5)	0.497
	Father and mother	275 (25.1)	78	0.9 (0.6-1.2)	0.415
	Other	8 (0.7)	63	0.4 (0.1-1.6)	0.175
Highest level of education	Post-graduate or higher	329 (30.0)	89	2.5 (1.7-3.8)	<0.001
	College	595 (54.3)	76	¹	
	High school or lower	172 (15.7)	84	1.6 (1.03-2.5)	0.036
Occupation	Doctor	293 (26.8)	92	2.7 (1.4-5.4)	0.002
	Nurse/midwife	469 (42.9)	76	0.7 (0.4-1.2)	0.220
	Allied health personnel	99 (9.1)	81	¹	
	Technical/administrative staff	235 (21.4)	77	0.8 (0.4-1.4)	0.380
Professional experience	Less than two years	363 (33.1)	60	¹	
	3-5 years	272 (24.8)	82	1.6 (1.1-2.3)	0.028
	6-10 years	150 (13.7)	84	1.8 (1.1-2.9)	0.021
	11 years or more	311 (28.4)	87	2.3 (1.5-3.5)	<0.001
Work clinic	Outpatient-COVID-19	95 (8.7)	85	1.4 (0.8-2.5)	0.299
	Inpatient-COVID-19	248 (22.6)	78	0.8 (0.5-1.1)	0.111
	Outpatient-non-COVID-19	215 (19.6)	87	1.8 (1.1-2.7)	0.010
	Inpatient-non-COVID-19	292 (26.6)	84	1.2 (0.9-1.8)	0.246
	ICU-COVID-19	207 (18.9)	75	0.6 (0.5-0.9)	0.015
	ICU-non-COVID-19	131 (12.0)	80	0.9 (0.6-1.5)	0.721
	Others	380 (34.7)	83	1.3 (0.9-1.7)	0.189

Table 1. Demographics and vaccine acceptance of the participant HCWs (continue)

		n (%)	Vaccine acceptance (%)	OR (95% CI)	p
Ever cared for a patient with COVID-19	Yes No	929 (84.8) 167 (15.2)	82 78	1.3 (0.9-1.9)	0.214
Diagnosis of COVID-19 in the work unit	Yes No	856 (78.1) 240 (21.9)	81 83	0.8 (0.6-1.2)	0.360
Chronic disease	Present Absent	192 (17.5) 904 (82.5)	85 81	1.4 (0.9-2.1)	0.159
Immunosuppressive use	Present Absent	40 (3.6) 1056 (96.4)	88 81	1.6 (0.6-4.2)	0.305
Family member with a chronic disease	Present Absent	639 (58.3) 457 (41.7)	80 83	0.8 (0.6-1.1)	0.240
COVID-19 history	Present Absent	335 (30.6) 760 (69.4)	78 83	0.8 (0.6-1.0)	0.084
COVID-19 history among household members	Present Absent	505 (46.1) 591 (53.9)	81 81	1.0 (0.7-1.3)	0.933
Loss of a friend or relative due to COVID-19	Present Absent	246 (22.4) 850 (77.6)	84 81	1.1 (0.9-1.8)	0.264
Recommendation of COVID-19 vaccination	Yes, definitely Yes, maybe Hesitant No, I don't think so No, absolutely not	683 (62.7) 182 (16.7) 184 (16.9) 23 (2.1) 18 (1.6)	94 79 49 43 22	52.1 (16.4-165.1) 12.8 (4.0-41.2) 3.4 (1.1-10.8) 2.7 (0.7-10.7) 1	<0.001 <0.001 0.271 0.155
Influenza vaccination	Every year Occasionally Not before but during the pandemic Never before	82 (17.5) 281 (25.7) 49 (4.5) 681 (62.3)	94 87 90 77	4.7 (1.9-11.8) 2.1 (1.4-3.1) 2.7 (1.1-6.9) 1	<0.001 <0.001 0.033
Own children's vaccination status ^a	Vaccinated Not vaccinated Some vaccinated	392 (99.2) 2 (0.5) 1 (0.3)	86 66 50	3.1 (0.3-34.3) 2.0 (0.1-78.2) 1	0.337 0.146 0.709

^aFor those who have children.^bFor women.

HCW: Healthcare worker, OR: Odds ratio, CI: Confidence interval.

vaccinated against COVID-19 was significantly higher among the doctors than in the remaining occupations ($p= 0.002$).

When occupational experience and vaccination were compared, the percentage of vaccination was found to be significantly higher among the HCWs with more than two years' experience ($p= 0.028$ for the three to five years and $p= 0.021$ for six to 10 years). The p -value was determined to be 0.001 when the HCWs' experience exceeded 11 years. The percentage of vaccination among participants working in non-COVID-19 outpatient clinics was found to be significantly high ($p= 0.010$). The vaccination percentage of participants working in COVID-19 intensive care units was significantly lower.

In terms of encounters with COVID-19 and risk factors (caring for a patient with COVID-19, having had COVID-19, having a chronic disease, having a family member with a chronic disease, using immunosuppressive medication, having a household member with COVID-19, and losing a friend/relative due to COVID-19), there was

no significant difference between the vaccinated and non-vaccinated groups (Table 1).

Reasons for COVID-19 Vaccination Decisions

The reasons for COVID-19 vaccination decisions are shown in Table 2. Among the 891 (81%) vaccinated HCWs, the most common reasons for acceptance were fears related to transmitting the disease to relatives, knowledge of the protective effects of vaccination, and considering that the vaccine was safe. The participants were allowed to select more than one reason for their vaccination or non-vaccination decisions. The non-vaccinated group comprised 205 participants (19%). The most marked reasons for non-vaccination were concerns about the efficacy of the vaccine, fear of side effects, having had COVID-19, and being hesitant due to the rapid completion of vaccine phase studies.

The reasons for COVID-19 vaccination decisions were also analyzed according to the four occupational groups (Table 3). For the non-vaccinated group, the main reasons for

Table 2. Reasons influencing HCWs' COVID-19 vaccine decisions^a

	n	%
Reasons for being vaccinated	891	81.0
Fear of transmitting COVID-19 to relatives	531	59.6
Knowing the protective effects of the vaccine	397	44.6
Considering the vaccine to be safe	394	44.2
Fear of contracting COVID-19	264	29.6
Social responsibility	11	1.2
Concerns of being pressured or restricted in case of non-vaccination	11	1.2
Other	16	1.8
Reasons for not being vaccinated	205	19
Concerns about the efficacy of vaccines	69	33.7
Fear of vaccine side effects	64	31.2
Having had COVID-19	60	29.3
Hesitation due to the rapid completion of vaccine phase studies	58	28.3
Approval of vaccines for emergency use due to the pandemic	35	17.1
Not trusting foreign vaccines	27	13.2
Waiting for the development of domestic vaccines	26	12.7
Planning a pregnancy	11	5.4
Being pregnant	10	4.9
Breastfeeding	8	3.9
Not having sufficient knowledge about the vaccine	5	2.4
Other	2	1.0

^aMore than one reason could be selected.
HCW: Healthcare worker.

Table 3. Reasons influencing HCWs' COVID-19 vaccine decisions by occupational groups

	Medical Doctor		Nurse/ midwife		Allied health personnel		Technical/ administrative staff		
	n	%	n	%	n	%	n	%	p
Reasons for being vaccinated									
Fear of transmitting COVID-19 to relatives	170	62.7	196	54.9	49	60.5	115	63.9	0.123
Knowing the protective effects of the vaccine	163	60.1	136	38.1	36	44.4	61	33.9	<0.001
Fear of contracting COVID-19	71	26.2	141	39.5	13	16.0	39	21.7	<0.001
Concerns of being pressured or restricted in case of non-vaccination	1	0.4	8	2.2	0	0	2	1.1	0.130
Considering the vaccine to be safe	161	59.4	148	41.5	29	35.8	56	31.1	<0.001
Social responsibility	4	1.5	3	0.8	2	2.5	2	1.1	0.656
Other	6	2.2	4	1.1	3	3.7	3	1.7	0.411
Reasons for not being vaccinated									
Being pregnant	2	9.1	4	3.6	0	0	4	7.7	0.384
Planning a pregnancy	2	9.1	6	5.4	0	0	3	5.8	0.652
Breastfeeding	0	0	4	3.6	3	16.7	1	1.9	0.026
Having had COVID-19	14	63.6	35	31.3	3	16.7	7	13.5	<0.001
Concerns about the efficacy of vaccines	3	13.6	42	37.5	7	38.9	17	32.7	0.178
Fear of vaccine side effects	5	22.7	33	29.5	7	38.9	19	36.5	0.558
Hesitation due to the rapid completion of vaccine phase studies	4	18.2	36	32.1	9	50.0	9	17.3	0.027
Approval of vaccines for emergency use due to the pandemic	4	18.2	20	17.9	4	22.2	7	13.5	0.830
Not trusting foreign vaccines	0	0	14	12.5	2	11.1	11	21.2	0.097
Waiting for the development of domestic vaccines	2	9.1	15	13.4	3	16.7	6	11.5	0.891
Not having sufficient knowledge about the vaccine	1	4.5	2	1.8	0	0	2	3.8	0.685
Other	0	0	1	0.9	0	0	1	1.9	0.830

HCW: Healthcare worker.

refusing vaccination were breastfeeding among allied health personnel ($p= 0.026$), having had COVID-19 among doctors ($p< 0.001$), and hesitation due to the rapid completion of vaccine phase studies among allied health personnel and technical and administrative staff ($p= 0.027$), which were found at significant levels. There was no significant difference between the occupational groups concerning the remaining reasons for non-

vaccination ($p> 0.05$). For accepting vaccination, fear of contracting COVID-19 was significantly more common among the nurses and midwives group than in other occupation groups ($p< 0.01$). Lastly, knowledge of the protective effects of vaccination and the belief that the vaccine was safe were determined to be reasons that were reported at significantly higher rates among the doctors ($p< 0.01$).

Recommendations of COVID-19 Vaccination, History of Influenza Vaccination, and Views on Childhood Vaccination

A significantly higher rate of vaccinated participants stated that they would recommend COVID-19 vaccination to their patients or relatives compared to non-vaccinated individuals ($p < 0.001$). Over half of vaccinated HCWs ($n = 681$, 62.3%) had never received influenza vaccination. For those who had received at least one influenza vaccine, the rate of COVID-19 vaccination was significantly higher. Almost all participants who were parents ($n = 459$, 98.9%) stated that they had had their children receive childhood vaccinations. There was no significant difference between the vaccinated and non-vaccinated groups in terms of the participants' attitudes to their children's vaccination.

Anxiety Levels of HCWs

In the survey, the HCWs were also asked to rate their anxiety levels concerning COVID-19 from 1 (lowest) to 10 (highest) (Table 4). The mean anxiety score of the participants regarding the risk of contracting COVID-19 was determined to be 6.2 ± 3.0 (range, 1-10). The difference between the vaccinated and non-vaccinated groups was significant ($p = 0.017$). Regarding anxiety about infecting family members with COVID-19, the mean score was 8.5 ± 2.4 (range, 1-10), and the difference between the vaccinated and non-vaccinated participants was statistically significant ($p = 0.008$). According to the analysis of all participants, the mean anxiety score for transmitting the disease to family members was significantly higher than the mean anxiety score for contracting COVID-19.

Table 4. HCWs' levels of anxiety about contracting COVID-19 and infecting their family members

Anxiety Level	Total		Vaccinated		Non-vaccinated		p
	n	%	n	%	n	%	
Contracting COVID-19							
1	121	11.2	6	10.9	25	12.4	0.017 ^a
2	38	3.5	27	3.1	11	5.4	
3	66	6.1	53	6.0	13	6.4	
4	55	5.1	44	5.0	11	5.4	
5	199	18.3	150	17.0	49	24.3	
6	95	8.8	80	9.1	15	7.4	
7	110	10.1	95	10.8	15	7.4	
8	113	10.4	95	10.8	18	8.9	
9	50	4.6	40	4.5	10	5.0	
10	238	21.9	203	23.0	35	17.3	
Mean ± SD	6.2 ± 3.0		6.3 ± 3.0		5.7 ± 2.9		0.017
Median (IQR)	6 (1-10)		6 (1-10)		5 (1-10)		
Infecting family members with COVID-19							
1	44	4.0	32	3.6	12	5.9	0.008 ^a
2	6	0.6	5	0.6	1	0.5	
3	20	1.8	15	1.7	5	2.5	
4	14	1.3	13	1.5	1	0.5	
5	52	4.8	33	3.7	19	9.4	
6	41	3.8	29	3.3	12	5.9	
7	55	5.1	47	5.3	8	3.9	
8	108	9.9	92	10.4	16	7.9	
9	120	11.0	98	11.1	22	10.8	
10	629	57.8	522	58.9	107	52.7	
Mean ± SD	8.5 ± 2.4		8.6 ± 2.3		8.1 ± 2.7		0.008
Median (IQR)	10 (1-10)		10 (1-10)		10 (1-10)		

^aLinear-by-linear association test (trend analysis)
HCW: Healthcare worker, SD: Standard deviation.

DISCUSSION

Vaccination is one of the most important public health measures for protecting against infectious diseases. However, the acceptance of vaccination in the community varies based on the characteristics of the group to be vaccinated, place, time, and human behavior^[14]. Patients generally consider HCWs to be the most reliable source of information about vaccines^[15]. Therefore, determining the reasons for acceptance of vaccination among HCWs, who are seen as role models in the public, will also contribute to the improvement of vaccination rates^[16]. In addition, identification of factors that influence vaccination acceptance among HCWs will improve vaccine acceptance in the whole society^[9]. For healthcare guidance, medical doctors and other healthcare professionals are consistently recognized as reliable sources. To increase vaccine acceptance, healthcare providers must listen to their patients' concerns and offer them support and encouragement. In addition, if physicians are aware of concerns circulating in their communities, they can inform their patients accordingly^[4].

This study aimed to investigate various factors influencing healthcare workers' decisions to receive the COVID-19 vaccine. Ankara City Hospital was selected as the focal point of this research due to its designation as a pandemic hospital. The acceptance rate of COVID-19 vaccination in this study population was determined to be 81%. The percentage of participants who stated that they were planning to be vaccinated later was 7%, while 6% of the HCWs were still hesitant, a further 6% did not have any intention to be vaccinated, and 1% did not answer this question.

Various studies conducted in different countries and cities have reported different rates of COVID-19 vaccine acceptance: higher rates were observed in Singapore (94%) and New York-USA (92%), whereas lower rates were reported in the USA (68%) and France (73%)^[19]. In a worldwide study by Noushad et al., the COVID-19 vaccine acceptance rates of HCWs in Malaysia and Brazil were determined to be higher (98% and 97%, respectively) than those in Egypt, Kenya, Nigeria, Sudan, Jordan, India, and Pakistan (49%, 50%, 57%, 53%, 69%, and 76%, respectively). The

mean vaccine acceptance rate was found to be 69%^[20]. In a survey conducted in multiple public healthcare settings in Saudi Arabia to assess the acceptance and reluctance of healthcare workers concerning COVID-19 vaccination (n= 2043), the overall vaccine acceptance rate was determined to be 76.9% (21).

It can be concluded that HCWs generally exhibit higher levels of enthusiasm for COVID-19 vaccine acceptance compared to non-healthcare workers (non-HCWs)^[22]. However, there are also studies showing a high rate of vaccine-hesitant HCWs despite a lower rate of those with no intention of being vaccinated (approximately 1-6%)^[23]. This suggests that many HCWs can be encouraged or persuaded to be vaccinated. In addressing pandemics, concerted efforts are necessary to modify the attitudes and behaviors of individuals who are hesitant or refuse vaccination^[24].

In our study, although the rate of COVID-19 vaccine acceptance was higher among male participants (83%-81%), this was not statistically significant. Therefore, our study found no gender disparity in terms of COVID-19 vaccine acceptance. However, contradictory findings have been reported in other studies. For example, some studies have reported a higher prevalence of COVID-19 vaccination among women, while others have indicated the opposite trend^[25,26]. Additionally, there are studies reporting no difference in vaccination rates according to sex, consistent with our findings^[27].

This study demonstrated that COVID-19 vaccine acceptance was associated with age and having children, but not with marital status. The COVID-19 vaccine acceptance rate was significantly higher among the HCWs older than 30 years and among parents. Older age also explained the relationship between professional experience and vaccine acceptance. Consistent with our results, in the literature, the mean age of the vaccinated group was higher. There are also other studies that found a significant difference in age and experience between the vaccinated and non-vaccinated groups^[27-29].

Pregnancy was found to affect vaccine decisions, with vaccine acceptance being six times higher among non-pregnant female participants in our study. Of the non-vaccinated participants, 14.2% stated that they had not been vaccinated due to being pregnant, breastfeeding, or planning a pregnancy. There are some studies reporting similar results^[30,31]. At the time of the study, COVID-19 vaccines had been newly developed, and their effects on pregnant women had not yet been revealed by scientific studies, which might have affected the vaccination decisions of some women in our study.

This research also aimed to explore the effect of educational level on the capacity to make informed decisions concerning COVID-19 vaccination. The HCWs who participated in the current study were from many different occupations and educational levels, and these two variables were found to affect the participants' vaccine acceptance. The rate of vaccine acceptance was 2.5 times greater in those with a post-graduate or higher degree and 2.7 times greater among the doctors ($p < 0.001$ and $p = 0.002$, respectively). Doctors often having the highest level of education among HCWs may explain this finding. However, although doctors exhibited the highest rate of vaccine acceptance among faculty members (97%), the differences among doctors based on their positions (faculty member, physician, assistant doctor, general practitioner, or dentist) were not statistically significant. Similar to our study, previous studies reported that the percentage of vaccine acceptance was higher among doctors and those with higher educational levels. In many studies, doctors had the highest percentage of vaccine acceptance among all occupational groups^[27,28]. The high percentage of vaccine acceptance among doctors underscores their significance in vaccination efforts, as they serve as a crucial source of information and set an example for other healthcare personnel, patients, and society as a whole^[32].

Among occupational groups, the vaccine acceptance rate ranged from 76% to 92%, with the highest rate observed among medical doctors in our sample. Similar results have been

reported in the literature^[19,27]. We determined that the COVID-19 vaccine acceptance rate was lower among the nurses and midwives compared to technical and administrative staff, but the difference was not statistically significant. Likewise, previous studies have indicated lower vaccine acceptance percentages among nurses^[33]. Due to both clinical concerns and gender differences, nurses, mostly women, had more hesitations about vaccination than the other HCWs in our study, as well as in some other studies^[9,34].

No relationship was found between vaccine acceptance and previous encounters with COVID-19 or risk factors for the disease ($p > 0.05$). The most common reasons for non-vaccination were concerns about efficacy, fear of side effects, and the rapid pace of vaccine phase studies. Many studies in the literature have identified vaccine efficacy, safety, and side effects as the primary factors contributing to COVID-19 vaccine hesitancy^[18,28,31,35]. Furthermore, some participants reported not being vaccinated due to their lack of trust in foreign vaccines (13%), with the majority indicating that they were awaiting the development of domestic vaccines. This shows that the source of the vaccine is important, and it may be a reason for vaccine hesitation or rejection^[9,36]. On the other hand, we determined that the most common reasons given by the HCWs for making a decision to be vaccinated were to minimize the risk of transmitting COVID-19 to family members or relatives, their knowledge of the protective effects of the vaccine, and being afraid of contracting the disease themselves. When assessed based on occupational groups, medical doctors predominantly cited considering the vaccine safe and being aware of its protective effects as the primary reasons for vaccination. Conversely, among nurses and midwives, the fear of contracting the disease emerged as the most common reason for vaccination ($p < 0.001$). Similar results have been found in other studies^[9,18,35]. All these results show that most healthcare professionals have a high sense of responsibility and good knowledge of COVID-19 transmission and the preventive effects of vaccination.

We detected a significant difference between the vaccinated and non-vaccinated HCWs in terms of their recommendations for COVID-19 vaccination to their relatives or patients ($p < 0.001$). The rate of HCWs recommending COVID-19 vaccination was higher in the vaccinated group. A previous study including HCWs from Ethiopia and Japan also reported a high rate of participants advocating COVID-19 vaccination^[37,38].

According to the findings of this survey, the participants exhibited a lower mean anxiety score related to contracting COVID-19 themselves compared to their mean anxiety score related to transmitting the disease to their family members. In addition, anxiety levels regarding contracting COVID-19 and transmitting COVID-19 to family members were significantly higher among the vaccinated HCWs. This is more likely to be the cause than the result of vaccine acceptance. Previous studies have similarly found that HCWs who were worried about contracting COVID-19 or infecting their families were more likely to accept vaccination^[28,29]. In the current study, having at least one influenza vaccine was also determined to be associated with a higher probability of COVID-19 vaccine acceptance ($p < 0.05$), which is consistent with findings from numerous other studies^[19,40]. Accordingly, hesitations concerning COVID-19 vaccination may originate from hesitancy toward previous vaccinations.

Within the scope of this study, not only the reasons for COVID-19 vaccine hesitancy but also factors facilitating vaccine acceptance were investigated. It is hoped that collecting data in this manner will prove beneficial in addressing vaccine hesitancy in the future. Moreover, the sample encompassed physicians, nurses, health technicians, as well as all administrative and technical staff involved in delivering health services, which can be viewed as advantageous in terms of providing a broader dataset for analyses.

Limitations

Due to the single-center design of the study, the results cannot be generalized. In addition,

vaccination information was self-reported and not based on official records or transcripts. The data collection was conducted until July 2021, while the pandemic and vaccination efforts continued beyond this period. Despite these limitations, the comprehensive exploration of vaccine decision-making among healthcare workers across all occupational groups is a valuable aspect of this study. The data obtained can serve as a guide for future research and training initiatives.

CONCLUSION

We found no significant differences between the vaccinated and non-vaccinated HCWs in terms of sex, marital status, number of children, and household composition. However, factors such as being over 30 years old, having child, not being pregnant, living with a child, holding a post-graduate degree or higher, working as a doctor, having three or more years of professional experience, and having a history of at least one influenza vaccination were found to be associated with COVID-19 vaccine acceptance. Of the 1096 HCWs working at a tertiary pandemic hospital, 81% had been vaccinated until July 2021. Of all the HCWs, 6% were hesitant about vaccination, and a further 6% rejected it. While the vaccination rate was high, there is still room for improvement through additional measures such as educational initiatives, communication efforts to combat misinformation, and strategies aimed at promoting vaccination. Analyzing the reasons behind vaccine decisions among healthcare workers can aid in developing strategies to enhance their vaccine knowledge and mitigate related hesitations. We anticipate that similar studies will contribute to bolstering health security for healthcare workers and preparing society for potential future pandemics.

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ETHICS COMMITTEE APPROVAL

The study was approved by the Number 1 Clinical Research Ethics Committee of Ankara City Hospital (Decision no: 17.03.2021, number: E-21-1666). Informed consent was obtained from all participants.

CONFLICT of INTEREST

No conflicts of interest are disclosed by the authors.

AUTHORSHIP CONTRIBUTIONS

Concept and Design: RG

Analysis/Interpretation: RG, SG

Data Collection or Processing: SG

Writing: SG

Review and Correction: RG, SG

Final Approval: RG

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