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Determination of Pneumococcal Vaccination Status and Knowledge Levels of Inpatients-A Point Prevalence Study

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What's known on the subject? and What does the study add?

Pneumococcal vaccination rates remain low globally, often due to lack of awareness and vaccine hesitancy, further exacerbated by the COVID-19 pandemic. This study reveals that education significantly improves vaccination uptake, yet 35.8% of patients became less willing to vaccinate post-pandemic, emphasizing the need for targeted awareness campaigns in high-risk groups.

Abstract

Aim: This study is a point prevalence survey study conducted to determine the status of pneumococcal vaccination in hospitalized patients, to measure the level of knowledge about pneumococcal vaccination and to increase awareness afterwards.

Methods: Data was collected by a questionnaire to measure demographic characteristics, pneumococcal vaccination status, confidence in the vaccine and knowledge about the vaccine.

Results: A total of 409 patients participated in the study. Vaccination rates were higher in individuals with risk factors for pneumococcal vaccination ($p<0.05$). In addition, higher vaccination rates were found in those with higher knowledge about pneumococcal vaccination ($p<0.001$).

When these variables evaluated in multivariate analysis, only receiving training about pneumococcal vaccination was found to be statistically significant ($p <0.001$). The rate of patients whose willingness to vaccination was negatively affected after the COVID-19 pandemic was 35.8%.

Conclusions: In our study, pneumococcal vaccination rates and knowledge levels were found to be low. Studies should be conducted to increase awareness and willingness for vaccination, especially in patients in risk groups.

Keywords: ***Pneumococcal vaccine*, *Knowledge*, *Awareness***

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Introduction

Streptococcus pneumoniae (S. pneumoniae) is an encapsulated bacterium with more than 90 serotypes identified [1]. It is the most common bacterial agent of community-acquired pneumonia, acute meningitis, and sinusitis. It accounts for approximately 20-25% of community-acquired pneumonia agents, but this rate is estimated to be much higher when unidentified pneumonia agents are considered. In the United States, there are 150.000 hospitalizations due to pneumococcal pneumonia each year, and the mortality rate is 5.7%. Although bacteremia and meningitis are less common, mortality is higher; one in every six elderly people infected with pneumococcal meningitis and one in every eight adults who develop bacteremia die [2]. When we look at the pre-COVID-19 period, according to the World Health Organization data, pneumonia and other respiratory tract infections are the first infectious diseases that cause death and the fourth among all causes [3]. Considering all these data, the importance of adult pneumococcal vaccination is understood.

Vaccination is one of the most effective and successful methods in preventing infections associated with immune deficiency and possible health problems [4]. While national programs and awareness about childhood vaccination worldwide exist, adult vaccination remains in the background [5]. In our country, the latest guidelines recommend pneumococcal vaccination for chronic obstructive pulmonary disease, chronic heart disease *(CHD),* DM, chronic liver disease, chronic kidney failure (CKF), people living in nursing homes, functional or anatomic asplenia, immunosuppressive diseases *(malignancy, congenital or acquired immune deficiencies, organ transplantation, immunosuppressive treatment),* cochlear implants, cerebrospinal fluid leaks and HIV infection [6].

This study aimed to evaluate the pneumococcal vaccination rates and knowledge levels of inpatients.

Methods

This study was designed as a cross-sectional point prevalence study to assess awareness and measure the level of knowledge regarding pneumococcal vaccination among hospitalized patients. The study was conducted in a tertiary education and research hospital in Turkey. Patients receiving inpatient treatment in the following departments were invited to participate: cardiovascular diseases, neurology, cardiology, physical therapy and rehabilitation, gynecology and obstetrics, infectious diseases, internal medicine, oncology, pulmonology, neurosurgery, urology, otolaryngology, thoracic surgery, general surgery, orthopedics, and nephrology.

Patients who agreed to participate in the study completed a structured questionnaire on pneumococcal vaccination, with assistance from a physician when necessary. Upon completing the survey, participants were provided with recommendations and educational information regarding pneumococcal vaccination.

Inclusion criteria consisted of patients aged 18 years and older, who were hospitalized and consented to participate in the study. Exclusion criteria included patients who did not speak Turkish, had difficulty understanding the questionnaire, or were unable to respond independently. Additionally, patient relatives and outpatient clinic patients were excluded.

The questionnaire comprised 11 questions evaluating:

- Demographic characteristics (age, gender, education level, marital status, place of residence, and income status).
- Hospitalization details (internal medicine or surgical department).
- Comorbidities (e.g., chronic obstructive pulmonary disease [COPD], coronary heart disease [CHD], chronic renal failure [CRF], diabetes mellitus [DM], and immunosuppressive conditions).
- Pneumococcal vaccination status and history of receiving vaccine-related education.

- Perceptions and knowledge regarding pneumococcal vaccination, including confidence in the vaccine.

For further analysis, patients were categorized into two groups based on their admission department: internal medicine and surgical services.

Ethical considerations

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation *(institutional and national)* and with the Helsinki Declaration of 1975, as revised in 2008. Ethics committee approval has been granted from our institution *(Health Sciences University Bursa High Specialization Training and Research Hospital)* with protocol number 2011-KAEK-252023/11-07, and informed consent has been obtained from all participants.

In order to assess the participants' knowledge levels regarding vaccines, a 6-question survey was created by the researchers. These questions were determined by expert physicians in the field and by reviewing the literature. The questions in the survey form consist of 6 questions that include the necessity of vaccination for those over the age of 65, opinions on vaccination for chronic diseases and opinions on the necessity of vaccination for people with immunodeficiency.

Statistical Analysis

SPSS software version 26.0 was used for statistical analysis. Categorical variables were presented as absolute frequency and percentage *"n (%)"*, and continuous variables were presented as mean ± *SD*. The characteristics of both groups categorized in terms of pneumococcal vaccination status and service types were compared using *Pearson's chi-square test or Fisher's exact test for categorical variables*. *Logistic regression analysis* was performed for statistically significant data, and *$p<0.05$ was considered statistically significant*. The validity of the vaccine questionnaire was examined with *Exploratory Factor Analysis* (EFA) and its reliability was examined with *Cronbach's a Logistic regression analysis*.

Results

A total of 409 patients participated in the study. It was found that 71 patients *(17.4%)* had pneumococcal vaccination. The mean age was 56.1 ± 18.6, and 39.4% of the patients were 65 and over. The mean age was higher in those who had pneumococcal vaccination *($p=0.025$)*. In terms of gender, 50.6% of the patients were female, and 49.4% were male. The pneumococcal vaccination rate was higher in males than in females *(19.8% and 14.9%, respectively)*. Regarding educational status, 38.6% of the patients *(n=136)* had secondary, high, and university-level education. The majority of the vaccinated patients *(70.4%)* lived in the city center. Income was less than expenses in 34.3% of the patients *(n=140)*. Concerning pneumococcal vaccination, there was no significant relationship between the patient's gender, hospitalization type, marital status, education level, place of residence and income level *(Table 1)*.

Table 1. *Demographic data of patients and pneumococcal vaccination status according to underlying conditions*

Demographic data		Total	Getting a pneumococcal vaccine		*p-value*
			Yes 71 (17.4)	No 338 (82.6)	
Age		56.1 ± 18.6	60.63±17.32	55.20±18.74	0.025
Gender	Female	207 (50.6)	31 (43.7)	176 (52.1)	0.198
	Male	202 (49.4)	40 (56.3)	162 (47.9)	
Service type	Internal Medicine	184 (45)	39 (54.9)	145 (42.9)	0.064
	Surgical Services	225 (55)	32 (45.1)	193 (57.1)	
Level of education	Illiterate	49 (12)	7 (9.9)	42 (12.4)	0.737
	Literate	202 (49.4)	38 (53.5)	164 (48.5)	
	Secondary school	69 (16.9)	14 (19.7)	55 (16.3)	
	High school	54 (13.2)	7 (9.9)	47 (13.9)	
	University	35 (8.6)	5 (7)	30 (8.9)	
Marital status	Married	339 (82.9)	61 (85.9)	278 (82.2)	0.450
	Single	70 (17.1)	10 (14.1)	60 (17.8)	
Residency	Provincial Center	268 (65.5)	50 (70.4)	218 (64.5)	0.340
	Other	141 (34.5)	21 (29.6)	120 (35.5)	
Income level	Income is less than the expense	140 (34.3)	22 (31)	118 (34.9)	0.719
	Income equals expense	183 (44.9)	36 (50.7)	147 (43.5)	
	Income is more than expense	23 (5.6)	3 (4.2)	20 (5.9)	
	I don't want to specify	63 (15.4)	10 (14.1)	53 (15.7)	
Underlying conditions					
Participants with risk factors		255 (62.3)	56 (78.9)	199 (58.9)	0.002
65 years and older		161 (39.4)	36 (50.7)	125 (37)	0.031
DM		114 (27.9)	28 (39.4)	86 (25.4)	0.017
Immunosuppressive disease		57 (13.9)	15 (21.1)	42 (12.4)	0.054
CHD		45 (11.1)	9 (12.7)	36 (10.7)	0.620
COPD		35 (8.6)	11 (15.5)	24 (7.1)	0.022
CKF		34 (8.3)	11 (15.5)	23 (6.8)	0.016
Pneumococcal vaccine training		31 (7.6)	16 (22.5)	15 (4.4)	<0.001

There were 255 patients *(62.3%)* with underlying risk factors for pneumococcal diseases. The pneumococcal vaccination rate in these patients was 21.9%, significantly higher than those without risk *(p =0.002)*. The group aged 65 and over was in first place among participants with risk factors *(39.4%)*. The highest vaccination rate was in patients with CKD diagnosis, at 32.4%. Pneumococcal vaccination rates were significantly higher in individuals aged 65 and over *(p =0.031)*, DM (p =0.017), COPD *(p =0.022)* and CKD *(p =0.016)*. The rate of those who received training on pneumococcal vaccination was 7.6%, and 70.6% of them received information from a physician. The status of receiving pneumococcal vaccination training was significantly higher in those who were vaccinated *(22.5%)* than in those who were not *(4.4%) (p <0.001) (Table 1)*. When the factors that significantly affected vaccination rates *(age, DM, CKD, etc.)* were re-evaluated with multivariate analysis, a significant relationship was found only between receiving training in terms of pneumococcal vaccination beforehand and a high vaccination rate *(p <0.001)*. The rate of those who wanted to receive

pneumococcal vaccination after being informed was 28%. The most common reasons for not getting vaccinated were distrust of the vaccine *(20.4%) (n=47),* vaccine side effects *(16.9%) (n=39),* and not knowing about the vaccine *(10%) (n=23)*. Other reasons for not getting vaccinated, as stated by the patients, were as follows, *"I did not know the vaccine was free", "I do not need it", "I am afraid of needles", "I am old", "I could not access the vaccine", "I take a lot of medicine", "I should consult my doctor", "I think I will not get sick", "I have suspicions of cancer", "I have additional diseases" were stated.*

When the patients were evaluated according to the internal and surgical services, the number of those who received training on pneumococcal vaccination was similar in both groups. In contrast, those who had received pneumococcal vaccination *(21.2% & 14.2%)* and those who wanted to receive it *(35.5% & 21.9%)* were higher in the internal service group. In addition, the level of knowledge about pneumococcal vaccination in patients hospitalized in internal services was statistically significantly higher than in surgical services *(Table 2)*.

Other vaccines the patients had received in the last three years were 71.9% COVID-19 and 9.3% flu vaccine *(Table 2)*. Of the participants who had received pneumococcal vaccination, 70.4% *(n=50)* had received the COVID vaccine and 18.3% *(n=13)* had received the flu vaccine. While no relationship was found between receiving the pneumococcal vaccine and those who received the COVID-19 vaccine *(p =0.773),* the rate of receiving the pneumococcal vaccine was higher in those who received the flu vaccine *(p =0.011)*.

Table 2. *Pneumococcal vaccination status and knowledge levels of patients according to the type of service*

		Internal Medicine Services 184 (45)	Surgical Services 225 (55)	Total	*p-value*
Those who have received a pneumococcal vaccine		39 (21.2)	32 (14.2)	71 (17.4)	0.064
Those who have received training on pneumococcal vaccine		14 (7.6)	17 (7.6)	31 (7.6)	0.984
Those who want to have the pneumococcal vaccine		65 (35.5)	49 (21.9)	114 (28)	0.002
Those who had another vaccine in the last 3 years		142 (77.2)	195 (86.7)	337 (82.4)	0.012
- COVID-19 vaccine		131 (71.2)	163 (72.4)	294 (71.9)	0.780
- Flu vaccine		24 (13)	14 (6.2)	38 (9.3)	0.018
Is it necessary to vaccinate those aged 65 and over?	Yes	55 (29.9)	35 (15.6)	90 (22)	0.002
	No	11 (6)	18 (8)	29 (7.1)	
	Don't know	118 (64.1)	172 (76.4)	290 (70.9)	
Is it necessary to vaccinate diabetics?	Yes	34 (18.5)	18 (8)	52 (12.7)	0.002
	No	14 (7.6)	10 (4.4)	24 (5.9)	
	Don't know	136 (40.8)	197 (59.2)	333 (81.4)	
Is it necessary to vaccinate COPD patients?	Yes	47 (25.5)	22 (9.8)	69 (16.9)	<0.001
	No	14 (7.6)	12 (5.3)	26 (6.4)	
	Don't know	123 (66.8)	191 (84.9)	314 (76.8)	
Is it necessary to vaccinate chronic heart patients?	Yes	39 (21.2)	15 (6.7)	54 (13.2)	<0.001
	No	16 (8.7)	10 (4.5)	26 (6.4)	
	Don't know	129 (70.1)	199 (88.8)	328 (80.4)	
Is it necessary to vaccinate chronic kidney disease patients?	Yes	35 (19)	18 (8)	53 (13)	0.001
	No	15 (8.2)	10 (4.4)	25 (6.1)	
	Don't know	134 (72.8)	197 (87.6)	331 (80.9)	
Is it necessary to vaccinate patients with deficient immune systems?	Yes	47 (25.5)	22 (9.8)	69 (16.9)	<0.001
	No	17 (9.2)	12 (5.3)	29 (7.1)	
	Don't know	120 (65.2)	191 (84.9)	311 (76)	

Of the 394 patients who responded to the question about whether the COVID-19 period and vaccine applications changed their perspective on other vaccines, 35.8% stated that it had a negative effect, 33.5% said that it had a positive effect, and 30.7% said that there was no change. The rate of participants who had been negatively affected was higher in internal medicine wards, at 38.3%, and in surgical wards, at 61.7% *(p =0.47)*.

According to the EFA, it was found that the KMO value of the vaccination questionnaire form was 0.86, the Bartlett's Test (X2=1075.01 p<0.001) was statistically significant, the measurement tool consisted of a single factor, the eigenvalue of the measurement tool consisting of a single factor was 3.62, and the total variance value explained was 60.26. According to EFA, it was found that the common variance value varied between 0.43-0.712, the factor loading value varied between 0.654-0.844, and the Cronbach's α value of the measurement tool was 0.86 (Table 3).

Table 3. *Validity and Reliability of the Vaccine Questionnaire*

	Common Variance	Factor Loading Value	Item Total Correlation	Cronbach's α When Item is Deleted
Q1. Is it necessary to vaccinate those aged 65 and over?	,428	,654	,533	,865
Q2. Is it necessary to vaccinate diabetics?	,607	,779	,665	,839
Q3. Is it necessary to vaccinate chronic obstructive pulmonary disease patients?	,641	,800	,698	,832
Q4. Is it necessary to vaccinate chronic heart disease patients?	,712	,844	,744	,824
Q5. Is it necessary to vaccinate chronic kidney disease patients?	,649	,806	,686	,835
Q6. Is it necessary to vaccinate patients with immunodeficiencies?	,579	,761	,641	,842

KMO=0.86, Bartlett's Test (X2=1075.01 p<0.001), Eigenvalue=3.62, Total Variance Explained=60.26, Cronbach's α=0.86.

Discussion

In our study, the vaccination rate in patients with pneumococcal vaccination indications was 21.9%, and the highest vaccination rate was found in the groups with CKD *(32.4%)* and COPD *(31.4%)*. In a study conducted by *Yekeduz et al*. from our country, which evaluated individuals with pneumococcal vaccination indications, the pneumococcal vaccination rate was 17.2% [7]. When studies including patients with risk factors for pneumococcal diseases were evaluated, the pneumococcal vaccination rate was 10-15% in COPD patients and 3-9.9% in individuals aged 65 and over [8-11]. In a recent study conducted in India, the knowledge of pneumococcal vaccination was found to be 4.1%, and the vaccination rate was found to be 0.7%; when countries with higher levels of development were examined, higher rates were reported as 41% in France, 24% in Australia under the age of 65, and 53% in individuals over the age of 65 [12-14]. Although the pneumococcal vaccination rates in risk groups in our country are not at the desired level, when previous studies are taken into consideration, an increase in vaccination rates is observed in our study. When the factors affecting the

pneumococcal vaccination rates are evaluated, they are seen to be higher in those aged 65 and over and those with pneumococcal risk factor diseases *(especially COPD, CRF and DM)*. However, no statistically significant difference was found in the multivariate analysis. In a study evaluating DM patients, being under 65 years of age, having a high school or higher education level, being a housewife or retired, having a diabetes diagnosis for DM patients for more than ten years and developing diabetes-related complications, and having an additional chronic disease were seen as factors that increased vaccination rates [15]. The increase in pneumococcal vaccination rates with an increase in education status is also generally seen in other studies [8,11,16]. However, the education level of the individuals in our study did not affect the pneumococcal vaccination rate. Although some studies indicate that factors such as age, gender, and marital status do not affect vaccination status, some studies also report that vaccination rates are higher in women [8,11]. In our study, the fact that factors other than receiving education on pneumococcal vaccination were not found to be statistically significant in multiple analyses indicates that the most important situation in individuals with risk factors is pneumococcal vaccination awareness. When the knowledge status of pneumococcal vaccination indications was evaluated in our study, it was seen that the highest knowledge level was 22% for individuals aged 65 and over to be vaccinated, and the lowest knowledge level was 12.7% for individuals with diabetes to be vaccinated. While the rate of those who did not know pneumococcal vaccination indications was between 70.9-81.4%, it was noteworthy that 5.9-7.1% also stated that pneumococcal vaccination was not required for appropriate indications. When other studies conducted in our country were examined, it was seen that vaccine knowledge levels were similarly low [17,18]. Even in a study where more than one-third of the participants were healthcare workers, the level of knowledge about pneumococcal vaccine was 30% [17]. In another study evaluating those aged 65 and over, the level of knowledge about pneumococcal vaccine was determined to be 8.8% [18]. Although awareness has increased slightly in our country's 65 and overpopulation, it has not reached the desired levels. Many studies have shown increased vaccine knowledge and vaccination rates after information provided by physicians or other healthcare personnel [19,20]. It is thought that increasing patient information by physicians and other healthcare personnel *(nurses, pharmacists, home healthcare providers, etc.)* and supporting it with visual and written media will increase the knowledge level of people with appropriate indications and thus increase the immunization rate. Olasupo et al. conducted a retrospective, cross-sectional study, using the 2015 National Health Interview Survey. They mentioned that there are missed opportunities for pneumococcal vaccinations in high-risk adult populations and healthcare providers should take advantage of patient interactions to increase vaccination rates [21].

The higher level of vaccine knowledge in patients hospitalized in internal medicine departments may be related to the fact that patients hospitalized in these departments are also a group with more risk factors. The fact that pneumococcal vaccination is administered more frequently in patients with the flu vaccine may be associated with similar indications. Informing physicians in internal medicine departments more about pneumococcal vaccination and informing people who have had the flu or other vaccines about pneumococcal vaccination may increase vaccination rates. While vaccine refusal is an important problem, especially in childhood vaccinations today, it is also a problem in adult vaccinations. The fact that 35.8% of our patients' views on vaccination have changed negatively after COVID-19 is a significant obstacle in this period when the importance of adult immunization is understood. When the reasons for not getting vaccinated are questioned, the most common reasons are distrust of the vaccine and not wanting to get it due to side effects, supporting this situation. Durmus et al. The study also showed the negative effect of conspiracy theories regarding

COVID-19 vaccines on vaccine attitudes [22].

It has been reported that for a measurement tool to be valid and reliable; the KMO value should be above 0.80, the result of Bartlett's Test should be statistically significant, the factor loading values should be above 0.30, the total variance explained should be above 0.50 and the Cronbach's α value should be above 0.70 (23-25). Therefore, it can be said that the constructive vaccination questionnaire in this study measured the desired feature in a valid and reliable way.

The main limitation of our study was that patients who were hospitalized on a certain day in our hospital were included in the survey. The number of participants is limited due to patients who could not be included in the study due to language, communication problems, disease effects, etc. and did not accept the study. However, it is considered an important study to evaluate the effects of the COVID-19 period in evaluating pneumococcal vaccination rates and affecting factors.

Conclusions

In our study, pneumococcal vaccination rates and knowledge levels were low. Strengthening health education, providing media support will increase awareness and willingness for vaccination, especially in patients in risk groups. Further studies are needed to prevent invasive pneumococcal infections and increase the willingness for pneumococcal vaccination.

Author contributions

AA, AUO and INH were responsible for conceptualization, search design and execution. MSS, MOA, SYG, CO and EO were responsible for screening, data extraction, quality assessment and interpretation. AA, AUO, INH writing, review and editing. AA prepared the first draft.

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Competing interests

The authors declare that they have no competing interests.

References

1. Cillóniz C, Amaro R, Torres A (2016) Pneumococcal vaccination. Curr Opin Infect Dis 29:187-196. doi: 10.1097/QCO.0000000000000246
2. National Foundation of Infectious Diseases. Washington (DC): "Pneumococcal Disease. Available: https://www.nfid.org/. Accessed: 14.05.2024
3. World Health Organization. The top 10 causes of death. Available: https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death. Accessed: 14.05.2024.
4. "Benefits from Immunization During the Vaccines for Children Program Era-United States. Available: https://www.cdc.gov/Mmwr/preview/mmwrhtml/mm6316a4.htm. Accessed: 14.05.2024.
5. Swanson KA, Schmitt HJ, Jansen KU, Anderson AS. (2015) Adult vaccination: Current recommendations and future prospects. Hum Vaccines Immunother 11: 150-155. doi: 10.4161/hv.35858
6. Köksal, İftihar and Türkiye EKMUD (2024) Erişkin bağışıklama rehberi 2024. Available: https://www.ekmud.org.tr/files/uploads/files/eriskin-bagisiklama-rehberi-2024.pdf Accessed: 15.05.2024. [Website in Turkish]
7. Yekeduz E, Durusu Tanriöver M, Ünal S, Çalik Başaran N, Ozisik L, Helvaci O (2016) Pneumococcal and influenza vaccination coverage rates of adult patients at risk and their attitudes towards vaccination. Flora İnfeksiyon Hastalık ve Klin Mikrobiyoloji Derg 21:15-20.
8. Erer OF, Karadeniz G, Gazibaba D, Ürpek G, Yalnız E, Aktoğu SÖ (2013) Immunization in the chronic obstructive pulmonary disease: can we have really done it? İzmir Göğüs Hastan Derg 27: 31-40.
9. Bîlgîç H, Maden E, Özsu S, Uçar E, Arslan Y (2011) The frequency of influenza and pneumococcal vaccination in COPD. Solunum 13: 21-25. Doi: 10.5505/solunum.2011.88155.
10. Erbay A, Kader C, Ede H, Süher M, Akyol L, İntepe YS, Börekçi E, Yıldırım E, Erbay AR (2018) Influenza and pneumococcal vaccination uptake in adults aged ≥65 years and high risk groups admitted to Yozgat Bozok University Research and Application Hospital. Klimik Derg 31: 205-209. doi: 10.5152/kd.2018.50.
11. Mutlu HH, Coşkun FO, Sargın M (2018) The incidence and awareness of vaccination among people aged 65 and over applied to a family medicine outpatient clinic. Ankara Med J 18: 1-13. doi: 10.17098/amj.408968.
12. Kunnuru S, Godella V, Vinala S, Anne B (2023) A study to evaluate the knowledge, vaccination status and acceptance of adult vaccinations against respiratory infections in patients with type 2 diabetes in South India. Int J Diabetes Dev Ctries 10: 1-7. doi: 10.1007/s13410-022-01166-0.
13. Loubet P, Rouvière J, Merceron A, Launay O, Sotto A (2021) On Behalf Of The Avnir Group. Patients' Perception and Knowledge about Influenza and Pneumococcal Vaccination during the COVID-19 Pandemic: An Online Survey in Patients at Risk of Infections. Vaccines 22: 1372. doi: 10.3390/vaccines9111372.
14. Trent MJ, Salmon DA, MacIntyre CR (2022) Predictors of pneumococcal vaccination among Australian adults at high risk of pneumococcal disease. Vaccine 40: 1152-1161. doi: 10.1016/j.vaccine.2022.01.011.

15. Alkan B. Investigation of awareness, vaccination rates and affecting factors of patients with diabetes mellitus who applied to family medicine specialists about COVID-19, influenza and pneumococcal Vaccine Pamukkale University Faculty of Medicine; 2023. Available: https://gcris.pau.edu.tr/handle/11499/50390. Accessed: 16.05.2024.

16. Uzuner A, Uç D, Dikmen İ, Akman M, Sarısoy M, Güzel S, Çifçili S (2014) The vaccination status and knowledge level of vaccines among adults over the age of sixty- five. J Turk Fam Physician 5: 19-23.

17. İneli BU (2016) Evaluation of knowledge and attitudes about adult vaccines, and the vaccination rate in adults over the age of 18. Akdeniz University Faculty of Medicine Available: https://tez.yok.gov.tr/UlusalTezMerkezi/tezDetay.jsp?id=r1pIQh3UKxuB0mRtIcNXTQ&no=wtiEPGY2TLAOINaXqpUoRA. Accessed: 16.05.2024.

18. Medetalibeyoglu A, Ezirmik E (2020) A study on determining the level of knowledge about influenza, pneumococcal, herpes zoster, and tetanus vaccines among the vaccines recommended by the World Health Organization and the level of vaccination in individuals sixty-five years old and over. Haseki Tıp Bul 58: 414-421. doi: 10.4274/haseki.galenos.2020.6531.

19. Yılmaz T, Yılmaz TE, Ceyhan Ş, Kasım İ, Kaya A, Odabaş ÖK (2018) Evde sağlık hizmetleri birimine kayıtlı geriatrik hastaların influenza ve pnömokok aşısı ile aşılanma durumları ve doktor önerisinin etkisi. Ankara Med J 18: 391-401. doi:10.17098/amj.461416. doi: doi.org/10.17098/amj.461416

20. Ozdemir N (2022) Determining the factors affecting attitudes and behaviors in adult vaccination in cancer patients and examining the effect of vaccination education given by pharmacist. Available: https://openaccess.hacettepe.edu.tr/xmlui/handle/11655/27174. Accessed: 16.05.2024.

21. Olasupo O, Segal R, Brown J (2020) Missed opportunities for pneumococcal vaccinations in high-risk and older adults in the United States. J Infect Public Health 13:101-103. doi: 10.1016/j.jiph.2019.06.010.

22. Durmuş A, Ünal Ö (2023) The effect of conspiracy beliefs regarding COVID-19 vaccines on vaccine attitude The case of Sakarya. J Human & Soc 13: 105-125. doi: dx.doi.org/10.12658/M0676.

23. Slocum-Gori, S. L, Zumbo, B. D. (2011) Assessing the unidimensionality of psychological scales: Using multiple criteria from factor analysis. Social indicators research 102: 443-461. doi: 10.1007/s11205-010-9682-8

24. Yaşlıoğlu, M. M. (2017) Factor Analysis and Validity in Social Sciences: Application of Exploratory and Confirmatory Factor Analyses. Istanbul Business Research 46: 74-85.

25. Tavakol, M, Dennick, R. (2011) Making sense of Cronbach's alpha. International journal of medical education 2: 53. doi: 10.5116/ijme.4dfb.8dfd