



RESEARCH PAPER



## Evaluation of COVID-19 vaccine acceptance of healthcare providers in a tertiary Pediatric hospital

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### ABSTRACT

**Objective:** The aim of this study was to reveal the perceptions of healthcare providers who work in a tertiary children's hospital about domestic and foreign COVID-19 vaccines to determine the frequency of hesitancy toward COVID-19 vaccination prior to its availability in Turkey and to elucidate the reasons for its rejection and distrust.

**Methods:** A questionnaire about COVID-19 vaccination was conducted with 343 healthcare providers, including pediatricians, pediatric nurses, and auxiliary health staff. The questionnaire was conducted online. In the survey, participants were asked about sociodemographic characteristics and opinions on domestic and foreign COVID-19 vaccines, and reasons for vaccine refusal.

**Results:** Women were more likely to be reluctant to get a domestic ( $p < .001$ ) or foreign ( $p < .001$ ) COVID-19 vaccine than men. There was a significant relationship between age and vaccine acceptance ( $p = .01$ ). The younger the age of the healthcare provider, the higher the rate of vaccine hesitancy ( $r = -0.25$ ). Years of professional experience were correlated with vaccine acceptance ( $r = 0.19$ ,  $p < .05$ ), but vaccine rejection and indecision did not change ( $p > .05$ ). The factors predicting vaccine acceptance were status as a doctor, more than 10 years of professional experience, and male gender.

**Conclusion:** More than half of the healthcare providers were willing to have a COVID-19 vaccine once available. Indecision rates were found to be high, although rejection rates were not. Status as a doctor, more than 10 years of professional experience, and male gender were factors associated with vaccination intention.

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## Introduction

The novel coronavirus disease (COVID-19), first described in December 2019, has affected a large number of people of all age groups worldwide.<sup>1</sup> The disease poses subversive challenges and difficulties for healthcare providers and systems in many countries. Since no effective drugs or treatment regimens to cure the disease have yet been found, vaccination remains the gold standard for restraining the disease's spread. Some of the vaccine development studies published preliminary results that offer hope for an efficacious and safe vaccine.<sup>2</sup> On the other hand, the mere availability of a vaccine is not adequate to establish an efficient vaccination program and control the pandemic, a high rate of vaccine acceptance by society is also a necessity.<sup>3</sup> The incidence of vaccine hesitancy is gradually increasing in many countries; however, little is currently known about the impact of the COVID-19 pandemic on vaccine hesitancy, in general, and among COVID-19 vaccines, in particular. Thus, a prediction of rejection rate of a COVID-19 vaccine is essential to guide future public health policies and provide herd immunity to COVID-19 via vaccination.<sup>4</sup>

Beyond being under the burden of excess working hours, healthcare providers are at huge risk because of the increased rates of infection through direct contact with patients. Thus, the higher rate of COVID-19 vaccine acceptance in healthcare providers compared with the general population is desirable.

A study conducted in Turkey showed that only 6.7% of the healthcare providers were regularly annually vaccinated for influenza and that 55% had never had the influenza vaccine. The biggest obstacle against getting vaccinated was determined to be not believing in the necessity of the vaccine (53.1%).<sup>5</sup> Nevertheless, according to our observations, vaccine skepticism among medical staff is above our prediction. Kose et al. found that 68.6% of the healthcare providers were willing to get the COVID-19 vaccine.<sup>6</sup> Therefore, we wanted to evaluate the vaccination compliance rates of pediatricians and pediatric nurses who are among the key people maintaining the national vaccination program. The aim of this study was to reveal the perceptions of healthcare providers who work in a tertiary children's hospital, including doctors, nurses, and auxiliary health staff, about domestic and foreign COVID-19 vaccines to determine the frequency of hesitancy toward COVID-19 vaccines prior to vaccine availability in Turkey and to elucidate the reasons beneath rejection and distrust.

## Materials and methods

A questionnaire about COVID-19 vaccination was conducted with 343 healthcare providers, including pediatricians, pediatric nurses, and auxiliary health staff, who work at the

Children's Hospital of the Ankara City Hospital and agreed to participate in the survey. Our hospital is the biggest tertiary pediatric hospital in Turkey (740 beds, 340 pediatricians, 480 pediatric nurses, 48 auxiliary health staff), and among the biggest pediatric hospitals in Europe. Approximately 35,000 pediatric COVID-19 patients have been followed up that have been treated as inpatients and outpatients in our hospital since the first case of COVID-19 was documented in Turkey in March 2020. There are no mandatory vaccines for staff, including the seasonal influenza and the COVID-19 vaccine in our hospital.

The present study was conducted between December 15–20, 2020, two weeks before the COVID-19 vaccination was started. The questionnaire was conducted online, for which the survey link was delivered to all staff in our hospital through social networks. Approximately half of the doctors as supervisors and approximately one-fifth of the nurses as vaccine distributors are expected to take part in the COVID-19 vaccination program when it is started. Our study was based on voluntary participation. The response rate of the questionnaire was 39.5%. All participants provided informed consent prior to participating in the study. One respondent completed the questionnaire only once.

Our Turkish-language questionnaire consisted of 14 questions addressing these topics: (1) sociodemographic characteristics of the participants (age, gender, occupation, professional year); (2) their own and their family members' history of COVID-19; history of death in the family due to COVID-19; (3) preference of vaccine type (mRNA, viral vector, inactive); (4) general intention to get vaccinated and preference toward a domestic or foreign COVID-19 vaccine when they become available. Further, if the participant preferred not to be vaccinated, we asked their reasons for refusal. Response options included "yes," "no," and "undecided." Participants were also asked to provide a score between 0 and 10 on their level of fear and anxiety about COVID-19. The medical participants, (i.e., not the auxiliary health staff), were asked if they would recommend to their patients a domestic or foreign COVID-19 vaccine of proven efficacy that had been approved by the authorities. Whether the participants opted for the seasonal influenza vaccine was not queried. The questionnaire was pilot-tested by 12 pediatricians not included in the survey for clarity and length prior to conducting the study. There was determined to be no need to make any changes to the survey.

The Statistical Package for the Social Sciences (SPSS) version 23.0 (IBM Corp., Armonk, New York, USA) was used to analyze the data. Basic descriptive statistics and frequencies were calculated to describe all variables. The results were expressed as mean  $\pm$  standard deviation, median, and range (minimum value–maximum value), and number (%) depending on whether the data were parametric or not. Quantitative data were compared using the chi-squared test. The level of statistical significance was established as  $p < .05$ . A  $t$ -test or an ANOVA were also run to show significant differences between study groups. A logistic regression model was made to reveal the relationship between vaccine acceptance and demographic and attitudinal factors and to estimate the odds ratio (OR) and confidence interval (CI) of vaccine acceptance. In

Turkey, employees with over 10 years of professional experience are considered legally as senior. They even gain some rights; including additional annual permit. In order to determine the effect of professional experience on vaccine acceptance, we provided a 10-year interval in the logistic regression model.

The study conformed with the principles of the Declaration of Helsinki and was approved by the Republic of Turkey Ministry of Health and the Institutional Review Board of the Children's Hospital of the Ankara City Hospital.

## Results

The survey was delivered to all pediatricians, pediatric nurses and auxiliary health staffs in our hospital and a total of 343 surveys was completed online. Of the 343 participants in the study, 264 (76.9%) were women, and 79 (23.1%) were men. Pediatricians, including residents, specialists, subspecialty fellows and specialists, associate professors, and professors, consisted of 40.8% of respondents; nurses consisted of 49.9%; and auxiliary health staff, including secretaries and medical admissions clerks, consisted of 9.3%. Descriptive features of the participants are displayed in Table 1.

Looking at gender and vaccine preference, women were more likely to be reluctant to get a domestic ( $p < .001$ ) and a foreign ( $p < .001$ ) COVID-19 vaccine than men. There was a significant correlation between vaccine acceptance and age ( $p = .01$ ). According to the correlations analyses, it was found that the younger the age, the higher the rate of vaccine hesitancy ( $r = -0.25$ ). In addition, it was observed that as the professional years increased, vaccine acceptance increased ( $r = 0.19$ ,  $p < .01$ ), but vaccine rejection and indecision did not change ( $p > .05$ ).

There was no difference toward acceptance of a domestic or foreign vaccine and having had COVID-19 ( $p > .05$ ), having had a family member ever diagnosed with COVID-19 ( $p > .05$ ), or having lost any relatives due to COVID-19 ( $p > .05$ ).

The fear and anxiety level about COVID-19 was  $6.8 \pm 2.4$  on a scale of 0 to 10 points. No relationship was found between

**Table 1.** Descriptive features of the participants.

Variables	n (%)
Age (year) (mean $\pm$ SD) (median)	31.5 $\pm$ 7.9 (median: 28)
Gender	
Female	264 (76.9%)
Male	79 (23.1%)
Occupation	
Pediatrician	140 (40.8%)
Pediatric nurse	171 (49.9%)
Auxiliary health staff	32 (9.3%)
Years of profession (mean $\pm$ SD) (min-max) (median)	7.2 $\pm$ 7.9 (1-40) (4)
Personal history of COVID-19 diagnosis	
Yes	95 (27.7%)
No	248 (72.3%)
Family member ever diagnosed with COVID-19	
Yes	140 (40.8%)
No	203 (59.2%)
Family member loss due to COVID-19	
Yes	47 (13.7%)
No	296 (86.3%)
Fear and anxiety level due to COVID-19 (mean $\pm$ SD)	6.7 $\pm$ 2.4

occupation and fear level ( $p > .05$ ), nor between age and fear level ( $p > .05$ ). It was found that there was no relationship between fear level and acceptance of vaccination.

When asked about participants' choice of vaccine type, 30% preferred inactivated viral vaccines, 11.4% preferred mRNA vaccines, 3.2% preferred viral vector vaccines, 37.7% were indecisive, 9.3% preferred none, and 8.4% stated that it makes no difference. Unlike other groups, nearly half of all nurses (49.7%) were indecisive about vaccine types. Vaccine type preference had no relationship with occupation ( $p > .05$ ) and years of profession experience ( $p > .05$ ). To the question, "Does the country where the vaccine was produced affect your vaccination decision?" 46.4% of the participants answered "Yes, it does," 32.1% answered "No, it does not," and 21.6% were undecided.

The acceptance rate of a foreign or domestic vaccine was much higher among doctors and staff than nurses ( $p < .001$ ). Nurses were much more indecisive toward foreign and domestic vaccines ( $p < .001$ ). The rate of foreign vaccine reluctance was highest in nurses ( $p < .001$ ), but there was no difference between all groups in domestic vaccine reluctance ( $p > .05$ ). Furthermore, nurses were less likely to recommend both domestic and foreign vaccines to patients than doctors were ( $p < .001$ ) (Table 2).

In our study, there was much indecision about COVID-19 vaccines, especially among nurses. The participants were asked reasons for their indecision and were told that more than one reason could be listed. The participants who were indecisive or reluctant to have a COVID-19 vaccine identified the following factors as their reason: not knowing the actual effectiveness of the vaccine (75.1%), avoiding possible vaccine side effects (70.7%), distrust in vaccines from abroad (18.1%), not being afraid or anxious about COVID-19, in general (6.7%), thinking they will not get COVID-19 again (5.8%), and distrust in domestic vaccines (3.1%).

In the present study, the multivariate logistic regression analysis revealed that factors predicting COVID-19 vaccine acceptance were status as a doctor (OR = 5.0, 95% CI 3.01–8.31,  $p < .001$ ), 10 or more years of professional experience (OR = 3.60, 95% CI 2.07–6.20,  $p < .001$ ), and male gender (OR = 2.86, 95% CI 1.57–5.21,  $p < .001$ ) (Table 3).

## Discussion

The prevention of infectious diseases by vaccination is one of the most outstanding and essential public health achievements of the last century.<sup>7</sup> As seen worldwide, cases of vaccine rejection are increasing in Turkey, and the impact of the COVID-19 pandemic on vaccine hesitancy and refusal is not yet known prior to vaccine availability. As we showed before, the parents' COVID-19 vaccine refusal rates were reasonably high.<sup>8</sup> Healthcare providers, especially doctors and nurses, will play an indispensable role in informing society and encouraging COVID-19 vaccination.<sup>3</sup> On the other hand, skepticism and hesitancy toward potential COVID-19 vaccines are not rare among healthcare providers in the literature.<sup>6,7</sup> This study aimed to reveal the opinions of healthcare providers about domestic and foreign COVID-19 vaccines.

A study by Dror et al. found that nearly 78% of doctors and 75% of the general population would be willing to accept a COVID-19 vaccine, while only 61% of nurses would accept.<sup>9</sup> In another study, it was reported that the proportion of people that intended to take the COVID-19 vaccine was 63% among nurses.<sup>10</sup> Shekhat et al. found in their study that only about one-third of the respondents were willing to take a COVID-19 vaccine as soon as it became available. The majority of the healthcare providers (56%) were not sure or would wait to review safety data before getting vaccinated.<sup>11</sup> The present study found that 55.4% of the healthcare providers were willing to receive a domestic vaccine and 52.2% were willing to receive a foreign vaccine. In a French study, it was found that nurses and assistant nurses were less inclined to get vaccinated against COVID-19 than physicians.<sup>12</sup> Another COVID-19 vaccination study conducted with nurses showed that 40% of nurses had the intention to accept the COVID-19 vaccination.<sup>13</sup> The acceptance rate of pediatricians and auxiliary health staff was high in our study. However, pediatric nurses expressed more hesitancy about COVID-19 vaccination (Table 2). Since pediatricians and pediatric nurses are among the key people maintaining the national vaccination program, nurses' high hesitancy rate could negatively impact future vaccination programs. In contrast, doctors' high vaccine acceptance rate may be the factor that encourages approval of the vaccination in the general population by getting vaccinated themselves so that they could provide a reassuring example to patients.

**Table 2.** Vaccine preference and acceptance rates of the groups.

	Answers	Pediatricians n(%)	Pediatric Nurses n(%)	Auxiliary Health Staffs n(%)
Preference to have a foreign vaccine	Yes	102 (72.9%)	55 (32.2%)	22 (68.8%)
	No	9 (6.4%)	43 (25.1%)	6 (18.7%)
	Indecisive	29 (20.7%)	73 (42.7%)	4 (12.5%)
Preference to have a domestic vaccine	Yes	88 (62.9%)	77 (45%)	25 (78.1%)
	No	18 (12.8%)	20 (11.7%)	4 (12.5%)
	Indecisive	34 (24.3%)	74 (43.3%)	3 (9.4%)
Foreign vaccines recommendation to patients	Yes	118 (84.3%)	48 (28.1%)	*
	No	2 (1.4%)	28 (16.4%)	*
	Indecisive	20 (14.3%)	95 (55.5%)	*
Domestic vaccines recommendation to patients	Yes	104 (74.3%)	66 (38.5%)	*
	No	8 (5.7%)	23 (13.5%)	*
	Indecisive	28 (20%)	82 (48%)	*

\*not asked in this group.

**Table 3.** Factors associated with intentions to accept COVID-19 vaccination.

	Beta	S.E.	p	OR	95% C.I.for EXP(B)	
					Lower	Upper
Gender (Male)	1,052	,306	,001	2,863	1,572	5,216
Occupation (Doctor)	1,611	,259	,000	5,006	3,013	8,317
>10 years of professional experience	1,278	,279	,000	3,589	2,076	6,203

S.E.: Standart error, OR: Odds ratio, C.I.: Confidence interval, EXP(B): Exponential beta.

In our survey, no relationship was found between occupation and fear level ( $p > .05$ ). The fear and anxiety level related to COVID-19 was  $6.8 \pm 2.4$  on a scale from 0 to 10 points. In our other study about vaccinating against COVID-19 conducted with 428 parents, we found the mean fear level to be  $6.2 \pm 2.7$  on a scale from 0 to 10 points.<sup>8</sup> The fear level of healthcare providers was higher than the general population ( $p = .002$ ). Since healthcare providers are at substantial risk of occupational exposure and transmission of SARS-CoV-2 through direct contact with patients and are aware of the morbidity and mortality of COVID-19 infection, high levels of fear compared to society is logical.

Although mRNA vaccines are a new type of vaccine, healthcare providers preferred it most frequently after inactivated vaccines. On the other hand, viral vector vaccines were seldom preferred. In our previous study conducted with the general population, the acceptance of a domestic vaccine was 62.6%, while the acceptance of a foreign vaccine was 33.9%.<sup>8</sup> In the present study, no significant difference was found in rates of acceptance between a domestic or foreign vaccine among healthcare providers. Only the rate of foreign vaccine reluctance was highest in nurses ( $p < .001$ ). The scientific knowledge of healthcare providers about vaccines is higher, and healthcare providers have a more scientific and impartial approach to vaccines compared with the general population; thus, the acceptance of a foreign vaccine by healthcare providers may be much higher for these reasons.

We observed that women expressed more hesitancy toward vaccines. The male gender was a positive predictive factor for the acceptance of the COVID-19 vaccine. Similarly, several contemporary studies showed that women were less likely to be willing to get the COVID-19 vaccine than men.<sup>4,9,14,15</sup> In our previous study about COVID-19 vaccination conducted with the general population, we found the vaccine acceptance rate of men was significantly higher than that of women.<sup>8</sup> Dror et al. propose this sex-based difference in COVID-19 vaccination acceptance may stem from the higher morbidity and mortality rates of men. However, the results of our study do not agree with this interpretation because there was no difference in fear and anxiety levels of both genders in the present study. In addition, there was a higher rate of rejection of all available vaccines, not just the COVID-19 vaccination, found in women.<sup>16–18</sup> As was shown in previous studies,<sup>16</sup> this may result from the fact that women were more likely to be concerned about adverse effects, to believe that some vaccines cause autism, and to refuse to vaccinate their children.

One of the positive predictors of COVID-19 vaccination demonstrated in this study is more than 10 years of professional experience. Moreover, it was found that the younger the

age, the higher the rate of vaccine hesitancy. Rhodes et al. showed that vaccine hesitancy or refusal for COVID-19 vaccines was associated with being younger than 60 years of age.<sup>18</sup> Detoc et al. found that an older age was associated with a higher acceptance of the COVID-19 vaccination.<sup>15</sup> A systematic review by Bish et al. made during the 2009 global influenza pandemic determined that older age was associated with vaccination.<sup>19</sup> The increase in vaccination rate with age and professional years may be due to the older population being in a higher risk group for COVID-19 complications, infectivity, and death. However, no significant relationship was found between age and fear level in our study.

Our study had some limitations. The study was conducted in a single center. Although the Children's Hospital of the Ankara City Hospital is among the biggest hospitals in Europe, our study findings should not be generalized beyond the study population. Still, this study contributes meaningfully to the literature due to the dearth of pediatric studies related to COVID-19 vaccination.

## Conclusion

More than half of the healthcare providers who participated in this study were willing to have a COVID-19 vaccine once available. Indecision rates were found to be high, although outright rejection rates were not. Status as a doctor, 10 or more years of professional experience, and the male gender were associated with vaccination intention. Concerns about the safety and efficacy of vaccines were the most common reasons underlying hesitancy, which may adversely affect the success of the national vaccination program. Therefore, it is crucial to educate and inform both society and healthcare providers.

## Disclosure of potential conflicts of interest

No potential conflicts of interest were disclosed.

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