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Research Article

Evaluation of Influenza Vaccine Coverage Levels of People 65 Years and Older by Lot Quality Technique: A Cross-Sectional Study

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What is already known on this topic?

- *The influenza vaccine is an effective and safe preventive measure that reduces hospitalizations and mortality among older adults and is recommended for individuals aged 65 years and over.*
- *Although the target vaccination coverage for the elderly population is set at 70% or higher, vaccination rates in many communities remain below this target.*
- *In Türkiye, data on influenza vaccination coverage are limited to studies based on small, non–population-representative samples.*

What this study adds on this topic?

- *In metropolitan areas, assessments conducted at the provincial or district level do not adequately reveal differences in vaccination coverage between neighborhoods.*
- *This study is among the first to use the Lot Quality Assessment method to identify neighborhood-level deficiencies in vaccination coverage and to define "unacceptable" areas requiring targeted interventions.*
- *The findings indicate that the main reasons for non-vaccination among older adults are lack of information and disbelief in the benefits of the vaccine, underscoring the need for communication- and education-based interventions.*

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Abstract

AIM: There is a lack of epidemiologic studies representing the community regarding vaccine uptake in older people. The aim of this study was to determine the frequency of seasonal influenza vaccination and influenza vaccine coverage and examine the relationship between sociodemographic and health characteristics and vaccination in older adults over 65 years of age.

METHODS: The study is a cross-sectional epidemiological study representing the province of in all central districts of Ankara, and the sample consists of individuals over 65 years of age selected from each neighborhood (LOT) method. The data were collected between November 20, 2022 and Decemer 31, 2022 by means of a questionnaire form including sociodemographic and health-related characteristics created by the researchers.

RESULTS: In 2022, 43.0% of elderly individuals received the influenza vaccine, and in 2021, 45.5% received it. Among the reasons for not getting the influenza vaccination, the first was a lack of information about vaccination (24.4%) and the second was the belief that vaccination would be useless (17.8%). In terms of the continuity of vaccination behavior of individuals, the vaccination rate in both years was 47.2%. According to the cut-off values used in Lot Quality Assessment Analyses determined for this study, there are 18 (24%) neighborhoods with influenza vaccination prevalence below 35%, and the number of elderly vaccinated in these neighborhoods is below six, which is determined as "unacceptable." Only two neighborhoods have a vaccination prevalence above the national target of 70%. In 73.3% of the neighborhoods, the vaccination prevalence is between 35% and 69% and needs to be improved in terms of the national target. Being single, not visiting a doctor in the last year, hospitalization, and living more than 30 minutes away from the Family Health Center increased the risk of not being vaccinated.

CONCLUSION: Health policies aimed at creating vaccine awareness in society should be shaped by taking into account factors such as education, gender, marital status, chronic disease, and geographical access. In addition, methods that will facilitate individuals' access to health services and enable them to obtain information about vaccines should be developed, and social awareness should be increased.

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Introduction

The disability that occurs with aging is among the most fundamental problems that cause difficulty in meeting the needs of the older population with the limited resources of societies. Therefore, the most important investment to be made in the older population is preventing disability and delaying it as much as possible (Corselli-Nordblad et al., 2020). A good immunization program for the older population will contribute significantly to avoiding disability by

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preventing infectious diseases and many related problems. Pneumonia is one of the important causes of morbidity and mortality in older adults in the world and the country. Therefore, ecological trend designs, such as those utilized to assess the impact of pneumococcal vaccination against pneumonia (Palmu et al. 2017). The increasing aging of society has increased the importance of pneumonia prevention, especially with the COVID-19 pandemic experience in recent years. Older people and individuals with chronic diseases are at high risk for influenza and related pneumonia, and it has been reported in the literature that the influenza vaccine is protective in terms of hospitalization and mortality, prevents disease, and is effective in reducing antibiotic use and thus preventing antimicrobial resistance (Darvishian et al., 2012; Dong et al., 2023; TURKSTAT, 2021; Fallani et al., 2021; Lapi et al., 2022; Yao et al., 2020).

Although the importance and effects of influenza vaccination in older adults are generally accepted worldwide, vaccination rates are not at expected levels, and there may be significant differences between countries. In Hong Kong, the influenza vaccination rates in individuals aged 65–74 years and over 75 years were 49.1% and 69.9% (Sun et al., 2020), in Greece 56.6% (Dardalas et al., 2020), and in Türkiye 28.1% in individuals over 65 years of age who applied to Family Health Centers (FHC) (Bal & Borekci, 2016), 33.9% and 36% in those who applied to family medicine outpatient clinics. Among those who received influenza vaccination, 47.1% reported receiving it yearly and 40.2% only once (Başpınar et al., 2020; Mutlu et al., 2018). However, in a population-based study on influenza vaccination in older adults, it was reported that 22.3% of older adults received influenza vaccination every year and 8.9% irregularly. In patients hospitalized with a diagnosis of pneumonia and registered in the Turkish Thoracic Society Pneumonia Database (2009–2013), 81% were never vaccinated, and 10% received influenza vaccines (Demirdogen Cetinoglu et al., 2017; Elbi & Değer, 2018).

Studies examining factors affecting vaccination status have shown that vaccination rates are generally lower among individuals from lower socioeconomic backgrounds and minority groups. In contrast, vaccination rates tend to be higher among older adults, those with at least a primary school education, and people who visit their physician regularly. Additionally, individuals with chronic diseases, especially those who are older and take medication continuously, also have higher vaccination rates (Bal & Borekci, 2016; Başpınar et al., 2020; Elbi & Değer, 2018).

The World Health Organization (WHO) emphasizes that the estimated information on influenza disease comes mostly from high-income countries. More studies are needed on the severe influenza situation and geographical burdens in low- and middle-income countries, especially in risk groups. In addition, due to the continuous evolution of the influenza virus, WHO updated its research agenda in 2017 and decided to prioritize influenza research. During the COVID-19 pandemic, which recently affected the world, it was emphasized that influenza vaccinations should not be neglected and that it was important to develop new vaccination strategies, especially for disadvantaged groups (WHO, 2019).

In Türkiye, the influenza vaccine is covered by the state once a year when prescribed by physicians for adults with asthma, chronic lung, heart, and other chronic diseases. However, since there is no regular data collection on vaccination information for older people in Türkiye, there is no registry system where information on the prevalence of vaccination and the characteristics of older people who receive vaccination can be accessed. As seen in the literature, there is a lot of evidence-based information on the effectiveness of the influenza vaccine recommended for older people. However, when the accumulation of knowledge is evaluated, it is noteworthy that the data based on developed countries are predominant and that country and region-specific data should be constantly updated to address the problems. In Türkiye, it is noteworthy that the prevalence data on influenza vaccination in older people are mainly based on those who apply to hospitals or FHCs; most of them are studies in basic descriptive design, and there is a lack of epidemiologic studies representing the community regarding vaccine uptake in older people (Bal & Borekci, 2016; Başpınar et al., 2020; Demirdogen Cetinoglu et al., 2017; Elbi & Değer, 2018; Mutlu et al., 2018).

It is thought that determining the community-based prevalence and coverage of influenza vaccination in elderly individuals and examining the determinants of vaccination will provide important information for the development of vaccination programs in the country, reviewing the appropriate target groups for the program, and developing new vaccination strategies.

This study aimed to determine the frequency of seasonal influenza vaccination and influenza vaccine coverage in older adults over 65 living in Ankara and examine the relationship between sociodemographic and health characteristics and vaccination.

Research Questions

1. What is the rate and coverage of influenza vaccination in older adults?
2. Is influenza vaccination in older adults associated with sociodemographic characteristics?
3. Is influenza vaccination in older adults associated with health characteristics?

Methods

Study Design

The study is a cross-sectional study . The reporting of the study was done according to the STROBE (The Strengthening the Reporting of Observational Studies in Epidemiology) guidelines.

Sample

The sample size required for the study and its distribution by neighborhoods were calculated according to the WHO Lot Quality Assurance Sampling (LQAS) method. In determining the sample size of the cross-sectional study, the minimum required sample size was calculated as 972 based on the influenza vaccination frequency (33.9%) (Mutlu et al., 2018) reported in a study conducted with older adults over 65 years of age who applied to the family medicine outpatient clinic, with $p = 35\%$, 95% CI, and deviation value ±3. How the neighborhoods to be included in the study were determined is explained in detail in the study

titled "Quality of Life Scale for Healthy Housing Environments: The Case of Ankara" explains in detail how neighborhoods are determined (Özüduru et al., 2022). In this study, a six-step method was used to determine which of these neighborhoods would be included in the study.

1. A "living environment index" was obtained with different variables that are considered specific to the living environment.
2. There are 378 neighborhoods in the central districts of Ankara. Using clustering analysis, these neighborhoods were divided into six clusters according to the index values obtained.
3. These six clusters were classified according to SES groups.
4. Neighborhoods in each class were ranked according to their living environment index values.
5. According to the ranking, 149 neighborhoods were identified, excluding the neighborhoods in the first and last 25%.
6. From these 149 neighborhoods, 75 neighborhoods with a population of more than 5000 were selected, taking into account their distribution by district and SES groups. In this study, each of these 75 neighborhoods was considered as a LOT and fieldwork was conducted.

Considering the minimum sample size of 15 for the number of elderly people per LOT and considering possible data losses, the number was increased by 20%, and the sample size was accepted as 1166. Sample selection in the study was made in accordance with the Lot Quality Vaccination Rate. The main purpose of choosing this technique was not only to determine the vaccine coverage level (vaccinated prevalence) for Ankara in general but also to evaluate the regions and identify the regions with a vaccine coverage rate below the acceptable level.
By conducting the survey using the Lot quality technique, it was possible to calculate prevalence values for the province and identify neighborhoods with vaccine coverage values below the "acceptable" level (35%). In statistical analysis; according to the vaccination rate ($p = .35$) used to calculate this study sample size and the national vaccination target ($p = .70$), the study areas were graded on vaccination coverage. Areas with vaccination rates below 35% were considered to have "unacceptable" coverage. Between 35% and 70% was considered "acceptable," and higher rates were considered "national target achieved." The study was conducted in Ankara province. The provincial population of Ankara is 5,663,322, according to the 2020 census. The proportion of the population over 65 years of age (515, 245) is 9.1% of the total population (TURKSTAT, 2021).

In the study, the area belonging to each LOT was determined on the map, and the sample was selected using random methods. The first respondent was randomly selected from each street or avenue in each neighborhood (LOT). The surveyors were given at least 16 older adults from this selected street or avenue and proceeded by randomly selecting the sampling points with the random household selection method in a way that participants were chosen from each street without leaving the neighborhood. A new household was selected if there were no people in the target population group in the selected household. If there was more than one person over 65 in the selected household, one was selected by lottery.

Cut-off Values Used in Lot Quality Assessment Analyses: For the vaccine studied in the research, the "threshold" value according to the LQAS, i.e., the lower value accepted to decide that the performance of the lots is "unacceptably" low, was 35% and the high threshold value was accepted as 70% in line with the national target. Accordingly, the "decision value," i.e., the value to be used to determine the "unacceptable" level of performance of a lot if more than the maximum number of elderly per lot are unvaccinated, was set at six (Valadez, 1991) The relevant decision values were determined using the Sample LQ© package program (the program can be downloaded free of charge from http://www.brixtonhealth.com/index.html).
The inclusion criterion was defined as being over 65 years of age. Patients with a diagnosis of cancer and diseases requiring immunosuppressive treatment (transplantation cases, rheumatoid arthritis, systemic lupus erythematosus, inflammatory bowel disease) were excluded. These groups were excluded because they were in need of physician guidance with regard to vaccine contraindications.

Data Collection Tools
The data collection form is a descriptive characteristics questionnaire created by the researchers and consists of two parts (Başpınar et al., 2020; Dardalas et al., 2020; Kharroubi et al., 2021). The Demographic Characteristics Information section assessed socio-demographic characteristics (gender and marital status) and socio-economic characteristics (education, income level, perceived economic status, health insurance).
The Vaccination and Health-related Characteristics section assessed health-related characteristics (vaccination history in the previous season, vaccination status in the current season, primary preference for health services, frequency of hospital and doctor visits in the last six months, distance to nearest health facility, presence of chronic diseases, use of medication) were assessed.

Data Collection
Data were collected between November 20 and December 31, 2022, by data collection specialists through home visits and telephone interviews. For influenza vaccination, it is recommended to start in September and complete by the end of October, but practices can extend until the end of November. Influenza vaccination status of older adults was questioned based on self-report.

Statistical Analysis
In the study, influenza coverage level was determined, and bivariate and multivariate logistic regression analysis was used to determine the factors associated with this coverage level. Omnibus tests of model coefficient, Hosmer and Lemeshow test, and Classification Table values were checked before the analysis. Multivariate logistic regression analysis included the variables that were significant in bivariate analysis. In addition, health insurance was not used in the analyses because of the correlation between health insurance and perceived income. A software program used for the statistical analysis process of the study (IBM, SPSS 27, Chicago, IL, USA). The threshold for statistical significance was set at $p<0.05$.

Ethical Considerations

Ethics committee permission (September 13, 2021, number 2021/106, code 2021103) was obtained from the Lokman Hekim University Non-Interventional Clinical Research Ethics Committee. Written institutional notification was made to the Ankara governorship, and written informed consent was obtained from the participants.

Results

General Characteristics

Of the 1201 elderly individuals who participated in the study (Table 1), 58.9% were male, 71.9% were married, 43.0% were primary school graduates, 45.3% had a moderate economic status, and 94.9% had health insurance. Of older individuals, 43.0% evaluate their general health status at a moderate level, 73.2% have chronic diseases, 73.8% use medication continuously, 49.0% prefer public hospitals, 91.6% have consulted a doctor in the last year, 12.6% have been hospitalized in the previous year, and 95.3% of them live less than 30 minutes away from the FHC (Table 1).

Evaulation of Influenza Vaccine Coverage By Neighbourhoods

According to the Cut-off Values Used in Lot Quality Assessment Analyses determined for this study, there are 18 (24%) neighborhoods with influenza vaccination prevalence below 35%, and the number of vaccinated elderlies in these neighborhoods is below six, which is determined as "unacceptable." Only two neighborhoods (Bahçeler içi and Kazım Orbay) have a vaccination prevalence above the national target of 70%. In 73.3% of the neighborhoods, vaccination prevalence was between 35% and 69%, which needs improvement in the national target (Supplementary File 1).

Participants' Influenza Vaccination Status

Based on self-report, 43.0% of elderly individuals received influenza vaccine this year, and 45.5% received influenza

Table 1.
Descriptive Characteristics of Individuals (N=1201)

Features	*n*	%	Features	*n*	%
Gender			**Perceived health status**		
Woman	494	41.1	Too bad	36	3.0
Male	707	58.9	Bad	322	26.8
Marital status			Middle	516	43.0
Married	864	71.9	Good	314	26.1
His wife passed away	261	21.7	Very good	13	1.1
Divorced	38	3.3	**Presence of chronic disease**		
Single	28	2.3	Yes	879	73.2
Lives separately	10	0.8	No	322	26.8
Education status			**Use of medication**		
Illiterate	93	7.7	Yes	886	73.8
Literate	86	7.2	No	315	26.2
Primary school	516	43.0	**First choice in receiving healthcare services**		
Middle school	195	16.2	Family Health Center	498	41.5
High school and equivalent	205	17.1	Public Hospital	588	49.0
College	76	6.3	University Hospital	70	5.8
Degree	29	2.4	Private practice/polyclinic	21	1.7
Doctorate	1	0.1	Private hospital	24	2.0
Perceived economic situation			**Application to a doctor within the last year**		
Too bad	135	11.2	Yes	1100	91.6
Bad	359	29.9	No	101	8.4
Middle	544	45.3	**Hospitalization in the last year**		
Good	157	13.1	Yes	151	12.6
Very good	6	0.5	No	1050	87.4
Health insurance			**Distance of the house to FHS**		
Yes	1140	94.9	Less than 30 minutes	1144	95.3
No	61	5.1	30 and more than 30 minutes	57	4.7

vaccine last year. Among the reasons individuals did not get influenza vaccines, the first was a lack of knowledge about vaccination (24.4%), and the second was thinking that the vaccine would be useless (17.8%). The continuity of the vaccination behavior of the individuals was examined as being vaccinated in both years, and it was determined that 568 individuals (47.2%) had never received the influenza vaccine; 430 individuals had received the influenza vaccine for two consecutive years, and the Phi coefficient for the behavior of receiving the influenza vaccine for two consecutive years was 0.658 (Table 2).

Risk of Influenza Vaccination according to Research Regions

These neighborhoods were selected from the six clusters identified for Ankara. Of these clusters, the third region had the highest vaccination prevalence (54.2%), and the risk of not receiving influenza vaccination (OR: 1.900) was 1.9 times higher for region six in the analysis performed with this group as the reference group (Table 3).

Risk Factors for not Getting the Flu Vaccination

The effect of sociodemographic factors on non-vaccination risk was evaluated by Bivariate Logistic Regression analysis (Tables 4 and 5). Females were at higher risk of not being vaccinated compared to males (OR: 1.264), single/widowed compared to married (OR: 1.680), and those with no basic education compared to those with high school and above education (OR: 1.549 times). Perception of economic status was not identified as a risk factor (Table 4).

Risk Factors for not Receiving Influenza Vaccination

In terms of health characteristics, those who did not have a chronic disease (OR: 1.412), who did not use medication continuously (OR: 1.418), who did not visit a doctor in the last year (OR: 14.813), who did not have hospitalization (OR: 1.630), and who lived more than 30 minutes away from the FHC (OR: 3.317) had a higher risk of not being vaccinated (Table 5).

When the risk factors were re-evaluated with multivariate logistic regression analysis, being single (OR: 1.490), not visiting a doctor in the last year (OR: 4.164), hospitalization (OR: 1.507), and living more than 30 minutes away from the FHC increased the risk of not being vaccinated (OR: 3.165). In the multivariate analysis, gender, education level, and region of residence were no longer significant determinants (Table 6).

Discussion

In this study, influenza vaccination rate, influenza vaccine coverage, and determinants of vaccination were evaluated in terms of sociodemographic and health characteristics and region of residence in older adults in Ankara, Türkiye. In the study group, the prevalence of self-reported vaccination was 43.0%, and the percentage of vaccination in the previous year was slightly higher (45.5%). The percentage of those who had never been vaccinated in both years was 47.2%. Regarding the continuity of vaccination behavior, a weak positive dependence (phi: 0.658) was found for vaccination behavior two years in a row. Although vaccination one year ago affects vaccination this year, this relationship's weakness indicates a continuity in vaccination/

Table 2.
Distribution of Findings Regarding Participants' Influenza Vaccination Status Evidence of Influenza Vaccine Coverage

Features	***n***	**%**
Getting a flu vaccine a year ago		
Yes	546	45.5
No	655	54.5
Didn't get the flu vaccine this year		
Yes	517	43.0
No	684	57.0
Vaccine behavior	***n***	**Test value**
Only those vaccinated this year	87	$X^2 = 520.647$
Only those vaccinated in the previous year	116	$p < .001$
Vaccinated every two years	430	Phi: 0.658
Those who were not vaccinated in both years	586	
Reason for not getting influenza vaccine (*n* = 684)	***n***	**%**
Lack of information about vaccination	293	42.8
Inability to pay the vaccination fee	37	5.4
Don't think the vaccine will be useless	214	31.2
Don't think the vaccine will be harmful	26	3.8
Other factors*	114	16.6

*(%) Has not been vaccinated yet but is considering getting vaccinated (1.7), Side effects (0.4), Not needing/not seeing the need (4.9), Not being able to find a vaccine (1.5), COVID-10 disease (1, 0)

Table 3.
Examination of the Risk of Influenza Vaccination According to Research Regions

	Influenza Vaccination (Yes/No)						
Region	***n***	**%**	***n***	**%**	**OR**	**(95% GA)**	
Region 1	127	44.1	161	55.9	1.489	0.811-	2.767
Region 2	56	50.0	56	50.0	1.182	0.600-	2.328
Region 3	26	54.2	22	45.8			
Region 4	108	42.2	148	57.8	1.620	0.872-	3.009
Region 5	126	41.4	178	58.6	1.670	0.905-	3.079
Region 6	74	38.3	119	61.7	1.900	1.005-	3.596

non-vaccination behavior. A study conducted with individuals with chronic diseases reported that vaccination in the previous period was an important determinant of willingness to be vaccinated (Kharroubi et al., 2021).

Vaccination rates vary in different regions of the world (1.23%–83.3%) (Fayed et al., 2021; Gomes de Macedo Bacurau et al., 2021; Han et al., 2022; Sulis et al., 2022; Tannous et al., 2023; Yalçın Gürsoy et al., 2022; Yunhua et al., 2022; Zalloum et al., 2022). Considering that the prevalence of influenza vaccination in this study (43.0%) was higher than in the general population studies in the country (28.1%–41.3%) and that even the influenza vaccination rate of elderly individuals with chronic problems was 36.5% and 10%, it can be inferred that the rate of influenza vaccination has increased. Although this rate is higher than the vaccination rates reported globally and in Türkiye, it still falls short of the targeted coverage, with variations observed between regions (Aka Aktürk et al., 2017; Bal & Borekci, 2016; Başpınar et al., 2020; Mutlu et al., 2018; Yalçın Gürsoy et al., 2022). As a matter of fact, 24% of the neighborhoods in the study area fall below the Lot Quality Assessment criterion (35%) set for this study. In these neighborhoods, the number of vaccinated elders below six was considered "unacceptable," and only two neighborhoods were found to have a vaccination prevalence in line with the national target (70%). In 73.3% of the neighborhoods, the vaccination prevalence (35%–69%) is at a level that needs to be improved in terms of the national target (Table 3). It can be considered that vaccination services and community education have not adequately reached these regions, which should be prioritized for influenza vaccination in Ankara. Considering that lack of information about vaccination and thinking that vaccination is useless were ranked first among the reasons for non-vaccination in this study, and similar findings were reported in the literature, it can be said that the people living in these regions cannot benefit from health services and health education opportunities sufficiently (Gomes de Macedo et al., 2021; Gatwood et al., 2022). Therefore, the

Table 4..
Risk Factors for not Getting the Flu Vaccination: Sociodemographic Characteristics (Bivariate Logistic Regression (N=1201)

	Getting the Flu Vaccination					
	Yes		No			
Features	***n***	**%**	***n***	**%**	**OR (95%)**	***p***
Gender						.049
Male	321	45.4	386	54.6		
Woman	196	39.7	298	60.3	1.264 (1.001–1.597)	
Marital status						
Married	402	46.5	222	53.5		<.001
Single/Widow	115	34.1	222	65.9	1.680 (1.293–2.183)	
Education status						
Literate/not literate	64	35.8	115	64.2	1.549 (1.061–2.262)	.023
Primary school + secondary school	309	43.5	402	56.5	1.122 (0.858–1.466)	.400
High school and above	144	46.3	167	53.7		
Income rate						
5500 TL or less	233	41.0	335	59.0	1.215 (0.802–1.840)	.359
5500–11000 TL	235	44.7	291	55.3	1.046 (0.689–1.588)	.689
11,000 TL and above	49	45.8	58	54.2		
Level of perception of economic income status						
Very bad + bad	357	42.3	486	57.7	0.954(0.757–1.203)	.692
Medium and above	160	44.7	198	55.3		

Table 5..
Risk Factors for not Receiving Influenza Vaccination: Health Characteristics (Bivariate Logistic Regression)

	Getting the Flu Vaccination					
	Yes		No			
Features	***n***	**%**	***n***	**%**	**OR (95% GA)**	***p***
General health perception Very bad/bad	160	44.7	198	55.3	1.100 (0.857–1.411)	.453
Medium and above	357	42.3	486	55.7		
Chronic disease						
Yes	398	45.3	481	54.7		.010
No	119	37.0	203	63.0	1.412 (1.086–1.835)	
Drug use						
Yes	401	45.3	485	54.7		.009
No	116	36.8	199	63.2	1.418 (1.089–1.848)	
Doctor's check-up in the last year						
Yes	502	45.6	598	54.4		<.001
No	15	14.9	86	85.1	4.813 (2.746–8.455)	
Hospitalization in the last year						
Yes	81	53.6	70	46.4		.005
No	436	41.5	614	58.5	1.630 (1.157–2.295)	
First choice in healthcare						
FHC-Hospital	477	42.9	633	92.5		.856
University Hospital-Private polyclinic	40	43.9	51	56.1	0.961 (0.625–1.478)	
Distance of the house to FHC						
Less than 30 minutes	506	44.2	638	55.8		<.001
Less than 30 minutes	11	19.3	46	80.7	3.317 (1.700–6.469)	

socioeconomic status and educational level of the regions at risk in terms of non-vaccination should also be taken into consideration as factors affecting vaccination status.

When the risk factors were re-evaluated with Multivariate logistic regression analysis, being single increased the risk of not being vaccinated by 1.49; not visiting a doctor in the last year by 4.16; being hospitalized by 1.15; and living more than 30 minutes away from the FHC by 3.16 times. Bivariate logistic regression analysis performed in this study shows that the risk of not being vaccinated varies depending on various demographic, health status, and access factors. The fact that women have a higher risk of not being vaccinated than men may indicate that their access to health services or their level of awareness about health may be different from men. However, in order to understand this difference more deeply, cultural, economic, and socio-psychological factors should also be taken into account. In addition, the fact that singles and widows have a higher risk of not being vaccinated than married people may suggest that married individuals may have more social support and access to health services and that factors such as the health status of children within the family may also affect individuals' vaccination behavior. Similar to the study, being unmarried/living alone was a significant risk factor for non-vaccination (Eiden et al., 2022). Although having a chronic disease has been defined as a positive effect on vaccination in many studies (Sun et al., 2020; Kharroubi et al., 2021; Tannous et al., 2023; Yao et al., 2020), in this study, it was found that determinants other than marital status among sociodemographic characteristics were less important as risk factors for non-vaccination in multivariate analysis compared to other characteristics. However, among the health-related characteristics, not visiting a doctor and not being hospitalized in the last year were found to be important, similar to the literature. Indeed, it can be said that individuals

Table 6.
Risk Factors for not Receiving Influenza Vaccination (Multivariate Logistic Regression)

	AdjOR	**(95% GA)**	***p***
Gender	1.111	0.52–1.449	.430
Marital status	1.593	1.199–2.116	.001
Education	1.250	0.861–1.816	.240
Chronic disease	1.173	0.882–1.561	.273
Doctor in the last year	4.447	2.493–7.936	<.001
Hospitalization	1.444	1.012–2.062	.043
Distance to FHC	3.409	1.732–6.710	<.001
Region 5	1.257	0.907–1.714	.169

with chronic diseases generally pay more attention to their health and seek health services more regularly, and this situation can be associated with a higher willingness to be vaccinated and that individuals with chronic diseases may be more sensitive to vaccination due to concerns that their immune systems may be weakened. Again, individuals who use medication regularly generally seek health services more frequently, and these individuals may be more inclined to get vaccinated because they pay more attention to their health. In addition, concerns about medication use and health status may also lead to a preference for vaccination.

Individuals who do not go to the doctor may also have limited access to health services and have difficulty accessing health information. This may lead to a lack of knowledge about vaccinations and therefore a tendency not to get vaccinated. Regular doctor visits can be an important channel for providing information about vaccinations and general health. Individuals who are hospitalized are usually more likely to have a serious health condition, so they may have more knowledge about their health and be more receptive to preventive health services such as vaccinations. In addition, hospitalization may lead to increased medical intervention and health awareness.

It is known that health awareness is related to the level of education and that the level of education has a significant effect on health behaviors. It is known that as the level of education increases, health literacy also increases and these people are more sensitive to health services such as vaccination. Individuals without basic education may not have sufficient information about vaccination or may have less access to health services. In addition, although studies are reporting that low education level and being female are risk factors for non-vaccination, it has also been reported that there are contradictory findings on the effect of being male or female and low education on non-vaccination (Eiden et al., 2022; Sun et al., 2020; Yao et al., 2020).

Another point is that living far from the FHC is the most important risk factor among sociodemographic and health characteristics, similar to the literature (Gatwood et al., 2022; Eiden et al., 2022). It comes to the forefront once again that distance to the health institution is an important factor in terms of accessibility of health services. Since conflicting findings have been reported in studies on the determinant of socioeconomic status in vaccination, it is also reported that the region of residence is an important determinant of vaccination as an important indicator of social and economic resources and lifestyle. In this context, it can be said that the density of the region in terms of health institutions and the distance to the primary care unit, a condition related to accessibility to services, is an important indicator of vaccine coverage. These findings suggest that the risk of not being vaccinated depends on many factors, and that demographic, health status, and geographic conditions play important roles. In particular, social and economic factors (education, income, geographic access) appear to have a major impact on vaccination rates. In addition, regular access to health services and chronic disease status are also important factors that increase individuals' propensity to be vaccinated. Such data can guide the development of targeted health policies and vaccination campaigns.

Study Limitations

An important limitation of this study is that vaccination was based on self-report. In Türkiye, there is no database in which influenza vaccination is recorded throughout the country and accessible for research purposes. Therefore, the only way to obtain vaccination data is to self-report. In addition, the fact that the data on vaccination were collected within one and a half months after vaccination reduced the possibility of not remembering information about vaccination. However, the determination of the study group with a group representing older people living in the study area, thus obtaining reliable findings on the vaccination rate and obtaining data on vac-cine coverage with the Lot method, constitutes the study's strengths.

Conclusion and Recommendations

In individuals over 65, the influenza vaccination rate appears to be high compared to the world and Türkiye. There is a weak positive correlation between being vaccinated against influenza one year ago and being vaccinated this year. The most important reason for not being vaccinated is a lack of knowledge about vaccination. Although vaccination rates are not low, influenza vaccine coverage in Ankara is below the expected national target. The most important risk factors for not being vaccinated are not visiting a doctor within the last year, living more than 30 minutes away from the FHC, not being married, and having been hospitalized within the last year. Considering disadvantaged regions in vaccine coverage, it is necessary to develop programs on the transportation of vaccination services and community education. Older adults who use health services less, whose homes are far from primary care centers, and who are single should be prioritized for vaccination services. These findings suggest that the risk of not being vaccinated depends on many factors, and that demographic, health status, and geographic conditions play important roles. In particular, social and economic factors (education, income, geographic access) appear to have a major impact on vaccination rates. In addition, regular access to health services and chronic disease status are also important factors that increase individuals' propensity to be vaccinated.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

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