Research Article (Araştırma Makalesi)

Determination of Knowledge Levels and Attitudes of Healthcare Workers on Coronavirus Disease-19 Vaccines

Sağlık Çalışanlarının Koronavirüs-19 Aşıları Hakkındaki Bilgi Düzeyi ve Tutumlarının Değerlendirilmesi

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Özet

Amaç: Sağlık çalışanları COVID-19 mücadelesinde ön saflarda yer almakta olup aşılanmaları hayati önem taşımaktadır. Üstelik hem konuşmaları hem davranışları ile pandeminin kontrolünde önemli rol üstlenmektedirler. Bu çalışmada sağlık çalışanlarının COVID-19 aşılanma durumları, bilgi düzeyleri ve bakış açılarının değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntemler: Çalışma kesitsel ve tanımlayıcı bir tipte olup, 15-30 Temmuz 2021 tarihleri arasında Türkiye'deki tıp öğrencisi, asistan hekim, hemşirelik öğrencisi ve hemşirelere yönelik çevrimiçi bir anket formu üzerinden gerçekleştirilmiştir.

Bulgular: Toplam 822 sağlık çalışanında aşılanma oranı %79.2 idi. Sağlık çalışanları aşılar hakkında yeterince bilgi sahibi değildi (Doğru cevaplama oranları %21.6-73 arasındaydı). En önemli bilgi edinme kaynakları sosyal medya (%41.9) ile Sağlık Bakanı-Bilim Kurulu açıklamalarıydı (%29.5). Aşılanma oranı; 25 yaş üstündekilerde, asistan hekimlerde, batı bölgelerinde yaşayanlarda, COVID-19 hastalarına sağlık hizmeti verenlerde, daha önce COVID-19 geçirmeyenlerde ve bilgi sorularını doğru yanıtlayanlarda daha yüksekti ($p=0.019$, $p<0.001$, $p<0.001$, $p=0.042$, $p<0.001$, $p<0.001$). En önemli aşı tereddütü/reddi nedeni bilgi eksikliğiydi (%41.6).

Sonuç: Türkiye'deki sağlık çalışanlarının aşı tereddütü sosyal medyanın daha efektif kullanımı ve Sağlık Bakanı ile Bilim Kurulu'nun pandemi sürecini daha şeffaf ve hassas yönetmesi ile giderilebilir.

Anahtar kelimeler: Aşı reddi, Comirnaty ,CoronoVac, COVID-19 aşıları, Sağlık çalışanları

Abstract

Objective: Healthcare workers (HCWs) are at the forefront of the fight against COVID-19, and vaccination is crucial. In addition, HCWs have the potential, both through their behaviours and their words, in controlling the pandemic. The aim of this study is to determine the vaccination statuses, knowledge levels and perspectives of HCWs regarding vaccination.

Materials and Methods: This was a descriptive and cross-sectional study designed for medical students, assistant physicians, nursing students and nurses, in Turkey, between July 15, 2021 and July 30, 2021, using an online questionnaire.

Results: Vaccination rate among 822 HCWs was 79.2%. HCWs did not have enough information about vaccines (correct response rates were between 21.6% and 73%). The most important sources of information were social media and the statements of Turkish Minister of Health and Scientific Committee (41.9% and 29.5%, respectively). Vaccination rate was statistically higher in HCWs over 25 years old, physicians, living in the western regions of Turkey, serving patients with COVID-19, those who did not have previous COVID-19, and those who answered the vaccination questions correctly ($p=0.019$, $p<0.001$, $p<0.001$, $p=0.042$, $p<0.001$, $p<0.001$, respectively). The most important reason for vaccine hesitation/rejection was lack of confidence (41.6%).

Conclusion: Vaccine hesitation among HCWs in Turkey can be eliminated by paying attention to the correct and effective use of social media, and the Ministry of Health and the Scientific Committee to pay attention to more transparent and precise management of the pandemic

Keywords: Comirnaty, CoronaVac, COVID-19 vaccines, Healthcare workers, Vaccine hesitancy

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Geliş tarihi: 05.01.2022

Kabul tarihi: 18.01.2022

DOI: 10.17517/ksutfd.1053968

INTRODUCTION

Coronavirus disease 2019 (COVID-19), which is caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), first appeared in Wuhan, China, in December 2019 and quickly spread worldwide. Shortly after the emergence of the disease, the World Health Organization (WHO) declared it to be a pandemic and a public health emergency (1). As of October 22, 2021, the total number of recorded COVID-19 cases in Turkey was 7387537, and 65788 patients had died (2).

The absence of highly effective antivirals highlights the need to find preventive measures to end the pandemic. These measures include vaccination together with general measures such as hand hygiene, staying away from crowded environments and wearing masks in closed environments (3). It takes many years to develop, test and license a new vaccine. However, this process has been greatly accelerated in the COVID-19 pandemic; indeed, phases II and III have been done concurrently in many vaccine studies. The WHO published specific guidelines for clinical trial design, implementation, evaluation and follow-up for COVID-19 vaccines (4).

In Turkey, the inactivated vaccine, which is called CoronaVac and was developed by the Chinese company Sinovac Biotech, became the first COVID-19 vaccine to receive permission for emergency use, on January 13, 2021 (5). Vaccination with Sinovac was initially used for healthcare workers (HCWs). The second vaccine to be approved, on April 2, 2021, was Comirnaty, which was produced with the mRNA technology and developed by the German biotechnology company BioNTech in collaboration with the American company Pfizer (6). On July 1, 2021, the third dose of this vaccination was started for HCWs, if they had had their second doses at least three months previously. According to the data from the Ministry of Health, 77.27% of the population who were over the age of 18 had received two doses of vaccine by October 23 (2). Although the two-dose vaccination rate seems high, the number of newly infected cases and deaths is still high. This may be because a significant portion of the population is vaccinated with CoronaVac, which is much less effective (7). We still seem to be far from the desired herd immunity target. Recently, there has been a decrease in the vaccination rate. On the other hand, anti-vaccine actions and posts have increased both on social media platforms and conference centers. Unfortunately, the number of HCWs among these activists is increasing. In this study, we aimed to reveal the knowledge levels of HCWs regarding COVID-19, their vaccination statuses, their knowledge about the vaccine, the relationship between levels of knowledge and vaccination and the reasons for prejudice against the vaccine, if any. We hope that when vaccine hesitation among HCWs is eliminated, the anti-vaccine actions that grow within the society will decrease.

MATERIALS AND METHODS

Study Design and Sampling

The present descriptive cross-sectional study was designed for medical students, residents, nursing students and nurses and was conducted in Turkey between July 15 and July 30, 2021. An online questionnaire was designed using Google forms. It was distributed on social media platforms and received wide coverage by authors working in different geographical regions of Turkey. Snowball sampling was also encouraged to disseminate the research questionnaire in different institutions. Individuals aged over 18 years were included in the study. Written informed consent was obtained from the participants before submitting the final form. The survey did not contain any identifying information, and all data were collected anonymously. Incomplete questionnaires, in which not all questions were answered, were excluded from statistical analysis.

Study Variables and Measures

In the first part of the questionnaire (Questions 1-5), demographic data were assessed. The participants' COVID-19 experience was assessed in 6-9 questions. The participants' COVID-19 vaccine experience was evaluated in questions 10-12. The question 12 assessed the reasons for not being vaccinated. Multiple-choice questions were asked, and each participant was asked to mark the most suitable option. The next section of the questionnaire contained seven questions (Questions 13-19) about COVID-19 vaccines. The participants were asked to evaluate the accuracy of the provided information and to select any one option: 'yes', 'no' or 'no idea'. In addition to the rate of accurate responses, the relationship between knowledge levels and vaccination was evaluated. The next section contained eight more questions (Questions 20-27) to assess the participants' attitudes towards COVID-19 vaccines. In response to the first five questions, they were asked to choose the option 'yes', 'no' or 'I am not sure'. In the sixth question, the participants were asked whether they would recommend the vaccine to those around them. The participants who answered 'yes' and those who answered 'no' to the sixth question were asked to provide their reasons in 26th and 27th questions, respectively. In the last three questionnaire, the participants were asked whether they thought they had enough information about COVID-19 vaccines. Their sources of information were also examined, and they were asked whether they wanted a meeting regarding COVID-19 vaccines (**Table 1**).

Table 1. Survey questions
1-How old are you?
2-What is your gender?
3-What is your marrital status?
4-What is your profession type?
5-Which geographical area do you live in?
6-Have you ever been infected with COVID-19?
7- If your answer to the previous question is yes, how was the course of the disease?
8-Has any of your family members ever been developed serious illness or died from COVID-19?
9-Have you ever been provided healthcare to someone with COVID-19?
10-Did you get vaccinated for COVID- 19?
11-If you have not been vaccinated, what is the reason?
12-If you have been vaccinated, which vaccine have you received?
13-What type of vaccine is the CoronaVac vaccine?
14-What type of vaccine is the Comirnaty vaccine?
15-CoronaVac vaccine is a very effective vaccine even if it is a single dose. Is it true?
16-Risk of allergic reaction is higher after CoronaVac vaccine. Is it true?
17-Comirnaty vaccine is a very effective vaccine even if it is a single dose. Is it true?
18-Risk of allergic reaction is higher after Comirnaty vaccine. Is it true?
19-Risk of thromboembolic event (heart attack, pulmonary embolism and etc.) is higher after Comirnaty vaccine. Is it true?
20-Did the introduction of the COVID-19 vaccine in the community relieve you psychologically?
21-Do you believe that the pandemic will end with the widespread use of the COVID-19 vaccine?
22-Did the vaccination of the people in your work environment (peers, teachers) affect you positively in terms of getting vaccinated?
23-Did the Ministry of Health's promotion of vaccination on social media (twitter, instagram, tv, website, etc.) affect you positively in getting vaccinated?
24-Do you think that COVID-19 vaccines will cause unpredictable side effects in the future?
25-As a healthcare worker, do you encourage those around you to get vaccinated?
26-What are your reasons for not recommending the vaccine?
27-What are your reasons for encouraging vaccination?
28- Do you think you know enough about COVID-19 vaccines?
29- What sources do you follow for information about the COVID-19 vaccine?
30- Would you like to have a meeting about COVID-19 vaccines at your institution?

Statistical Analysis

Descriptive analyses were done to provide information about the general characteristics of the study groups. Data regarding continuous variables are presented in the form of mean ± standard deviation and data on categorical variables are given as n (%). When comparing the means of quantitative variables between groups, the significance of differences between two means and one-way analysis of variance were used. Cross tables and chi-square tests were used to evaluate whether there was a relationship between the qualitative variables. When p values were calculated to be less than 0.05, this was considered statistically significant. Ready-made statistical software was used in the calculations (IBM SPSS Statistics 20, SPSS Inc., an IBM Company, Somers, NY).

Ethical Aspects

The study was conducted in accordance with the Helsinki Declaration and approved by the Bitlis Eren University Ethical Principles and Ethics Committee (Decision number 21/8-2 and document registration number E.836).

RESULTS

Respondent Demographics and COVID-19 Experience

A total of 836 participants answered the survey. Fourteen of these were excluded as they did not answer all the survey questions. Thus, a total of 822 participants' responses were included in the present study. More than two-thirds of the participants (68.9%) were younger than 25 years, 68.6% were female and 81.1% were single. There was participation from all regions of Turkey, with the highest participation being noted from the Eastern Anatolia (25.3%), Black Sea (24.3%) and Southeast Anatolia (22.9%) regions. Approximately one-third of the participants (36.3%) were nursing students, 28.6% were nurses, 19% were medical students and 16.2% were assistant physicians.

More than two-thirds of the participants (71.7%) did not have a history of COVID-19. A significant portion of the participants (86%) who had a history of COVID-19 had experienced a mild or moderate clinical course. Only 5.7% of the participants developed pneumonia that necessitated hospitalisation. Moreover, 0.8% of them required intensive care. A significant portion of the participants (70.1%) did not have a family member who had severe disease or died of COVID-19. In addition, more than half of the participants (58.2%) did not provide health care to someone who had COVID-19 (**Table 2**).

Vaccination status and level of knowledge about the COVID-19 vaccines.

In total, 79.2% of the participants had been vaccinated against COVID-19. Of these, 54.7% were vaccinated with two doses of CoronaVac, 41.7% with two doses of Comirnaty and 3.8% with a single dose of Comirnaty after two doses with CoronaVac (**Figure 1**).

The most important reason for not being vaccinated was a lack of confidence in the vaccine content

Table 2. Description of participants

Variables	Category	n (%)
Age	18-24	453 (55.1)
	≥ 25	369 (44.9)
Sex	Male	258 (31.4)
	Female	564 (68.6)
Marrital status	Single	667 (81.1)
	Married	155 (18.9)
Profession type	Nursing student	298 (36.3)
	Nurse	235 (28.6)
	Medical student	156 (19)
	Assistant physician	133 (16.2)
Geographical area	Aegean	28 (3.4)
	Central Anatolia	208 (25.3)
	Mediterrenian	23 (2.8)
	Black Sea	200 (24.3)
	Marmara	97 (11.8)
	Eastern Anatolia	208 (25.3)
	Southeastern Anatolia	188 (22.9)
Previous infection with COVID-19	Yes	233 (28.3)
	No	589 (71.7)
Having a family member who had severe COVID-19 or died	Yes	245 (29.9)
	No	574 (70.1)
Providing healthcare to someone with COVID-19	Yes	343 (41.8)
	No	478 (58.2)
Vaccination status against COVID-19	Yes	652 (79.3)
	No	170 (20.7)

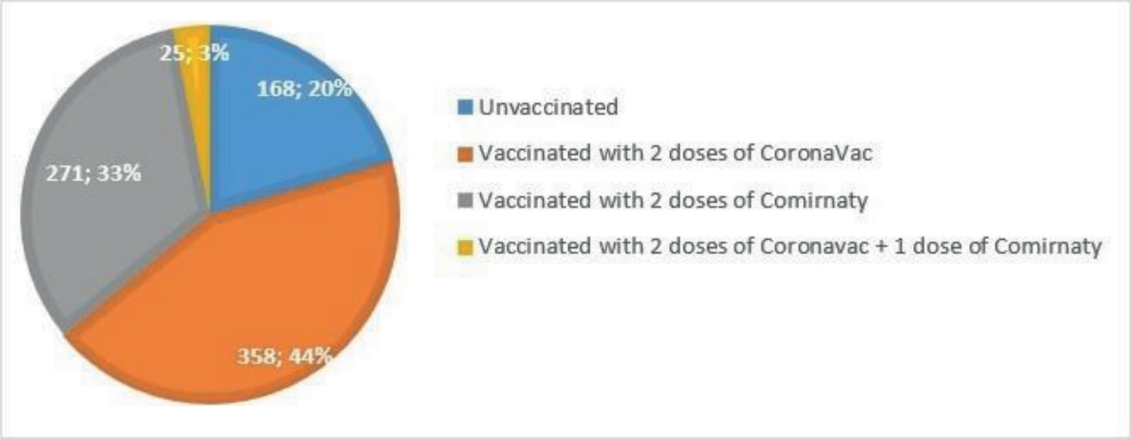

Figure 1. Vaccination information of healthcare workers.

(41.6%). The other reasons were a history of COVID-19 (21.1%), insufficient time (12%), pregnancy/breastfeeding (9.6%), a history of allergy (8.4%) and the thought that the vaccine was unnecessary (7.2%). The reasons for not being vaccinated significantly differed by age, marital status and profession type (p<0.001) (**Table 3**).

In total, 73% of the participants knew that CoronaVac was an inactive vaccine, 48.2% knew that the risk of allergy was low and 54% knew that the effect of the vaccine was very low when a single dose was administered. On the other hand, 55.8% of the participants knew that Comirnaty was an mRNA vaccine and 30.3% knew that it was more effective even when a single dose was administered. The question that assessed whether the Comirnaty vaccine increases the risk of thromboembolic events (TEEs) received the lowest accurate responses. While only 21.6% of the participants knew that the risk did not increase, almost a quarter of them (25.2%) thought that it did.

Table 3. Relationship between demographic data and reasons for not being vaccinated

Variable		Reasons for not getting vaccinated						p
		Allergy history	Lack of confidence	Redundancy	Lack of time	Pregnancy / breastfeeding	Previous infection	
		n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	
Age	18-24	6(5.9)	43(42.6)	9(8.9)	19(18.8)	1(1)	23(22.8)	<0.001
	≥25	8(12.3)	26(40)	3(4.6)	1(1.5)	15(23.1)	12(18.5)	
Sex	Female	11(9.3)	46(39)	7(5.9)	15(12.7)	15(12.7)	24(20.3)	0.283
	Male	3(6.3)	23(47.9)	5(10.4)	5(10.4)	1(2.1)	11(22.9)	
Marrital status	Married	2(5.4)	13(35.1)	2(5.4)	0(0)	14(37.8)	6(16.2)	<0.001
	Single	12(9.3)	56(43.4)	10(7.8)	20(15.5)	2(1.6)	29(22.5)	
Geographial area	Mediterrenian	0(0)	1(33.3)	1(33.3)	1(33.3)	0(0)	0(0)	0.608
	Eastern Anatolia	5(9.4)	21(39.6)	4(7.5)	8(15.1)	3(5.7)	12(22.6)	
	Aegean	0(0)	1(50)	0(0)	0(0)	1(50)	0(0)	
	Southeastern Anatolia	4(7.1)	27(48.2)	5(8.9)	5(8.9)	3(5.4)	12(21,4)	
	Central Anatolia	0(0)	3(50)	0(0)	2(33.3)	0(0)	1(16.7)	
	Black Sea	3(10)	10(33.3)	2(6.7)	4(13.3)	6(20)	5(16.7)	
	Marmara	2(12.5)	6(37.5)	0(0)	0(0)	3(18.8)	5(31.3)	
Profession type	Assistant physician	1(14.3)	4(57.1)	1(14.3)	0(0)	1(14.3)	0(0)	<0.001
	Nurse	3(5.2)	27(46.6)	4(6.9)	1(1.7)	13(22.4)	10(17.2)	
	Nursing Student	7(7.8)	33(36.7)	7(7.8)	19(21.1)	2(2.2)	22(24.4)	
	Medical Student	3(27.3)	5(45.5)	0(0)	0(0)	0(0)	3(27.3)	
Total		14(8,4)	69(41.6)	12(7.2)	20(12)	16(9.6)	35(21.1)	

Participants' Attitudes towards The COVID-19 Vaccine

A significant portion of the participants (69%) were psychologically relieved by the introduction of COVID-19 vaccines in the community. Approximately half of the participants (49.1%) believed that the pandemic would end with the widespread use of COVID-19 vaccines. The vaccination of people in the same working environment (e.g. peers and teachers) had a positive effect on most participants (69.6%). Vaccination promotion by the Ministry of Health through social media platforms (such as Twitter, Instagram, TV and its website) had a positive impact on nearly half of the participants (47.3%) and encouraged them to get vaccinated. Moreover, 34.1% of the participants thought that COVID-19 vaccines would cause unpredictable side effects in the future. Most participants (74.9%) encouraged those around them to get vaccinated. The participants who did not recommend the vaccine to those around them stated the following reasons: unwillingness to take responsibility (30.6%), not trusting the effectiveness of the vaccine (27.2%), not having enough knowledge about the vaccine (23.8%) and refraining because of the side effects of the vaccine (18.4%). The most important factor in recommending the vaccine to those around them is the end of the pandemic thanks to vaccination and the desire to return to normal life (42%).

Vaccine Acceptance and Predictors

There was a significant association between vaccine acceptance and demographic variables, COVID-19 experience and level of knowledge. Vaccination rate was higher in those over 25 years old, asistant physicians, and those living in the Aegean, Central Anatolia and Mediterranean regions ($p=0.019$, $p<0.001$, and $p<0.001$, respectively). Moreover, the rate of vaccination was high in HCWs had not previously been infected with COVID-19 and provided healthcare to patients with COVID-19 ($p<0.001$, and $p=0.042$, respectively) (**Table 4**).

HCWs answered the information questions about vaccines correctly (questions 13-19 in **Table 1**) were more vaccinated ($p<0.001$).

COVID-19 Information Resources

A total of 43.9% of the participants thought that they did not have enough information about vaccines. Only 25.5% answered "yes" and 30.5% said they were not sure. The two most frequently consulted sources of information about vaccines were social media (41.6%) and statements of the Ministry of Health/Science Committee (29.5%), respectively (**Figure 2**). Most of the participants (69.8%) wanted a training/meeting on COVID-19 vaccines.

DISCUSSION

Undoubtedly, HCWs have been at the forefront of the fight in the COVID-19 pandemic, making them the most at risk for transmission (8). Since the onset of the pandemic, thousands of HCWs worldwide have been infected and died due to COVID-19 (9). In Turkey, it is estimated that at least a quarter to a fifth of all HCWs are infected and 491 of them died due to COVID-19 (10,11). Fortunately, vaccines were developed and widely used at an unprecedented rate. HCWs were given priority in the COVID-19 vaccine application in Turkey. The fact that the vaccination rate of this group, which is at risk, is not close to 100% when there are effective vaccines in use and there is no problem in the supply of vaccines. After the start of vaccination, the most critical point in the deaths of HCWs in Turkey was vaccination hesitancy/refusal. Most of those who died in June and later were unvaccinated or did not receive additional doses after 2 doses of CoronoVac vaccine (10). This is very thought-provoking and the underlying causes should be examined. Therefore, the current study focused on revealing the underlying reasons of HCWs to accept or hesitate the COVID-19 vaccines.

International health authorities show HCWs among reliable sources from which information about vaccines can be obtained, and even emphasize that they have an important role in the confidence of the society in vaccines (12,13). It is believed that these concerns of the public, who have concerns about the rapidly developed COVID-19 vaccines, can be eliminated thanks to the positive attitudes of HCWs (14). However, it is seen that there is hesitation/rejection of vaccination among HCWs. It is stated that 23.1% of HCWs in France and one out of every six HCWs in Croatia have hesitations about vaccination (14,15). In a study conducted in Ethiopia, this rate goes up to 51.6% (16). In a multicenter study conducted in Turkey, this rate was found to be 15% (17). In our study, the rate unvaccinated partipicants was 21.8%. However, 21.1% of them was unvaccinated because they had recently had COVID-19, and 8.4% had a history of allergy. We believe that the real vaccine hesitancy rate may be lower.

In the studies of Tomljenovic et al. and Angelo et al., vaccine hesitancy was higher in nurses than in physicians (15,16). More than 98% of medical students in a study in the Unated States of America (USA) and 89.4% in a study in India were positive about COVID-19 vaccines (18,19). In a multicenter study conducted in Europe, the rate of vaccination among nursing students was as low as 24% (20). In our study, while the rate of vaccination was higher in physicians and medical students, it was lower in nurses and nursing students. In

Table 4. The relationship between demographic data and COVID-19 experience with getting vaccinated

	Vaccination status against COVID-19 n (%)		p
	Yes	**No**	
Age			
18-24	345 (76.3)	107 (23.7)	0.019
≥ 25	307 (83)	63 (17)	
Gender			
Male	211(81.8)	47 (18.2)	0.238
Female	441(78.2)	123 (21.8)	
Marrital status			
Single	534 (80.1)	133 (19.9)	0.276
Married	118 (76.1)	37 (23.9)	
Geographical area			
Aegean	26 (92.9)	2 (7.1)	<0.001
Central Anatolia	72 (92.5)	6 (7.7)	
Mediterrenian	20 (87)	3 (13)	
Black Sea	170 (85)	30 (15)	
Marmara	82 (84.5)	15 (15.5)	
Eastern Anatolia	153 (73.6)	55 (26.4)	
Southeastern Anatolia	129 (68.6)	59 (31.4)	
Profession type			
Nursing student	202 (67.8)	96 (32.2)	<0.001
Nurse	178 (75.7)	57 (24.3)	
Medical student	146 (93.6)	10 (6.4)	
Assistant physician	126 (94.7)	7 (5.3)	
Previous infection with COVID-19			
Yes	166 (71.2)	67 (28.8)	<0.001
No	486 (82.5)	103 (17.5)	
Severity of previous infection			
Asymptomatic	23 (88.5)	3 (11.5)	0.214
Mild	74 (71.8)	29 (28.2)	
Mild-Moderate	67 (65.7)	35 (34.3)	
Moderate-Cevere	9 (75)	3 (25)	
Critical	1 (50)	1 (50)	
Having a family member who had severe COVID-19 or died			
Yes	189 (77.1)	56 (22.9)	0.305
No	461 (80.3)	113 (19.7)	
Providing healthcare to someone with COVID-19*			
Yes	284 (82.8)	59 (17.2)	0.042
No	368 (77)	110 (23)	

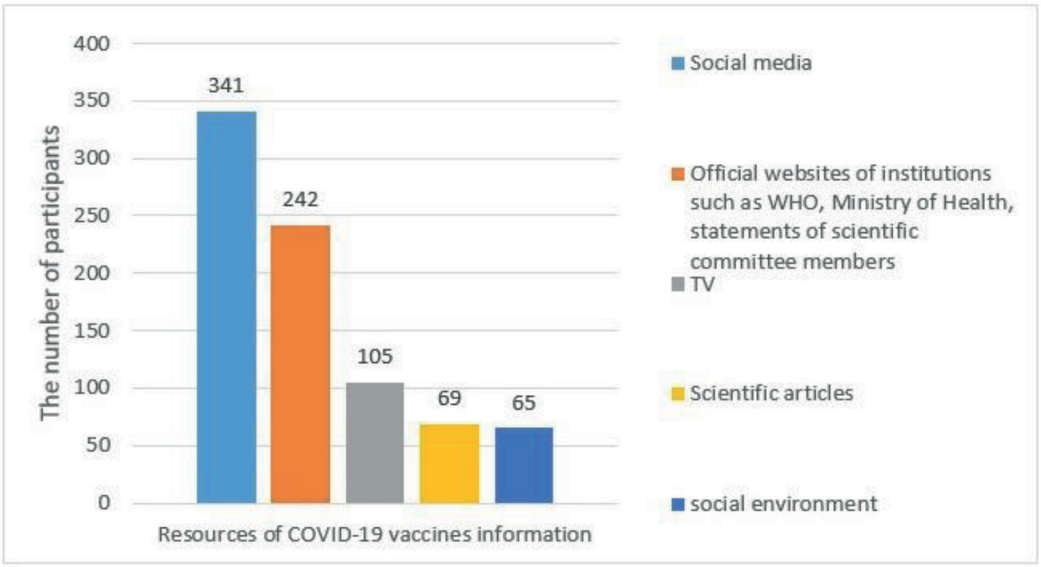

Figure 2. Resources of COVID-19 vaccines informations

the study of Özceylan et al., it was stated that the provinces of Southeast and East Anatolia had the highest rate of vaccine rejection in Turkey (21). Similarly, in our study, the rate of being vaccinated against COVID-19 was lower in HCWs working in these provinces. In our results, vaccination was less common in HCWs with previous COVID-19. We think this is due to reliance on natural immunity. The rate of vaccination was higher in HCWs providing healthcare to COVID-19 patients. In the study conducted in Israel, the results were similar (22).

The most important reason for not vaccinating in our study was lack of confidence to the vaccine content (41.6%). Similarly, in two studies from Turkey and Israel, lack of confidence was the most important reason for vaccine hesitancy (17,22). We think that the rapid development of COVID-19 vaccines worldwide, the simultaneous execution of Phase II-III studies, and the lack of experience with mRNA technology may have led to a lack of confidence. The second reason was previous COVID-19 infection. We are of the opinion that this is the idea of relying on natural immunity. The third reason was the inability to find time to get vaccinated. Almost all of those were nursing students (19/20). We think that they should not have provided health services to COVID-19 patients and their lack of chronic diseases may led to delays in vaccination. There was also a small group of people who delayed vaccination due to pregnancy or breastfeeding. Inactivated and mRNA vaccines are not contraindicated in pregnancy. They can be applied in any trimester. In fact, studies show that antibodies developed with mRNA-based vaccines will pass into the milk and protect the baby (23). Unfortunately, there was a group who thought that vaccines were completely unnecessary, albeit at a very low rate (7.2%). A significant portion of them were nursing students and nurses (11/12). We think that this is due to the lack of information.

CoronaVac, an inactivated SARS-CoV-2 vaccine, in which the majority of HCWs are vaccinated in our country, has proven to be well tolerated in both phase studies and real-life data. Side effects are rare, most of them mild and temporary (5,24). However, its effectiveness is gradually decreasing and it has been shown to decrease up to 21.8% even if two doses are applied against the variants (7). Comirnaty, which is an mRNA vaccine, is much more effective, but has more side effects (6,25). It was reported that there was a 91% decrease in hospital admissions due to COVID-19 even after the first dose of Comirnaty vaccine (26). There are publications showing that thromboembolic events (TEEs) increase after COVID-19 vaccines (27). However, the risk does not increase after Comirnaty vaccine (28). In the light of these informations, the knowledge levels of the participants about vaccines were investigated. A total of 73% of them knew that CoronaVac was an inactive vaccine, 48.2% knew that the risk of allergy was low, and 54% knew that the effect was very low when a single dose was applied. Elseways, 55.8% knew that Comirnaty was a mRNA vaccine, and 30.3% were aware that its effectiveness was better even in a single dose application. The least accurate information was that the Comirnaty vaccine did not increase the susceptibility to TEEs. Only 21.6% of the participants knew. We think that this false information is caused by the information pollution on social media. Because the most important source of information for the participants was social media. HCWs are expected to refer to scientific publications as a source of information. It is surprising that social media was the most referenced

source of information in our study. We believe that this finding is related to the high number of students in our study. The second important source was the statements of the Minister of Health and the Scientific Committee. In addition, nearly half of the participants were positively affected by the Ministry of Health's vaccination promotion on social media. Thus, we are of the opinion that the restriction of disinformation web pages and the transparent and clear scientific statements of the Minister of Health are very effective on vaccination.

CONCLUSION

In Turkey, the rate of vaccination among HCWs was found to be higher than in previous studies. Vaccine hesitancy of HCWs in Turkey can be eliminated by paying attention to the correct and effective use of social media, and the Ministry of Health and the scientific committee to pay attention to more transparent and precise management of the pandemic process.

Author contributions: Idea/Concept: ETY/**Design:** ETY, EKDY/**Data collecting:** HOA, DY, SA, EKDY/**Analysis:** OD, ETY/**Literature review:** ETY, SA **Writing the article ETY, OD**

Conflict of Interest: This statement is to certify that all authors have seen and approved the manuscript being submitted. We warrant that there is no conflict of interest to declare. The article has not received prior publication and is not under consideration for publication elsewhere. On behalf of all Co-Authors, the corresponding Author shall bear full responsibility for the submission.

Ethics Committee Approval: The study was conducted in accordance with the Helsinki Declaration and the study protocol was approved by the local ethics committee (decision number 21/8-2 and document registration number E.836)

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