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Research Article

Immunization Awareness in Geriatric Age Group: Missed Opportunities

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Abstract

Background and Objective: Due to low adult immunization rates, Vaccine-Preventable Diseases (VPDs) are a major health problem, especially among older people. In this study, it was aimed to shed light on future solutions by determining the vaccination rates related to immunization over 65 years of age, determining the factors affecting vaccination in the elderly and analyzing the determinants of vaccine hesitancy/refusal. **Materials and Methods:** A total of 459 elderly people over 65 years of age were included in the study. This study was conducted as a cross-sectional study between May, 1 and August, 31, 2022. A sum of 24 questions were put by the physicians in the questionnaire and those questions were asked in a face-to-face manner. Frequency and percentage distributions of categorical data were determined. The relationships of categorical variables were determined by Chi-square and Likelihood Ratio tests. **Results:** The mean age was 75.35 ± 7.84 years. The 34.0% had received influenza vaccine, 29.2% had received tetanus vaccine, 27.9% had received only childhood vaccines and 14.6% had received hepatitis B vaccine. The 48.84% (215) of the elderly had received none dose of the hepatitis B, influenza, pneumococcal, herpes zoster, meningococcal or tetanus vaccines. When the distribution of the groups was analyzed, the vaccination rate was higher in those elderly who were in the age range of 65-74. The most common reason for not having been vaccinated was declared by the elders that they had not known they should be vaccinated (51.6%). **Conclusion:** While making arrangements to increase national immunization rates, systematic mechanisms for vaccination should be developed by making separate evaluations according to age groups, marital status, gender, educational status, social security status, occupation, place of residence and comorbid diseases. To reduce the reasons for vaccine hesitancy, the use of effective information channels, follow-up and national regulations are recommended.

Key words: Elderly population, hepatitis B vaccine, hesitancy, influenza vaccine, meningococcal vaccine, pneumococcal vaccine, refusal

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Vaccines are an important public health tool that reduces the rate of the spread of infectious diseases¹⁻³. Vaccine interventions reduce mortality rates and prolong the life expectancy of the global population⁴. The life expectancy of the average person is sixty years or older. By 2030, it is estimated that one out of every six people in the world will be 60 years of age or older. Globally, it is estimated that the number of people over the age of 60 will double by 2050 and the population aged 80 and over will reach 426 million⁵. According to population data projections for Turkey, it is estimated that the proportion of elderly population will be 12.9% in 2030 and will nearly double by 2060⁶.

The immune system is aging as the human life span increases. With aging, changes occur in the distribution and activity of immune cells. With the loss of acquired immunity and the acquisition of non-specific innate immunity, elderly individuals become susceptible and vulnerable to infection⁷. These age-related changes lead to lower responses after vaccination. As a result, vaccination effectiveness decreases, susceptibility to disease increases and morbidity and mortality increase in the elderly⁸⁻¹⁰.

Vaccination is one of the most cost-effective ways of medical protection against infectious diseases for children, adults and the elderly. In line with the recommendation of the World Health Organization's Expanded Immunization Program, many infectious diseases have reached the point of elimination⁵. Especially with vaccination programs for the pediatric population, the vaccination rate has reached over 90% in many countries. However, the success of adult vaccination programs remains low^{4,11}. Due to low adult immunization rates, Vaccine-Preventable Diseases (VPDs) are a major health problem, especially among older people, leading to increased global costs. For this reason, the US Centers for Disease Control and Prevention (CDC) included influenza virus vaccine, *Streptococcus pneumoniae* (pneumococcal) vaccine, tetanus-diphtheria toxoid, chickenpox, shingles, hepatitis B, hepatitis A, meningococcal and *Haemophilus influenzae* type b vaccines in the adult vaccination program¹². Although, heartbreaking efforts have been gone through for decades in order to reach most favourable vaccination ratios in all age groups, infections of influenza and herpes zoster (HZ) viruses and *Streptococcus pneumoniae* still seriously remain to result in morbidities and deaths¹³⁻¹⁶.

Although, studies (guidelines/recommendations and establishment and/or implementation of vaccination programs) have been carried out on vaccination in adults, the

vaccination rate in adults has not reached the desired levels. In this study, it was aimed to shed light on future solutions by determining the vaccination rates related to immunization over 65 years of age, determining the factors affecting vaccination in the elderly and analyzing the determinants of vaccine hesitancy/refusal to prevent VPDs in the population aged 65 years and over.

MATERIALS AND METHODS

Study area: This study was conducted as a cross-sectional study between May 1 and August 31, 2022.

Ethical consideration: Ethics committee approval was obtained from the ethics committee of Gaziantep Islamic Science and Technology University (protocol no: 2022/123, decision no: 123.17.13).

Study design: Despite we calculated a required sample size of 195 while using the vaccination rate of 46% with $\alpha = 0.05$, power = 0.80 and deviation of 10%, a sum of 459 elderly people over 65 years of age were included in the study. Patients over 65 years of age who applied to the outpatient clinics and home health unit of Dr. Ersin Arslan Training and Research Hospital and who gave informed consent were included in the study. Patients with a diagnosis of dementia and any condition that prevented healthy communication as a result of comprehensive geriatric evaluation were excluded from the study. The questions in the questionnaire forms prepared for the participants were recorded by the physicians conducting the study by asking them face-to-face. Before the survey, the participants were asked questions about their demographic data and vaccination status, determination of vaccination rates, determination of factors affecting vaccination in the elderly and determinants related to knowledge, attitude and practice, taking into account patient privacy without informing them about the survey questions and without asking for their identity information.

Study questionnaire: In this study, a total of 24 questions were asked to the participants. In the first 7 questions, participants were asked about their demographic characteristics (age, gender, marital status, occupation and employment status, educational status, social security and place of residence) to evaluate the variable affecting their attitudes toward vaccines. In questions 8 and 9, participants were questioned about comorbid diseases and tobacco product use. Questions 10-13 evaluated the presence of

hepatitis B disease in the family and hepatitis B vaccination status. In questions 14-21, it was asked whether they had been vaccinated with influenza vaccine in the current year, conjugated pneumococcal vaccine in any period of life, polysaccharide pneumococcal vaccine in the last five years, DBT vaccine in the last 10 years, herpes zoster vaccine in any period of life, meningococcal vaccine in any period of life and whether they had any related diseases that can be prevented by vaccination. Questions 22-24 aimed to learn about the groups recommending vaccination, factors contributing to vaccination and reasons for vaccine hesitancy/refusal.

Statistical analysis: Statistical analyses were analyzed with the SPSS 27.0 program. Frequency and percentage distributions of categorical data were determined. The relationships of categorical were determined by Chi-square (X^2) and Likelihood Ratio (LR) tests. Results with a p-value below 0.05 were considered statistically significant.

RESULTS

A total of 459 elderly people over 65 years of age participated in the study. The mean age of the participants was 75.35 ± 7.84 years (median: 74.0, minimum: 65.0 and maximum: 102.0). The 52.3% were between 65-74 years of age, 57.5% were female and 53.6% were married. The 92.8% lived in a house owned by their families and 72.3% had primary school education. Of the participants, 53.2% were housewives and 91.3% had social security. The 74.3% were non-smokers and 86.7% had known comorbid diseases (Table 1).

There were 398 individuals with comorbid diseases and a total of 789 diagnoses were identified. The distribution of comorbid diseases was as follows: Hypertension (21.8%), diabetes mellitus (20.0%), chronic neurological diseases (10.6%), chronic cardiovascular diseases (8.7%) and chronic obstructive pulmonary diseases (7.8%), aspirin usage (5.8%), chronic kidney diseases (4.7%), morbid obesity (4.0%), vascular diseases (2.4%), chronic liver disease (1.9%), hyperlipidemia (1.8%), blood diseases (1.6%), malignancy (0.6%), alcohol abuse (0.5%), immunosuppression (0.4%) and HIV/AIDS (0.2%). Those without comorbid diseases were 7.2%.

Of the 459 elderly people who participated in the study, 34.0% had received influenza vaccine, 29.2% had received tetanus vaccine, 27.9% had received only childhood vaccines, 14.6% had received hepatitis B vaccine, 8.5% had received meningococcal vaccine, 8.3% had received pneumococcal vaccine and 2.2% had received herpes zoster vaccine. Meningococcal vaccine was most frequently administered for pilgrimage (84.6%).

Participants were divided into two groups: Those who had received at least one of the six vaccines and those who had received none of the six vaccines. Among the elderly, 53.16% ($n = 244$) had received at least one vaccine for hepatitis B, influenza, pneumococcal, herpes zoster, meningococcal, or tetanus, while 48.84% ($n = 215$) had not received any of these vaccines. There were statistically significant associations between vaccination status and age groups ($X^2 = 10.641$ and $p < 0.001$), gender ($X^2 = 4.605$ and $p = 0.032$), marital status ($X^2 = 23.359$ and $p < 0.001$), occupation ($X^2 = 13.441$ and $p = 0.009$) and educational status ($X^2 = 19.900$ and $p = 0.001$). When the distribution of the groups was analyzed, the vaccination rate was higher in those elderly who were in the age range of 65-74, in comparison to the others who were 75 years or older. And, it was also higher among male gender, married, retired civil servant, high school and higher educated elderly. Statistically significant associations were also found between COPD ($X^2 = 17.117$ and $p < 0.001$), vascular disease ($X^2 = 4.006$ and $p = 0.045$), hyperlipidemia ($X^2 = 4.487$ and $p = 0.034$), blood diseases ($X^2 = 12.724$ and $p < 0.001$), aspirin usage ($X^2 = 13.107$ and $p < 0.001$) and alcohol abuse ($X^2 = 5.086$ and $p = 0.024$). They were found to affect the vaccination rate (Table 2).

In addition, 31.41% ($n = 49$) of those who received influenza vaccine had influenza and 4.08% ($n = 2$) were hospitalized. Among those who received pneumococcal vaccine, 13.6% ($n = 5$) had pneumonia and none of them were hospitalized.

The 55.8% of the participants stated that they would get vaccinated by a doctor, 17.4% by other healthcare professionals, 15.5% by neighbors or friends, 7.2% by pharmacists and 4.1% by social media recommendations. There was a statistically significant relationship between the groups recommending vaccination and educational status ($X^2 = 30.813$ and $p = 0.014$), the presence of social security ($X^2 = 18.731$ and $p = 0.001$) and the presence of comorbid diseases ($X^2 = 26.936$ and $p < 0.001$). Among comorbid diseases, statistically significant associations were found between COPD ($X^2 = 23.754$ and $p < 0.001$), vascular diseases ($X^2 = 10.619$ and $p = 0.025$), hyperlipidemia ($X^2 = 9.673$ and $p = 0.046$), malignancy ($X^2 = 10.293$ and $p = 0.036$) and aspirin usage ($X^2 = 14.328$ and $p = 0.006$) (Table 3). The distribution of the groups was analyzed. In all education groups, doctor's recommendation was most effective. Other healthcare professionals were most effective in those without social security and physician recommendations were most effective in those with social security. In those with comorbid diseases, the doctor's recommendation was most effective, while in those without comorbid diseases, recommendations from neighbors or friends were effective.

Table 1: Demographic characteristics of participants (n = 459)

Variable	N (%)
Age (year)	
Mean ± SD	75.35 ± 7.84
65-74 years	240 (52.3%)
75 years and over	219 (47.7%)
Gender	
Male	195 (42.5%)
Female	264 (57.5%)
Education	
Primary school	332 (72.3%)
Secondary education	73 (15.9%)
High school	41 (8.9%)
University degree	13 (2.8%)
Marital status	
Married	246 (53.6%)
Single	94 (20.5%)
Divorced and widowed	119 (25.9%)
Insurance	
Insured	419 (91.3%)
Not insured	40 (8.7%)
Occupation	
Retired	159 (34.6%)
Housewives	244 (53.2%)
Others	56 (12.2%)
Place of residence	
Elderly nursing home	33 (7.2%)
Own home	426 (92.8%)
Types of comorbidities	
Hypertension	186 (21.8%)
Diabetes mellitus	170 (20.0%)
Neurological disease	90 (10.6%)
Cardiovascular disease	74 (8.7%)
Chronic obstructive pulmonary disease	67 (7.8%)

Table 2: Relationships of categorical variable according to vaccination status

Variable		Total n (%)	Vaccination status		X ² /LR	p
			Vaccinated n (%)	Not vaccinated n (%)		
Age group	75 and over	219 (47.71)	99 (45.21)	120 (54.79)	10.641*	0.001
	65-74 years	240 (52.29)	145 (60.42)	95 (39.58)		
Gender	Male	195 (42.48)	115 (58.97)	80 (41.03)	4.605*	0.032
	Female	264 (57.52)	129 (48.86)	135 (51.14)		
Marital status	Married	246 (53.59)	153 (62.2)	93 (37.8)	23.359*	<0.001
	Single	94 (20.48)	49 (52.13)	45 (47.87)		
	Divorced	119 (25.93)	42 (35.29)	77 (64.71)		
Occupation (Retirement category)	Civil servant	34 (7.41)	27 (79.41)	7 (20.59)	13.441*	0.009
	Laborer	44 (9.59)	25 (56.82)	19 (43.18)		
	Private sector	81 (17.65)	46 (56.79)	35 (43.21)		
	Housewife	244 (53.16)	122 (50)	122 (50)		
Education status	Others	56 (12.2)	24 (42.86)	32 (57.14)	19.900*	0.001
	Illiterate	207 (45.1)	98 (47.34)	109 (52.66)		
	Primary school	125 (27.23)	59 (47.2)	66 (52.8)		
	Secondary school	73 (15.9)	48 (65.75)	25 (34.25)		
	High school	41 (8.93)	27 (65.85)	14 (34.15)		
Insurance	University	13 (2.83)	12 (92.31)	1 (7.69)	2.467*	0.116
	No	40 (8.71)	26 (65)	14 (35)		
Place of residence	Yes	419 (91.29)	218 (52.03)	201 (47.97)	0.279*	0.598
	Elderly nursing home	33 (7.19)	19 (57.58)	14 (42.42)		
Smoking	Own home	426 (92.81)	225 (52.82)	201 (47.18)	0.491*	0.484
	No	341 (74.29)	178 (52.2)	163 (47.8)		
	Yes	118 (25.71)	66 (55.93)	52 (44.07)		

Table 2: Continued

Variable		Total n (%)	Vaccination status		X ² /LR	p
			Vaccinated n (%)	Not vaccinated n (%)		
Presence of comorbid disease	Yes	396 (86.27)	205 (51.77)	191 (48.23)	2.243*	0.134
	No	63 (13.73)	39 (61.9)	24 (38.1)		
COPD	No	392 (85.4)	224 (57.14)	168 (42.86)	17.117*	<0.001
	Yes	67 (14.6)	20 (29.85)	47 (70.15)		
Cardiovascular disease	No	385 (83.88)	201 (52.21)	184 (47.79)	0.868*	0.352
	Yes	74 (16.12)	43 (58.11)	31 (41.89)		
Chronic kidney disease	No	419 (91.29)	219 (52.27)	200 (47.73)	1.535*	0.215
	Yes	40 (8.71)	25 (62.5)	15 (37.5)		
Diabetes mellitus	No	289 (62.96)	151 (52.25)	138 (47.75)	0.259*	0.610
	Yes	170 (37.04)	93 (54.71)	77 (45.29)		
Vascular disease	No	439 (95.64)	229 (52.16)	210 (47.84)	4.006*	0.045
	Yes	20 (4.36)	15 (75)	5 (25)		
Hypertension	No	273 (59.48)	142 (52.01)	131 (47.99)	0.354*	0.552
	Yes	186 (40.52)	102 (54.84)	84 (45.16)		
Chronic liver disease	No	443 (96.51)	234 (52.82)	209 (47.18)	0.581*	0.446
	Yes	16 (3.49)	10 (62.5)	6 (37.5)		
Hyperlipidemia	No	444 (96.73)	232 (52.25)	212 (47.75)	4.487	0.034
	Yes	15 (3.27)	12 (80)	3 (20)		
Immunosuppression	No	456 (99.35)	242 (53.07)	214 (46.93)	0.227**	0.638
	Yes	3 (0.65)	2 (66.67)	1 (33.33)		
Malignancy	No	454 (98.91)	240 (52.86)	214 (47.14)	1.584**	0.208
	Yes	5 (1.09)	4 (80)	1 (20)		
Morbid obesity	No	425 (92.59)	224 (52.71)	201 (47.29)	0.473*	0.492
	Yes	34 (7.41)	20 (58.82)	14 (41.18)		
Neurological disease	No	367 (79.96)	203 (55.31)	164 (44.69)	3.413*	0.065
	Yes	92 (20.04)	41 (45.56)	51 (54.44)		
Aspirin usage	No	410 (89.32)	206 (50.24)	204 (49.76)	13.107*	<0.001
	Yes	49 (10.68)	38 (77.55)	11 (22.45)		
HIV/AIDS	No	457 (99.56)	242 (52.95)	215 (47.05)	2.535**	0.111
	Yes	2 (0.44)	2 (100)	0 (0)		
Alcohol abuse	No	455 (99.13)	240 (52.75)	215 (47.25)	5.086**	0.024
	Yes	4 (0.87)	4 (100)	0 (0)		
Blood disease	No	445 (96.95)	230 (51.69)	215 (48.31)	12.724*	<0.001
	Yes	14 (3.05)	14 (100)	0 (0)		

n: Number, %: Percentage distribution, X²*: Chi-Square test, LR**: Likelihood ratio and p: Significance (p<0.05)

This study analyzed that what should be done to encourage vaccination and reduce vaccine hesitancy/refusal in the elderly. The most influential factor was found to be the explanation of the indications for vaccination by the physician and providing information to the patient (51.6%). In addition, the follow-up of vaccination records (29.8%), vaccination being covered by social security (15.5%) and intermittent immunization titer follow-up (3.1%) were also found to be influential groups motivating participants to be vaccinated were analyzed. Statistically significant associations were found between motivating groups and marital status (X² = 30.015 and p<0.001), educational status (X² = 55.500 and p<0.001) and place of residence (X² = 24.527 and p<0.001). There was a statistically significant association between the motivating groups and the presence of cardiovascular diseases, chronic liver diseases, malignancy and morbid obesity (Table 4). Analysis of the distribution of marital status, educational status and place of residence groups revealed that physician's

explanation and providing information to the patient were effective in all of them. Explanation and providing information to the patient were effective in those with and without cardiovascular diseases, while keeping vaccination records was most effective in those with chronic liver diseases and physician's explanation and providing information to the patient were effective in those without chronic liver diseases. In the presence of malignancy, the fact that the vaccine was covered by social security was effective, while in the absence of malignancy, the physician's explanation and providing information to the patient was effective and in the presence and absence of morbid obesity, the physician's explanation and providing information to the patient was effective.

In this study, the elderly were asked the reasons for vaccine hesitancy/refusal. It was found that the most common reason for not vaccinating was not knowing that they should be vaccinated (51.6%). The most common reasons were not recommending vaccination (18.7%), fear of vaccine side

Table 3: Associations of categorical variable according to groups recommending vaccination

Variable		Total n (%)	Groups recommending vaccination					X ² /LR	p
			Doctor n (%)	Other healthcare workers n (%)	Pharmacist n (%)	Friends/neighbors n (%)	Social media n (%)		
Age group	75 and over	219 (47.71)	126 (57.53)	35 (15.98)	19 (8.68)	28 (12.79)	11 (5.02)	4.762*	0.313
	65-74 years	240 (52.29)	130 (54.17)	45 (18.75)	14 (5.83)	43 (17.92)	8 (3.33)		
Gender	Male	195 (42.48)	105 (53.85)	32 (16.41)	14 (7.18)	34 (17.44)	10 (5.13)	2.077*	0.722
	Female	264 (57.52)	151 (57.2)	48 (18.18)	19 (7.2)	37 (14.02)	9 (3.41)		
Marital status	Married	246 (53.59)	137 (55.69)	45 (18.29)	12 (4.88)	43 (17.48)	9 (3.66)	10.037*	0.262
	Single	94 (20.48)	51 (54.26)	12 (12.77)	9 (9.57)	16 (17.02)	6 (6.38)		
	Divorced	119 (25.93)	68 (57.14)	23 (19.33)	12 (10.08)	12 (10.08)	4 (3.36)		
Occupation (retirement category)	Civil servant	34 (7.41)	14 (41.18)	7 (20.59)	0 (0)	10 (29.41)	3 (8.82)	26.319**	0.051
	Laborer	44 (9.59)	30 (68.18)	2 (4.55)	2 (4.55)	7 (15.91)	3 (6.82)		
	Private sector	81 (17.65)	45 (55.56)	16 (19.75)	8 (9.88)	7 (8.64)	5 (6.17)		
	Housewife	244 (53.16)	136 (55.74)	45 (18.44)	19 (7.79)	38 (15.57)	6 (2.46)		
Education status	Others	56 (12.2)	31 (55.36)	10 (17.86)	4 (7.14)	9 (16.07)	2 (3.57)		
	Illiterate	207 (45.1)	117 (56.52)	30 (14.49)	21 (10.14)	33 (15.94)	6 (2.9)	30.813**	0.014
	Primary school	125 (27.23)	79 (63.2)	24 (19.2)	6 (4.8)	13 (10.4)	3 (2.4)		
	Secondary school	73 (15.9)	40 (54.79)	15 (20.55)	3 (4.11)	11 (15.07)	4 (5.48)		
	High school	41 (8.93)	14 (34.15)	8 (19.51)	1 (2.44)	12 (29.27)	6 (14.63)		
Insurance	University	13 (2.83)	6 (46.15)	3 (23.08)	2 (15.38)	2 (15.38)	0 (0)		
	No	40 (8.71)	12 (30)	13 (32.5)	3 (7.5)	12 (30)	0 (0)	18.731*	0.001
Place of residence	Yes	419 (91.29)	244 (58.23)	67 (15.99)	30 (7.16)	59 (14.08)	19 (4.53)		
	Elderly nursing home	33 (7.19)	12 (36.36)	9 (27.27)	2 (6.06)	8 (24.24)	2 (6.06)	6.528*	0.163
Smoking	Own home	426 (92.81)	244 (57.28)	71 (16.67)	31 (7.28)	63 (14.79)	17 (3.99)		
	No	341 (74.29)	187 (54.84)	68 (19.94)	22 (6.45)	50 (14.66)	14 (4.11)	6.576*	0.160
Presence of comorbid disease	Yes	118 (25.71)	69 (58.47)	12 (10.17)	11 (9.32)	21 (17.8)	5 (4.24)		
	No	396 (86.27)	234 (59.09)	68 (17.17)	29 (7.32)	48 (12.12)	17 (4.29)	26.936*	<0.001
COPD	Yes	63 (13.73)	22 (34.92)	12 (19.05)	4 (6.35)	23 (36.51)	2 (3.17)		
	No	392 (85.4)	203 (51.79)	77 (19.64)	28 (7.14)	69 (17.6)	15 (3.83)	23.754*	<0.001
Cardiovascular disease	Yes	67 (14.6)	53 (79.1)	3 (4.48)	5 (7.46)	2 (2.99)	4 (5.97)		
	No	85 (83.88)	212 (55.06)	66 (17.14)	26 (6.75)	64 (16.62)	17 (4.42)	3.459*	0.484
Chronic kidney disease	Yes	74 (16.12)	44 (59.46)	14 (18.92)	7 (9.46)	7 (9.46)	2 (2.7)		
	No	419 (91.29)	232 (55.37)	74 (17.66)	27 (6.44)	68 (16.23)	18 (4.3)	6.090*	0.193
Diabetes mellitus	Yes	40 (8.71)	24 (60)	6 (15)	6 (15)	3 (7.5)	1 (2.5)		
	No	289 (62.96)	157 (54.33)	48 (16.61)	22 (7.61)	52 (17.99)	10 (3.46)	4.874*	0.301
Vascular disease	Yes	170 (37.04)	99 (58.24)	32 (18.82)	11 (6.47)	19 (11.18)	9 (5.29)		
	No	439 (95.64)	248 (56.49)	72 (16.4)	30 (6.83)	70 (15.95)	19 (4.33)	10.619**	0.025
Hypertension	Yes	20 (4.36)	8 (40)	8 (40)	3 (15)	1 (5)	0 (0)		
	No	273 (59.48)	155 (56.78)	46 (16.85)	16 (5.86)	46 (16.85)	10 (3.66)	3.106*	0.540
Chronic liver disease	Yes	186 (40.52)	101 (54.3)	34 (18.28)	17 (9.14)	25 (13.44)	9 (4.84)		
	No	443 (96.51)	247 (55.76)	77 (17.38)	32 (7.22)	69 (15.58)	18 (4.06)	0.294**	0.990
Hyperlipidemia	Yes	16 (3.49)	9 (56.25)	3 (18.75)	1 (6.25)	2 (12.5)	1 (6.25)		
	No	444 (96.73)	244 (54.95)	77 (17.34)	33 (7.43)	71 (15.99)	19 (4.28)	9.673**	0.046
Immunosuppression	Yes	15 (3.27)	12 (80)	3 (20)	0 (0)	0 (0)	0 (0)		
	No	456 (99.35)	253 (55.48)	80 (17.54)	33 (7.24)	71 (15.57)	19 (4.17)	3.519**	0.475
Malignancy	Yes	3 (0.65)	3 (100)	0 (0)	0 (0)	0 (0)	0 (0)		
	No	454 (98.91)	255 (56.17)	76 (16.74)	33 (7.27)	71 (15.64)	19 (4.19)	10.293**	0.036
Morbid obesity	Yes	5 (1.09)	1 (20)	4 (80)	0 (0)	0 (0)	0 (0)		
	No	425 (92.59)	239 (56.24)	71 (16.71)	28 (6.59)	68 (16)	19 (4.47)	7.395*	0.116
Neurological disease	Yes	34 (7.41)	17 (50)	9 (26.47)	5 (14.71)	3 (8.82)	0 (0)		
	No	367 (79.96)	202 (55.04)	66 (17.98)	28 (7.63)	57 (15.53)	14 (3.81)	1.463*	0.833
Aspirin usage	Yes	92 (20.04)	54 (58.70)	14 (15.22)	5 (5.43)	14 (15.22)	5 (5.43)		
	No	410 (89.32)	235 (57.32)	63 (15.37)	31 (7.56)	62 (15.12)	19 (4.63)	14.328*	0.006
HIV/AIDS	Yes	49 (10.68)	21 (42.86)	17 (34.69)	2 (4.08)	9 (18.37)	0 (0)		
	No	457 (99.56)	256 (56.02)	78 (17.07)	33 (7.22)	71 (15.54)	19 (4.16)	7.030**	0.134
Alcohol abuse	Yes	2 (0.44)	0 (0)	2 (100)	0 (0)	0 (0)	0 (0)		
	No	455 (99.13)	252 (55.38)	80 (17.58)	33 (7.25)	71 (15.6)	19 (4.18)	4.699**	0.320
Blood disease	Yes	4 (0.87)	4 (100)	0 (0)	0 (0)	0 (0)	0 (0)		
	No	445 (96.95)	248 (55.73)	76 (17.08)	31 (6.97)	71 (15.96)	19 (4.27)	7.237**	0.124
	Yes	14 (3.05)	8 (57.14)	4 (28.57)	2 (14.29)	0 (0)	0 (0)		

n: Number, %: Percentage distribution, X²*: Chi-Square test, LR**: Likelihood ratio and p: Significance (p<0.05)

Table 4: Relationships of categorical variables according to groups motivating vaccination

Variable		Total n (%)	Groups providing motivation for vaccination				X ² /LR	p
			Doctor information n (%)	Follow-up of vaccination records n (%)	Vaccination covered by social security n (%)	Immunization titer follow-up n (%)		
Age group	75 and over	219 (47.71)	117 (53.42)	62 (28.31)	32 (14.61)	8 (3.65)	1.289	0.732
	65-74 years	240 (52.29)	120 (50)	75 (31.25)	39 (16.25)	6 (2.5)		
Gender	Male	195 (42.48)	99 (50.77)	59 (30.26)	35 (17.95)	2 (1.03)	5.972*	0.113
	Female	264 (57.52)	138 (52.27)	78 (29.55)	36 (13.64)	12 (4.55)		
Marital status	Married	246 (53.59)	126 (51.22)	85 (34.55)	28 (11.38)	7 (2.85)	30.015*	<0.001
	Single	94 (20.48)	46 (48.94)	17 (18.09)	30 (31.91)	1 (1.06)		
	Divorced	119 (25.93)	65 (54.62)	35 (29.41)	13 (10.92)	6 (5.04)		
Occupation (retirement category)	Civil servant	34 (7.41)	16 (47.06)	8 (23.53)	10 (29.41)	0 (0)	15.995*	0.191
	Laborer	44 (9.59)	19 (43.18)	17 (38.64)	7 (15.91)	1 (2.27)		
	Private sector	81 (17.65)	44 (54.32)	21 (25.93)	16 (19.75)	0 (0)		
	Housewife	244 (53.16)	128 (52.46)	72 (29.51)	33 (13.52)	11 (4.51)		
	Others	56 (12.2)	30 (53.57)	19 (33.93)	5 (8.93)	2 (3.57)		
Education status	Illiterate	207 (45.1)	112 (54.11)	48 (23.19)	37 (17.87)	10 (4.83)	55.500**	<0.001
	Primary school	125 (27.23)	70 (56)	36 (28.8)	18 (14.4)	1 (0.8)		
	Secondary school	73 (15.9)	37 (50.68)	26 (35.62)	10 (13.7)	0 (0)		
	High school	41 (8.93)	18 (43.9)	20 (48.78)	0 (0)	3 (7.32)		
	University	13 (2.83)	0 (0)	7 (53.85)	6 (46.15)	0 (0)		
Insurance	No	40 (8.71)	18 (45)	12 (30)	10 (25)	0 (0)	4.284*	0.232
	Yes	419 (91.29)	219 (52.27)	125 (29.83)	61 (14.56)	14 (3.34)		
Place of residence	Elderly nursing home	33 (7.19)	17 (51.52)	2 (6.06)	14 (42.42)	0 (0)	24.527*	<0.001
	Own home	426 (92.81)	220 (51.64)	135 (31.69)	57 (13.38)	14 (3.29)		
Smoking	No	341 (74.29)	170 (49.85)	109 (31.96)	51 (14.96)	11 (3.23)	3.166*	0.367
	Yes	118 (25.71)	67 (56.78)	28 (23.73)	20 (16.95)	3 (2.54)		
Presence of comorbid disease	Yes	396 (86.27)	206 (52.02)	120 (30.3)	56 (14.14)	14 (3.54)	5.769*	0.122
	No	63 (13.73)	31 (49.21)	17 (26.98)	15 (23.81)	0 (0)		
COPD	No	392 (85.4)	194 (49.49)	122 (31.12)	63 (16.07)	13 (3.32)	5.109*	0.164
	Yes	67 (14.6)	43 (64.18)	15 (22.39)	8 (11.94)	1 (1.49)		
Cardiovascular disease	No	385 (83.88)	192 (49.87)	125 (32.47)	56 (14.55)	12 (3.12)	8.281*	0.041
	Yes	74 (16.12)	45 (60.81)	12 (16.22)	15 (20.27)	2 (2.7)		
Chronic kidney disease	No	419 (91.29)	213 (50.84)	124 (29.59)	68 (16.23)	14 (3.34)	3.832*	0.28
	Yes	40 (8.71)	24 (60)	13 (32.5)	3 (7.5)	0 (0)		
Diabetes mellitus	No	289 (62.96)	159 (55.02)	80 (27.68)	43 (14.88)	7 (2.42)	4.140*	0.247
	Yes	170 (37.04)	78 (45.88)	57 (33.53)	28 (16.47)	7 (4.12)		
Vascular disease	No	439 (95.64)	228 (51.94)	130 (29.61)	67 (15.26)	14 (3.19)	1.280*	0.734
	Yes	20 (4.36)	9 (45)	7 (35)	4 (20)	0 (0)		
Hypertension	No	273 (59.48)	149 (54.58)	70 (25.64)	46 (16.85)	8 (2.93)	5.988*	0.112
	Yes	186 (40.52)	88 (47.31)	67 (36.02)	25 (13.44)	6 (3.23)		
Chronic liver disease	No	443 (96.51)	230 (51.92)	128 (28.89)	71 (16.03)	14 (3.16)	9.336**	0.025
	Yes	16 (3.49)	7 (43.75)	9 (56.25)	0 (0)	0 (0)		
Hyperlipidemia	No	444 (96.73)	229 (51.58)	131 (29.5)	71 (15.99)	13 (2.93)	5.713**	0.126
	Yes	15 (3.27)	8 (53.33)	6 (40)	0 (0)	1 (6.67)		
Immunosuppression	No	456 (99.35)	234 (51.32)	137 (30.04)	71 (15.57)	14 (3.07)	3.984**	0.263
	Yes	3 (0.65)	3 (100)	0 (0)	0 (0)	0 (0)		
Malignancy	No	454 (98.91)	236 (51.98)	137 (30.18)	67 (14.76)	14 (3.08)	11.428**	0.01
	Yes	5 (1.09)	1 (20)	0 (0)	4 (80)	0 (0)		
Morbid obesity	No	425 (92.59)	220 (51.76)	134 (31.53)	60 (14.12)	11 (2.59)	16.237*	0.001
	Yes	34 (7.41)	17 (50)	3 (8.82)	11 (32.35)	3 (8.82)		
Neurological disease	No	367 (79.96)	189 (51.5)	104 (28.34)	64 (17.44)	10 (2.72)	6.635*	0.084
	Yes	92 (20.04)	48 (52.17)	33 (35.87)	7 (7.61)	4 (4.35)		
Aspirin usage	No	410 (89.32)	209 (50.98)	121 (29.51)	67 (16.34)	13 (3.17)	2.543*	0.468
	Yes	49 (10.68)	28 (57.14)	16 (32.65)	4 (8.16)	1 (2.04)		
HIV/AIDS	No	457 (99.56)	235 (51.42)	137 (29.98)	71 (15.54)	14 (3.06)	2.652**	0.448
	Yes	2 (0.44)	2 (100)	0 (0)	0 (0)	0 (0)		
Alcohol abuse	No	455 (99.13)	235 (51.65)	137 (30.11)	69 (15.16)	14 (3.08)	4.603**	0.203
	Yes	4 (0.87)	2 (50)	0 (0)	2 (50)	0 (0)		
Blood disease	No	445 (96.95)	229 (51.46)	135 (30.34)	67 (15.06)	14 (3.15)	3.684**	0.298
	Yes	14 (3.05)	8 (57.14)	2 (14.29)	4 (28.57)	0 (0)		

n: Number; %: Percentage distribution; X²*: Chi-Square test, LR**: Likelihood ratio and p: Significance (p<0.05)

Table 5: Relationships of categorical variables according to reasons for vaccine hesitancy/refusal

Variable		Total (%)	Reasons for vaccine hesitancy/refusal						X ² /LR	p
			I didn't know I had to get it done n (%)	Vaccination was not recommended n (%)	I'm afraid of side effects n (%)	It does not prevent disease n (%)	I didn't vaccinate because it was overdue n (%)	Other reasons n (%)		
Age group	75 and over	219 (47.71)	128 (58.45)	24 (10.96)	16 (7.31)	21 (9.59)	20 (9.13)	10 (4.57)	21.347*	0.001
	65-74 years	240 (52.29)	109 (45.42)	62 (25.83)	27 (11.25)	17 (7.08)	15 (6.25)	10 (4.17)		
Gender	Male	195 (42.48)	90 (46.15)	43 (22.05)	23 (11.79)	15 (7.69)	15 (7.69)	9 (4.62)	6.286*	0.279
	Female	264 (57.52)	147 (55.68)	43 (16.29)	20 (7.58)	23 (8.71)	20 (7.58)	11 (4.17)		
Marital status	Married	246 (53.59)	120 (48.78)	52 (21.14)	26 (10.57)	16 (6.5)	23 (9.35)	9 (3.66)	72.664	<0.001
	Single	94 (20.48)	25 (26.6)	22 (23.4)	12 (12.77)	17 (18.09)	7 (7.45)	11 (11.7)		
	Divorced	119 (25.93)	92 (77.31)	12 (10.08)	5 (4.2)	5 (4.2)	5 (4.2)	0 (0)		
Occupation (retirement category)	Civil servant	34 (7.41)	11 (32.35)	7 (20.59)	7 (20.59)	3 (8.82)	6 (17.65)	0 (0)	66.492**	<0.001
	Laborer	44 (9.59)	16 (36.36)	8 (18.18)	4 (9.09)	3 (6.82)	10 (22.73)	3 (6.82)		
	Private sector	81 (17.65)	28 (34.57)	20 (24.69)	11 (13.58)	12 (14.81)	6 (7.41)	4 (4.94)		
	Housewife	244 (53.16)	137 (56.15)	44 (18.03)	20 (8.2)	20 (8.2)	12 (4.92)	11 (4.51)		
	Others	56 (12.2)	45 (80.36)	7 (12.5)	1 (1.79)	0 (0)	1 (1.79)	2 (3.57)		
Education status	Illiterate	207 (45.1)	109 (52.66)	35 (16.91)	19 (9.18)	17 (8.21)	17 (8.21)	10 (4.83)	38.087**	0.009
	Primary School	125 (27.23)	68 (54.4)	20 (16)	13 (10.4)	7 (5.6)	10 (8)	7 (5.6)		
	Secondary School	73 (15.9)	44 (60.27)	14 (19.18)	6 (8.22)	8 (10.96)	1 (1.37)	0 (0)		
	High School	41 (8.93)	15 (36.59)	14 (34.15)	3 (7.32)	3 (7.32)	5 (12.2)	1 (2.44)		
	University	13 (2.83)	1 (7.69)	3 (23.08)	2 (15.38)	3 (23.08)	2 (15.38)	2 (15.38)		
Insurance	No	40 (8.71)	13 (32.5)	6 (15)	7 (17.5)	6 (15)	2 (5)	6 (15)	16.233**	0.001
	Yes	419 (91.29)	224 (53.46)	80 (19.09)	36 (8.59)	32 (7.64)	33 (7.88)	14 (3.34)		
Place of residence	Elderly	33 (7.19)	7 (21.21)	0 (0)	10 (30.3)	10 (30.3)	2 (6.06)	4 (12.12)	48.423**	<0.001
	nursing home Own home	426 (92.81)	230 (53.99)	86 (20.19)	33 (7.75)	28 (6.57)	33 (7.75)	16 (3.76)		
Smoking	No	341 (74.29)	178 (52.2)	61 (17.89)	29 (8.5)	31 (9.09)	26 (7.62)	16 (4.69)	3.045	0.693
	Yes	118 (25.71)	59 (50)	25 (21.19)	14 (11.86)	7 (5.93)	9 (7.63)	4 (3.39)		
Presence of comorbid disease	Yes	396 (86.27)	228 (57.58)	71 (17.93)	25 (6.31)	32 (8.08)	26 (6.57)	14 (3.54)	58.333*	<0.001
	No	63 (13.73)	9 (14.29)	15 (23.81)	18 (28.57)	6 (9.52)	9 (14.29)	6 (9.52)		
COPD	No	392 (85.4)	200 (51.02)	71 (18.11)	39 (9.95)	35 (8.93)	28 (7.14)	19 (4.85)	5.388*	0.37
	Yes	67 (14.6)	37 (55.22)	15 (22.39)	4 (5.97)	3 (4.48)	7 (10.45)	1 (1.49)		
Cardiovascular disease	No	385 (83.88)	202 (52.47)	68 (17.66)	39 (10.13)	30 (7.79)	32 (8.31)	14 (3.64)	8.278*	0.142
	Yes	74 (16.12)	35 (47.3)	18 (24.32)	4 (5.41)	8 (10.81)	3 (4.05)	6 (8.11)		
Chronic kidney disease	No	419 (91.29)	218 (52.03)	77 (18.38)	37 (8.83)	35 (8.35)	32 (7.64)	20 (4.77)	5.418**	0.367
	Yes	40 (8.71)	19 (47.5)	9 (22.5)	6 (15)	3 (7.5)	3 (7.5)	0 (0)		
Diabetes mellitus	No	289 (62.96)	148 (51.21)	45 (15.57)	35 (12.11)	23 (7.96)	23 (7.96)	15 (5.19)	11.918*	0.036
	Yes	170 (37.04)	89 (52.35)	41 (24.12)	8 (4.71)	15 (8.82)	12 (7.06)	5 (2.94)		
Vascular disease	No	439 (95.64)	222 (50.57)	81 (18.45)	43 (9.79)	38 (8.66)	35 (7.97)	20 (4.56)	14.465**	0.013
	Yes	20 (4.36)	15 (75)	5 (25)	0 (0)	0 (0)	0 (0)	0 (0)		
Hypertension	No	273 (59.48)	138 (50.55)	50 (18.32)	31 (11.36)	20 (7.33)	20 (7.33)	14 (5.13)	4.794*	0.442
	Yes	186 (40.52)	99 (53.23)	36 (19.35)	12 (6.45)	18 (9.68)	15 (8.06)	6 (3.23)		
Chronic liver disease	No	443 (96.51)	229 (51.69)	80 (18.06)	43 (9.71)	36 (8.13)	35 (7.9)	20 (4.51)	9.705**	0.084
	Yes	16 (3.49)	8 (50)	6 (37.5)	0 (0)	2 (12.5)	0 (0)	0 (0)		
Hyperlipidemia	No	444 (96.73)	232 (52.25)	78 (17.57)	42 (9.46)	37 (8.33)	35 (7.88)	20 (4.5)	9.677**	0.102
	Yes	15 (3.27)	5 (33.33)	8 (53.33)	1 (6.67)	1 (6.67)	0 (0)	0 (0)		
Immunosuppression	No	456 (99.35)	234 (51.32)	86 (18.86)	43 (9.43)	38 (8.33)	35 (7.68)	20 (4.39)	3.984**	0.552
	Yes	3 (0.65)	3 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		
Malignancy	No	454 (98.91)	235 (51.76)	83 (18.28)	43 (9.47)	38 (8.37)	35 (7.71)	20 (4.41)	6.030**	0.303
	Yes	5 (1.09)	2 (40)	3 (60)	0 (0)	0 (0)	0 (0)	0 (0)		
Morbid obesity	No	425 (92.59)	222 (52.24)	77 (18.12)	41 (9.65)	35 (8.24)	32 (7.53)	18 (4.24)	2.271**	0.811
	Yes	34 (7.41)	15 (44.12)	9 (26.47)	2 (5.88)	3 (8.82)	3 (8.82)	2 (5.88)		
Neurological disease	No	367 (79.96)	173 (47.14)	73 (19.89)	37 (10.08)	35 (9.54)	30 (8.17)	19 (5.18)	16.511*	0.006
	Yes	92 (20.04)	64 (69.57)	13 (14.13)	6 (6.52)	3 (3.26)	5 (5.43)	1 (1.09)		
Aspirin usage	No	410 (89.32)	218 (53.17)	71 (17.32)	42 (10.24)	32 (7.8)	33 (8.05)	14 (3.41)	17.469**	0.004
	Yes	49 (10.68)	19 (38.78)	15 (30.61)	1 (2.04)	6 (12.24)	2 (4.08)	6 (12.24)		
HIV/AIDS	No	457 (99.56)	237 (51.86)	84 (18.38)	43 (9.41)	38 (8.32)	35 (7.66)	20 (4.38)	6.737**	0.241
	Yes	2 (0.44)	0 (0)	2 (100)	0 (0)	0 (0)	0 (0)	0 (0)		
Alcohol abuse	No	455 (99.13)	235 (51.65)	86 (18.9)	43 (9.45)	38 (8.35)	33 (7.25)	20 (4.4)	7.492**	0.187
	Yes	4 (0.87)	2 (50)	0 (0)	0 (0)	0 (0)	2 (50)	0 (0)		
Blood disease	No	445 (96.95)	231 (51.91)	84 (18.88)	39 (8.76)	36 (8.09)	35 (7.87)	20 (4.49)	8.042**	0.154
	Yes	14 (3.05)	6 (42.86)	2 (14.29)	4 (28.57)	2 (14.29)	0 (0)	0 (0)		

n: Number; %: Percentage distribution; X²*: Chi-Square test, LR**: Likelihood ratio and p: Significance (p<0.05)

effects (9.4%), feeling that vaccination did not protect them from diseases (8.3%) and thinking that their vaccination date had passed (7.6%), respectively. Refusal of vaccination due to the presence of comorbid disease (1.5%), belief that vaccination was not effective (1.3%), refusal due to financial difficulties (0.9%), fear of injection (0.7%) and refusal due to religious belief (0.0%) were rare reasons and were combined

under the other tab in the table to determine the statistical relationship. Statistically significant associations were found between participants' reasons for vaccine hesitancy/refusal and age groups (X² = 21.347 and p = 0.001), marital status (X² = 72.664 and p<0.001), educational status (X² = 38.087 and p = 0.009), presence of social security (X² = 16.233 and p = 0.001), place of residence (X² = 48.423 and p<0.001)

and presence of comorbid diseases ($X^2 = 58.333$ and $p < 0.001$). A statistically significant relationship was found between the reasons for vaccine hesitancy/refusal and diabetes mellitus, vascular diseases, neurologic diseases and aspirin usage (Table 5).

Analysis of the distribution of age groups, marital status, social security status and place of residence revealed that all groups stated that they did not vaccinate because they did not know that they should be vaccinated. When analyzed according to place of residence, those living in a nursing home stated that they did not get vaccinated mostly because they were afraid of side effects/not effective in disease prevention, while those living in their own homes stated that they did not get vaccinated mostly because they did not know that they should get vaccinated.

In the presence of comorbid diseases, the most common reason for not vaccinating was that they did not know that they should be vaccinated, while those without comorbid diseases did not vaccinate mostly because they were afraid of side effects. When the distribution of diabetes mellitus, vascular diseases, neurological diseases and aspirin usage groups were analyzed, it was observed that the most common reason for not vaccinating was that they did not know that they should be vaccinated.

DISCUSSION

Vaccination is one of the most cost-effective medical interventions against infectious diseases. Providing access to vaccines at all ages has been included in the United Nations Sustainable Development Goal to achieve vaccination targets¹⁷. The VPDs are seen at serious rates in the elderly population. Therefore, within the framework of global strategies and policies, especially adults and older adults have been included among the target groups for vaccination. In addition, since the elderly are particularly susceptible to infections, treatment and vaccination programs have become mandatory. Antimicrobial resistance is observed in the elderly due to inappropriate use of antimicrobials, difficulties in accessing drugs and vaccines and lack of awareness. Antimicrobial resistance can be reduced with vaccination and the cost of health services can be reduced by preventing infectious diseases¹⁸. Functional capacity is also affected after VPD in the elderly. It has been shown that patients hospitalized due to influenza lose their daily life activity capacity and need care and assistance after discharge¹⁹. In another study, deficiencies in physical, social and

psychological functioning were observed in the elderly after postherpetic neuralgia²⁰. Therefore, it is particularly important to increase vaccination rates in older adults²¹.

The vaccination rates of the elderly in our study were influenza vaccine (34.0%), tetanus vaccine (29.2%), childhood vaccines only (27.9%), hepatitis B vaccine (14.6%), meningococcal vaccine (8.5%), pneumococcal vaccine (8.3%) and herpes zoster (2.2%), respectively. In a study conducted with patients who applied to the Geriatrics Outpatient Clinic, influenza vaccination rate was found to be 18%, pneumococcal vaccination rate 6% and DPT vaccination rate 5%²². According to one of previous studies, only 45.6% of geriatrics are able to be vaccinated and most commonly applied influenza (41.3%), pneumococcal and tetanus (5.5%), respectively²³. In the elderly over 65 years of age, the vaccination rates were influenza vaccine (72.2%), pneumococcal vaccine (69.0%) and tetanus vaccine (58.9%), respectively²⁴. In a study conducted in Greece, the vaccination rates of the elderly were influenza vaccine (83%), conjugated pneumococcal vaccine (49.5%), pneumococcal polysaccharide vaccine (23.5%), herpes zoster vaccine (20%), hepatitis B vaccine (0.3%) and tetanus vaccine (0.30%), respectively²⁵. Similar to previous studies, influenza vaccination was found to be the most common vaccine in our study and the rate of vaccination every year was 11.1%. Korkmaz *et al.*²⁶ found the rate of influenza vaccination every year to be 19% in a study conducted with participants over the age of 65. In a study involving four countries, most of the participants were vaccinated with influenza and tetanus vaccine, while the rate of pneumococcal and herpes zoster vaccination was very low²⁷. Similarly, herpes zoster vaccination rate was very low in our study. In a study conducted in the USA, the herpes zoster vaccination rate was 33.3% (range: 17.8%-48.8%) and varied between states²⁸. Vaccination rates varied from country to country in the studies. In the elderly, systems should be adjusted according to countries when making health policies and planning.

In a previous study, 53.7% of the elderly had received at least one of the influenza, pneumococcal, herpes zoster, or tetanus vaccines, while 46.3% had not received any of these vaccines²⁹. Similarly, in this study, 53.16% had received at least one vaccine and 48.84% had not received any of the vaccines. Comorbid diseases were found to be cardiovascular system diseases (52.6%), endocrine system diseases (23.7%), respiratory system diseases (10.2%) and urogenital system diseases (9.2%), respectively²⁹. In the study by Bal and Börekçi³⁰ cardiovascular system diseases (82.6%), endocrine

system diseases (46.3%), respiratory system diseases (10.9%) and musculoskeletal system diseases (10.0%) were found as comorbid diseases. In this study, hypertension (21.8%) was most common in the elderly, followed by diabetes mellitus (20.0%), chronic neurological diseases (10.6%), chronic cardiovascular diseases (8.7%) and chronic obstructive pulmonary diseases (7.8%). Those without comorbid diseases were 7.2%. It was thought that the difference in the distribution of comorbid diseases between the studies may be due to the diversity of the sample group.

In addition, statistically significant correlations were found between the vaccine group and age groups ($p < 0.001$), gender ($p = 0.032$), marital status ($p < 0.001$), occupation ($p = 0.009$) and educational status ($p = 0.001$). In this study, no statistically significant relationship was found for the presence of chronic disease ($p = 0.134$). However, when subgroups were analyzed, statistically significant associations were found between COPD ($p < 0.001$), vascular diseases ($p = 0.045$), hyperlipidemia ($p = 0.034$), blood diseases ($p < 0.001$), aspirin usage ($p < 0.001$) and alcohol abuse ($p = 0.024$). In current study, the lower vaccination rates in individuals aged 75 years and older compared to the 65-74 age group may be related to the fact that this age group is less likely to apply for healthcare services due to their increasing bed dependency with age. In addition, the vaccination rate was higher in married people and male gender. Similar to the study by Gürsoy *et al.*²³ higher vaccination rates were found in those with high school education and above in this study.

In the literature review, it was observed that most studies on influenza vaccination were conducted. For this reason, the current study is one of the rare studies conducted with more than one vaccine group. In a study conducted in Poland with elderly people diagnosed with diabetes mellitus, a relationship was found between the number of comorbidities and influenza [odds ratio (OR) = 1.351 and $p = 0.004$] and pneumococcal vaccination (OR = 2.778 and $p = 0.000$)³¹. Factors affecting influenza vaccination were found to be being over 65 years of age, educational status, living in an urban center and the presence of COPD and cardiovascular disease. In addition, the presence of comorbid diseases increased vaccination²⁶. In China, the factors affecting influenza vaccination were age, marital status and education level and a positive correlation was found between these factors and vaccination. The rate of influenza vaccination in patients with comorbid diseases was 4.8%³².

In our study, 31.41% ($n = 49$) of those who received influenza vaccine had influenza and 4.08% ($n = 2$) were hospitalized. Among those who received the pneumococcal vaccine, 13.6% ($n = 5$) had pneumonia and none of them were

hospitalized. Similar to our study, it was found that as the influenza vaccination rate increased, influenza cases decreased and hospitalization could be prevented. It was observed that a 5% increase in the vaccination rate led to a decrease of 785,000 in the number of illnesses and 11,000 in hospitalizations³³. A decrease in community-acquired pneumonia and invasive pulmonary diseases was observed with pneumococcal vaccination and pneumococcal vaccination in the elderly was found to be cost-effective³⁴. With the national pneumococcal vaccination program in the elderly, hospitalization time, mortality rates and medical expenditures could be reduced³⁵. Especially influenza and pneumococcal vaccination can provide effective cost savings in health services³⁶.

The current study examined the effect of people/groups recommending vaccination on vaccination uptake. The influence rates were physicians (55.8%), other healthcare professionals (17.4%), neighbors or friends (15.5%), pharmacists (7.2%) and social media (4.1%), respectively. The highest increase in vaccination requests was due to physician recommendations. Similar to our study, participants' acceptance of vaccination was influenced by work/work environment, family members, media and friends' vaccination experiences. The preferred sources of information were general practitioners, specialists, pharmacists and other health professionals, respectively. It was also found that general practitioners provided the most information about vaccines and influenced the vaccination rate²⁷. The sources of information affecting influenza vaccination were television (53.4%), physicians (43.9%), nurses (6.8%), newspapers (5.5%) and internet sources (4.3%), respectively³². It was found that the rate of vaccination increased especially when pharmacists directed the elderly to the physician and provided information³⁷. In another study, 27.0% of the participants reported that they received the influenza vaccine because the physician recommended it³⁸. In addition, it was observed that the rate of pneumococcal vaccination increased by 18.7% with direct mail notification to the participants³⁹. As observed, different methods should be used to increase vaccination rates in the elderly. It is thought that more effective results will be obtained by organizing information at the national level. In addition, in this study, there was a statistically significant relationship between educational status, social security, COPD, vascular disease, hyperlipidemia, malignancy and aspirin usage and the person/groups who recommended vaccination. The effect of the presence of comorbid diseases should not be ignored while increasing vaccination rates.

In our study, when asked about the factors that encourage vaccination and reduce vaccine hesitancy/refusal

in the elderly, the most influential factor was the physician explanation of the indications for vaccination and providing information to the patient (51.6%). In addition, the follow-up of vaccination records (29.8%), vaccination being covered by social security (15.5%) and intermittent immunization titer follow-up (3.1%) were also found to be effective. A statistically significant relationship was found between the factors affecting vaccination and marital status, educational status, place of residence and presence of comorbid diseases. Among comorbid diseases, a statistically significant relationship was found especially between cardiovascular diseases, chronic liver diseases, malignancy and morbid obesity. In the literature review, similar to our study, it was observed that participants who received information from physicians were more motivated to receive influenza vaccine²⁶. In addition, a relationship was found between vaccination motivation and the presence of social security. A low rate of vaccination was observed in the absence of health insurance^{27,28}. Similar to our study, visiting health centers, evaluating the vaccination status at the patient's application, making recommendations for vaccination with regular physician information, recording and monitoring the vaccines administered in the system will help increase the vaccination rate^{27,40}. In addition, the presence of comorbid diseases affects vaccination. In the presence of cardiovascular risk factors, there is a risk of heart attack and stroke after influenza. The rate of influenza vaccination has increased with physician information on this subject⁴¹. Current study findings were consistent with the literature.

When the reasons for not vaccinating/vaccine hesitancy were asked, the most common reason given by the elderly in our study was not knowing that they should be vaccinated. Other factors were not being recommended by anyone (18.7%), fear of vaccine side effects (9.4%), thinking that vaccination did not prevent their diseases (8.3%), thinking that the vaccination dates had passed (7.6%), refusing vaccination due to comorbid diseases (1.5%), thinking that vaccination was not effective (1.3%), refusing vaccination due to financial difficulties (0.9%) and fear of injection (0.7%), respectively. It was found that religious belief did not affect vaccine hesitancy/refusal. In this study, there was a statistically significant relationship between the age groups, marital status, educational status, social security, place of residence and presence of comorbid diseases and the reasons for vaccine hesitancy/refusal.

In the literature review, it was observed that the reasons for vaccine hesitancy/refusal were generally investigated based on vaccine type⁴²⁻⁴⁴. It has been observed that participants did not receive vaccination because they were

healthy or did not know that they should be vaccinated³². In the study conducted by Uzuner *et al.*⁴⁵ 47.1% of the participants stated that they were not informed about vaccination and 43.2% stated that they did not believe that vaccination was necessary. Similar to previous studies, the most common reason for vaccine hesitancy/refusal in our study was not knowing that vaccination was necessary. All these responses indicate that people do not know that they should be vaccinated and do not sufficiently understand the importance of vaccination. In the current study, there was a statistically significant relationship between place of residence and reasons for vaccine hesitancy and the rate of influenza vaccination was lower in those living alone⁴⁶. In addition, low awareness of the recommendation of vaccines^{47,48}, poor perception of the importance of diseases^{49,50} and attitudes towards previous vaccination⁵¹ were found to be associated with vaccination rates. In addition, factors such as lack of information about vaccination, whether there is a certain age limit, side effects, vaccine cost, vaccine recommendation and belief in the efficacy of the vaccine have also been demonstrated to affect the rates of vaccine hesitancy/refusal²⁷. It has been recommended to increase vaccination rates by investigating the reasons for the lack of a vaccination program, lack of information and vaccine hesitancy. The reasons for non-vaccination/vaccine hesitancy among the elderly in our study were similar to the studies. In addition, it has been recommended to increase vaccination rates by investigating the reasons for the lack of a vaccination program and vaccine hesitancy⁵². The reasons for vaccine hesitancy/refusal among the elderly in this study were similar to the studies.

Finally, this study had some limitations. The limiting aspect of this study was that it was conducted on patients admitted to the hospital. Although the participants were selected after geriatric evaluation, the evaluation of vaccination status is based on the memory factor. In addition, this study was single-centered and multicenter studies are needed to make national guidelines.

CONCLUSION

This is one of the rare studies analyzing the effects of demographic data and comorbid diseases on more than one vaccine type. While making arrangements to increase national immunization rates, systematic mechanisms for vaccination should be developed by making separate evaluations according to demographic data such as age groups, marital status, gender, educational status, social security status, occupation, place of residence and comorbid diseases.

To reduce the reasons for vaccine hesitancy, the use of effective information channels, follow-up and national regulations are recommended.

SIGNIFICANCE STATEMENT

Due to low vaccination rate among elderly, preventable infectious diseases bear high risk of mortality and co-morbidities and also result in higher health care expenditures. We aimed at discovering the most striking reasons of low vaccination rate among the elderly over 65 years old. In this study, 51.6% of the elderly were determined not to have been informed satisfactorily before about the essentialness of the vaccination. We think that our study will be an important source of data regarding the vaccination rates of the elderly population in Turkey. Moreover, the results of our study clearly confirm that in order to achieve the desired vaccination rates in the elderly population, we need health system approaches specific to this age group.

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