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Status of COVID-19 Infection and Vaccination Among Hospital Workers

Hastane Çalışanlarında COVID-19 Enfeksiyonu Geçirme ve Aşı Olma Durumu

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ABSTRACT

Objective: The aim of our study is to determine the COVID-19 infection and vaccination status among hospital workers and to examine the reasons for vaccine hesitancy.

Material and Methods: A questionnaire was administered to 412 volunteers working in our hospital, querying their COVID-19 disease and vaccination statuses and the reasons for not being vaccinated. Based on PCR tests, participants were divided into 2 separate groups: those who had contracted COVID-19 and those who had not. Those who had received at least three doses of the vaccine were classified as the "vaccine-compliant" group, while those who had received two or fewer doses and those who had never been vaccinated were classified as the "vaccine-hesitant" group. Data from these groups were compared.

Results: Of the 412 hospital workers, 241 (58.5%) had contracted COVID-19 infection. Eighty-one (20%) participants expressed hesitations about vaccination. Women, nurses, and those with vaccine hesitancy were more common in the COVID-19 group (p=0.015, p=0.032, p<0.001, respectively). Physicians had the highest rate of vaccination compliance, followed by non-medical staff (p=0.009, p=0.03, respectively). Nurses were the most numerous in the vaccine-hesitant group (p=0.046). The influenza vaccination rate was significantly higher in the vaccine-compliant group (p=0.03). Reasons for vaccine hesitancy among participants included doubts about vaccine effectiveness (28 [34.57%]), distrust in the vaccine (23 [28.39%]), fear of side effects (16 [19.75%]), presence of allergies (8 [9.88%]), and negative influences from social media and the community (6 [7.41%]). Among participants who had never been vaccinated, nurses (14 [66%]) and medical secretaries (4 [19%]) were the most represented.

Conclusion: Ensuring that hospital staff adhere to general precautions, providing them with information about the effectiveness, safety, importance, necessity, and side effects of the vaccine, and addressing their concerns are crucial for the success of vaccination campaigns.

Keywords: COVID-19 infection, hospital workers, vaccination, vaccine hesitancy.

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ÖZ

Amaç: Çalışmamızın amacı, hastane çalışanları arasında COVID-19 geçirme ve aşı olma durumunu belirlemek, aşı tereddüdünün nedenlerini incelemektir.

Gereç ve Yöntemler: Hastanemizde çalışan 412 gönüllüye COVID-19 geçirme ve aşılanma durumları ile aşı olmama nedenlerini sorgulayan bir anket uygulandı. PCR testine göre katılımcılar, COVID-19 geçirenler ve COVID-19 geçirmeyenler olmak üzere 2 ayrı grupta incelendi. En az üç doz aşı olanlar "aşıya uyumlu" grup; iki ve daha az sayıda aşı olanlar ve hiç aşı olmayanlar "aşı tereddütlü" grup olarak adlandırılıp, veriler karşılaştırıldı.

Bulgular: 412 hastane çalışanından 241'i (%58,5) COVID-19 enfeksiyonu geçirmiştir. Aşı tereddüdü yaşayan 81 (%20) idi. Kadınlar, hemşireler, aşı tereddüdü yaşayanlar COVID-19 geçiren grupta daha fazlaydı (sırasıyla p=0,015, p=0,032, p<0,001). Aşı uyumu en yüksek doktorlardaydı, ikinci sırada sağlık dışı personel yer alıyordu (sırasıyla p=0,009, p=0,03). Aşı tereddütü olan grupta hemşireler en fazla sayıdaydı (p=0,046). Aşı uyumlu grupta grip aşısı olma oranı anlamlı olarak daha yüksekti (p=0,03). Katılımcıların aşı tereddüdü yaşama nedenleri sırasıyla etkisiz olduğunu düşünme 28 (%34,57), aşıya güvensizlik 23 (%28,39), yan etkilerden korkma 16 (%19,75), alerji varlığı 8 (%9,88), sosyal medya ve çevrenin olumsuz paylaşımları 6 (%7,41) idi. Hiç aşı olmayan katılımcılar arasında hemşireler 14 (%66) ve tıbbi sekreterler 4 (%19) ilk iki sıradaydı.

Sonuç: Hastane çalışanlarının genel önlemlere uymalarını sağlamak, aşının etkinliği, güvenliği, önemi, gerekliliği ve yan etkileri hakkında bilgilendirmek, endişelerini gidermek aşı kampanyalarının başarıya ulaşmasında çok önemlidir.

Anahtar kelimeler: COVID-19 enfeksiyonu, hastane çalışanları, aşılama, aşı tereddüdü.

INTRODUCTION

On March 11, 2020, the World Health Organization declared that COVID-19 infection had become a pandemic. On the same day, the first COVID-19 patient was reported in Türkiye. Like all countries around the world, the pandemic deeply affected our country. To end the pandemic, vaccine development studies were carried out worldwide in a short time, and following the approval for emergency use, vaccinations started in our country on January 14, 2021.[1] Since healthcare professionals are at higher risk, they were vaccinated as a priority to protect them from the disease and to ensure that healthcare services are not disrupted. As the COVID-19 pandemic continues to grow due to mutations and the low rate of vaccination worldwide, the positive attitude of healthcare professionals towards vaccination is crucial in building confidence in vaccines and promoting acceptance in the general population.[2]

Vaccine hesitancy is defined by the World Health Organization as the delay or rejection of immunization even though it is available and has been listed among the top 10 global health threats in 2019.[3] During the pandemic, hesitancy to receive COVID-19 vaccines has been reported in many countries and not only in the community but also among healthcare professionals. The vaccine hesitancy rate among healthcare professionals has been reported as 22.5%.[4] Rejection or hesitation in the community and among healthcare professionals arises from concerns about vaccine safety, skepticism about the vaccine, the speed of vaccine development, potential side effects, beliefs, conspiracy theories, and pre-existing health conditions.[4,5–7]

There are some studies in our country[8–10] and in European countries[11,12] on attitudes towards vaccination at the beginning of the pandemic. However, although the second year of the pandemic has been completed and now that there is experience and knowledge on vaccines, data on how healthcare professionals, especially those who had COVID-19, approach vaccination are still limited. This study aims to determine the status of COVID-19 infection and vaccination among hospital workers and to examine the reasons for vaccine hesitancy.

MATERIAL AND METHODS

This study was conducted between March 2022 and July 2022 among the employees of a chest diseases hospital functioning as a pandemic hospital. A self-administered questionnaire regarding the status of COVID-19 infection and vaccination, as well as the reasons for avoiding vaccination, was distributed among participants, consisting of both healthcare and non-healthcare professionals in our hospital. The survey topics included: 1- Demographic characteristics of the participants, 2- History of previous vaccinations, 3- History of COVID-19 disease, 4- History of COVID-19 vaccination, 5- The impact of vaccination on their families, and 6- Adherence to general COVID-19 measures.

Those who did not wish to complete the questionnaire and those who could not be vaccinated due to pregnancy were excluded from the study. Professions such as psychologists and dietitians were classified as "healthcare professionals," roles such as X-ray technicians and laboratory technicians were classified as "health technicians," and roles such as cleaning staff, cooks, and waiters were categorized as "non-healthcare professionals."

Participants were divided into two groups based on PCR test results: those who had contracted COVID-19 and those who had not. They were further analyzed according to their vaccine compliance. Those who had received at least three doses of the vaccine were considered the "vaccine-compliant" group, while those who had received two or fewer doses and those who had never been vaccinated were considered the "vaccine-hesitant" group. Data from these groups were compared, and the reasons for both vaccination and vaccine hesitancy were analyzed.

The study was approved by the University of Health Sciences İzmir Dr. Suat Seren Chest Diseases and Surgery Training and Research Hospital Ethics Committee (date: 04/01/2022 / 3356). Participant consent was obtained, and their identity information and data were kept confidential. This study was conducted in accordance with the Declaration of Helsinki.

Table 1: Comparison of participants according to the status of previous COVID-19 infection

Variables	All participants (n=412)		COVID infection (+) (n=241)		COVID infection (-) (n=171)		p
	n	%	n	%	n	%	
Age (years)	36.6±9.4		36.8±9.3		36.3±9.7		0.643
BMI (kg/m^2)	25.8±8.1		25.4±4.4		26.4±11.6		0.221
Cigarette consumption (pack-years)	15 (10/20)		15 (10/20)		10 (9/18)		0.266
Gender							**0.015**
Female	278	67.5	174	72.2	104	60.8	
Male	134	32.5	67	27.8	67	39.2	
Marital status							0.121
Married	259	62.9	159	66.0	100	58.5	
Single	153	37.1	82	34.0	71	41.5	
Educational status							
Primary school	18	4.4	9	3.7	9	5.3	0.454
Secondary school	13	3.2	5	2.1	8	4.7	0.136
High school	82	19.9	43	17.8	39	22.8	0.213
University	204	49.5	131	54.4	73	42.7	**0.019**
Post-graduate	95	23.1	53	22.0	42	24.6	0.541
Occupation							
Doctor	64	15.5	36	14.9	28	16.4	0.691
Nurse	170	41.3	110	45.6	60	35.1	0.032
Healthcare professional	17	4.1	7	2.9	10	5.8	0.138
Health technician	15	3.6	8	3.3	7	4.1	0.679
Medical secretary	59	14.3	34	14.1	25	14.6	0.883
Non-healthcare professional	87	21.1	46	19.1	41	24.0	0.230
Smoking status							
Non-smoker	196	47.6	116	48.1	80	46.8	0.787
Smoker	130	31.6	71	29.5	59	34.5	0.277
Ex-smoker	26	6.3	13	5.4	13	7.6	0.363
Comorbidity							0.544
Yes	137	33.3	83	34.4	54	31.6	
No	275	66.7	158	65.6	117	68.4	
COVID-19 vaccination status							0.299
Yes	391	94.9	231	95.9	160	93.6	
No	21	5.5	10	4.1	11	6.4	

Table 1: Cont.

Variables	All participants (n=412)		COVID infection (+) (n=241)		COVID infection (-) (n=171)		p
	n	%	n	%	n	%	
COVID-19 Vaccination attitude							**0.015**
Vaccine compatible	331	80.3	184	76.3	147	86.0	
Vaccine hesitant	81	19.7	57	23.7	24	14.0	**<0.001**
Influenza vaccination status							0.375
Yes	35	8.5	18	7.5	17	9.9	
No	377	91.5	223	92.5	154	90.1	
Did you have any influence on your family's vaccination decision?							
1. Yes, I got them vaccinated too	265	64.3	153	63.5	112	65.5	0.674
2. Yes, I prevented them from getting vaccinated	5	1.2	3	1.2	2	1.2	0.945
3. I was not involved in their decision.	142	34.5	85	35.3	57	33.3	0.683
Did you provide one-to-one care to a COVID-19 patient??							**0.025**
Yes	215	52.2	137	56.8	78	45.6	
No	197	47.8	104	43.2	93	54.4	
I pay attention to wearing mask							0.521
Yes	380	92.2	224	92.9	156	91.2	
No	32	7.8	17	7.1	15	8.8	
I keep social distance							0.940
Yes	326	79.1	191	79.3	135	78.9	
No	86	20.9	50	20.7	36	21.1	

BMI: Body mass index

Statistical Analysis

The SPSS program (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) was utilized for statistical analysis. The conformity of continuous variables to the normal distribution was assessed by the Shapiro-Wilk test. Mean±standard deviation values were employed for normally distributed variables, and median (interquartile range of 25/75) values were used for non-normally distributed variables. Categorical variables were expressed as n (%). Based on the results of the normality test, the Mann-Whitney U test was applied for comparisons between groups, and the t-test was used for independent groups. Categorical variables were analyzed using the Chi-square test. The significance level was set at $p<0.05$.

RESULTS

A total of 412 hospital workers participated in the study, with 58.5% (n=241) having contracted COVID-19. Participants were divided and analyzed into two groups: those who had COVID-19 and those who did not. General characteristics such as age, BMI, household size, tobacco consumption, marital status, presence of comorbidity, COVID-19 vaccination status, influenza vaccination status, influence of family on vaccination decisions, mask use, and social distancing practices were similar in both groups ($p>0.05$). The proportion of female participants and university graduates was significantly higher in the COVID-19 group ($p=0.015$ and $p=0.019$, respectively). Occupational distribution analysis revealed a higher rate of nurses in the COVID-19 group ($p=0.032$). Although vaccination status was similar between groups ($p>0.05$), the "vaccine-compliant" participants were more prevalent in the non-COVID-19 group, while "vaccine-hesitant" participants were more common in the COVID-19 group ($p=0.015$ and $p<0.001$, respectively). The number of participants providing direct care to COVID-19 patients was significantly higher in the COVID-19 group ($p=0.025$) (Table 1).

Participants were further divided and analyzed as "vaccine compliant" and "vaccine hesitant." Age, BMI, gender, tobacco consumption level, household size, marital status, smoking status, and presence of comorbidity were similar in both groups ($p>0.05$). The "vaccine-hesitant" group had a higher rate of university graduates ($p<0.001$), while the "vaccine-com-

Table 2: Comparison of the participants according to their vaccination status

Variables	Vaccine compatible (n=331)		Vaccine hesitant (n=81)		p
	n	%	n	%	
Age (years)	36.98±9.60		35.44±8.95		0.244
BMI (kg/m^2)	25.90±8.88		25.52±4.37		0.717
Household size	2.98±1.23		3.08±1.36		0.544
Cigarette consumption (pack-years)	14 (10/20)		12 (6/20)		0.601
Gender					
Female	220	66.5	58	71.6	0.376
Male	111	33.5	16	28.4	
Educational status					
Primary school	16	4.8	2	2.5	0.350
Secondary school	12	3.6	1	1.2	0.269
High school	65	19.6	17	21.0	0.785
University	150	45.3	54	66.7	**<0.001**
Post-graduate	88	26.6	7	8.6	**<0.001**
Occupation					
Doctor	59	17.8	5	6.2	**0.009**
Nurse	129	39.0	41	50.6	**0.046**
Healthcare professional	13	3.9	4	4.9	0.681
Health technician	11	3.3	4	4.9	0.486
Medical secretary	42	12.7	17	21.0	0.055
Non-healthcare professional	77	23.3	10	12.3	**0.030**
Marital status					
Married	210	63.4	49	60.5	0.622
Single	121	36.6	32	39.5	
Smoking status					
Non-smoker	165	49.8	31	38.3	0.214
Smoker	99	29.9	31	38.3	0.205
Ex-smoker	21	6.3	5	6.2	0.776
Comorbidity					0.587
Yes	108	32.6	29	35.8	
No	223	67.4	52	64.2	
COVID-19 (+)	184	55.6	57	70.4	**0.016**
No of people with influenza vaccination	33	10.0	2	2.5	**0.030**
Did you have any influence on your family's vaccination decision?					
1. Yes, I got them vaccinated too	232	70.1	29	35.8	**<0.001**
2. Yes, I prevented them from getting vaccinated.	–	–	2	2.5	–
3. I was not involved in their decision.	89	26.9	47	58.0	**<0.001**
Did you provide one-to-one care to a COVID-19 patient?					0.155
Yes	167	50.5	48	59.3	
No	164	49.5	33	40.7	
I pay attention to wearing mask					0.210
Yes	308	93.1	72	88.9	
No	23	6.9	9	11.1	
I keep social distance					0.978
Yes	262	79.2	64	79.0	
No	69	20.8	17	21.0	

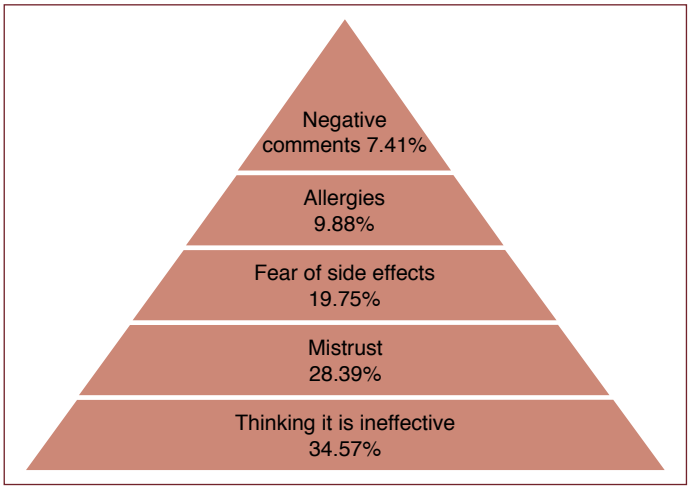

Figure 1: Reasons of participitans who hesitated about vaccination.

pliant" group had a higher rate of participants with post-graduate degrees (p<0.001). Analysis of occupational groups' vaccination attitudes showed that doctors and non-healthcare professionals had significantly higher vaccination compliance (p=0.009 and p=0.03, respectively), and nurses exhibited significantly higher vaccine hesitancy (p=0.046). The proportion of healthcare professionals who had contracted COVID-19 was higher in the vaccine-hesitant group (p=0.016). The influenza vaccination rate was higher in the vaccine-compliant group (p=0.03). The percentage of participants who had vaccinated family members was higher in the vaccine-compliant group (p<0.001). The vaccine-hesitant group tended not to influence their family members' vaccination decisions (p<0.001). The rates of providing direct care to COVID-19 patients and maintaining social distance were similar in both groups (p=0.155, p=0.978). Although the vaccine-hesitant group had a higher number of participants who reported neglecting mask use, the difference was not statistically significant (p=0.210) (Table 2).

Examining the reasons for vaccine hesitancy, 28 (34.57%) participants doubted the vaccine's effectiveness, 23 (28.39%) had concerns about the vaccine, 16 (19.75%) feared side effects, 8 (9.88%) had allergies, and 6 (7.41%) were negatively influenced by social media and their close circle (Fig. 1).

Among the 21 participants who had never been vaccinated, nurses (14 [66%]) and medical secretaries (4 [19%]) were the most represented. One participant (5%) from each of the healthcare professional, health technician, and non-healthcare professional groups had never been vaccinated. All doctors were vaccinated (Fig. 2).

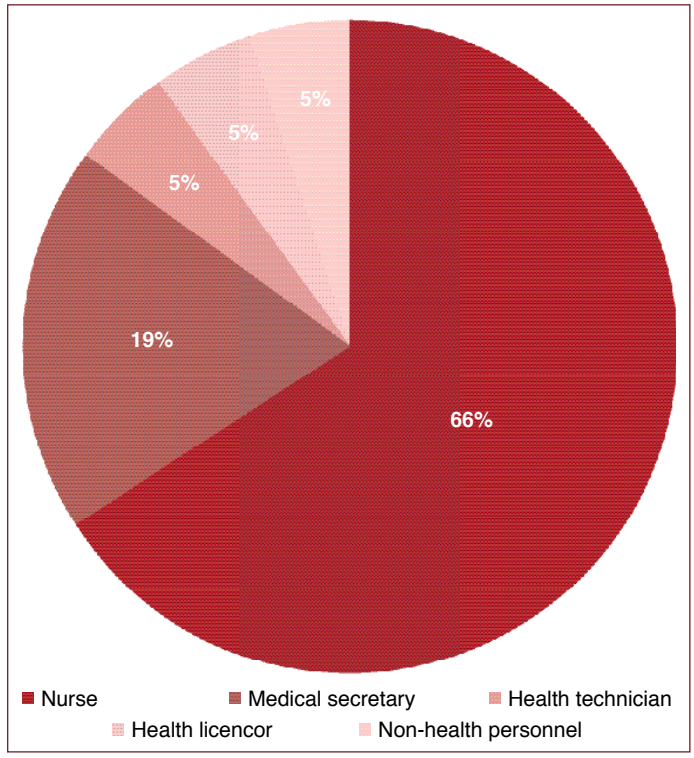

Figure 2: Distribution of those who have never been vaccinated by occupation.

DISCUSSION

Among the healthcare professionals who participated in the survey, 241 (58.5%) had contracted COVID-19. The incidence of COVID-19 was notably higher among women, nurses, and university graduates. As anticipated, individuals providing direct care to COVID-19 patients experienced a higher rate of infection. Vaccine compliance was more prevalent in the group without COVID-19, whereas those hesitant about vaccination exhibited a higher incidence of the disease. The vaccine-hesitant group had a greater proportion of university graduates, while postgraduate degree holders were significantly more common in the vaccine-compliant group. Nurses displayed more vaccine hesitancy compared to other occupational groups, with a notable number of hesitant nurses, whereas all doctors were vaccinated. High vaccine compliance among non-healthcare professionals was remarkable. The highest rate of COVID-19 infection was observed in the vaccine-hesitant group. Members of the vaccine-compliant group ensured their families were vaccinated, whereas those hesitant about vaccination refrained from influencing their family members' vaccination decisions. The predominant reasons for vaccine hesitancy included skepticism about vaccine efficacy and concerns regarding vaccine content and manufacturer. Other hesitancy factors involved fear of side effects, existing allergies, negative influences from social media, and peer opinions. Nurses comprised the largest proportion among the unvaccinated, while all doctors had been vaccinated.

The risk of COVID-19 infection among healthcare professionals is reported to be 2.9 times higher than that in the general population, with infections predominantly occurring in women and nurses.[13,14] In our study, 241 (58.5%) out of 412 hospital workers contracted COVID-19. In line with existing literature, our findings indicate a higher infection rate among women and nurses, which may be attributed to the predominance of female nurses in direct patient care roles. The lower incidence of COVID-19 in the vaccine-compliant group suggests the efficacy of vaccines in preventing infection.

While vaccination is a particularly important measure against COVID-19 disease, vaccine hesitancy can be an obstacle to an effective vaccination program.[15] The rapid development and immediate use approval of vaccines have raised concerns about the safety, efficacy, and side effects of vaccines both among healthcare professionals and the public.[16–18] Similar to a study[3] where the vaccine

hesitancy rate among emergency healthcare professionals was determined as 21%,[3] the vaccine hesitancy was approximately 20% in our study. High education level and medical profession were found to be associated with high vaccination rates.[19] In our study, vaccine compliance was higher in those with postgraduate degrees and among doctors. There were no doctors in the no vaccine group. Most of the studies found a higher rate of vaccination against COVID-19 among healthcare professionals who also had the influenza vaccine.[8,19] In our study, vaccination compliance was higher in those who had the influenza vaccine. Health-related behaviors such as getting regular flu shots may be associated with vaccination compliance in general. Nurses were more hesitant about vaccination in our study as was the case in the study which found that nurses had less adherence to vaccination compared to doctors.[15] In our study, it is noteworthy that the vaccination compliance of the nurses was low, and the vaccination compliance of the non-health professionals was high. Insufficient information, lack of trust, and influence of the anti-vaccine media may be higher among the nurses. On the other hand, it can be thought that non-healthcare professionals were positively affected by the attitude of healthcare professionals towards vaccines. In a study that determines the vaccination attitude of the participants via e-questionnaire, the rate of vaccination in the general population was determined as 49.7%.[20] In another study, the rate of vaccination among healthcare professionals was reported as 63%.[18] In our study, the rate of vaccination among hospital workers was 80%. Since our hospital is a chest diseases hospital and serves as a pandemic hospital, this may be the reason for the high vaccination rate. Like the study where most of the vaccinated participants reported that their children were also vaccinated,[21] in our study, those who were vaccinated also had their family members vaccinated. Precautions such as social distancing and wearing masks were followed among hospital workers and there were no differences between the groups.

Concerns about the vaccine, fear of side effects, lack of knowledge, ineffectiveness, conspiracy theories, and skepticism are the most common reasons for vaccine hesitancy.[15,21,22] In our study, in addition to all these reasons, anti-vaccine posts on social media and comments from the social environment as well as the presence of allergies caused the hospital workers to hesitate about vaccination. Having COVID-19 infection despite vaccination has affected the attitude towards vaccination among healthcare professionals. While some studies detected increased vaccination rates,[18,8,22] others found lower vaccination rates.[18] Our study showed that having COVID-19 infection despite vaccination increased vaccine hesitancy.

Unlike studies in the literature, our study reviewed the COVID-19 infection and vaccination status of non-health professionals. Since our study was cross-sectional and conducted in a single center, the rates given may have changed over time. Those who did not accept to fill out the questionnaire, those who were not vaccinated for medical reasons such as pregnancy, the inability to deliver the questionnaire to all hospital workers, the lack of PCR testing for employees who were asymptomatic, and false negatives may have affected the results of the study. Employees who doubted the survey's confidentiality might have provided misleading answers.

In conclusion, in our study, vaccination rates, like COVID-19 infection rates, were high among healthcare professionals. The positive attitude of healthcare professionals towards vaccination contributes significantly to building confidence in vaccines and ensuring vaccine compliance in the general population. Providing information to hospital workers about the efficacy, safety, importance, necessity, and side effects of the vaccine increases vaccine compliance. Emphasis should be placed on eliminating the concerns of employees about vaccines and understanding their perceptions, and they should be reminded of their responsibilities about public health. The collaboration of media, politicians, and healthcare professionals will increase the success of vaccination campaigns.

Disclosures

Ethics Committee Approval: The study was approved by The University of Health Sciences İzmir Dr. Suat Seren Chest Diseases and Surgery Training and Research Hospital Clinical Research Ethics Committee (date: 04/01/2022, number: 3356).

Author Contributions: Concept – E.C.; Design – H.Ş.; Supervision – E.C.; Fundings – H.Ş.; Materials – S.B.; Data Collection and/or Processing – M.Ö.; Analysis and/or Interpretation – İ.N., A.K.Ç.; Literature Search – B.T.; Writing – E.C.; Critical Reviews – H.Ş., A.K.Ç.

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