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Original Article

Evaluation of the knowledge, attitudes, vaccine hesitancy, and behaviors of anesthesia technicians on adult vaccination

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Abstract

Background: Anesthesia technicians work in places with a high risk of infectious diseases. Vaccination is one of the most essential methods that protect society and healthcare workers against infectious diseases. This study aims to determine anesthesia technicians' knowledge, behavior, attitude, and vaccine hesitancy.

Methods: A cross-sectional web-based study was conducted between October 2021 and February 2022 at the Ankara Yildirim Beyazit University, Turkiye. A semi-structured and self-reported online survey was recruited to collect data from the Turkish anesthesia technicians' community. Data of 1600 participants have undergone descriptive and univariate analyses to evaluate the differences in mean scores on knowledge, attitudes, and vaccine hesitancy.

Results: The mean age of respondents was 24 years (±6.15). More than two-thirds (79.2%) were females, single (84.9%), aged less than 30 years (88.4%), and unemployed (61.1%); however, 12.4% had chronic diseases. The mean knowledge, attitude, and vaccine hesitancy score were 13.24± 3.22 (range: 0-21), 11.19 ± 3.19 (range: 0-15), and 28.67± 6.64, range: 12–60), respectively. Most respondents had information (1458, 91.1%) about COVID-19 vaccines, and 1247(77.9%) had been vaccinated. However, 240 (16.3%) did not receive vaccines at all compared to 59 (3.7%) who completed the thirteen recommended vaccines in Turkiye. The mean of vaccine hesitancy was significantly higher among females (P=0.001), unemployed (P=0.007), residents in Southeast Anatolia (P=0.001), and those who did not use medication continuously (P=0.016). However, participants aged 40 years and above (P=0.013) showed the lowest mean of vaccine hesitancy than the other age groups.

Conclusion: Appropriate training and guidance might increase the vaccination information and enhance the vaccination rates among anesthesia technicians.

Keywords: Covid-19, Vaccination, Knowledge, Anesthesia Technicians, Vaccination Hesitancy, Turkey

Background

Demographic changes in societies, increase in global travel, migration, and adaptation of microorganisms with these conditions made infectious diseases a renewed threat to the world. [1]. Infectious diseases have caused many epidemics and millions of morbidities and mortalities throughout history (such as the Antonine Plague (165-180 AD), Black Plague (14th century), Typhoid epidemic (19th century), Spanish Flu (19th century), HIV/AIDS (1960), the COVID -19 pandemic (2019), etc. Moreover, infectious diseases were responsible for extending hospital stays, prolonged inability to work, economic loss, and social unrest [2]. Protection against infectious diseases with significant social consequences has always been one of the

goals of humanity. In this sense, there are many methods to combat infectious diseases. The most successful of these methods is vaccination [3]. Furthermore, it is essential to protect groups that work in places with a high risk of infectious diseases, such as healthcare facilities [4]. In vaccination, microorganisms or toxins whose infectious power has been destroyed or weakened are identified and administered to the body to protect a healthy person from the disease. When the body encounters the same microorganisms or toxins again in the future, it stimulates the immune system and destroys the microorganisms [5]. In order to remain healthy throughout life, it is necessary to immunize the entire society in childhood and adulthood through vaccination. In Turkey, the Ministry of Health recommended COVID -19, hepatitis B, influenza, diphtheria, tetanus, pertussis, hepatitis A, chicken pox pneumococcal (pneumonia), measles - mumps - rubella, Haemophilus influenza type b, meningococcus and inactivated polio vaccines for adults [6].

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All those who work in healthcare facilities, including physicians, nurses, anesthesiologists/technicians, and who ensure the continuation of preventive and curative health services are referred to as healthcare workers (HCWs). HCWs employed under the anesthesiologist's responsibility to safely induce, maintain, and terminate anesthesia are anesthesia technicians. In Turkey, HCWs who graduated from a vocational school of health care services until 2017 are referred to as "anesthesia teknisyeni" in Turkish, and those who graduated from a vocational school of health care services of higher education (2 years of post-high school education) in anesthesia programs since 1984-1985 are referred to as "anesthesia teknikleri" in Turkish [7]. However, in this study, we will call both "anesthesia technicians" for simplicity. Priority to vaccination shall be given to those in direct contact with patients, including the anesthesia technicians, to protect them and their patients. However, high vaccine hesitancy rates were recorded among HCWs worldwide. Arghittu et al. [8] found that only 30.6% HCWs in an Italian University Hospital had the "flu vaccination". Tian et al. [9] found that among 1739 Chinees anesthesiologists, 91.9% were exposed to sharps injuries, and 79.4% received three "HBV vaccination doses". However, half of them received reminder HBV vaccination doses. Goins et al. [10] reported that among 1,819 surveyed American HCWs, 13.0% had the intention to get the pertussis vaccine. Moreover, the authors found that 38.0% of those who refused the pertussis vaccine thought there was no risk of getting pertussis. All health professionals, including anesthesia technicians, contribute to delivering health guidance to the population. Therefore, their knowledge, attitudes, and behaviors can help increase immunization coverage. This study aims to assess the knowledge, attitudes, behaviors, and vaccine hesitancy according to recommendations of the Ministry of Health in the Republic of Turkey.

Methods
Study design
A cross-sectional web-based study was conducted between October 2021 and February 2022 at the Department of Public Health, Ankara Yildirim Beyazit University, Turkiye. In response to the health protection procedures imposed due to the COVID-19 pandemic and to improve the accessibility of the whole of Turkey, the survey method was more appropriate to reach the target population. The Google Docs Form was recruited to prepare an online self-reported questionnaire. The link has been shared with many social media sites concerned with disseminating anesthesia-related knowledge.

Inclusion and Exclusion criteria
All Anesthesia technicians who graduated from the department of anesthesia, both genders, using social media regularly and willing to participate, were included in the study. However, Anesthesia students, other health department workers, incomplete data, and those who did not feel willing to participate were excluded from the study.

Sample size
The authors aimed to reach the broader target population (anesthesia technicians). Out of 11064 anesthesia technicians listed in the Republic of Turkey Ministry of Health's personnel

allocation plan [7], about 5000 anesthesia technicians are estimated to use anesthesia-related social media pages. The sample size calculator arrived at 357 participants, using a margin of error of ±5.0%, a confidence level of 95%, a 50% response distribution, and 5000 people. However, 1709 subjects were collected in the system [11]. The final sample was 1600 after excluding 109 none anesthesia technicians.

Study tool
First Sections: This part included the sociodemographic factors such as gender, age (0-22 years, 23-29 years, 30-39 years, 40 years and above), Marital Status, number of children, place of residence, education (Vocational High School, Vocational School), number of years worked, institution (University Hospital, Training and Research Hospital, State Hospital, Private Hospital, Other), the location of the workplace (Central District, Rural District), monthly income, chronic disease status, continuous drug use and chronic diseases in fellow residents.

Second Sections: This part included one question with 12 sub-items according to the "Turkey Vaccine Hesitancy Scales" created by Kiliçarslan and his friends in 2020 [12]. The assessment was based on a 5-point Likert scale. Because the first 4-questions contained statements in favor of the vaccine, they were reverse scored. Participants rated the response to each question between 1 and 5, and survey respondents received a total score between 12 and 60 (inclusive) points. Cronbach's alpha reliability coefficients range from 0.71 to 0.86, corresponding to high-reliability levels.

Third Sections: This part included 11 main questions and ten sub-items established as a result of the literature review to determine the level of knowledge about vaccination in adults. Responses were scored on a 3-point Likert scale. Correct answers were scored 1 point, and incorrect and "I have no idea" answers were scored 0 points. A participant scored between 0 and 21 (inclusive). As the score increases, the level of knowledge increases.

Fourth Section: This part included 15 questions developed from the literature review on adult vaccination to determine the level of attitude. Responses were scored on a 3-point Likert scale. Questions 38, 39, 40, and 46 were reverse scored because they contained statements about vaccine hesitancy. Correct answers were scored 1 point; incorrect and "I have no idea" answers were scored 0 points. A participant scored between 0 and 15 (inclusive) points. As the score increases, the level of attitude increases.

Fifth Section: This part included two questions developed to determine the respondents' information about the recommended vaccines by the Ministry of Health in Turkiye and whether they had received the vaccines.

Dependent and Independent variables
The dependent variables included the level of knowledge, attitude, behavior, and vaccine hesitancy. The independent variables are sociodemographic factors.

Statistical analysis
The collected data were analyzed using the program IBM SPSS version 20.0. In the descriptive results section, categorical variables were presented as numbers and percentages and

continuous variables as mean ± standard deviation and median. We found that the dependent variables, which are "level of knowledge, attitude, behavior, and value of vaccine hesitancy", did not have a Kolmogorov-Smirnov normal distribution. Mann-Whitney U and Kruskal-Wallis tests were used for statistical analysis. The statistical significance threshold was set at $p \leq 0.05$.

Results

Sociodemographic characteristics

A total of 1600 respondents were included in the final analysis. The mean age was 24 ± 6.15 years. Most of them were females (79.2%), single (84.9%), aged less than 30 years (88.4%), unemployed (61.1%), and lived in the Marmara region (31.2%); however, 12.4% had a history of chronic disease. Out of 623 employed respondents, 205(32.9%) work in the private sector within the central district (541, 86.8%). The participants 'characteristics are shown in Table 1.

Table 1. The distribution of participants according to sociodemographic characteristics (N=1600)

Variable	Categorized Variables	N	%
Gender	Male	332	20.8
	Female	1268	79.2
Age Group	0-22 years	879	54.9
	23-29 years	534	33.4
	30-39 years	118	7.4
	40 years and over	69	4.3
Marital Status	Married	241	15.1
	Single	1359	84.9
Number of Children	No Children	1423	88.9
	1 Child	69	4.3
	2 Children or more	108	6.8
Place of Residence (Region)	Marmara	499	31.2
	Aegean	144	9.0
	Mediterranean	153	9.6
	Central Anatolia	447	27.9
	Black Sea	135	8.4
	Eastern Anatolia	107	6.7
	Southeast Anatolia	115	7.2
Education	Vocational High School	63	3.9
	Vocational School of Higher Education	1537	96.1
Number of years worked	Not working	977	61.1
	1 - 9 Years	479	29.9
	10 - 19 Years	89	5.6
	20 Years or more	55	3.4
Work Institution	University Hospital	41	2.5
	Training and Research Hospital	162	10.1
	State Hospital	161	10.1
	Private Hospital	205	12.9
	Other	54	3.3
	Not working	977	61.1
District of Workplace	Central District	541	86.8
	Rural District	82	13.2
Monthly Income	3000 TL or less	1034	64.6
	3001 - 5000 TL	251	15.7
	5001 - 7000 TL	241	15.1
	7001 TL or more	74	4.6
Chronic Disease Status	Yes	199	12.4
	No	1401	87.6
Continuous Medication Use	Yes	38	2.6
	No	1399	97.4
Chronic Disease Status in Fellow Residents	Yes	675	42.2
	No	925	57.8

Level of knowledge

The mean knowledge score was 13.24 (± 3.22) (range: 0-21), giving an overall 63.05% (13.24 /21*100) correct response. The knowledge score was significantly higher among respondents who were males (13.70 ± 3.40, P=0.001), aged 40 years and above (14.39 ± 3.22, P<0.001), married (13.74 ± 3.18, P=0.005), had 2 Children or more (14.49 ± 3.27, P=0.009), the experience of 20 years and above (14.49 ± 3.27, P<0.001), monthly income of 7001 TL and above (14.47 ± 3.17, P<0.001), history of chronic disease (13.84 ± 3.27, P=0.001), and those continuously use medication (13.64 ± 3.35, P=0.030), respectively.

Information and behavior towards vaccination

Table 3 presents the participants' responses about whether they have information about the recommended list of vaccines by the Republic of Turkey (Ministry of Health) or not and whether they have received the vaccine. The first three most well-known vaccines by respondents were COVID -19 (91.1%), hepatitis B (70.0%), and influenza (60.8%). While the least known vaccines are inactivated polio (14.6%), meningococcal (14.8%), and Hemophilus influenza type b (23.3%). Moreover, more than half of the respondents do not know about hepatitis A, pneumococcal, and measles - mumps - rubella vaccines. The most frequently administered vaccines by participants were COVID -19 (77.9%), hepatitis B (63.4%), and measles-rubella-mumps (53.8%). Meningococcal vaccine, Hemophilus influenza type B vaccine, and inactivated polio vaccine were the least used vaccines (10.5%). Furthermore, diphtheria, pertussis, varicella, hepatitis A, pneumococcal, influenza, and diphtheria-tetanus-acellular pertussis vaccinations were administered among less than half of the participants.

Adult vaccines taken by respondents

Table 4 shows the percentage of adult vaccines taken by respondents. The list of recommended vaccines by the Ministry of Health in Turkey included thirteen vaccines. Two hundred and sixty (16.3%) respondents declared that they did not receive any vaccine. The highest percentage of the taken vaccines was reported by 270 (16.9%), 224 (14.0%), and 198(12.4%) respondents for the three, two, and four vaccines, respectively. However, 21(1.3%) of respondents received only one vaccine, and 59(3.7%) received all the thirteen recommended vaccines.

Table 2. Distribution of participants' knowledge level scores on sociodemographic characteristics (N=1600)

Variable	Categorized Variables	Mean Knowledge Score (± SD)	P value
Gender*	Male	13.70 ± 3.40	0.001
	Female	13.12 ± 3.16	
Age Group **	0-22 years	13.14 ± 3.25	<0.001
	22-29 years	13.10 ± 3.14	
	30-39 years	13.99 ± 3.21	
	40 years and over	14.39 ± 3.22	
Marital Status *	Married	13.74 ± 3.18	0.005
	Single	13.15 ± 3.22	
Number of Children **	No Children	13.16 ± 3.21	0.009
	1 Child	13.65 ± 3.06	
	2 Children or more	14.02 ± 3.31	
Place of Residence (Region)**	Marmara	13.27 ± 3.06	0.107
	Aegean	13.61 ± 3.04	
	Mediterranean	13.56 ± 3.40	
	Central Anatolia	13.24 ± 3.28	
	Black Sea	13.37 ± 3.31	
	Eastern Anatolia	12.61 ± 3.36	
	Southeast Anatolia	12.63 ± 3.28	
Education *	Vocational High School	13.20 ± 3.90	0.393
	Vocational School of Higher Education	13.24 ± 3.19	
Number of years worked **	Not working	13.00 ± 3.28	<0.001
	1 - 9 Years	13.38 ± 3.00	
	10 - 19 Years	14.40 ± 3.26	
	20 years or more	14.49 ± 3.27	
District of Workplace *	Central District	13.67 ± 2.97	0.679
	Rural District	13.26 ± 3.78	
Work Institution**	University Hospital	13.63 ± 3.11	0.525
	Training and Research Hospital	13.64 ± 3.24	
	State Hospital	13.52 ± 3.22	
	Private Hospital	13.83 ± 2.94	
	Other	13.01 ± 2.74	
Monthly income**	3000 TL or less	13.03 ± 3.24	<0.001
	3001 - 5000 TL	13.40 ± 3.14	
	5001 - 7000 TL	13.61 ± 3.11	
	7001 TL or more	14.47 ± 3.17	
Chronic Disease Status*	Yes	13.84 ± 3.27	0.001
	No	13.15 ± 3.20	
Continuous Medication Use*	Yes	13.64 ± 3.35	0.030
	No	13.18 ± 3.20	
Chronic Disease Status in Fellow Residents*	Yes	13.26 ± 3.07	0.883
	No	13.23 ± 3.22	

Table 3. Participants' information and behavior towards vaccines recommended by the Republic of Turkey Ministry of Health (n=1600).

Vaccines	Has Information N (%)	No Information N (%)	Has Vaccinated N (%)	Not Vaccinated N (%)
COVID-19	1458 (91.1)	142 (8.9)	1247 (77.9)	353 (22.1)
Hepatitis B	1120 (70.0)	480 (30.0)	1015 (63.4)	585 (36.6)
Influenza	973 (60.8)	627 (39.2)	435 (27.2)	1165 (72.8)
Diphtheria	924 (57.8)	676 (42.3)	568 (35.5)	1032 (64.5)
Tetanus	924 (57.8)	676 (42.3)	568 (35.5)	1032 (64.5)
Pertussis	924 (57.8)	676 (42.3)	568 (35.5)	1032 (64.5)
Hepatitis A	762 (47.6)	838 (52.4)	619 (38.7)	981 (61.3)
Chickenpox	755 (47.1)	845 (52.9)	791 (49.4)	809 (51.6)
Pneumococcus	703 (43.9)	897 (56.1)	241 (15.1)	1359 (84.9)
Measles - Mumps – Rubella	577 (36.1)	1023 (63.9)	860 (53.8)	740 (46.3)
Hemophilus Influenza type b	372 (23.3)	1228 (76.8)	168 (10.5)	1432 (89.5)
Meningococcus	237 (14.8)	1363 (85.2)	168 (10.5)	1432 (89.5)
Inactive Polio	233 (14.6)	1367 (85.4)	168 (10.5)	1432 (89,5)

Table 4. Number of vaccinations taken by participants

Vaccination Count	N	%
0	260	16.3
1	21	1.3
2	198	12.4
3	270	16.9
4	224	14.0
5	188	11.8
6	147	9.2
7	82	5.1
8	44	2.8
9	32	2.0
10	34	2.1
11	18	1.1
12	23	1.4
13	59	3.7

Level of attitude Vaccine Hesitancy

The mean attitude score was 11.19 ($\pm$ 3.19) (range: 0-15), giving an overall 74.6% (11.19 /15*100) correct response. However, none of the sociodemographic factors significantly affect the mean attitude score (p > 0.05). Therefore, we did not include the related data.

Vaccine Hesitancy

The mean vaccine hesitancy score was 28.67 ($\pm$ 6.64) (range: 12-60), giving an overall 47.8% (28.67 /60*100) correct response. The mean vaccine hesitancy score was significantly higher among respondents who were females (28.98 $\pm$ 6.70, P=0.001), unemployed (28.93 $\pm$ 6.60, P=0.007), resident in Southeast Anatolia (30,80 $\pm$ 6,67, P=0.001), and those who did not use drugs continuously (28.78 $\pm$ 6.56, P=0.016), however, respondents aged 40 years and above (26.10 $\pm$ 5.23, P=0.013) have the lowest mean vaccine hesitancy score than the other age groups. The distribution of participants' hesitancy rate to vaccination by sociodemographic structure is shown in Table 5.

Discussion

To our knowledge, this study is the first national study to explore Turkish anesthesia technicians' knowledge, attitude, behavior, and vaccination hesitancy rates. The mean knowledge score was 13.24 ($\pm$ 3.22), with a 63.05% correct knowledge rate about the vaccine. About two-thirds of our sample (anesthesia technicians) answered the information questions correctly because any knowledge about vaccination is very valuable. Moreover, the rate of those who answered all information questions correctly was acceptable, indicating adequate vaccination training during education and in-institution training of anesthesia technicians. A German study reported a similar finding [13]. Authors reported that the level of knowledge was average to very good among 93.3% of respondents. Moreover, the knowledge increases with advanced training. Oğuzöncül et al. [14] found that the knowledge of family physicians about the vaccine in Elazığ province (Turkey) was 7.59 ($\pm$ 2.17), with a 63.25% correct answer rate. El-Sanafi and Sallam [15] found that the COVID-19 vaccine acceptance rate was 83.3% among HCWs in Kuwait, and the vaccine hesitancy rate was higher among females than males. A systematic review and meta-analysis study conducted by Zintel et al. [16] reported that

58.0% of articles from different countries indicated that fewer females had the intention to get vaccinated than males, "OR 1.41 (95% CI 1.28 to 1.55)". Moreover, HCWs showed a bigger difference compared to the general population. Similarly, in our study, the male gender has more knowledge about vaccination than the female (13.70 $\pm$ 3.40, P=0.001). The reason why the knowledge level of men about vaccination was higher than that of women might be because women have just started their profession, and their average age and work experience are lower than that of their male counterparts. The vaccination knowledge was higher among anesthesia technicians older than 40 years than in other age groups. Similar to our study, Al-Hanawi et al. [17] found that willingness to get vaccinated was higher among Saudi males aged fifty years and above than their counterparts "an OR: 2.277; 95% CI: 1.092 to 4.745". Margüello et al. [18] indicated that respondents aged 65 years and older were positive toward the benefits of vaccines and their effectiveness". Unlike our finding, Oğuzöncül et al. [14] reported that there was no association between the age group of HCWs and vaccine knowledge level [15]. The reason behind the high level of knowledge among people aged 40 years and older is the increasing awareness of diseases with age. The elderly see vaccination as a preventive health service, especially due to the deadly impact of the COVID -19 pandemic on the advanced age group, quarantine, vaccination, etc. Moreover, the increase in vaccination information may be due to the use of precautions, especially in older age groups. In this study, the participants with chronic diseases (P=0.001) and constant drug use (P=0.030) were more informed about vaccination. Similarly, Medetalibeyoglu et al. [19] reported that more than fifty percent of patients admitted to intensive care units due to infectious diseases, especially during the pandemic COVID -19, had chronic diseases and were constantly taking drugs. The high awareness of people with chronic diseases and the need to take medications continuously is that the recovery process is more difficult when exposed to infectious diseases. They may spend part of their treatment in the ICU. For this reason, they are thought to be receptive to vaccination to protect themselves, and therefore their level of knowledge is high. The top three vaccines acknowledged by our sample were COVID-19, hepatitis B, and influenza vaccines. In a recent Turkish study conducted by Han-Yekdeş et al. [20], the top three vaccines recommended and surveyed by physicians were hepatitis B, influenza, and tetanus-diphtheria. Several reasons might explain why the COVID-19 vaccine topped the list of the most known vaccine among our respondents; for example, the pandemic is still active, and the COVID-19 vaccine has rapidly been used worldwide. Moreover, information about the COVID-19 vaccine has been disseminated throughout social media and mass media. The hepatitis B vaccine is rated after the COVID-19 vaccine because anesthesia technicians are among the healthcare providers who might expose to workplace injuries due to handling the piercing and cutting tools. Therefore, the possibility of hepatitis B infection is very high. Moreover, examining the hepatitis B serum antibodies is routine during periodic health checks. Acikgoz et al. [21] reported that 86.0% of the healthcare students received the hepatitis B vaccine. Dayyab et al. [22] found that 44.51% of the surveyed Nigerian HCWs had good knowledge of the hepatitis B vaccine, and 46.70% received at least one vaccine against it.

Table 5. Distribution of participants' hesitancy rate to vaccination on sociodemographic characteristics (n=1600)

Variable	Categorized variables	Mean Hesitancy Score ($\pm$ SD)	P value
Gender*	Male	27.49 ± 6.25	<0.001
	Female	28.98 ± 6.70	
Age Group**	0-22 years	28.81 ± 6.53	0.013
	23-29 years	28.68 ± 6.49	
	30-39 years	29.08 ± 9.39	
	40 years or more	26.10 ± 5.23	
Number of Children **	No Children	28.73 ± 6.54	0.152
	1 Child	27.26 ± 6.36	
	2 Children or more	28.73 ± 7.98	
Place of Residence (Region)**	Marmara	28.23 ± 6.35	0.001
	Aegean	28.44 ± 6.86	
	Mediterranean	28.08 ± 6.68	
	Central Anatolia	28.51 ± 6.85	
	Black Sea	29.10 ± 5.70	
	Eastern Anatolia	29.66 ± 7.35	
	Southeast Anatolia	30.80 ± 6.67	
Marital Status *	Married	28.52 ± 7.44	0.307
	Single	28.70 ± 6.49	
Education *	Vocational High School	28.35 ± 6.44	0.517
	Vocational School of Higher Education	28.68 ± 6.65	
Number of years worked **	Not working	28.93 ± 6.60	0.007
	1 - 9 Years	28.46 ± 6.43	
	10 - 19 Years	28.55 ± 8.07	
	20 years or more	26.02 ± 6.16	
District of Workplace *	Central District	28.09 ± 6.61	0.229
	Rural District	28.83 ± 6.88	
Work Institution**	University Hospital	29.29 ± 8.49	0.330
	Training and Research Hospital	27.87 ± 6.69	
	State Hospital	28.34 ± 6.32	
	Private Hospital	27.92 ± 6.37	
	Other	29.69 ± 7.27	
Monthly income**	3000 TL or less	28.90 ± 6.62	0.199
	3001 - 5000 TL	28.55 ± 6.90	
	5001 - 7000 TL	28.10 ± 6.43	
	7001 TL or more	27.72 ± 6.58	
Chronic Disease Status*	Yes	28.19 ± 6.96	0.118
	No	28.74 ± 6.59	
Continuous Medication Use*	Yes	27.91 ± 7.15	0.016
	No	28.78 ± 6.56	
Chronic Disease Status in Fellow Residents*	Yes	28.67 ± 6.63	0.659
	No	28.67 ± 6.56	

The influenza vaccine takes a healthy and economic dimension due to the settlement of influenza as endemic, especially in large cities. Sometimes influenza turns into epidemics, causing a burden on employees and health institutions. Employers are often forced to grant workers healthcare at no cost, especially during the fall months. Unlike our findings, Arghittu et al. [8] reported that 30.6% of Italian HCWs received the flu vaccination. Furthermore, inactivated polio, meningococcal, and Haemophilus influenza type b vaccines occupy the last three list items. In fact, the anesthesia technicians have less knowledge about the three vaccines mentioned above because they are either rarely exposed to these infections or because the usual preoperative tests do not include inactive polio, meningococcal, and Haemophilus influenza type b vaccination as it should be done about COVID -19, hepatitis, etc. Han-Yekdeş et al. [8] reported that Turkish physicians recommended and surveyed the least known vaccines, the five-mix vaccine, the meningococcal vaccine, and the human papillomavirus vaccine. The participants' attitude level was 74.6%, with a mean of 11.19 ± 3.19. Our result was consistent with an earlier study conducted by Pelullo et al. [23] among Italian HCWs. The authors reported that the level of attitude towards adult vaccines was high. furthermore, the high level of attitude in the current study might be that anesthesia technicians, like all other

healthcare workers, want to protect themselves, their environment, and their patients. A systematic review [24] to assess the attitude toward COVID-19 vaccination found that "two-thirds" of the reviewed articles have a "positive attitude (≥50%)" compared to one-quarter that showed a negative attitude (<50%)". Sociodemographic, professional, and factors related to the safety of vaccines might stand against the acceptance of the vaccine. Similarly, in our study, the immunization knowledge of anesthesia technicians was acceptable, and their attitude was positive. The percentage of anesthesia technicians who did not have adult vaccination was 16.3%. A similar finding was reported by Scatigna et al. [25]. The authors found that most HCWs in a hospital setting had significantly inadequate vaccination rates. Unlike our finding, Pelullo et al. [23] reported that the rate of HCWs who had received at least one vaccination was 16.9%, compared to 1.3% in our study. The average number of vaccinations received by our participants was four, and the rate of those who received all vaccinations was only 3.7%. Our result was inconsistent with Pulello et al. [23]. The authors found that 14.1% of respondents were aware of all recommended vaccinations. In evaluating these results, it was noted that the vaccination rates of the anesthesia technicians in our study were low. The reason for this could be the lack of active campaigns for all adult vaccines, the lack of information about vaccines, the hesitation expressed by nonprofessionals on social media, the fact that some vaccines have a cost, the idea that some vaccines are only for children, and the lack of sufficient information about adult vaccination. Similar to our study, Graitcer et al. [26] reported in a study of health care workers that the number one reason for unvaccinated individuals was the "lack of an active offer for vaccines. In our study, the most applied vaccines were COVID - 19, hepatitis B, and measles - mumps – rubella vaccines. The first two vaccines anesthesia technicians knew the most about and the first two vaccines they were administered showed parallels. However, the third most commonly known influenza vaccine lagged behind in use. This could be because people thought the flu vaccine's effectiveness was low. In addition, the low reported cases of influenza in 2021 during the COVID -19 pandemic might be due to masking, social distance, and cleaning measures leading to an increase in the reluctance to vaccinate. About half (47.8%) of the respondents have vaccine hesitancy. Different rates have been reported across the HCWs in Turkey. İkiışık et al. [27] reported that the vaccine hesitancy rate was 29.0%, and 20.7% of respondents refused the COVID-19 vaccine in a "district of Istanbul city". Kaya et al. [28] found that 48.8% of surveyed midwives had vaccine hesitancy, and 10.5% declared that they disliked getting vaccinated. Karamüftüoğlu et al. [29] indicated that 12.9% of the studied dentist had not been vaccinated yet. El-Sanafi et al. [18] [30] reported that the rate of vaccination hesitancy among Kuwaiti HCWs was 7.7%, and 9.0% refused the vaccine. In our study, the vaccination hesitancy was higher among women than men. İkiışık et al. [27] showed that male doctors had a higher acceptance rate than females. Yilmaz et al. [31] briefly reported that fear and lack of confidence were the most cited reasons related to vaccine hesitancy among HCWs. In addition to the average age and professional experience, pregnancy and breastfeeding were the most common reasons for vaccine hesitancy among females. The anesthesia technicians aged 30-39 showed more vaccine hesitancy than the other age groups. Indeed, the young age group feels healthier and has fewer chronic diseases. Moreover, the Southeastern Anatolia region showed more vaccine hesitancy than other regions in Turkey for reasons related to the representative sample. The unemployed anesthesia technicians have more vaccine hesitancy than the employed participants. The people who regularly attend a workplace prefer to be vaccinated for self-protection due to the high working environment risk. There is a significant difference in the rate of vaccination hesitancy in those who do not have a chronic disease and do not take medications compared to their counterparts. Healthy people are less receptive to preventive health services and do not emphasize vaccination because they do not feel at risk. The lack of a standard scale to measure vaccine knowledge and participant attitudes in the literature and the inability to reach our entire universe because of COVID-19 conditions represent limitations of the research. In addition, the fact that our study has a cross-sectional design creates a limitation for revealing causality.

Policy Implication

In Turkey, employment in the healthcare field is increasing, especially due to the new city hospitals, the increase in private sector investment in healthcare, and the development of health tourism. In parallel, the number of anesthesia technicians is increasing daily, which is an important part of the Ministry of Health. However, there are no direct studies in the literature about anesthesia technicians' views on immunization, either in our country or worldwide. However, few studies generalized under the name of "other healthcare workers". Our study might help fill this gap in the literature. Anesthesia technicians typically receive information about vaccinations during the school period and in-institution education courses. Notably, during the COVID-19 pandemic, both face-to-face and in-institution collective training were suspended and replaced with online training. In parallel, both the number and followers of social media sites offering anesthesia training increased, especially the pages that provide anesthesia training, such as "anestezi_günlüğü", "ahmetemreazaklı", anestezinin_içsesi", etc. Some pages have more than 10 thousand followers, of which about 5000 are anesthesia technicians. Such pages became an effective mass communication and educational tool throughout the country. We thank the educational posts they publish both immediately and repeatedly.

Conclusion

In conclusion, 63.05% of Turkish anesthesia technicians showed adequate knowledge, and 74.6% expressed a high attitude toward adult vaccination. Therefore, 91.1% of participants had information about COVID-19 vaccines, and 77.9% received the vaccine. However, the vaccine hesitancy rate was 47.8% among anesthesia technicians, and only 3.7% had completed the thirteen vaccines recommended by the Ministry of Health in Turkey. Females have higher vaccine hesitancy than males (P=0.001) and unemployed anesthesia technicians (P=0.007). The old respondents (40 years and above) had the lowest vaccine hesitancy of the other age groups (P=0.013). We recommend raising the level of knowledge and reducing hesitation against vaccines by adopting training of anesthesia technicians on social media.

Abbreviation

AD: After Christ; HIV: Human Immunodeficiency Virus; AIDS: Acquired Immune Deficiency Syndrome; COVID-19: Coronavirus Disease-2019; IBM: International Business Machines; SPSS: Statistical Package for the Social Sciences; SD: Standard Deviation; ICU: Intensive Care Unit; OD: Odis Ratio

Availability of data and materials

Data will be available by emailing serdalkerem19@gmail.com

Authors' contributions

All authors equally contributed to the concept, design, literature search, data analysis, data acquisition, manuscript writing, editing, and reviewing. All authors have read and approved the final manuscript.

Ethics approval and consent to participate

We conducted the research following the Declaration of Helsinki. The protocol was approved by Ankara Yildirim Beyazit University Ethics Committee (Ref: SR/05 at 22-September-2021); In addition, web-based informed consent was obtained from each participant after the study objectives and confidentiality guarantee was explained.

Consent for publication

Not applicable

Competing interest

The authors declare that they have no competing interest.

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