

## RESEARCH ARTICLE

# Evaluation of the knowledge levels of 6th-year medical faculty students regarding routine vaccines recommended for healthcare workers

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### ABSTRACT

**Objective:** The aim of this study is to assess the knowledge levels of 6th-year medical faculty students regarding vaccines recommended for healthcare workers.

**Methods:** This study is a descriptive and cross-sectional research. The data for the study were collected between November 8, 2023, and December 25, 2023. The study sample comprises 206 6th-year medical students enrolled in the 2023-2024 academic year at Selçuk University Faculty of Medicine. In the study, a 26-item questionnaire form, developed by the researcher through a review of the literature, was employed.

**Results:** It was observed that students were most familiar with hepatitis B (96.1%), hepatitis A (86.4%), diphtheria-tetanus (70.4%) and MMR (Measles, Mumps, Rubella) vaccine (63.6%) among the vaccines routinely recommended for healthcare workers. The rates of participants, whose source of information was lectures, knowing 4 or more vaccines out of the 6 routinely recommended for healthcare workers, were significantly higher compared to those who received information from publications and healthcare institutions ( $p<0.001$ ).

**Conclusion:** It is important for physicians to have sufficient knowledge not only about vaccinations for adults and children but also for healthcare worker vaccinations. This is crucial for both employee safety and patient safety. Throughout medical education, these vaccines recommended for healthcare workers should be explained in detail to students, emphasizing their importance.

**Keywords:** Vaccine, Immunization, Medical students, Healthcare workers

### ÖZET

**Tıp fakültesi 6.sınıf öğrencilerinin sağlık çalışanı rutin aşıları ile ilgili bilgi düzeylerinin değerlendirilmesi**

**Amaç:** Bu çalışmanın amacı tıp fakültesi 6. sınıf öğrencilerinin sağlık çalışanına önerilen aşılar hakkında bilgi düzeylerinin değerlendirilmesidir.

**Yöntem:** Bu çalışma tanımlayıcı ve kesitsel tipte bir çalışmadır. Çalışmanın verileri 08.11.2023- 25.12.2023 tarihleri arasında toplanmıştır. Çalışmanın örneklemini 2023-2024 akademik yılında Selçuk Üniversitesi Tıp Fakültesinde öğrenim gören 206 6.sınıf tıp fakültesi öğrencisi oluşturmaktadır. Çalışmada, araştırmacı tarafından literatür taranarak oluşturulan 26 soruluk anket formu kullanılmıştır.

**Bulgular:** Öğrencilerin sağlık çalışanına rutinde önerilen aşılarından en çok hepatit B (%96,1), hepatit A (%86,4), difteri-tetanoz (%70,4) ve KKK (Kızamık, Kabakulak, Rubella) (%63,6) aşısını bildikleri görülmüştür. Bilgi edinme kaynağı dersler olan katılımcıların sağlık çalışanlarına rutinde önerilen 6 aşıdan 3 üzerinde aşı bilme oranları; yayın organı ve sağlık kuruluşundan bilgi alanlara göre anlamlı oranda yüksek bulunmuştur ( $p<0.001$ ).

**Sonuç:** Hekimlerin erişkinler ve çocuklara yönelik aşılamalar yanında sağlık çalışanı aşılarına yönelik bilgi düzeylerinin yeterli olması hem çalışan güvenliği hem de hasta güvenliği açısından önemlidir. Tıp eğitimi boyunca sağlık çalışanlarına önerilen bu aşılar öğrencilere ayrıntılı anlatılmalı ve önemi vurgulanmalıdır.

**Anahtar kelimeler:** Aşı, Bağışıklama, Tıp öğrencileri, Sağlık çalışanı

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## INTRODUCTION

A vaccine is a low-cost, effective, safe, and preventive health service carried out with the aim of preventing infectious diseases by stimulating the immune system and eliciting an adequate immunological response in the individual. Vaccination reduces the mortality and morbidity of various infectious diseases [1,2].

The eradication of smallpox in Somalia in 1977, marking the last case worldwide, exemplifies the initial success of vaccination. Today, similarly, thanks to vaccination, the incidence of polio in the world has decreased by 99% and polio has been brought to the point of eradication. According to the data of the World Health Organization, it has been determined that thanks to vaccination; 3.5-5 million deaths caused by infectious diseases such as diphtheria-tetanus-pertussis, influenza are prevented every year [3-5].

Although childhood vaccinations come to mind first when it comes to vaccination, it is a fact that individuals can be protected from many diseases and deaths through vaccination programs in adulthood [6,7].

In our country, there has been a need for an immunization program that encompasses both childhood and adulthood. In response to this need, the Turkish Society of Clinical Microbiology and Infectious Diseases (EKMUD) prepared an adult immunization guide in 2007. Over the years, the immunization guidelines have been updated and maintained by the association [3,8].

In our country, one of the risk groups within adult vaccination programs is healthcare workers. Healthcare workers are defined as those who provide healthcare services, are in contact with patients and patient materials, and work in a healthcare facility with an infectious environment, including contaminated medical materials and surfaces [3,9,10]. Vaccination of healthcare workers is very valuable both in terms of preventing transmission to others they are in contact with and in terms of being role models for the community. Studies have shown that the information parents receive from healthcare professionals plays a critical role in their attitudes toward vaccinating their children. In this sense, it is very valuable for the doctors of the future to be knowledgeable about vaccination and to guide the society in the right way [9,11,12].

In the Adult Immunization Guidelines published in 2023 by the Infectious Diseases and Clinical Microbiology Specialty Society of Turkey, the vaccines recommended for healthcare workers are hepatitis B, hepatitis A, measles-mumps-rubella, influenza, varicella, tetanus-diphtheria. Especially in adults who have not received childhood vaccinations, primary vaccination is appropriate, and if they have been vaccinated, booster doses are recommended [3,13,14].

Anti HBs level should be checked for hepatitis B, which is one of the health worker vaccinations, and if it is 10 and above, it is accepted that there is sufficient antibody in terms of hepatitis B immunity. For immunity status against Hepatitis A, MMR and varicella,

vaccination is recommended if antibody levels in the blood are checked and found to be negative. The person should be vaccinated, taking into account pregnancy and immunodeficiency conditions. Annual vaccination is recommended for the influenza vaccine [3,13].

The aim of this study is to measure the knowledge levels of 6th-year medical students about healthcare worker routine vaccinations and to create awareness about vaccination.

## MATERIALS and METHODS

This study is a descriptive and cross-sectional type of research. This study was conducted between 08.11.2023 and 25.12.2023 and was carried out with 6th grade medical students studying at Selçuk University Faculty of Medicine in the 2023-2024 academic year. Out of 209 6th-year medical students, 206 were reached, resulting in a general participation rate of 98.6%.

The 26-question questionnaire form, which was created by reviewing the literature, was recorded using face-to-face interview technique after verbal and written permissions were obtained. The questionnaire applied to the participants consists of 3 sections. The first section includes questions about the participant's age, gender, marital status, sources of information about vaccinations. The second section explores the general knowledge levels regarding the timing of administration of live and inactivated vaccines. The third section examines the overall knowledge levels about vaccines recommended for healthcare workers. The study obtained written permission from the Selçuk University Non-Interventional Clinical Research Ethics Committee with decision number 2023/525 on 07.11.2023. The study was conducted in accordance with the ethical principles of the Helsinki Declaration.

### Statistical Analysis

Statistical analyses were performed with SPSS (Statistical Packet for The Social Science) 22.0 computer program. Frequency (n), percentage (%), mean±standard deviation and min (minimum) - max (maximum) values were used as descriptive statistical methods to evaluate the data obtained from the study. For statistical analysis, descriptive data were expressed as numbers and percentages, and for comparative analysis, data were evaluated using Chi-square test. All analyses were conducted with a 95% confidence interval. A significance level of  $p < 0.05$  was considered statistically significant.

## RESULTS

This study was conducted with a total of 206 6th-grade medical students. It was observed that 54% (n=111) of the participants were female, and 46% (n=95) were male; looking at the age distribution of the participating students, the majority were 23 years old (37.4%), followed by those who were 24 years old (32.5%). It was observed that 95.1% (n=196) of the participants were single and 4.9% (n=10) were married. At the same time, among the information questions asked to the participants; 73.3% (n=151) of the

participants gave the correct answer to the question of how much time should be left between two live vaccines by selecting the option of 4 weeks, 83% (n=171) of the participants gave the correct answer to the question of how much time should be left between two dead vaccines by selecting the option of no need to leave time, and 64% (n=134) of the participants gave

the correct answer to the question of how much time should be left between one dead and one live vaccine by selecting the option of no need to leave time. The distribution of participants' answers to questions about gender, age, marital status, and the time to be left between vaccines is shown in Table-1.

Variable	Category	n	%
<b>Gender</b>	Female	111	53.9
	Male	95	46.1
<b>Age Mean±SD</b>	24.13±1.19		
<b>Age Groups</b>	23-29 Age	206	100.0
<b>Marital status</b>	Married	10	4.9
	Single/divorced	196	95.1
<b>How much time should be left between two live vaccines?</b>	There is no need to leave a deadline.	13	6.3
	2 weeks	24	11.7
	4 weeks	151	73.3
	I don't know	18	8.7
<b>How much time should be left between two dead vaccines?</b>	There is no need to leave a deadline.	171	83.0
	2 weeks	10	4.9
	4 weeks	17	8.3
	I don't know	8	3.9
<b>How much time should be left between a live and a dead vaccine?</b>	There is no need to leave a deadline.	134	65.0
	2 weeks	16	7.8
	4 weeks	19	9.2
	I don't know	37	18.0
<b>Total</b>		206	100.0

**Table-1:**Evaluation of sociodemographic characteristics of the participants and information about vaccination

In response to the question about which of the vaccines recommended for all healthcare workers in the Adult Immunization Guidelines organized by EK-MUD were known, it was observed that students mostly answered hepatitis B (96.1%), hepatitis A (86.4%), diphtheria-tetanus (70.4%) and MMR (63.6%) vaccines. The least well-known vaccines were observed to be the influenza vaccine with 52.4% and the varicella vaccine with 38.3%. Pneumococcal vaccine, which is not included in the routine recommended vaccinations, was the most frequently marked incorrect answer with 43.7%. The distribution of responses to the question is shown in Figure-1. The percentage of participants who knew 4 or more out of the 6 vaccines routinely recommended for health workers was 67% (n=138), while 33% of the participants (n=68) knew 3 or fewer vaccines. It was observed that 15% of the participants (n=31) knew all 6 vaccinations correctly.

When 21 information questions about vaccines recommended for healthcare workers were scored with 1 point for each question, it was observed that the participants had an average knowledge score of 14.29±3.5 regarding vaccines. The percentage of par-

ticipants who answered 11 or more questions correctly is 88.8% (n=183), while the percentage of participants who answered 10 or fewer questions correctly is 11.2% (n=23). It was observed that only 2 participants answered all questions correctly.

The first 3 questions of the 21 knowledge questions are shown in Table 1 and the answer distributions of the remaining 18 knowledge questions are shown in Table 2.

Participants whose source of information was lectures had significantly higher rates of knowing 4 or more vaccines out of the 6 vaccines routinely recommended for health workers than those who received information from publications and health institutions ( $X^2$ : 16,567,  $p<0.001$ ) (Table-3).

Participants who answered 11 or more questions correctly out of 21 knowledge questions had significantly higher rates of knowing 4 or more vaccines among the vaccines routinely recommended for healthcare workers compared to those who knew 10 or fewer questions. ( $X^2$ :10,561,  $p=0.001$ ) (Table-3) However, the numbers of correct answers to knowledge questions did not show a significant difference based on information sources. ( $X^2$ : 1,610,  $p=0.447$ ) (Table-4).

Vaccination information questions	True		False		I Don't Know	
	n	%	n	%	n	%
Primary immunization of all healthcare workers who have not been previously vaccinated should be completed by vaccinating them with 3 doses of tetanus vaccine.	*176	85.4	11	5.3	19	9.2
A Td booster every 10 years, with at least one dose of Tdap, is recommended for all health workers who have completed the primary series.	*173	84.0	7	3.4	26	12.6
Vaccination is not required for those who have a record of measles, rubella and mumps or who have been shown to be immune by laboratory tests.	*168	81.6	21	10.2	17	8.3
Two doses of MMR vaccine are recommended at least 1 month apart.	*109	52.9	42	20.4	55	26.7
Pregnant women can receive MMR vaccine	9	4.4	*170	82.5	27	13.1
Two doses of influenza vaccine are recommended each year.	77	37.4	*87	42.2	42	20.4
Meningococcal vaccine is required for laboratory staff working with meningococcus in the Microbiology laboratory.	*160	77.7	17	8.3	29	14.1
Those with a history of varisella do not need to be vaccinated.	*149	72.3	33	16.0	24	11.7
People with no history of varisella or no vaccination record should have their antibody levels assessed before vaccination.	*136	66.0	36	17.5	34	16.5
Varicella vaccine should be administered in 3 doses at least 4 weeks apart.	58	28.2	*54	26.2	94	45.6
Those who may become pregnant within the first 4 weeks after the administration of the varicella vaccine should not be vaccinated.	*165	80.1	6	2.9	35	17.0
Antibody levels should be assessed prior to hepatitis A vaccination.	*185	89.8	11	5.3	10	4.9
Hepatitis A vaccine should be given in two doses at 6-month intervals.	*146	70.9	16	7.8	44	21.4
No need to check antibody response for hepatitis B vaccination	20	9.7	*168	81.6	18	8.7
Hepatitis B vaccination scheme is 3 doses at 0, 1, 6 months.	*185	89.8	4	1.9	17	8.3
The person is immune if anti-HBs is at least 10 mIU/mL and above.	*161	78.2	6	2.9	39	18.9
If anti-HBs is negative (below 10 mIU/mL), the person should be given 1 dose of Hep-B vaccine again.	115	55.8	*47	22.8	44	21.4
There is no need for a booster dose after the primary administration of Hepatitis-B vaccine.	*66	32.0	87	42.2	53	25.7

The correct answer for the related question is indicated with \*. MMR: Measles-Rubella-Mumps

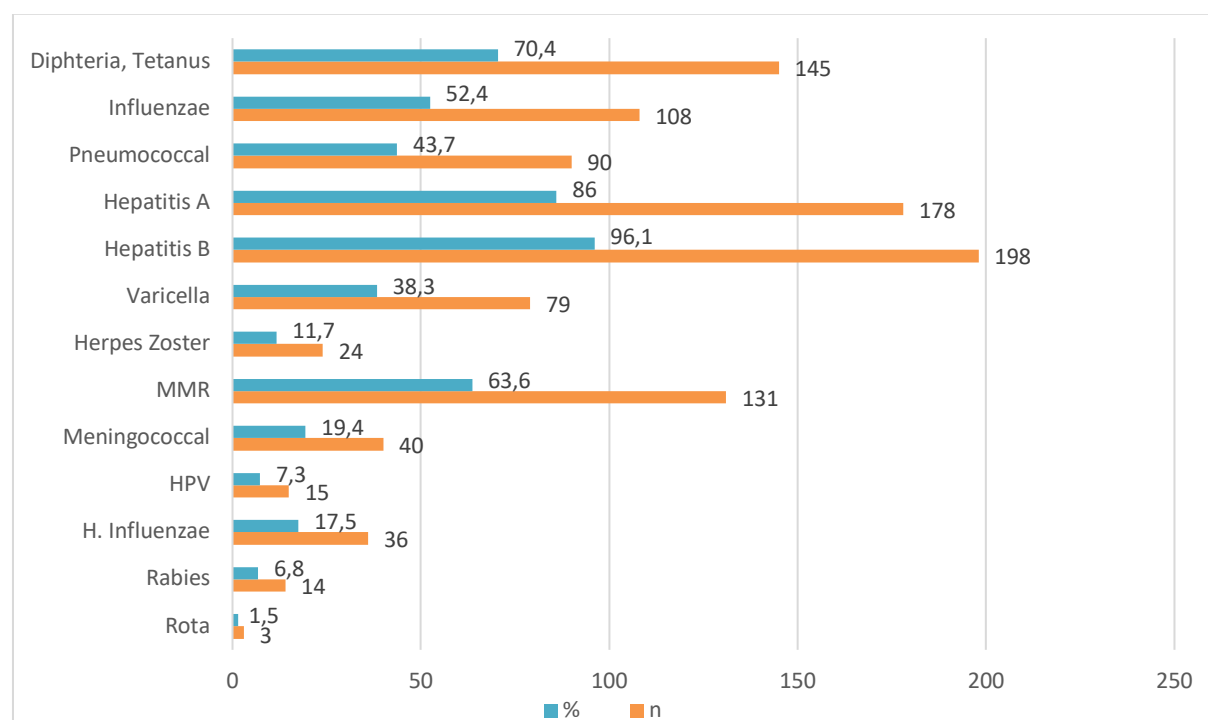
**Table-2:** Distribution of answers to the questions about vaccine-related information asked to the participants

	3 vaccines and below		4 vaccinations and more		X <sup>2</sup>	p
	n	%	n	%		
<b>How many of the knowledge questions they answered correctly</b>						
10 questions or less	15	22.1	8	5.8	10.561	<b>0.001</b>
11 or more questions	53	77.9	130	94.2		
<b>Sources of information</b>						
Lectures	35	51.5	80	58.0	16.567	<b>&lt;0.001</b>
Health institutions	27	39.7	23	16.7		
Media and publications	6	8.8	35	25.4		
<b>Total</b>	68	100.0	138	100.0		

**Table-3:** Sources of information and distribution of correct answers to the information questions of the participants who correctly knew the vaccines recommended for health workers

Sources of information	10 questions or less		11 or more questions		X <sup>2</sup>	p
	n	%	n	%		
Lectures	10	43.5	105	57.4	1.610	0.447
Health institutions	7	30.4	43	23.5		
Media and publications	6	26.1	35	19.1		
<b>Total</b>	23	100.0	183	100.0		

**Table-4:** Distribution of correct answers to information questions according to sources of information



**Figure-1:** Evaluation of responses regarding routine vaccines recommended for health workers (Note: The answers marked more than once by the participants were also taken into consideration)

## DISCUSSION

Vaccination is an effective and reliable healthcare service for the prevention of infectious diseases, aiming to reduce mortality and morbidity associated with infectious diseases. Although childhood vaccinations come to mind when it comes to vaccination, adult vaccinations are just as important. Adult vaccinations are classified according to risk groups; one of the risk groups is the vaccination of healthcare workers. Many professional groups are involved in the provision of healthcare services, and since they are in constant contact with patients and patient materials, contaminated materials, it is important to evaluate the immune status of healthcare workers in terms of both the health of the employees providing services and the patients and patient relatives receiving services. Increasing the level of knowledge of health workers about vaccinations increases participation in recommended vaccinations and prevents problems such as the spread of infectious diseases, loss of workforce and organizational deficiencies [9].

It is important that intern students, who have not yet started their professional life but are in contact with patients, are knowledgeable about health vaccinations in order to prevent the negativities arising from infectious diseases that may arise now and in the future for this reason, in our study, we aimed to examine the knowledge level of intern students studying at Selçuk University Faculty of Medicine about the vaccines routinely recommended for healthcare workers and to raise awareness about these vaccines.

Avcu, in his study investigating the awareness and knowledge levels of 6th grade medical faculty students about adult immunization, reported that the most known vaccination among the vaccinations for healthcare workers was hepatitis-B with 91.3%, covid-19 with 80.1% in the second place, followed by tetanus with 72.8%, influenza with 70.4% in the fourth place, and the least known vaccinations were MMR with 20.9% and varicella with 16.5% [15]. Aşık et al.'s study, which assessed the knowledge, attitudes, and behaviors of adult patients regarding adult immunization, revealed that among the participants, the most prominently recognized vaccine was influenza at 32%, followed by tetanus at 30%. The subsequent rankings included hepatitis-B at 12%, HPV at 9%, pneumococcal at 5%, KKK at 3%, and herpes zoster at 1% [16]. Candan evaluated the awareness of patients applying to a university hospital family medicine outpatient clinic about adult vaccines and their current adult vaccination status, and found that the most common vaccines known by the participants were influenza vaccine (68.5%), hepatitis B vaccine (66.7%), and tetanus vaccine (56.6%) [17]. Similarly, in a study conducted by Johnson et al. in the USA in 2008, the most widely known vaccines were influenza and tetanus vaccines [18].

In our study, it was observed that intern students were most familiar with hepatitis B (96.1%), hepatitis A (86.4%), diphtheria-tetanus (70.4%) and MMR

(63.6%) vaccines among the vaccines recommended for healthcare workers; the least well-known vaccines were influenza vaccine with 52.4% and varicella vaccine with 38.3. Although pneumococcal vaccination, which is not among the vaccines recommended in the routine, was the most frequently marked incorrect answer with 43.7%, it was thought that this situation was due to the fact that pneumococcal vaccination was given to intern students working within our faculty for prophylaxis purposes. In studies involving adults other than healthcare professionals, influenza and tetanus were the most commonly known vaccines, which may be due to the fact that these vaccines are frequently discussed in daily life, injuries are common and acute upper respiratory tract infections are common. The fact that hepatitis B is the most commonly known vaccine among intern students may be due to the high risk of increased transmission due to interventional procedures starting from the internship period in the hospital environment and the evaluation of hepatitis vaccination status in family medicine outpatient clinics before the internship period.

In a study conducted by Çam et al. among adult individuals, participants reported that the most common source of information about immunizations was health personnel (42.9%), followed by TV-radio (18.9%), and the third most common source was internet/social media (12.68%) [6]. In a study conducted by Uyar et al. in individuals over the age of eighteen, it was shown that when participants were asked about the sources of information about vaccination; health professionals (65.3%) and internet/TV (24.2%) were the most common responses [19]. In his study, Avcu reported that the most common source of information about adult immunizations for intern was lecture presentations of faculty members [15]. In our study, it was observed that intern students primarily used lectures (56%) as the main source of information for vaccinations, followed by healthcare institutions (clinics, hospitals, etc.) at the second position (24%), and publications (internet, journals, TV, brochures, etc.) at the least preferred source (20%).

In a study conducted by Ergin et al. with first and sixth-year intern students, they showed that 65.4% of the participants provided incorrect answers to half of the 22 knowledge questions related to adult and childhood vaccinations [11]. In our study, the percentage of participants who answered more than half of the 21 knowledge questions about vaccinations recommended for healthcare workers correctly was found to be 88.8%. It can be thought that the strict attitudes during intern examinations in the occupational medicine outpatient clinic of our hospital and during the training received by intern students in previous periods may have been a factor in achieving this result.

In our study, when the accuracy rates for specific questions asked to participants were examined, it was observed that for the question "If Anti-HBs is negative (below 10 mIU/mL), the person should receive an additional dose of Hepatitis B vaccine," 22.8% (n=47)

of individuals provided the correct answer "False" for the question "Varicella vaccine should be administered in 3 doses with a minimum interval of 4 weeks," 26.2% (n=54) gave the correct answer "False" for the question "It is recommended to administer 2 doses of influenza vaccine every year," 42.2% (n=87) provided the correct answer "False" and for the question "At least 1 month apart, two doses of MMR vaccine are recommended," 52.9% (n=109) gave the correct answer "True". This situation has suggested that intern students, despite having sufficient general knowledge about vaccines, do not possess adequate knowledge about vaccination schedules and dosages.

In our study, participants who identified medical school lectures as their primary source of information were observed to provide more correct answers to the questions compared to other participants. This indicates that any source of information cannot replace the education provided in medical school, emphasizing that aspiring physicians should not neglect their faculty education for access to accurate information and the durability of knowledge.

### CONCLUSION

In our study, the level of knowledge of intern students about vaccines recommended for healthcare workers was measured; it was found that their level of knowledge about vaccine administration doses was lower than their level of knowledge about other issues related to vaccinations. However, it is noteworthy that the number of students who knew all the recommended vaccines for healthcare workers was low in response to the question about what vaccinations are recommended for healthcare workers.

In addition to vaccinations for adults and children, the adequacy of physicians' level of knowledge about health workers is important in terms of both employee safety and the safety of their families and patient sa-

fety, as it will increase participation in vaccinations. For this reason, medical education should pay equal attention to adult and pediatric immunization, as well as immunizations recommended for healthcare workers.

Trainings should be organized for physicians and other health workers in all health care institutions to increase participation in recommended vaccinations. In addition, personal vaccination cards should be issued taking into account the person's age, existing diseases, pregnancy status, gender and occupational status. Ensuring the participation of healthcare personnel in vaccinations and tracking the vaccination schedule is a significant responsibility for family physicians and occupational health physicians in healthcare services.

### Limitations

There are many studies measuring knowledge about vaccinations and immunization, but not many studies measuring knowledge about recommended immunizations for health workers. Our study can be guiding in this regard. The single-center nature of our study is one of its main limitations. The absence of validity and reliability assessment for the questions used in the methodology section is one of the shortcomings of the article.

It may be useful to conduct larger multicenter studies with a higher rate of participation.

Since immunization is critically important for individual and public health, it is crucial that every response provided by healthcare workers is accurate. In this context, it is imperative that we address our own shortcomings and devise solutions for the areas that are lacking.

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