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Evaluation of COVID-19 Vaccination Status and Influencing Factors among Research Assistant Physicians and Sixth-Year Medical Students at a Faculty of Medicine

ABSTRACT

Objective: This study aimed to evaluate the COVID-19 vaccination status of research assistant physicians and sixth-year medical students at a faculty of medicine, as well as the factors influencing their vaccination decisions.

Method: The study was conducted as a descriptive and cross-sectional investigation between May 2021 and June 2021 among research assistant physicians and sixth-year medical students at a faculty of medicine. Data were collected using a 47-item questionnaire administered either face-to-face or online. The questionnaire included items on participants' sociodemographic characteristics, COVID-19 history, and vaccination history regarding COVID-19 and other vaccines. Data were analyzed using SPSS version 21, with statistical significance set at p<0.05.

Results: A total of 501 participants were included in the study, comprising 352 research assistant physicians and 149 sixth-year medical students. Among the participants, 88.2% (n=442) had received two doses of the COVID-19 vaccine. The most frequently cited reason for vaccination, reported by 54.4% of vaccinated participants, was "acquiring immunity against the disease." In contrast, the most common reason for vaccine hesitancy, reported by 42.6% of unvaccinated participants, was "lack of sufficient data concerning the efficacy and safety of vaccines." COVID-19 vaccine acceptance was significantly higher among men compared to women (p=0.023), single individuals compared to married individuals (p=0.006), and those who feared transmitting COVID-19 to their family members compared to those without such concerns (p=0.007).

Conclusions: The majority of participants in this study received the COVID-19 vaccine. The high level of vaccine acceptance among healthcare professionals, who serve as important role models for society, is crucial in combating the COVID-19 pandemic. It is recommended that vaccination campaigns consider the factors influencing vaccine acceptance and hesitancy to enhance their effectiveness.

Keywords: COVID-19, Vaccine, Research Assistant Physicians, Medical Students, Healthcare Workers.

Bir Tıp Fakültesindeki Araştırma Görevlisi Doktorların ve Dönem VI Tıp Fakültesi Öğrencilerinin COVID-19 Aşısı Olma Durumları ve Etkileyen Faktörlerin Değerlendirilmesi

ÖZET

Amaç: Bu çalışmada araştırma görevlisi doktorların ve dönem VI tıp fakültesi öğrencilerinin COVID-19 aşısı olma durumları ve bunu etkileyen faktörlerin değerlendirilmesi amaçlandı.

Yöntem: Bu çalışma Mayıs 2021 - Haziran 2021 tarihlerinde bir tıp fakültesindeki araştırma görevlisi doktorlar ve dönem VI tıp fakültesi öğrencilerinde gerçekleştirilen tanımlayıcı ve kesitsel tipte bir araştırmadır. Araştırma verileri katılımcıların sosyo-demografik özellikleri, COVID-19 anamnez bilgileri, COVID-19 aşısı ve diğer aşılarla ilgili anamnez bilgilerine yönelik sorulardan oluşan 47 soruluk yüz yüze veya çevrim içi doldurulan anket formu aracılığıyla toplandı. Veriler SPSS versiyon 21 kullanılarak analiz edildi. İstatistiksel anlamlılık p<0,05 düzeyinde değerlendirildi.

Bulgular: Bu çalışmaya katılan 501 katılımcının 352'si araştırma görevlisi doktor ve 149'u dönem VI tıp fakültesi öğrencisi idi. Çift doz COVID-19 aşısı yaptıranlar katılımcıların %88,2'sini (n=442) oluşturmaktadır. Katılımcılardan COVID-19 aşısı yaptıranların belirttiği en sık aşı yaptırma nedeni %54,4 oran ile "hastalığa karşı bağışıklık kazanmak" iken COVID-19 aşısı yaptırmayanların en sık aşı yaptırmama nedeni %42,6 oran ile 'aşının güvenliği ve etkinliği açısından verilerin yeterli olmaması' idi. Erkeklerde kadınlara göre (p=0,023), bekarlarda evlilere göre (p=0,006), COVID-19'u ailesine bulaştırmaktan korkanlarda korkmayanlara göre (p=0,007) COVID-19 aşı kabulü anlamlı derecede yüksek bulundu.

Sonuç: Bu çalışmada katılımcıların önemli bir çoğunluğu COVID-19 aşısını yaptırdı. Toplum için iyi bir rol model olan sağlık çalışanlarının aşı kabulünün yüksek olması COVID-19 pandemisi ile mücadelede önem arz etmektedir. Aşı kampanyaları oluşturulurken aşı reddi ve kabulüne etki eden bu faktörlerin göz önünde bulundurulmasının faydalı olacağı düşünülmelidir.

Anahtar Kelimeler: COVID-19, Aşı, Araştırma Görevlisi Doktorlar, Tıp Öğrencileri, Sağlık Çalışanları.

INTRODUCTION

Several pneumonia cases of unknown cause were reported in Wuhan in December 2019 (1). In January 2020, a new type of coronavirus, called 2019 novel coronavirus (2019-nCoV), was identified in throat swab samples taken from patients (2). Later, this virus was named severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) due to its similarity to SARS-CoV, and the disease caused by the virus was termed COVID-19.

While COVID-19 is asymptomatic or manifests with mild symptoms in some patients, it may cause clinical conditions progressing to severe respiratory failure and even multiple organ failure in other cases (3). Since there is no specific method proven in terms of efficacy and safety in the treatment of COVID-19, the treatment approach is more focused on symptoms (3,4). Therefore, the most crucial method for fighting against the disease is immunization through vaccination (5).

Vaccines that received emergency use approval began to be administered in late 2020. As of December 31, 2023, approximately 13,6 billion doses of vaccine had been administered across the world (5,6). Four vaccines received approval for emergency use in Turkey: the Pfizer/BioNTech (BNT162b2) mRNA vaccine, the Sinovac (CoronaVac) inactive vaccine, the Gamaleya (Sputnik V) non-replicative viral vector vaccine, and the Turcovac (Erucov-Vac) inactive vaccine (5,7). In Turkey, approval for emergency use was first granted for the Sinovac (CoronaVac) vaccine by the Turkish Medicines and Medical Devices Agency on January 13, 2021 (8). The strategy for implementing COVID-19 vaccination was announced by the Republic of Turkey Ministry of Health, and the priority groups to be vaccinated were determined by evaluating the risks of exposure to the disease, severe disease, and transmission, as well as the negative impact of the disease on the functioning of social life. Healthcare workers were considered to have the highest priority in this evaluation (9).

As of December 10, 2024, the rate of individuals aged 18 and over in Turkey who received the first dose of either vaccine is 93.4%, and the rate of those who received the second dose of either vaccine was 85.7%. The total number of vaccines administered to date is 152 million 737 thousand 320, of which 57 million 962 thousand 188 belong to the first dose, 53 million 195 thousand 230 to the second dose, and 28 million 237 thousand 406 to the third dose (10).

The high vaccine acceptance among healthcare professionals, who serve as critical role models for society, is of significant importance in the fight against the COVID-19 pandemic (11, 12). This study aimed to evaluate the COVID-19 vaccination status of research assistant physicians and sixth-year medical students at a faculty of medicine, as well as the factors influencing their vaccination decisions.

MATERIAL AND METHODS

Sample and Data Collection: The study population consisted of 210 sixth-year medical students enrolled at Selçuk University Faculty of Medicine during the 2020–2021 academic year and 420 research assistant physicians working at Selçuk University Faculty of Medicine Hospital. The study aimed to include the entire population, excluding those who declined participation. Among the sixth-year medical students, all were approached (210/210), but 61 declined participation, resulting in a response rate of 70.95% (149/210). Similarly, all research assistant physicians were approached (420/420), with 68 declining participation, yielding a response rate of 83.8% (352/420). Considering the combined data from both groups, a total of 610 individuals were reached, and 501 were included in the sample, resulting in a final participation rate of 79.52%. The data for the study was collected from May 6, 2021, through June 30, 2021, using a 47-question survey completed face-to-face or online. The survey form consisted of questions regarding the participants' sociodemographic characteristics and anamnesis information about COVID-19 disease, COVID-19 vaccination, and other vaccinations.

Data Collection Forms

Sociodemographic Data Form: This form was prepared by the researchers and included questions to obtain information about the participants' age, gender, marital status, history of receiving other vaccines, and other sociodemographic characteristics related to the COVID-19 pandemic.

COVID-19 Vaccine Data Form: Using this form, the participants were asked whether they were concerned about the side effects of COVID-19 vaccines, whether they had been vaccinated against COVID-19, and whether they would recommend COVID-19 vaccination to their families, friends, and patients. Individuals who reported having received the COVID-19 vaccination were presented with an open-ended question to determine their reasons for vaccination. The responses of the participants to this question were grouped into the following categories: "acquiring immunity against the disease", "protecting family and close circle against the disease", "contributing to social immunity", "reducing the risk of severe disease", "reducing transmission", and "possibility of restrictions being imposed on unvaccinated individuals". Individuals who reported not having received the COVID-19 vaccination were asked whether they would be willing to be vaccinated in the future. These participants were also presented with an open-ended question to determine their reasons for not being vaccinated, and their

responses were classified into the following groups: "not enough time having elapsed since contracting the disease to receive vaccination", "lack of sufficient data concerning the efficacy and safety of vaccines", "concerns about the short- and long-term side effects of vaccines", and "lack of studies on vaccination during pregnancy and breastfeeding".

This study was approved by the ethics committee of the Selcuk University Faculty of Medicine (decision number: 2021/240, date: May 5, 2021). Prior the study, informed consent was obtained from each participant in compliance with the Declaration of Helsinki of the World Medical Association.

Statistical Analysis: All data was evaluated using IBM SPSS v. 21.0 statistical package program. Before the analyses, the suitability of the variables to the normal distribution was examined using Q-Q plots and the Shapiro-Wilk test. Descriptive statistics for the data were defined as mean ± standard deviation or median (minimum–

maximum) for numerical variables, and as frequencies (n) and percentages (%) for categorical variables. Relationships between categorical variables were investigated with the Pearson chi-square, Yates continuity corrected chi-square, Fisher's exact chi-square, and Fisher-Freeman-Halton tests. Logistic regression models were constructed to determine factors affecting COVID-19 vaccination status. The results were evaluated at the 95% confidence interval, and the significance level was taken as $p < 0.05$.

RESULTS

A total of 501 volunteer research assistant doctors working at a medical school and term VI medical faculty students participated in the study. Of the participants, 53.9% (n = 270) were women, and 46.1% (n = 231) were men. The mean age of the participants was 27.5 ± 3.09 (23-40) years. Table 1 presents the participants' sociodemographic characteristics and anamnesis information related to other vaccines.

Table 1. Participants' sociodemographic characteristics and anamnesis information about other vaccines (n = 501)

Parameters	n Median (min-max)	%
Age	27 (23-40)	
Age group		
23-29 years	382	76.2
30-40 years	119	23.8
Gender		
Female	270	53.9
Male	231	46.1
Marital status		
Married	186	37.1
Single	315	62.9
Title		
Term VI medical faculty student	149	29.7
Research assistant doctor	352	70.3
Department employed		
Basic sciences	28	5.6
Internal sciences	208	41.5
Surgical sciences	116	23.2
Term VI medical faculty student	149	29.7
Years of profession		
<1 year	158	31.5
1-5 years	304	60.7
>5 years	39	7.8
Flu vaccination status for the 2020-2021 season		
Unvaccinated	383	76.4
Vaccinated	118	23.6
History of adverse reactions to previous vaccines		
Absent	478	95.4
Present	23	4.6
Total	**501**	**100.0**

min: minimum, max: maximum

Of the participants, 88.2% of the participants reported that they had received the COVID-19 vaccination, and 11.8% reported that they had not received the COVID-19 vaccination. The most common reason cited by vaccinated participants for

receiving the COVID-19 vaccine was "acquiring immunity against the disease", while unvaccinated participants most frequently reported "lack of sufficient data concerning the efficacy and safety of vaccines" as their reason for refusal (Table 2).

Table 2. Participants' reasons for accepting or rejecting covid-19 vaccination

	n	%
Reasons for being vaccinated against COVID-19 (n = 494)*		
Acquiring immunity against the disease	268	54.4
Protecting family and close circle against the disease	48	9.7
Contributing to social immunity	58	11.7
Reducing the risk of severe disease	85	17.2
Reducing transmission	17	3.4
Possibility of restrictions being imposed on unvaccinated individuals	18	3.6
Reasons for not being vaccinated against COVID-19 (n = 68)*		
Not enough time having elapsed since contracting the disease to receive vaccination	15	22.2
Lack of sufficient data concerning the efficacy and safety of vaccines	29	42.6
Concerns about the short- and long-term side effects of vaccines	12	17.6
Lack of studies on vaccination during pregnancy and breastfeeding	12	17.6

*More than one response was allowed.

Table 3 presents the evaluation of the participants' COVID-19 vaccination status according to their sociodemographic characteristics and anamnesis related to other vaccines.

Table 4 presents the evaluation of the participants' COVID-19 vaccination status according to their working status in the pandemic unit and anamnesis information related to COVID-19 infection and vaccine.

Logistic regression analysis was applied to parameters that were found to be statistically significant in influencing participants' COVID-19 vaccination status (Table 5).

Table 3. Evaluation of participants' covid-19 vaccination status according to their sociodemographic characteristics and anamnesis related to other vaccines

	COVID-19 vaccination status						X^2	p
	Vaccinated		Unvaccinated		Total			
	n	%	n	%	n	%		
Gender								
Female	230	85.2	40	14.8	270	100.0		
Male	212	91.8	19	8.2	231	100.0	$5,203^1$	**0.023**
Age group								
23-29 years	338	88.5	44	11.5	382	100.0		
30-40 years	104	87.4	15	12.6	119	100.0	0.025^2	0.874
Marital status								
Married	154	82.8	32	17.2	186	100.0		
Single	288	91.4	27	8.6	315	100.0	7.578^2	**0.006**
Title								
Term VI student	132	88.6	17	11.4	149	100.0		
Research assistant	310	88.1	42	11.9	352	100.0	$<0.001^2$	0.989
Department employed								
Basic sciences	25	89.3	3	10.7	28	100.0		
Internal sciences	181	87.0	27	13.0	208	100.0		
Surgical sciences	104	89.7	12	10.3	116	100.0		
Term VI student	132	88.6	17	11.4	149	100.0	0.569^1	0.904
Years of profession								
<1 year	139	88.0	19	12.0	158	100.0		
1-5 years	270	88.8	34	11.2	304	100.0		
>5 years	33	84.6	6	15.4	39	100.0	0.601^1	0.741
Flu vaccination status for the 2020-2021 season								
Unvaccinated	328	85.6	55	14.4	383	100.0		
Vaccinated	114	96.6	4	3.4	118	100.0	9.420^1	**0.002**
History of adverse reactions to previous vaccines								
Absent	425	88.9	53	11.1	478	100.0		
Present	17	73.9	6	26.1	23	100.0	0.001^3	**0.042**
Total	**442**	**88.2**	**59**	**11.8**	**501**	**100.0**		

[1]Pearson chi-square test, [2]Yates chi-square test, [3]Fisher chi-square test

Table 4. Evaluation of participants' COVID-19 vaccination status according to their employment in the pandemic unit and anamnesis information regarding COVID-19 infection and vaccine

	COVID-19 vaccination status							
	Vaccinated		Unvaccinated		Total		X^2	p
	n	%	n	%	n	%		
Active employment in the pandemic unit								
No	174	88.3	23	11.7	197	100.0		
Yes	268	88.2	36	11.8	304	100.0	0.001^2	1.000
Use of personal protective equipment								
Partial	124	89.2	15	10.8	139	100.0		
Full	318	87.8	44	12.2	362	100.0	0.072^2	0.788
Fear of contracting COVID-19								
Absent	172	86.9	26	13.1	198	100.0		
Present	270	89.1	33	10.9	303	100.0	0.383^2	0.536
Fear of transmitting COVID-19 infection to family								
Absent	14	66.7	7	33.3	21	100.0		
Present	428	89.2	52	10.8	480	100.0	0.001^3	**0.007**
History of COVID-19 infection (n = 501)								
Absent	311	91.2	30	8.8	341	100.0		
Present	131	81.9	29	18.1	160	100.0	8.243^2	**0.004**
Concerns about COVID-19 vaccine side effects								
Absent	280	94.3	17	5.7	297	100.0		
Present	162	79.4	42	20.6	204	100.0	0.001^3	**<0.001**
Recommending COVID-19 vaccination to family and friends								
Yes	426	91.2	41	8.8	467	100.0		
Not sure	16	47.1	18	52.9	34	100.0	0.001^3	**<0.001**
Recommending COVID-19 to patients								
Yes	429	90.1	47	9.9	476	100.0		
Not sure	13	52.0	12	48.0	25	100.0	0.001^3	**<0.001**

[1]Pearson chi-square test, [2]Yates chi-square test, [3]Fisher's chi-square test, [4]Fisher-Freeman-Halton test.

Table 5. Logistic regression analysis of factors affecting covid-19 vaccination status

Variable	Odds ratio (95% Cl)	p
Gender		
Female	1.000	
Male	1.941 (1.090-3.456)	**0.024**
Marital status		
Married	1.000	
Single	2.216 (1.281-3.835)	**0.004**
History of adverse reactions to previous vaccines		
Present	1.000	
Absent	2.830 (1.069-7.492)	**0.036**
Flu vaccination status		
Unvaccinated	1.000	
Vaccinated	4.779 (1.694-13.482)	**0.003**
Fear of transmitting COVID-19 infection to family		
Absent	1.000	
Present	4.115 (1.589-10.661)	**0.004**
History of COVID-19 infection		
Present	1.000	
Absent	2.295 (1.324-3.977)	**0.003**
Recommending COVID-19 vaccination to family and friends		
Not sure	1.000	
Yes	11.689 (5.545-24.642)	**<0.001**
Recommending COVID-19 vaccination to patients		
Not sure	1.000	
Yes	8.426 (3.636-19.525)	**<0.001**

CI: confidence interval

DISCUSSION

In this study, the majority of participants were found to have received the COVID-19 vaccine. Korkmaz et al., in their study conducted with 768 healthcare workers in Turkey in February 2021, reported a vaccination rate of 80.6% among healthcare workers (13). Similarly, Yılmaz et al. determined that the COVID-19 vaccination rate was 85.0% among 4,201 healthcare workers in Istanbul in April 2021 (14). In another study undertaken with 793 healthcare workers in Nigeria in May 2021, Abubakar et al. reported a vaccination rate of 90% (15). In their April 2021 study from China, Xu et al. found that 86.2% of 1,051 healthcare workers had been vaccinated (16). Schrading et al., who conducted a study with 1,398 healthcare workers in the USA in January 2021, showed that 86.0% of healthcare workers were vaccinated against COVID-19 (17). George et al., evaluating 7,763 healthcare workers in South Africa in 2022, similarly reported that 89% were vaccinated (18). The high vaccination rate observed in the current study, consistent with the literature, can be attributed to healthcare workers' awareness of the importance of vaccination in combating the pandemic.

In a study conducted by Shaw et al. with 4,537 healthcare workers in the USA in March 2021, it was observed that the frequency of vaccination was significantly higher among men than among women (19). Štěpánek et al., evaluating 3,550 healthcare workers in the Czech Republic in 2021, also reported a significantly higher frequency of vaccination among men compared to women (20). In their study with 2,761 healthcare workers in Canada in December 2020, Dzieciolowska et al. found that men were significantly more likely to be vaccinated than women (21). The higher acceptance of vaccination among men in the current study, consistent with the literature, may be due to women's higher levels of concern regarding vaccine safety and side effects.

Pacella-LaBarbara et al., in their study conducted with 475 healthcare workers in the USA in February 2021, found no significant relationship between marital status and vaccination frequency (22). In contrast, in a study conducted with 1,574 healthcare workers in Turkey in December 2020, Kaplan et al. observed that married healthcare workers had a higher vaccine acceptance rate than single healthcare workers (23). The higher vaccination rate among single participants in the current study can be attributed to fewer concerns about pregnancy and breastfeeding.

Kozak et al. carried out research with 3,401 healthcare workers in Germany in April 2021 and determined that the acceptance of the COVID-19 vaccine was significantly higher among healthcare workers who received the flu vaccine compared to those who did not receive the flu vaccine (24). In another study, Štěpánek et al. reported that the frequency of COVID-19 vaccination was significantly higher among healthcare workers who had received the flu vaccine at any time in the past and during the 2020-2021 flu season, compared to those without a history of flu vaccination (20). In a study conducted with 529 healthcare workers in Lebanon in February 2021, Nasr et al. observed that those who had received the influenza vaccine during the 2020–2021 season were significantly more likely to receive the COVID-19 vaccine than those who had not (25). The positive correlation between influenza vaccination and COVID-19 vaccination observed in the current study, consistent with the literature, may reflect healthcare workers' awareness of the importance of vaccination in combating infectious diseases.

In a study conducted by Holzmann-Littig et al. with 4,500 healthcare workers in Germany in February 2021, it was observed that the frequency of COVID-19 vaccination was statistically significantly lower among those who had previously experienced any post-vaccine side effects compared to those without this history (26). In the current study, participants with a history of adverse reactions to vaccines were less likely to be vaccinated against COVID-19, possibly due to concerns about experiencing similar side effects.

In a study undertaken by Pacella-LaBarbara et al., the vaccine acceptance of healthcare workers with a history of COVID-19 infection was reported to be significantly lower than that of healthcare workers who had never had this infection (22). Similarly, in an international study carried out by Qunaibi et al. with 5,708 healthcare workers in January 2021, the vaccine acceptance of healthcare workers with a history of COVID-19 infection was observed to be significantly lower than that of healthcare workers without a history of COVID-19 infection (27). In the current study, the lower vaccination rate among participants who had previously contracted COVID-19 may be explained by their belief that they had acquired immunity or the necessity of waiting a certain period after infection before vaccination. It is expected that unvaccinated participants with a history of COVID-19 infection may choose to be vaccinated at a later stage.

In a study by Nasr et al., the main reasons healthcare workers cited for receiving the COVID-19 vaccine were "protecting family members against infection", "protecting themselves from infection", and "contributing to herd immunity and ending the pandemic" (25). Similarly, Sirikalyanpaiboon et al., in their study with 705 physicians in Thailand in April 2021, reported that healthcare workers were motivated to vaccinate to "reduce the risk of severe illness" and "acquire immunity against the disease" (28). Nzaji et al. found that healthcare workers were motivated by the desire to "protect themselves from infection" and "protect their friends, family, and loved ones"

(29). In a study undertaken by Kozak et al., the reasons for healthcare workers to receive COVID-19 vaccination were related to the protection of their patients, family members, and themselves from infection, reducing transmission, and easing of restrictions (24). In the current study, the primary motivations for vaccination among participants were acquiring immunity against the disease, reducing the risk of severe illness, contributing to herd immunity, protecting family and community, potential restrictions for the unvaccinated, and reducing transmissibility. These findings highlight the global consistency of motivations for vaccination.

Nzaji et al. also observed that the primary reasons for vaccine hesitancy among healthcare workers were concerns about safety, side effects, and efficacy (29). In a study conducted by Sirikalyanpaiboon et al. reported that healthcare workers declined COVID-19 vaccination due to concerns about its short- and long-term side effects, efficacy, and safety, as well as insufficient data on vaccination during pregnancy (28). Kozak et al. observed that healthcare workers did not receive the COVID-19 vaccination due to their concerns about the short- and long-term side effects of vaccines, as well as those about the efficacy and safety of vaccines (24). In the current study, the reasons cited by unvaccinated participants for refusing the vaccine included a lack of sufficient data on the efficacy and safety of vaccines, insufficient time elapsed since recovery from COVID-19, concerns about the short- and long-term side effects of vaccines, and a lack of studies on vaccination during pregnancy and breastfeeding. The consistency of these findings with those reported in the literature underscores the need for further efforts to address concerns and knowledge gaps regarding vaccination.

In a study conducted by Kaplan et al., it was reported that vaccine acceptance was higher among individuals who recommended vaccination to others than among those who expressed hesitancy in recommending it (23). In another study, Sirikalyanpaiboon et al. observed that individuals who advocated for COVID-19 vaccination to their family, friends, and patients had a statistically significantly higher frequency of vaccination compared to those who did not recommend it or expressed hesitancy (28). In light of these findings, healthcare workers' recommendation of vaccination to others seems to be an indicator of their own vaccine acceptance.

CONCLUSION

The COVID-19 pandemic has placed a huge burden on the healthcare system due to high rates of morbidity and mortality. Healthcare professionals serve as important role models for society. COVID-19 vaccine acceptance by healthcare workers plays an important role in the fight against the pandemic by ensuring the uninterrupted operation of healthcare services and boosting public trust in vaccination (11,12). Vaccine acceptance is affected by various factors, including gender, marital status, history of flu vaccination, history of adverse reactions to other vaccines, history of COVID-19 infection, fear of transmitting COVID-19 to family, and willingness to recommend COVID-19 vaccination to family, friends, and patients. It would be useful to consider these factors affecting vaccine acceptance or rejection when developing vaccination campaigns.

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