ORIGINAL ARTICLE

VACCINATION FREQUENCY AND ASSOCIATED FACTORS IN OLDER ADULTS: A PRIMARY CARE-BASED CROSS-SECTIONAL STUDY

Turkish Journal of Geriatrics
DOI: 10.29400/tjgeri.2024.376
2024; 27(1):31–41

Rıza Sercan SOFUOGLU[1]
Melda DİBEK BÜYÜKDİNÇ[1]
Okay BAŞAK[1]

CORRESPONDANCE
[1]Melda DİBEK BÜYÜKDİNÇ

Phone : +905305793069
e-mail : meldadibek@hotmail.com
Received : Dec 08, 2023
Accepted : Feb 27, 2024

[1] Aydin Adnan Menderes University Faculty Of Medicine, Family Medicine, Aydin, Turkey

Abstract

Introduction: There is currently a lack of primary care or community-based regional and national data concerning vaccination rates among older individuals in Turkey. Thus, the present study aimed to determine the pneumococcal, influenza, and herpes zoster vaccination rates associated factors among individuals aged 65 and over in Efeler, the central district of Aydın Province, Turkey.

Materials and Method: An analytical, cross-sectional study was performed between September 2022 and November 2022 at 10 family health centers randomly selected from a total of 34 such centers in Efeler. The study's calculated sample size was 321 participants. During the study period, a researcher administered data collection forms that had been developed via a literature review to older patients on a face-to-face basis. The data were analyzed using IBM SPSS 20.0 statistical software, while descriptive statistics as well as chi-square and logistic regression tests were employed to identify the factors associated with vaccination rates among this population. The statistical significance level was set as $p < 0.05$.

Results: Among the 321 participants, 51.4% were male, 70.7% were in the 65–74 age range, 77.0% were married, and 88.2% had at least one chronic disease. Moreover, 90.0% were aware of the vaccines recommended for their age group, while 81.3% stated that vaccines had been recommended to them after the age of 60. In the past year, 39.3% of participants had received an influenza vaccine, 6.2% had received at least two doses of pneumococcal vaccine, and 0.3% had received a herpes zoster vaccine. The influenza vaccine coverage in the past year was 2.1 times higher in those aged 75 years and over than in younger participants ($p = 0.005$), while it was 3.9 times higher in those with chronic diseases compared to those without ($p = 0.004$). The participants with active employment had received at least two doses of pneumococcal vaccine, indicating a vaccine rate 13.1 times higher than among those without employment ($p < 0.001$), while participants with chronic obstructive pulmonary disease (COPD) and/or asthma had a vaccination rate 7.8 times higher than participants without either condition ($p < 0.001$).

Conclusion: The overall vaccination coverage among the participants was quite low. While the influenza vaccine was commonly received, the herpes zoster vaccine was only rarely administered. An older age and the presence of chronic diseases were associated with higher influenza vaccination rates, while being in active employment and having COPD and/or asthma were associated with higher pneumococcal vaccination rates. Further qualitative studies are required to elucidate the behaviors and attitudes of the younger members of the older adult age group who do not have chronic diseases when it comes to receiving vaccines included in the program.

Keywords: Pneumococcal Vaccine; Influenzavirus Vaccine; Zoster Vaccine; Aged

INTRODUCTION

Ensuring immunity via vaccination entails an ongoing, lifelong process. While there is global awareness and implementation of newborn and childhood vaccinations, adult vaccination programs have not yet been widely and routinely adopted in every country (1). Inadequate adult vaccination leaves individuals, especially those with chronic conditions, highly susceptible to infections. Thus, routine administration of influenza, pneumococcal, and herpes zoster vaccines has become common practice in older adults, with other vaccinations recommended on an as-needed basis (2).

Vaccination rates among the older population vary significantly worldwide, with only a few countries having achieved the World Health Organization (WHO) vaccination targets for older people (3,4). The lack of information, awareness, and health literacy, along with negative beliefs and attitudes, contribute to the failure to reach the desired levels of adult vaccination (5,6).

Studies conducted among older individuals who visited various outpatient clinics of university or research hospitals identified influenza vaccination rates ranging from 12–33% and pneumococcal vaccination rates ranging from 3–10% (7-10). Two studies conducted in hospital-based family practice clinics revealed influenza vaccination rates of 22%–34% and pneumococcal vaccination rates of 4%–10% (11,12).

These prior studies were primarily conducted in hospitals or highly limited primary care centers, and there is currently little research evidence regarding herpes zoster vaccination rates (12). Indeed, our literature review identified only two studies conducted at the primary care level in Turkey. Uzuner et al. performed their study in a district of Istanbul, revealing notably low vaccination rates among individuals aged 18 and over, although the specific rates for those aged 65 and over were not provided (13). Ünal et al. retrospectively reviewed the records of all the primary care centers in Denizli in 2011 to assess the influenza and pneumococcal vaccination rates among individuals aged 65 and over (14); however, this study only considered vaccinations administered in primary care centers and so lacked information about vaccinations administered elsewhere.

Our literature review identified no community-based, regional, or national primary care-based studies that assessed the influenza, pneumococcal, and herpes zoster vaccination rates among individuals aged 65 and over. To address this gap in the literature, the present study was designed to determine the pneumococcal, influenza, and herpes zoster vaccination rates among individuals aged 65 and over who visited family health centers in Efeler, the central district of Aydın Province. Additionally, this study also aimed to identify the factors associated with vaccination behaviors of older people.

MATERIALS AND METHOD

A descriptive, cross-sectional study was performed between September 2022 and November 2022 in Efeler, the central district of Aydın Province, Turkey. The study population comprised individuals aged 65 and over who were registered at all the family health centers in Efeler. The study's sample size was calculated to be 321 individuals based on the population of older adults in Efeler (35,422), an expected influenza vaccination prevalence of 30%, a 0.05 alpha level, and a 0.05 sampling error (3). Older individuals who volunteered to participate in the research were included in the study. The exclusion criteria for the study were having a mental or cognitive condition that hindered reading, comprehending, and/or completing the survey, in addition to having recently participated in another study.

To determine the study sample, we compiled a list of the 34 family health centers in Efeler. From these,

a total of 10 family health centers were randomly selected, considering the geographical distribution of the population, including two centers in rural areas and eight in urban areas. The required number of participants was determined for each center based on the number of family medicine units and the total registered population. During the study period, a researcher (RSS) visited the centers as part of a program and administered a data collection form developed via a literature review to older adult patients who visited the centers on the days in question. The survey was conducted on a face-to-face basis. The survey administration continued at each center consecutively until the predetermined number of participants was reached. The survey gathered socio-demographic information, general health information, and information related to behaviors regarding pneumococcal, influenza, and herpes zoster vaccinations and the associated factors.

The older adults' behaviors in terms of receiving vaccinations for elderly specific diseases were considered to be the dependent variable in the study. The socio-demographic characteristics, certain habits, and clinical features of the older adults were considered independent variables that influence the dependent variable.

The gathered data were analyzed using IBM SPSS Statistics 20.0 software. In addition to descriptive statistics, binary (chi-square test) and multiple (regression) tests were performed to identify factors associated with vaccination status. A level of $p < 0.05$ was considered to be statistically significant.

Ethical approval to conduct this study was obtained from the Aydin Adnan Menderes University Faculty of Medicine Non-Interventional Research Ethics Committee (protocol number: 2022/119; date: 15/06/2022), while administrative permission was obtained from the Provincial Directorate of Health in Aydın (letter number: 44021967-605.01; date: 21/07/2022).

RESULTS

Between September and November 2022, a total of 321 individuals aged 65 and over, who visited the 10 selected family health centers for any reason, were included in the study. Among the older adult participants, 51.4% were male and 70.7% were in the 65–74 age range. The participants' surveyed socio-demographic characteristics and habits are summarized in Table 1.

Among the participants, 88.2% had at least one chronic clinical condition, with cardiovascular disease (70.4%) and diabetes (33.6%) being the most commonly reported chronic conditions. Data concerning the participants' chronic clinical conditions are presented in Table 2.

Moreover, 289 (90.0%) participants reported knowing vaccines that are administered to people of their age, while 261 (81.3%) stated that vaccines had been recommended for them after the age of 60 years. The most common source of vaccine recommendations was family physicians (n=163, 50.8%).

Regarding vaccine awareness, 313 participants (97.5%) had heard about the influenza vaccine, with 291 (90.7%) about the pneumococcal vaccine, and 22 (6.9%) about the herpes zoster vaccine. Among the participants, 39.3% (n=126) had received the influenza vaccine in the past year, 47.0% (n=151) had received the pneumococcal vaccine once, 6.2% (n=20) had received the pneumococcal vaccine at least twice, and 0.3% (n=1) had received the herpes zoster vaccination.

The most common reasons for not getting vaccinated were the lack of perceived need concerning the influenza (n=66, 66.0%) and pneumococcal (n=95, 63.3%) vaccines, while a lack of awareness was the primary reason for not receiving the herpes zoster vaccine (n = 299, 93.4%).

Factors influencing influenza vaccination

According to the results of this study, age, income

Table 1. Sociodemographic characteristics and habits of the participants (n = 321)

Sociodemographic characteristic/habit		Number	%
Gender	Male	165	51.4
	Female	156	48.6
Education level	Less than 9 years	203	63.2
	9–12 years	75	23.4
	More than 12 years	43	13.4
Income status*	Low	58	18.1
	Medium	213	66.4
	High	50	15.6
Income–expenditure perception	Income is less than expenditure	69	21.5
	Income equals expenditure	189	58.9
	Income is more than expenditure	63	19.6
Age	65–74 years	227	70.7
	75+ years	94	29.3
Marital status	Single/widowed/divorced	74	23.1
	Married	247	76.9
Employment status	Not working	305	95
	Working	16	5
Occupation	Worker	42	13.1
	Civil servant	82	25.5
	Self-employed	81	25.2
	Housewife	116	36.1
Smoking status	No	164	51.1
	Quit (at least 1 year)	117	36.4
	Yes	40	12.5
Alcohol consumption	No	248	77.3
	Quit	46	14.3
	Yes	27	8.4
Total		**321**	**100**

* Below 4500 TL: Low income status; 4500–4000 TL: Medium income status; above 14000 TL: High income status.

Table 2. Participants' chronic clinical conditions (n = 321)

Clinical Characteristic		Number	%
Chronic condition	Absent	38	11.8
	Present	283	88.2
Cardiovascular disease	Absent	95	29.6
	Present	226	70.4
COPD*/asthma	Absent	259	80.7
	Present	62	19.3
Diabetes	Absent	213	66.4
	Present	108	33.6
Chronic kidney disease	Absent	305	95
	Present	16	5
Obesity	Absent	285	88.8
	Present	36	11.2
Cancer	Absent	306	95.3
	Present	15	4.7

* COPD: Chronic obstructive pulmonary disease.

Table 3. Independent variables affecting receiving influenza vaccine in the last year in binary and multiple analyses

Dependent Variable: Receiving Influenza Vaccine in the Last Year						
Independent Variable	Binary Logistic Regression Analysis			Multiple Logistic Regression Analysis[Þ]		
	OR*	95% CI*	p	OR*	95% CI*	p
75 years and older (Ref: Under 75 years)	2.126	1.300–3.476	0.003	2.058	1.249–3.390	0.005
High-income individuals (Ref: Low-income individuals)	2.900	1.313–6.405	0.008	---	---	NS±
High-income individuals (Ref: Middle-income individuals)	2.472	1.311–4.664	0.005	---	---	NS±
Individuals with chronic diseases (Ref: Those without chronic diseases)	4.025	1.631–9.936	0.003	3.857	1.551–9.589	0.004
Individuals with CVD* (Ref: Those without CVD)	1.936	1.151–3.255	0.013	---	---	NS±
Individuals with diabetes (Ref: Those without diabetes)	1.830	1.137–2.944	0.013	---	---	NS±

* OR: Odds ratio; CI: Confidence interval; CVD: Cardiovascular disease.

Þ Forward LR: Multiple logistic regression analysis; ±NS: Not significant.

Table 4. Independent variables affecting receiving pneumococcal vaccination at least twice in binary and multiple analyses (reference: never received)

Dependent Variable: Receiving Pneumococcal Vaccination at Least Twice (Ref: Not Fully Vaccinated)						
Independent Variable	**Binary Logistic Regression Analysis**			**Multiple Logistic Regression Analysis[þ]**		
	OR*	**95% CI***	**p**	**OR***	**95% CI***	**p**
75 years and older (Ref: Under 75 years)	2.966	1.131–7.777	0.027	4.230	1.366–13.105	0.012
Active workers (Ref: Non-active workers)	3.861	1.067–13.977	0.040	13.522	2.874–63.626	0.001
Those with COPD*/asthma (Ref: Those without COPD*/asthma)	6.048	2.246–16.287	<0.001	10.175	3.167–32.689	<0.001
Those with diabetes (Ref: Those without diabetes)	---	---	NS±	---	---	NS±

OR: Odds ratio; CI: Confidence interval; COPD: Chronic obstructive pulmonary disease.
þ Forward LR: Multiple logistic regression analysis; ±NS: Not significant.

Table 5. Independent variables affecting receiving at least two pneumococcal vaccinations (being fully vaccinated) in binary and multiple analyses (reference: not fully vaccinated)

Dependent Variable: Receiving at Least Two Pneumococcal Vaccinations (Reference: Not Fully Vaccinated)						
Independent Variable	**Binary Logistic Regression Analysis**			**Multiple Logistic Regression Analysis[þ]**		
	OR*	**95% CI***	**p**	**OR***	**95% CI***	**p**
Men (Reference: Women)	3.020	1.070–8.521	0.037	---	---	NS±
Active workers (Ref: Non-active workers)	5.979	1.733–20.631	0.005	13.111	3.260–52.732	<0.001
Alcohol users (Reference: Non-alcohol users)	4.197	1.395–12.625	0.011	---	---	NS±
Individuals with COPD*/asthma (Reference: Those without COPD/asthma)	4.863	1.925–12.286	0.001	7.762	2.682–22.181	<0.001

OR: Odds ratio; CI: Confidence interval; COPD: Chronic obstructive pulmonary disease.
þ Forward LR: Multiple logistic regression analysis; ±NS: Not significant.

level, presence of a chronic disease, presence of cardiovascular disease (CVD), and presence of diabetes all had a significant influence on the influenza vaccination rate ($p < 0.05$). Those participants who had received the influenza vaccine during the past year were older than 75 years, had higher income levels, and had a chronic disease, CVD, and/or diabetes. The other assessed demographic and clinical characteristics did not significantly affect the influenza vaccination rate ($p > 0.05$).

Binary and multiple logistic regression analyses were also performed to determine the extent of the influence of the related independent variables on the participants' decision to receive the influenza vaccine during the past year. In the multiple logistic regression analysis involving six variables, two variables were included in the model. Here, the frequency of receiving the influenza vaccine during the past year was 2.1 times higher in the older adult participants aged 75 and over when compared with those aged below 75, while it was 3.9 times higher among those with a chronic disease when compared with those without a chronic disease. The independent variables that influenced the frequency of receiving the influenza vaccine during the past year in the binary and multiple logistic regression analyses are listed in Table 3.

Factors influencing pneumococcal vaccination

In this study, receiving pneumococcal vaccination at least twice was interpreted as complete vaccination. Moreover, age, employment status, presence of chronic obstructive pulmonary disease (COPD) and/or asthma, and presence of diabetes were all found to significantly influence the pneumococcal vaccination rate ($p < 0.05$). When compared with not receiving any pneumococcal vaccine, the complete vaccination rates were higher in participants aged 75 and over, in those engaged in active employment, and in participants with COPD and/or asthma and diabetes. In addition, when compared with not receiving any pneumococcal vaccine or receiving it only once, the complete vaccination rates were higher in male participants, in those engaged in active employment, in those who consumed alcohol, and in those with COPD and/or asthma. The other demographic and clinical characteristics did not significantly affect the pneumococcal vaccination rate ($p > 0.05$).

Binary and multiple logistic regression analyses were also performed to determine the extent of the influence of the relevant independent variables on complete pneumococcal vaccination. In the multiple logistic regression analysis for the dependent variable of complete vaccination (with not receiving any pneumococcal vaccine as the reference), three variables were included in the model. Having received pneumococcal vaccination at least twice was 4.2 times more likely in participants aged 75 and over ($p = 0.012$), 13.5 times more likely in those engaged in active employment ($p = 0.001$), and 10.2 times more likely in participants with COPD and/or asthma ($p < 0.001$).

In the multiple logistic regression analysis for the dependent variable of complete vaccination (with not receiving any pneumococcal vaccine or receiving it only once as the reference), two variables were entered into the model. The situation of having received at least two pneumococcal vaccinations was 13.1 times more likely in those participants engaged in active employment ($p < 0.001$) and 7.8 times more likely in those participants with COPD and/or asthma ($p < 0.001$). The independent variables that were effective in terms of receiving at least two pneumococcal vaccinations in both the binary and multiple analyses are shown in Tables 4 and 5, respectively.

DISCUSSION

According to the results of our study, nine out of ten older adults are aware of the vaccines recommended for individuals of their age group, while four out of five older adults were recommended to receive vaccines after the age of 60 years. However, the vaccination rates for the recommended vaccines remain quite low. Two-thirds of those who choose not to get vaccinated believe that the vaccines are unnecessary. A higher percentage of those who are older and those with any chronic illness have received the influenza vaccine during the past year. Older individuals, those not engaged in active employment, and those with chronic respiratory diseases have a higher likelihood of having received complete vaccination.

The rate of receiving the influenza vaccine is higher than that of receiving the pneumococcal vaccine. While the majority of participants stated that they have been informed about the vaccines recommended for those over the age of 60 years, the crucial point to emphasize is that a significant portion of those who choose not to get vaccinated do so due to the belief that they do not require vaccination. The situation is different for the herpes zoster vaccine. The low awareness of the herpes zoster vaccine among older adults might be explained by the recent inclusion of the vaccine in the older adult vaccination program. In some prior studies conducted in Turkey, the rates of citing lack of knowledge or not being recommended as reasons for not getting vaccinated have been found to be much higher than those in our study (11,12).

In addition, in Turkey, two studies conducted in primary care centers have reported lower influenza vaccination rates than those identified in our findings. The influenza vaccination rate was found to be 24% among adults aged 18 and over in Istanbul district family health centers in the study by Uzuner et al. (13), In a retrospective study based on records from all the primary care centers in Denizli, Unal et al. found a rate of 14% (14). While this study only considered vaccinations conducted and recorded in primary care centers, our study also included vaccinations conducted outside primary care centers based on participant reports. Although Uzuner et al. conducted their study in primary care centers, they did not provide a separate vaccination rate for those aged 65 and over (13). Studies conducted in hospital-based family medicine clinics also reported lower rates than in our study (11,12). Moreover, studies conducted in various clinics of secondary and tertiary hospitals reported influenza vaccination rates between 10% and 71% (7-9,15-17).

According to the results of our study, only two independent variables appear to affect the frequency of receiving the influenza vaccination within the past year. Older adults aged 75 and over were 2.1 times more likely to have received the influenza vaccination than younger members of the older adult age group. Similar findings were reported in two previous studies conducted in Turkey (11,17). The increase in influenza vaccination rates with advancing age may be attributed to the higher prevalence of chronic diseases among older adults, leading to more healthcare visits, and consequently, more awareness of vaccination. By contrast, some prior studies have shown that vaccination rates decrease with age (8,18).

Moreover, having any chronic illness increases the likelihood of having received the influenza vaccine within the past year by 3.9 times. Interestingly, the specific chronic illness does not seem to be significant in this regard. In other studies, conducted in Turkey, unlike the present results, higher influenza vaccination rates were found among individuals with chronic heart diseases (11) and individuals with COPD, diabetes, and chronic heart diseases (7).

According to our results, the rate of being fully vaccinated against pneumococcal disease is quite low (6%). A study based on records from all the primary care centers in Denizli has found a rate of 12% (15). Similar rates have also been reported in studies conducted in hospital-based family medicine clinics (4–10%) (11,12), while studies conducted in various clinics of secondary and tertiary hospitals reported pneumococcal vaccination rates ranging from 3% to 27% (7-9,15-17).

Two telephone-based survey studies conducted in Canada among individuals aged 65 and over reported influenza vaccination rates of 65% and 70% as well as pneumococcal vaccination rates of 42% and 58%, respectively (17,19). In Germany, community-based studies among individuals aged 60 and over reported influenza vaccination rates of 50–66% and pneumococcal vaccination rates of 12–31% (18,20). In the United States, two studies conducted among individuals aged 65 and over determined influenza vaccination rates of 66–75% and pneumococcal vaccination rates of 62–72% (21,22). As these findings indicate, the vaccination rates reported in studies performed in Western

countries are higher than those found in Turkey. However, the criteria for being vaccinated varied in these studies. Both in Turkey and in other countries, influenza vaccination rates appear to be higher than pneumococcal vaccination rates. Similar patterns have been observed in studies conducted in both community settings and hospital-based clinics (20,23).

The results of this study also revealed that older adults aged 75 years and over, those engaged in active employed, and those with chronic respiratory diseases are more likely to have received at least two doses of the pneumococcal vaccine. According to the pneumococcal vaccination schedule in Turkey, adults aged 65 and over need to receive at least two pneumococcal vaccines. Evaluating those who are fully vaccinated when compared with those who have not received any vaccine indicated that individuals aged 75 and over are 4.2 times more likely to be vaccinated. Similar to the situation with influenza, the increasing prevalence of chronic diseases and healthcare visits with increasing age might have led to better awareness, and subsequently, to higher vaccination rates among the older adults. By contrast, the fact that many unvaccinated participants believed vaccination to be unnecessary might suggest that the increasing health issues with increasing age might change older adults' attitudes concerning the necessity of vaccination. Employment status also appears to have an impact on full vaccination status. The likelihood of receiving at least two doses of the vaccine was found to be 13 times higher in participants engaged in active employment. The presence of actively employed older adults in the community might expose them more to infectious diseases, which might influence their behavior regarding pneumococcal vaccination.

In individuals aged 65 and over with COPD and/or asthma, the likelihood of being fully vaccinated was 10.2 times higher when compared with those who had never received any vaccination, while it was 7.8 times higher when compared with those who were partially vaccinated. In the study by Mutlu et al., it was determined that individuals with chronic lung disease, chronic heart disease, and/or chronic kidney disease were more likely to receive pneumococcal vaccination, while no significant differences were observed for those with diabetes, hypertension, and/or chronic liver disease (11).

In our study, only one participant had received the herpes zoster vaccine (0.3%). This finding is consistent with the low awareness of the herpes zoster vaccine among older adults. Similar results have been obtained in two other primary care-based studies in Turkey (12,13), while in a study conducted in an internal medicine outpatient clinic among individuals aged 65 and over, the rate was slightly higher (7%) (3).

Strengths and limitations of the study

One of the strengths of the present study is the fact that it was conducted in primary care centers that reflect the older adult population in Efeler. The inclusion of vaccinations received not only in family health centers but also in other healthcare facilities enhances the representativeness of our results for the community.

However, the vaccination status of older adults was evaluated based on their declarations. The lack of vaccination cards and difficulties in recalling some vaccinations represent limitations of our study. Additionally, only older adults who received services from family health centers were included in the present study, which is another limitation, considering that those who received home care services during the study period were not included.

CONCLUSION AND RECOMMENDATIONS

The full vaccination rates among the participants in this study were quite low. While the influenza vaccine was relatively more commonly received, the herpes zoster vaccine was only rarely administered. Older adults and those with any chronic condition were more likely to have received the influenza vaccine

during the past year. Considering full vaccination status, older participants, those who actively continue to work, and participants with COPD and/or asthma were more likely to have received the pneumococcal vaccine.

Similar to the influenza and pneumococcal vaccines, family physicians can play a crucial role in educating older adults about the herpes zoster vaccination. Despite having information and receiving recommendations, a significant portion of older adults in this study did not perceive the necessity of receiving the influenza and pneumococcal vaccines. Family physicians should be more sensitive when it comes to changing their patients' misconceptions about vaccines. In particular, during the process of educating patients, family physicians should emphasize the linkage between vaccination and chronic disease. Besides, it needs public health policies and health interventions increasing for older people being in need of influenza, pneumococcal and herpes zoster vaccinations.

REFERENCES

1. Swanson KA, Schmitt HJ, Jansen KU, Anderson AS. Adult vaccination. Hum Vaccin Immunother. 2015 Jan;11(1):150-5. (DOI: 10.4161/hv.35858)
2. Infectious Diseases and Clinical Microbiology Specialty Society of Turkey. Adult immunization guide; 2019. [Internet]. Available from: https://www.ekmud.org.tr/emek/rehberler/1-ekmud-rehberleri. Accessed: 1.12.2023.
3. Thomas-Crusells J, McElhaney JE, Aguado MT. Report of the ad-hoc consultation on aging and immunization for a future WHO research agenda on life-course immunization. Vaccine. 2012 Sep 14;30(42):6007-12. (DOI:10.1016/j.vaccine.2012.07.025)
4. Palache A, Oriol-Mathieu V, Fino M, Xydia-Charmanta M, Influenza Vaccine Supply Task Force (IFPMA IVS). Seasonal influenza vaccine dose distribution in 195 countries (2004-2013): little progress in estimated global vaccination coverage. Vaccine. 2015 Oct 13;33(42):5598-605. (DOI:10.1016/j.vaccine.2015.08.082)
5. Kimmel SR, Burns IT, Wolfe RM, Zimmerman RK. Addressing immunization barriers, benefits, and risks. J Fam Pract 2007;56(2 Suppl Vaccines):S61-S9.
6. MacDougall DM, Halperin BA, MacKinnon-Cameron D, Li L, McNeil SA, Langley JM, et al. The challenge of vaccinating adults: attitudes and beliefs of the Canadian public and healthcare providers. BMJ Open 2015;5:e009062. (DOI:10.1136/bmjopen-2015-009062)
7. Akman M, Sarısoy M, Uzuner A. Vaccine status and known levels in adults over the age of sixty-five. J Turk Fam Physician. 2014;5:19-23. (DOI: 10.21763-tjfmpc.452487-521944) (in Turkish).
8. Erbay A, Kader C, Ede H, Suher M, Akyol L, Intepe YS, et al. Influenza and pneumococcal vaccination uptake in adults aged ≥65 years and high risk groups admitted to Yozgat Bozok University Research and Application Hospital. Klimik Journal 2019;31(3):205-9. (DOI: 10.5152/kd.2018.50) (in Turkish)
9. Ciftci F, Sen E, Demir N, Kayacan O. Which factors effects patients belief and attitudes about influenza vaccination? Tuberk Toraks. 2017;65(4):308-16. (DOI: 10.5578/tt.66324) (in Turkish)
10. Yılmaz T, Yılmaz TE, Ceyhan Ş, Kasım İ, Kaya A, Odabaş ÖK, et al. Geriatric patients' influenza and pneumococcal vaccination status registered at home care services and the effect of physician's advice. Ank Med J. 2018. 2018;18(3):391-40. (DOI: 10.17098/amj.461416) (in Turkish)
11. Mutlu HH, Coşkun FO, Sargın M. Vaccination frequency and awareness among people aged 65 and over who apply to the family medical clinic. Ank Med J 2018;1:1-13. (DOI: 10.17098/amj.408968) (in Turkish).
12. Kizmaz M, Kumtepe Kurt B, Çetin Kargin N, Döner E. Influenza, pneumococcal and herpes zoster vaccination rates among patients over 65 years of age, related factors, and their knowledge and attitudes. Aging Clin Exp Res. 2020;32(11):2383-91. (DOI: 10.1007/s40520-019-01423-z)
13. Uzuner A, Arabacı Ş, Yüceel Aİ, Kocatürk AC, Kaynar E, Khan A. Knowledge, attitude and behaviors of adults about adulthood immunization. TJFMPC. 2018:215-25. (DOI: 10.21763/tjfmpc.452487) (in Turkish)
14. Ünal S, Tanrıöver MD, Taş E, Güner İ, Çetin ÖY, Sayar İ. The effects of training family physicians and determining vaccination targets on pneumococcal vaccination rates. Flora Journal of Infectious Diseases and Clinical Microbiology. 2015;20:10-5 (in Turkish).

15. Erdoğdu Hİ. Influenza, pneumococcal and herpes zoster vaccination rates amongst people aged 65 years and older and related factors. Turkish journal of Geriatrics. 2018;21(4);498-506. (DOI: 10.31086/tjgeri.2018.54)

16. Bülbül Y, Öztuna F, Gülsoy A, Özlü T. Chronic obstructive pulmonary disease in the Eastern Black Sea region: disease characteristics and frequency of influenza-pneumococcal vaccination. Turkiye Klinikleri J Med Sci 2010;30(1):24-9. (DOI:10.5336/medsci.2008-8763) (in Turkish).

17. Erer OE, Karadeniz G, Gazibaba D, Ürpek G, Yalnız E, Aktoğu SÖ. Vaccination in chronic obstructive pulmonary disease: do we really do it?. Journal of Izmir Chest Hospital. 2013;27(1):31-40 (in Turkish).

18. Medetalibeyoğlu A, Ezirmik E. 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. Med Bull Haseki. 2020;58(5):414-21. (DOI: 10.4274/haseki.galenos.2020.6531) (in Turkish)

19. Poethko-Müller C, Schmitz R. Vaccination coverage in German adults: results of the German Health Interview and Examination Survey for Adults (DEGS1). Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz. 2013;56(5-6):845-57. (DOI: 10.1007/s00103-013-1693-6)

20. Christenson B, Lundbergh P, Hedlund J, Ortqvist A. Effects of a large-scale intervention with influenza and 23-valent pneumococcal vaccines in adults aged 65 years or older: a prospective study. Lancet. 2001;357(9261):1008-11. (DOI: 10.1016/S0140-6736(00)04237-9)

21. Lu PJ, O'Halloran A, Kennedy ED, Williams WW, Kim D, Fiebelkorn AP, et al. Awareness among adults of vaccine-preventable diseases and recommended vaccinations, United States, 2015. Vaccine. 2017;35(23):3104-15. (DOI: 10.1016/j.vaccine.2017.04.028)

22. Centers for Disease Control and Prevention (CDC). Public health and aging: influenza vaccination coverage among adults aged > or =50 years and pneumococcal vaccination coverage among adults aged > or =65 years--United States, 2002. MMWR Morb Mortal Wkly. 2003;52(41):987-92. [Internet]. Available from: https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5241a3.htm. Accessed: 1.12.2023.

23. Clancy U, Moran I, Tuthill A. Prevalence and predictors of influenza and pneumococcal vaccine uptake in patients with diabetes. Ir Med J. 2012;105(9):298-300.