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Research Article

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INFLUENZA VACCINATION RATES AND RELATED FACTORS IN PATIENTS WITH CHRONIC HEART DISEASE: A CROSS-SECTIONAL STUDY FROM A TERTIARY HOSPITAL

KRONİK KALP HASTALIĞI OLAN HASTALARDA GRİP AŞISI OLMA ORANLARI VE İLİŞKİLİ FAKTÖRLER: ÜÇÜNCÜ BASAMAK BİR HASTANEDEN KESİTSEL BİR ÇALIŞMA

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Öz

Amaç: Kronik kalp hastalığı (KKH) olan hastalar birçok kılavuzda influenza aşısı için öncelikli gruplardan biri olarak tanımlanmıştır. Bu çalışmanın amacı, KKH'li hastalarda influenza aşılama oranlarını ve ilişkili faktörleri değerlendirmektir.

Materyal ve Metot: Bu kesitsel anket çalışması Mayıs-Ağustos 2019 tarihleri arasında yapılmıştır. Ankette sosyo-demografik özellikler, 2018-19 influenza sezonunda aşılanma durumu, influenza aşısının önerilip önerilmediği ve aşı kabul veya ret nedenleri incelenmiştir.

Bulgular: Çalışmaya katılan 389 KKH hastasının %62,21'i erkek, %45,24'ü ≥65 yaşındaydı. İnfluenza aşısı olma oranı %11,31 idi. İleri yaş, hekim tarafından aşı önerisi, KKH hastaları ile yaşayan aile bireylerinin daha önce aşılanmış olması, kalp hastalığı veya solunum yolu hastalığı nedeniyle acil yatış ve grip aşısının ücretsiz olduğunun bilinmesi aşı kabulünü artıran faktörlerdi.

Sonuç: Bu çalışmada KKH hastalarında influenza aşılama oranı beklenen düzeyin oldukça altındadır. Özellikle doktorlar veya diğer sağlık çalışanları tarafından influenza aşısının tavsiye edilmemesi veya yeterince teşvik edilmemesi, KKH hastaları arasında influenza aşılamasının önündeki en büyük engel olarak görünmektedir.

Anahtar Kelimeler: Kalp hastalığı, grip, kalp-damar hastalığı, grip aşıları, aşı, aşı kapsamı.

Abstract

Objectives: Patients with chronic heart disease (CHD) have been defined in many guidelines as one of the priority groups for influenza vaccination. The purpose of this study was to evaluate influenza vaccination rates and related factors in patients with CHD.

Materials and Methods: This cross-sectional survey study was conducted between May and August 2019. The questionnaire investigated socio-demographic characteristics, vaccination status in the 2018-19 influenza season, whether the influenza vaccine had been recommended, and vaccine acceptance or refusal reasons.

Results: Of the 389 CHD patients participating in the study, 62.21% were male, and 45.24% were aged ≥65. The influenza vaccine uptake rate was 11.31%. Advanced age, vaccination recommendation by a physician, family members living with CHD patients having been previously vaccinated, emergency hospitalization for heart disease or respiratory disease, and knowing that the influenza vaccine was free of charge were factors that increased vaccination acceptance.

Conclusion: The influenza vaccination rate among the CHD patients in this study was well below the expected level. The influenza vaccine not being recommended or not sufficiently encouraged, especially by physicians or other healthcare workers, seems to represent the greatest obstacle to influenza vaccination among CHD patients.

Keywords: Heart disease, influenza, cardiovascular disease, influenza vaccines, vaccination, vaccination coverage.

Introduction

An estimated one billion influenza cases occur each year worldwide, of which 3 to 5 million are severe. While the majority of individuals infected by influenza recover with no severe complications or sequelae, 290,000 to 650,000 die due to respiratory illness caused by the disease. Influenza can cause serious illness, hospitalization, and mortality, especially in the elderly, very young children, pregnant women, and individuals with specific chronic medical conditions.[1] Annual vaccination is the most effective means of protecting against influenza. Vaccination reduces the significant burden of influenza-related illness, medical admissions, hospitalizations, and deaths.[2]

According to the Global Burden of Disease Study 2017, total global mortality from cardiovascular diseases increased by 21.1% between 2007 and 2017.[3] Patients with heart disease have an increased risk of numerous respiratory diseases. There is a significant relationship between respiratory tract infections, especially influenza, and cardiovascular diseases. Influenza infection increases the risk of cardiovascular events (exacerbations of myocardial infarction and heart failure) through various mechanisms, including proinflammatory mediators, neurohormonal activation, and coagulation activation cascade.[4] Heart disease patients have also been one of the high-risk groups during the COVID-19 pandemic. Patients with chronic heart disease (CHD) are defined as one of the priority groups for influenza vaccination in guidelines.[5] Studies still investigate low immune response levels to the influenza vaccine in heart failure patients and the optimal influenza vaccine formulation.[6] However, in many studies, influenza vaccination has been linked to a pronounced decrease in morbidity and mortality during the influenza season in CHD patients, all-cause mortality, and a decrease in numbers of cardiovascular or respiratory infection hospitalizations. Studies have also reported that influenza vaccination in patients with CHD is associated with significant reductions in morbidity and mortality, including all-cause mortality, and fewer hospitalizations for cardiovascular or respiratory infections.[7]

The multi-center multi-country PARADIGM-HF (Prospective Comparison of ARNI with ACEI to Determine Impact on Global Mortality and Morbidity in Heart Failure) study found that 21% of heart failure patients had been vaccinated against influenza. Studies show that vaccination rates range from 0% to 75% among different countries. In Turkey, the rate was 1.6%.[8] Studies have also found that influenza vaccination rates are generally below target levels and even decrease over time.[9,10] According to the "Turkey Health Survey, 2016" data, the rate of individuals vaccinated against influenza in the last 12 months decreased from 3.3% in 2014 to 2.6% in 2016.[11] Flu vaccination is recommended for all adults without contraindications.

Although the ideal situation is for everyone to be vaccinated, countries' abilities to increase and encourage vaccination are shaped on the basis of high- and low-risk groups in terms of influenza complications and

expected benefits. Vaccines are provided free of charge for such groups in Turkey, which include healthcare professionals, in line with World Health Organization (WHO) recommendations. The costs of influenza vaccines are reimbursed to members of priority groups by the Social Security Organization when prescribed by a physician. Although influenza vaccination is the best means of reducing the risk in high-risk patients, the low vaccination rates among these patients are worrying. The purpose of this study was to evaluate influenza vaccination rates and factors affecting these in patients with CHD.

Materials and Methods

Study design and procedures

This cross-sectional study employed a questionnaire based on a previous literature review.[5,12-18] The study data were collected between May and August 2019. Patients admitted to a tertiary hospital, aged over 18, and with CHD were included in the study. Patients with heart failure, cardiomyopathy, atherosclerotic heart disease, valvular disease, cyanotic congenital heart disease, and pulmonary arterial hypertension were included in the analysis as representing the CHD group recommended for receipt of the influenza vaccine. Diagnoses were made and confirmed by a cardiologist before inclusion in the study. The sample size was calculated at 384, with $Z\alpha=1.96$ for a 95% confidence interval, a predicted acceptable margin of error of $d=0.05$, and a 50% estimated vaccination rate. Four hundred two consecutive patients were included in the study. Thirteen patients were excluded due to missing data in their questionnaires.

Questionnaire

The questionnaire contained items investigating age, gender, marital status, residence, perceived socioeconomic status, educational status, smoking, alcohol use, other chronic diseases, and self-rated health status. We then investigated vaccination status in the 2018-19 influenza season, vaccination status at any time, influenza vaccine recommendation status, the source of that advice, the place of vaccination, post-vaccination side-effect history, and the influenza vaccination status of other members of the household. We also inquired into emergency admission or hospitalization due to heart disease in the previous year, emergency admission or hospitalization due to respiratory illness in the previous year, and awareness that the vaccine is provided free of charge to individuals with CHD. Finally, the reasons for vaccination against influenza or vaccination refusal were then examined using two open-ended questions.

Statistical analysis

The study data were analyzed on IBM SPSS version 21.0 software. The study data were presented as numbers and percentages. The chi-square test or Fischer's exact test were applied to compare categorical data, and logistic regression tests were used to evaluate the factors affecting receipt of the influenza vaccine. P values <0.05 were considered statistically significant.

Results

Of the 389 chronic heart patients participating in the study, 62.21% were male, 45.24% were 65 or over, 85.60% were married, 81.49% were living in urban areas, 73.26% perceived their economic situation as a medium, and 32.13% were primary school graduates. In addition, 21.59% were current smokers, and 10.54% consumed alcohol. 60.15% of them evaluated their health status as good, heart failure was present in 20.31%, and 78.92% had a chronic disease other than heart disease (Table 1). Forty-four patients (11.31%) had received an influenza vaccine during the 2018-2019 influenza season. Influenza vaccination rates in the 2018-2019 influenza season were significantly higher among patients aged 65 and over than those under 65 (p=0.003). No statistically significant difference was determined between patients with or without influenza vaccination regarding other socio-demographic characteristics (Table 1).

Analysis showed that 22.11% (86/389) of patients reported having received at least one influenza vaccine in previous years, 51.16% (44/86) of whom had received the vaccine in the 2018-19 influenza season. In terms of place of administration, 68.60% (59/86) of patients were vaccinated at a family health center, 24.42% (21/86) at a pharmacy, and 6.98% (6/86) in the hospital. Additionally, 12.79% (11/86) of those who had received influenza vaccination experienced subsequent side effects. Interestingly, 90.91% (10/11) of those who experienced side effects after vaccination did not receive the influenza vaccine in the 2018-2019 season. In contrast, 57.33% (43/75) of those who did not experience side effects after vaccination were also immunized in the 2018-2019 season. Patients who did not experience side effects after immunization received more influenza vaccines than those who did (p=0.003).

Influenza vaccination was recommended to 22.62% (88/389) of the patients, to 79.55% (70/88) of these by a physician, and to 20.45% (18/88) by others (such as a pharmacist, family members, or the media). In the 2018-19 influenza season, 88.64% (39/44) of the patients who received the vaccine had been advised to do so. In the 2018-2019 influenza season, 86.36% (38/44) of those who stated that a physician had advised them to receive the vaccine were vaccinated, compared to 2.27% (1/44) of those who had been advised to be vaccinated by others. The proportion of those who were vaccinated having been advised to do so by a physician was significantly higher (p<0.001).

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Table 1 Patients' socio-demographic and other characteristics, and a comparison of vaccination rates in the 2018-19 influenza season

		Vaccination in 2018-19 influenza season			
		Total n=389	**Vaccinated n=44**	**Non-vaccinated n=345**	***p***
Characteristics		**n (%)**	**n (%)**	**n (%)**	
Sex	Female	147(37.79)	19(43.18)	128(37.1)	0.433
	Male	242(62.21)	25(56.82)	217(62.9)	
Age	<65 years	213(54.76)	15(34.09)	198(57.39)	**0.003**
	≥65 years	176(45.24)	29(65.91)	147(42.61)	
Marital status	Married	333(85.60)	38(86.36)	295(85.51)	0.879
	Unmarried	56(14.40)	6(13.64)	50(14.49)	
Place of residence	Urban	317(81.49)	40(90.91)	277(80.29)	0.088
	Rural	72(18.51)	4(9.09)	68(19.71)	
Perceived economic status	Low	71(18.25)	8(18.18)	63(18.26)	0.913
	Medium	285(73.26)	33(75)	252(73.04)	
	High	33(8.48)	3(6.82)	30(8.7)	
Education	Literate	33(8.48)	4(9.09)	29(8.41)	0.071
	Primary school	125(32.13)	15(34.09)	110(31.88)	
	Secondary school	81(20.82)	5(11.36)	76(22.03)	
	High school	112(28.79)	19(43.18)	93(26.96)	
	University	38(9.77)	1(2.27)	37(10.72)	
Smoking status	Current smoker	84(21.59)	9(20.45)	75(21.74)	0.340
	Never smoked	215(55.27)	21(47.73)	194(56.23)	
	Former smoker	90(23.14)	14(31.82)	76(22.03)	
Alcohol consumption	Never used	348(89.46)	39(88.64)	309(89.57)	0.850
	Current user	41(10.54)	5(11.36)	36(10.43)	
Self-rated health status	Good	234(60.15)	30(68.18)	204(59.13)	0.248
	Poor	155(39.85)	14(31.82)	141(40.87)	
Chronic heart disease	Heart failure	79(20.31)	8(18.18)	71(20.58)	0.710
	Non-heart failure	310(79.69)	36(81.82)	274(79.42)	
Self-reported chronic diseases	None	82(21.08)	11(25.00)	71(20.58)	0.498
	≥1	307(78.92)	33(75.00)	274(79.42)	
History of influenza vaccination	No	303(77.89)	0(0.00)	303(87.83)	**<0.001**
	Yes	86(22.11)	44(100.00)	42(12.17)	
Influenza vaccination recommended	No	301(77.38)	5(11.36)	296(85.80)	**<0.001**
	Yes	88(22.62)	39(88.64)	49(14.20)	
Members of the household having been vaccinated	No	329(84.58)	27(61.36)	302(87.54)	**<0.001**
	Yes	60(15.42)	17(38.64)	43(12.46)	
History of pneumococcal vaccine	No	328(84.32)	25(56.82)	303(87.83)	**<0.001**
	Yes	61(15.68)	19(43.18)	42(12.17)	
Hospitalization requirement for respiratory disease	No	329(84.58)	30(68.18)	299(86.67)	**0.001**
	Yes	60(15.42)	14(31.82)	46(13.33)	
Hospitalization requirement for heart disease	No	306(78.66)	27(61.36)	279(80.87)	**0.003**
	Yes	83(21.34)	17(38.64)	66(19.13)	
Emergency department requirement for respiratory disease	No	308(79.18)	28(63.64)	280(81.16)	**0.007**
	Yes	81(20.82)	16(36.36)	65(18.84)	
Emergency department requirement for heart disease	No	304(78.15)	24(54.55)	280(81.16)	**<0.001**
	Yes	85(21.85)	20(45.45)	65(18.84)	
Knowing that the vaccine is free of charge	No	323(83.03)	19(43.18)	304(88.12)	**<0.001**
	Yes	66(16.97)	25(56.82)	41(11.88)	

A physician had recommended vaccination to 76.74% (66/86) of those who had received at least one vaccine to date. The rate of vaccination among patients who had received at least one vaccine was higher following a recommendation by a physician than after a recommendation by others (p = 0.004).

The present study's findings showed that 15.42% of family members living with CHD patients had received an influenza vaccine and that 15.68% of CHD patients had a history of receipt of pneumococcal vaccine. In addition, 15.42% of patients reported having been hospitalized due to respiratory disease in the previous year, while 21.34% had been hospitalized due to heart diseases. Moreover, 20.82% of patients reported being admitted to the emergency department due to respiratory illnesses, while 21.85% were admitted to the emergency department due to heart diseases. Only 16.97% of the participants knew that the influenza vaccine was free of charge for patients with CHD (Table 1).

Higher rates of vaccination recommendation were observed among patients who had received the vaccine in the 2018-19 influenza season compared to patients who were not vaccinated, and such patients also received the pneumococcal vaccine more frequently and were more likely to know that the vaccine was free of charge (p <0.001 for all). At the same time, patients who had received the influenza vaccine also exhibited higher rates of admission to the emergency department or hospitalization due to heart disease or respiratory disease in the previous year than those who were not vaccinated in the 2018-19 season (Table 1).

The factors affecting receipt of the influenza vaccination in the 2018-19 influenza seasons among patients with CHD are shown in Table 2. Advanced age and influenza vaccine recommendations were identified as factors increasing vaccination rates at multivariate regression analysis.

Factors affecting influenza vaccination in the 2018-19 influenza season among CHD patients who had been vaccinated at least once were evaluated using logistic regression analysis, and the results are shown in Table 3. Being a current smoker, recommendations by a physician and the absence of side effects after vaccination were identified as factors increasing influenza vaccination rates at multivariate regression analysis.

In terms of reasons for not receiving the influenza vaccine, 75.91% of patients reported that a healthcare professional (physician, nurse, or pharmacist) had advised against it. A further 28.71% of patients thought that influenza is not a disease requiring vaccination, 23.76% considered that the influenza vaccine offered no protection, 17.82% preferred to take medications after contracting influenza, and 16.50% reported used herbal products they had already prepared after contracting influenza (Figure 1). In terms of reasons for receiving the influenza vaccine, 68.60% of patients described themselves as being in a priority group, 41.86% wished to protect themselves from influenza, 39.53% reported becoming very sick when they had the flu, and 26.74% stated that a health professional had advised recommended them to be vaccinated (Figure 2).

Table 2 Factors affecting receipt of influenza vaccination in the 2018-19 influenza season among patients with chronic heart disease

	Univariate analysis		Multivariate analysis	
Factors	**p**	**OR (95% CI)**	**p**	**OR (95% CI)**
Age (<65 years)	**Reference**	NA	NA	NA
Age (≥65 years)	**0.004**	2.60 (1.35-5.03)	**0.043**	2.36 (1.03-5.42)
Influenza vaccination recommended (No)	**Reference**	NA	NA	NA
Influenza vaccination recommended (Yes)	**<0.001**	47.12 (17.70-125.40)	**<0.001**	31.24 (10.15-96.18)
Members of the household having been vaccinated (No)	**Reference**	NA	NA	NA
Members of the household having been vaccinated (Yes)	**<0.001**	4.422 (2.23-8.78)	0.814	1.12 (0.43-2.92)
History of pneumococcal vaccination (No)	**Reference**	NA	NA	NA
History of pneumococcal vaccination (Yes)	**<0.001**	5.48 (2.78-10.80)	0.160	1.96 (0.77-5.01)
Hospitalization requirement for respiratory disease (No)	**Reference**	NA	NA	NA
Hospitalization requirement for respiratory disease (Yes)	**0.002**	3.03 (1.50-6.15)	0.366	1.66 (0.56-4.93)
Hospitalization requirement for heart disease (No)	**Reference**	NA	NA	NA
Hospitalization requirement for heart disease (Yes)	**0.004**	2.662 (1.37-5.17)	0.372	0.58 (0.17-1.93)
Emergency department requirement for respiratory disease (No)	**Reference**	NA	NA	NA
Emergency department requirement for respiratory disease (Yes)	**0.008**	2.462 (1.26-4.82)	0.713	0.83 (0.30-2.27)
Emergency department requirement for heart disease (No)	**Reference**	NA	NA	NA
Emergency department requirement for heart disease (Yes)	**<0.001**	3.59 (1.87-6.89)	0.189	2.14 (0.69-6.67)
Knowledge that the vaccine is free of charge (No)	**Reference**	NA	NA	NA
Knowledge that the vaccine is free of charge (Yes)	**<0.001**	9.76 (4.94-19.25)	0.571	1.29 (0.53-3.16)

NA: Not available

Table 3 Factors affecting influenza vaccination in the 2018-19 influenza season among CHD patients with at least one previous vaccination

	Univariate analysis		Multivariate analysis	
Factors	**p**	**OR (95% CI)**	**p**	**OR (95% CI)**
Smoker (non-smoker)	**Reference**	NA	NA	NA
Smoker (current)	**0.023**	6.64 (1.30-33.88)	**0.019**	32.47 (1.77-595.84)
Smoker (former)	0.105	2.30 (0.84-6.27)	**0.037**	3,96(1.09-14.40)
Influenza vaccination recommended (by non-physician)	**Reference**	NA	NA	NA
Influenza vaccination recommended (by a physician)	**0.012**	14.929 (1.82-122.46)	**0.042**	19.388 (1.12-336.38)
History of side-effect after influenza vaccination (Yes)	**Reference**	NA	NA	NA
History of side-effect after influenza vaccination (No)	**0.016**	13.437 (1.64-110.39)	**0.027**	24.100 (1.43-405.87)

NA: Not available

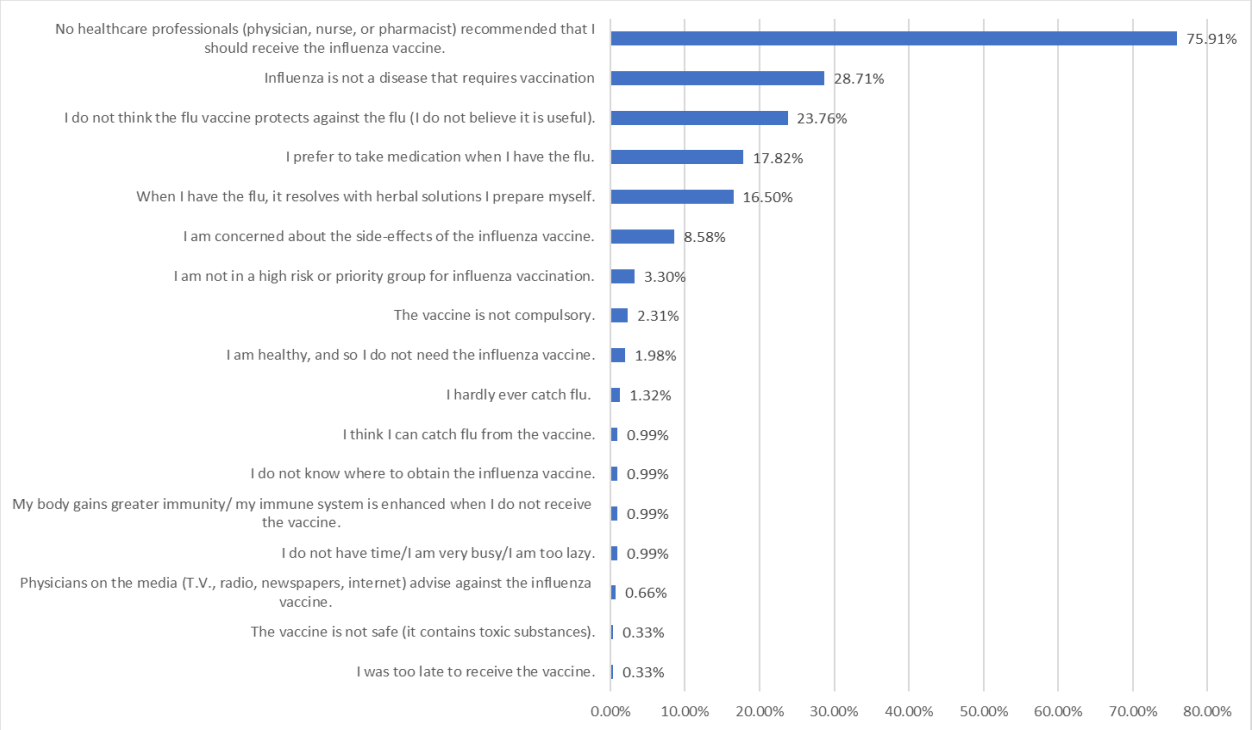

Figure 1. Reasons for refusing the influenza vaccine among CHD patients (n= 303)

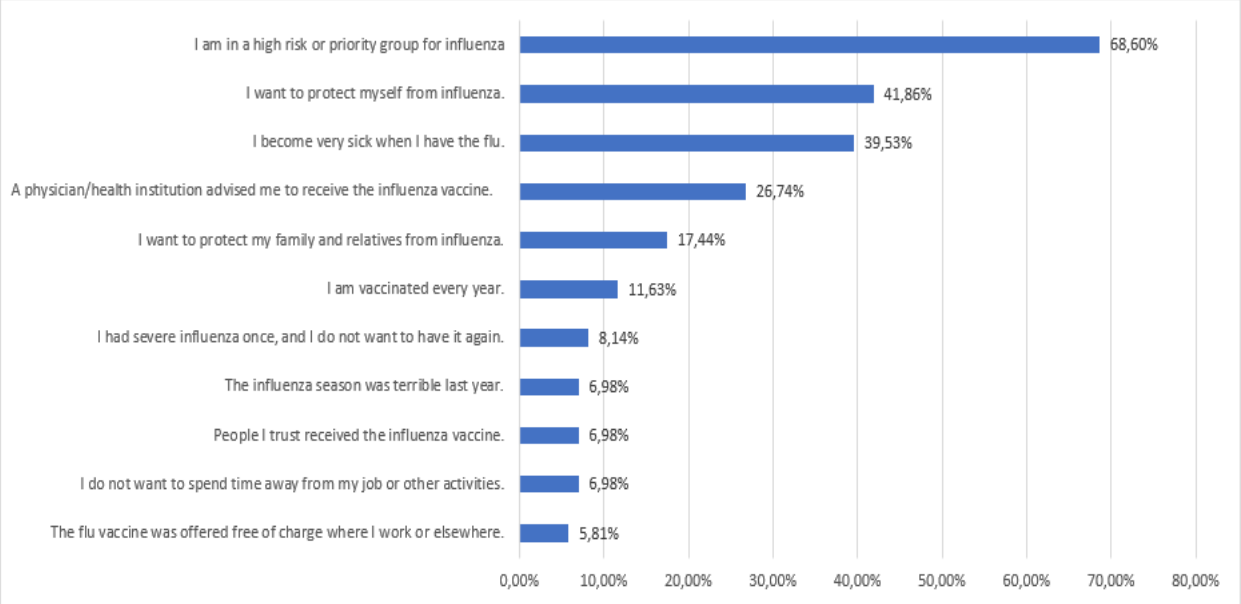

Figure 2. Reasons for receiving the influenza vaccine among CHD patients (n= 86)

Discussion

The influenza vaccination rate among patients with CHD in the present study was 11.31%. The most critical factors affecting influenza vaccination were vaccination recommendations and advanced age. Smoking, recommendation by a physician, and the absence of a history of side effects after vaccination were identified as factors affecting receipt of the influenza vaccine among patients who had been vaccinated at last once. Significant regional variations in influenza vaccination rates were observed in Western Europe, the United States, and Canada, compared to Asia, among patients with heart failure and reduced ejection fraction enrolled in the PARADIGM-HF study. However, despite strong recommendations from the CDC in the USA and a science advisory statement by the American Heart Association advocating annual vaccination, vaccination rates were still only 53%.[8] In a study involving 44 countries from the WHO European region, influenza vaccination rates in individuals with chronic diseases ranged from 0.3% to 86.8%. However, the rate in most countries was below 40%.[9] In a study involving the European Center for Disease Prevention and Control (ECDC) between 2015 and 2018, the rate of influenza vaccination among individuals with chronic diseases in seven European Union (EU) member states (Czech Republic, France, Ireland, Netherlands, Norway, Portugal, and the United Kingdom) ranged from 15.7% to 57.1%. Seventy-five percent of influenza vaccine coverage targets were not achieved in individuals with chronic diseases in any EU member states.[19] Vaccination rates being far below the desired levels, including in many developed countries, shows that the issue requires careful handling. In parallel with

these studies, the vaccination rates in the present study were also low. The influenza vaccination rate of individuals with chronic heart disease was higher than that in the general Turkish population.[20]

An influenza vaccination rate of 61% among individuals with cardiovascular disease was reported in Korea. Individuals with cardiovascular disease were vaccinated more than those without the disease. Women over 65 and with low education levels also had high rates of vaccination.[21] Reporting of perceived health status as poor was associated with receipt of more vaccinations.[16] The influenza vaccination rate among individuals with chronic diseases in China was reported at 0.4%. Rates were highest in the 70-79 age group and in urban areas compared to rural areas. Individuals with two or more chronic diseases and those who had received the pneumococcal vaccine also received more influenza vaccines.[22] In a study involving African-American patients with heart failure, influenza vaccination rates increased over 65 years, among individuals with comorbidity, and if recommended by a physician.[23] In a study from Spain, influenza vaccination rates decreased from 2014 to 2017 among individuals with chronic diseases, the elderly, individuals with more than one chronic disease, and men.[10] In another study of individuals with chronic illnesses from China, vaccination rates were higher in the elderly, individuals with a high education level, rural residents, and non-smokers.[24] Another study reported lower influenza vaccination rates in large, academic, and urban centers than in small, rural areas.[25] Vaccination rates for high-risk individuals aged 50-64 years in Korea were higher than those for non-high-risk adults of the same age but much lower than adults over 65. Vaccination rates were also lower among patients with chronic cardiovascular disease than in the non-high-risk group.[26] In the present study, individuals aged 65 and over had higher influenza vaccination rates than younger individuals. Gender, marital status, educational status, perceived health status, and the presence of other chronic diseases among individuals with CHD had no significant effect on influenza vaccination rates. The wide differences in socio-demographic variables between countries may be due to cultural differences.

One previous study identified the most critical determinants of influenza vaccination in patients with heart disease as advanced age, a history of diabetes mellitus, low NYHA functional class, low heart rate, use of digoxin, and receipt of an implantable cardioverter-defibrillator or cardiac resynchronization therapy.[8] A physician's recommendation significantly increases vaccination rates, and patients who have been informed about the vaccine by a physician also have higher vaccination rates.[27] Other research concluded that healthcare professionals should be informed of the significantly higher risk of acute influenza-related myocardial infarction and ischemic stroke in order to overcome vaccine hesitation.[28] For patients presenting with an acute coronary syndrome, influenza vaccination before discharge may significantly reduce subsequent re-hospitalization rates for major adverse cardiac events.[29] In the present study, influenza vaccination rates were higher in cases in which the vaccine had been recommended by a healthcare professional, especially by a physician, among individuals living with CHD patients, among individuals who received a pneumococcal vaccine together with the influenza vaccine, who were aware that the vaccine was free of charge, and among

individuals admitted to the emergency department or hospitalized due to heart or respiratory disease. This may be because healthcare professionals do not sufficiently recommend the influenza vaccine or that sufficient information is not provided about the severity of influenza. In this study, vaccination after hospitalization and emergency admissions and the greater vaccination of elderly individuals may be related to the advanced course of CHD at more advanced ages. The most critical factor in receipt of influenza vaccinations in this study was a recommendation by a physician. The absence of a history of side effects after vaccination is one of the most critical factors affecting revaccination rates. Interestingly, chronic heart patients who smoked also had higher influenza vaccination rates. This may be due to a fear of influenza being transmitted more easily because of respiratory problems associated with smoking.

In a study from China, reasons for vaccination included feeling safer after receipt of the influenza vaccine, increasing immunity against the disease, being vaccinated in order to accelerate recovery from it, and the vaccine being free of charge and recommended by physicians. The reasons for not being vaccinated included trusting one's immune system, regarding oneself as having a low risk of influenza, worries concerning the side-effects of the vaccine, doubting its effectiveness, lack of information regarding the influenza vaccine, insufficient time for vaccination, and reluctance to pay for the vaccine.[16] In a study of African-American patients with heart failure, reasons for not being vaccinated included fear of the side-effects of the vaccine, the concern that it might exacerbate heart failure, it's being regarded as ineffective, pain, anti-vaccine advice given by a healthcare professional, a lack of trust in drug companies, previous adverse experiences with the vaccine, and general opposition to vaccines.[23] Post-immunization side-effects were also identified as a major obstacle to vaccination in the present study. Patients being properly informed on these subjects by physicians may help eliminate such obstacles. Fear of needles is common in patients requiring preventive care and those receiving treatment. Greater attention should therefore be paid to interventions aimed at reducing fear in high-risk groups. Home remedy users generally have little confidence in vaccination and may be opposed to the influenza vaccine. This may also contribute to vaccine rejection if the individual considers that the risk associated with the vaccine is too high. Healthcare professionals should provide accurate information for home remedy users in order to alleviate their fears and correct their misconceptions about influenza and the vaccine.[30] The efficacy of influenza vaccines varies, depending on factors such as the recipient's age and health, the types and subtypes of circulating influenza viruses, and the degree of similarity between circulating viruses and those included in the vaccine. However, being vaccinated is better than not being vaccinated. Although the benefits of the influenza vaccine are manifest, a significant proportion of patients appear to hold adverse opinions and to avoid becoming immune to the disease. This is particularly alarming especially considering the high mortality and complication rates in patients with CHD. Our results were consistent with those of other studies evaluating the reasons for low vaccination rates.[16-18] Since cardiologists represent the physician group most closely associated with individuals with CHD, they can also play a key role in eliminating barriers to vaccination. However, cardiologists do not generally routinely recommend annual influenza vaccination to their patients in order to

reduce the possibility of subsequent adverse vascular events such as acute coronary syndrome or stroke. It would therefore be beneficial for postgraduate training to be organized to increase vaccination recommendations by physicians. Physicians' recommended Influenza vaccination was identified as a critical factor in increasing vaccination rates in the present study. If cardiologists were to emphasize the importance of vaccination at every visit and monitor their patient's vaccination status, this would result in increased vaccination rates. Implementing new vaccine campaign strategies aimed at increasing coverage should be the primary goal.[10] Vaccination programs, similar to pediatric vaccination programs, should be planned for adults with cardiovascular disease and may be useful in terms of eliminating problems that may arise in association with influenza. At the same time, electronic health records for identifying suitable patients in the inpatient setting and creating automatic vaccine orders for nurses increase vaccination rates more than clinical reminders. This will enable nurses, the health professionals who are most often in contact with patients during their hospital stay, to become advocates and educators on the subject of vaccination. Inter-disciplinary cooperation is, therefore is needed to achieve success. Cooperation between primary care institutions and hospitals, cardiologists and primary care physicians, physicians and nurses, pharmacists, and all other health professionals will improve vaccine coverage. The health system will also need to be planned appropriately in the context of such collaboration. However, this should not be limited to healthcare professionals or institutions only. If necessary, it may be appropriate to establish a special vaccination hotline for contact with patients. Maximum use should also be made of developing technological opportunities. Low- (postcards), medium- (personalized phone calls) and high-intensity (home visits and facilitators) interventions might exert significant positive effects, increasing community vaccination rates and access and improving provider/system responses. This process should be managed with multidimensional interventions to ensure the elimination of barriers to vaccination.

Limitations of the Study

There are a number of limitations to this study. First, the research was conducted in a single center. Second, data were obtained through patient statements and questionnaires. Further multi-center studies involving larges samples and information from databases are therefore now needed.

In conclusion, influenza vaccination rates among patients with CHD are considerably low. The most critical factors affecting influenza vaccination were the recommendation of the vaccine and more advanced age. Smoking, vaccination which is recommended by a physician, and no history of side effects after the influenza vaccine were determined as factors affecting vaccination among individuals who have been immunized at least once. The most common reason for low vaccination rates is the influenza vaccine not being recommended. Awareness on the part of healthcare professionals (especially physicians) needs to be improved, and patients

must be adequately informed about influenza vaccination in order to increase these low influenza vaccination rates in individuals with CHD.

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Ethical Considerations

Approval was obtained from the Clinical Research Ethics Committee (IRB: 2019/106).

Conflict of Interest

The authors declare no conflict of interest.

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