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The effect of pandemic and COVID-19 vaccination campaigns on influenza and pneumococcal vaccination trends in patients with chronic diseases

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ABSTRACT

Aim: We planned this study to examine whether the measures taken against COVID-19 infection during the pandemic and COVID-19 vaccination process raise awareness about influenza and pneumococcal vaccines for patients in the risk group.

Material and Method: Patients over the age of 18 who were in the risk group according to CDC and had chronic diseases requiring influenza and pneumococcal vaccination were included in the study. A questionnaire consisting of seven questions was applied to all volunteers, showing their clinical demographic findings, their vaccination history, and whether the pandemic and COVID-19 vaccination processes contributed to the vaccination processes.

Results: It was found that 42.5% of the entire population had had a preventive vaccine before. With the COVID-19 pandemic, it was determined by the survey that 74.7% of the people would get their preventive vaccinations regularly from now on. After that, it was determined that the pandemic and COVID-19 vaccination processes were effective at a rate of 57.9% in the formation of this idea in the group that wanted to get a preventive vaccine.

Conclusion: As a result, the idea of having a preventive vaccination compared to the period before the pandemic increased during the pandemic period in relation to the events experienced in the pandemic. In this, it was determined that catching COVID-19 infection, hospitalization and intensive care unit admission and COVID-19 vaccination campaigns were effective in the cases in the risk group.

Keywords: Chronic kidney disease, diabetes, hearth disease, influenza, pneumococci, vaccine

INTRODUCTION

Mortality due to influenza and pneumococcal infections in patients with chronic diseases, advanced age and immunosuppressive status has a serious rate all over the World (1-4). According to data from the Center of Disease Control (CDC), 70% to 85% of deaths related to seasonal flu in recent years have occurred in people aged 65 and over. It has also been estimated that 50-70% of seasonal flu-related hospitalizations occur in people with this condition (5,6). Similarly, patients with chronic diseases such as asthma, chronic heart disease, chronic renal failure, chronic obstructive pulmonary disease and diabetes are at risk for both serious hospitalization and mortality in influenza infection (6). Likewise, according to CDC data, 1.5 million people in the United States were diagnosed with pneumonia in 2018, and 44,000 of them died. The majority of those who died were adults and people with chronic diseases (7).

When the data in the world is examined, although the mortality rate is seriously high in people with advanced age and chronic diseases, in cases of catching influenza and pneumococcal infections (8,9), the desired level in terms of preventive measures has not been reached all over the world. When the health policies of all developed countries are examined, influenza and pneumococcal vaccines are recommended for people at risk (10). However, awareness of both health professionals and people in the risk group is still insufficient.

The precautions taken all over the world during the COVID -19 pandemic, the warnings made to people in the risk group, and the vaccination studies against the COVID -19 infection created serious awareness for all humanity in terms of protection against COVID -19 infection (11). This situation created the feeling that precautions should be taken against other infections (pneumococcal, influenza, etc.) for people in the risk group.

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In this study, we planned this study to examine whether the measures taken against COVID -19 infection during the pandemic and COVID -19 vaccination process raise awareness about influenza and pneumococcal vaccines for patients in the risk group.

MATERIAL AND METHOD

The study was carried out with the permission of Ankara City Hospital No:2 Clinical Researches Ethics Committee (Date: 27.10.2021, Decision No: E2-21-970). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Study design

Patients over the age of 18 who were in the risk group according to CDC (6) and had chronic diseases requiring influenza and pneumococcal vaccination were included in the study. A questionnaire consisting of seven questions was applied to all volunteers, showing their clinical demographic findings, their vaccination history, and whether the pandemic and COVID -19 vaccination processes contributed to the vaccination processes **Figure 1.**

In our study, influenza and pneumococcal vaccines were classified as protective –preventive vaccines.

Statistical Analysis

Statistical analyses of collected data were conducted using IBM SPSS Statistics for Windows 20.0 (IBM Corp., Armonk, NY, USA). Determination of the normally distributed data was conducted using the Kolmogorov-Smirnov test. Numerical variables that had normal distribution were expressed as the mean ± standard deviation, while those with non-normal distribution were expressed as the median (min-max). Categorical variables were expressed as numbers and percentages. Student's t-test or the Mann-Whitney U test was used to compare numerical variables between the groups. Chi-square, Yates's correction, and Fisher exact chi-square tests were used for comparisons of categorical data. $P < 0.05$ was taken as statistical significance.

RESULTS

The clinical and demographic findings of the study population are summarized in **Table 1**. A total of 513 volunteers were included in the study. It was determined that 295 (%57.5) of them did not have a preventive vaccine before, and 218 (%42.5) of them were previously vaccinated. It was observed that 214 (41.7%) people in the entire population were previously infected with COVID -19. It was determined that 135 (45.8%) of them were in the group that did not have a preventive vaccine before, and 79 (36.2%) were in the group that had a preventive vaccine before.

THE EFFECT OF THE PANDEMIC PROCESS AND COVID-19 VACCINE CAMPAIGNS ON THE PROPHYLACTIC VACCINATION TENDENCY

Name-Surname: **Age:**

Gender: A. Female B. Male

Education status: A. Illiterate B. Primary education C. High school D. University

1- Have you had a Covid-19 infection?

A. Yes **B.** No

□ If your answer is "YES"; did you need hospitalization in follow-up?

A. Yes **B.** No

□ If your answer is "YES"; did you need intensive care stay in hospital follow-up?

A. Yes **B.** No

2 – Have you had the Covid-19 vaccine?

A. Yes **B.** No

3- Chronic disease status

	Yes	No
Chronic disease		
Diabetes		
Chronic Heart Disease		
Chronic Kidney Disease		
Chronic Lung Disease		
Chronic Liver Disease		
Sickle Cell Anemia / Hemoglobinemiapathy		
Immunosuppressed Condition		
splenectomy		
Other :		

3- Do you know that in cases of chronic disease such as diabetes, chronic heart disease, chronic kidney disease, chronic lung disease, chronic liver disease, nephrotic syndrome, sickle cell anemia, immunosuppression, spleen surgery, you should get a preventive vaccination against influenza infection once a year and against pneumonia every 5 years?

A. Yes **B.** No

If the answer is "NO", suggest prophylactic vaccination and proceed to question 6.

4- Have you ever had a preventive flu vaccine before?

A. Yes **B.** No

5- Have you ever had a preventive pneumonia vaccine?

A. Yes **B.** No

6- Do you plan to have a preventive flu vaccine in your next follow-up periods?

A. Yes **B.** No

7- Are you considering getting a pneumonia vaccine in your next follow-up periods?

A. Yes **B.** No

□ If your answer is "YES"; What made you want to be vaccinated?

(You can tick more than one option)

☐	Have had a previous preventive flu/pneumonia vaccine
☐	Physician information
☐	Having a Covid-19 Infection
☐	The need for follow-up in the inpatient service during the Covid-19 Infection process
☐	The need for follow-up in the intensive care unit during the Covid-19 Infection
☐	Vaccination campaigns during the pandemic
☐	Being vaccinated against Covid-19
☐	Other :

Figure 1. Prophylactic vaccine questionnaire

The rate of those who had the COVID -19 vaccine was higher in the group who had a preventive vaccine before compared to did not (93.6% vs 87.5%, p=0.025). While the rate of preventive vaccination in the whole population was 42.5%, after that, the thought of having a preventive vaccination increased to 74.7%. Proportion of those who thought that would get their preventive vaccinations regularly from now on was higher in the group who had a preventive vaccine before compared to did not (83.9% vs 67.8%, $p < 0.001$). Factors in wanting to have their preventive vaccinations regularly from now on: 26.7% of them having a preventive vaccination before, 67.3% based on the physician's information, 13.9% of having COVID-19 infection, 8% of hospitalizations due to

COVID-19 infection, hospitalization to intensive care due to COVID-19 infection % 2.1, raising awareness of current COVID-19 vaccination campaigns 11.3% and getting COVID-19 vaccine 8.4% (**Table 1**).

In the whole population, it was determined that the vaccination campaigns against COVID-19 infection and the COVID-19 pandemic were effective at a rate of 43.3% in making preventive vaccinations after that.

After this stage, the clinical and demographic findings of the volunteers who wanted and did not want to have a preventive vaccine are shown in **Table 2**. When we look at those who want to have a preventive vaccine, 35.8% of them have had a preventive vaccine before, while 90.1% of them have been found to be effective in informing the physician. With this having had COVID-19 infection in 18%, hospitalization due to COVID-19 infection in 10.7%, intensive care unit hospitalization due to COVID-19 infection in 2.9%, COVID-19 vaccine campaigns in 15.1% and had the COVID-19 vaccine in 11.2% was effective.

After that, it was determined that the pandemic and COVID-19 vaccination processes were effective at a rate of 57.9% in the formation of this idea in the group that wanted to get a preventive vaccine.

Table 1. Comparison of patients with and without a history of prophylactic vaccination

Variable	All population n=513	History of preventive vaccination		p
		No n=295	Yes n=218	
Gender, n (%)				0.853
Female	313 (61.0)	181 (61.4)	132 (60.6)	
Male	200 (39.0)	114 (38.6)	86 (39.4)	
Age, year	59.0±14.2	58.8±13.7	59.2±14.8	0.711
Education status, n (%)				0.294
Illiterate	48 (9.4)	31 (10.5)	17 (7.8)	
Primary school	254 (49.5)	151 (51.2)	103 (47.2)	
High school	111 (21.6)	63 (21.4)	48 (22.0)	
University	100 (19.5)	50 (16.9)	50 (22.9)	
History of Covid – 19, n (%)	214 (41.7)	135 (45.8)	79 (36.2)	0.031*
Hospitalization due to Covid – 9, n (%)	109 (21.2)	64 (21.7)	45 (20.6)	0.773
ICU hospitalization due to Covid – 19, n (%)	29 (5.7)	18 (6.1)	11 (5.0)	0.701
COVID-19 vaccine history, n (%)				0.025*
No	51 (9.9)	37 (12.5)	14 (6.4)	
Yes	462 (90.1)	258 (87.5)	204 (93.6)	
Comorbidity, n (%)				
Diabetes	333 (64.9)	194 (65.8)	139 (63.8)	0.639
COPD	62 (12.1)	30 (10.2)	32 (14.7)	0.121
Heart disease	178 (34.7)	107 (36.3)	71 (32.6)	0.384
Chronic kidney disease	45 (8.8)	25 (8.5)	20 (9.2)	0.875
Chronic liver disease	16 (3.1)	9 (3.1)	7 (3.2)	0.999
Immunodeficiency	33 (6.4)	19 (6.4)	14 (6.4)	0.999
Splenectomy	3 (0.6)	2 (0.7)	1 (0.5)	0.999
History of preventive vaccination, n (%)				
No	295 (57.5)	295 (100.0)	-	
Yes	218 (42.5)	-	218 (100.0)	
Influenza vaccine	201 (39.2)	-	201 (92.2)	-
Pneumococcal vaccine	91 (17.7)	-	91 (41.7)	-
Consideration of preventive vaccination, n (%)				<0.001*
No	130 (25.3)	95 (32.2)	35 (16.1)	
Yes	383 (74.7)	200 (67.8)	183 (83.9)	
Factors in getting a preventive vaccine, n (%)				<0.001*
Have been vaccinated before	137 (26.7)	15 (5.1)	122 (56.0)	
Physician information	345 (67.3)	189 (64.1)	156 (71.6)	0.074
Having had Covid	69 (13.5)	39 (13.2)	30 (13.8)	0.859
Hospitalization due to Covid	41 (8.0)	24 (8.1)	17 (7.8)	0.999
ICU hospitalization due to covid	11 (2.1)	6 (2.0)	5 (2.3)	0.999
Covid vaccine campaigns	58 (11.3)	41 (13.9)	17 (7.8)	0.034*
Have had the Covid vaccine	43 (8.4)	23 (7.8)	20 (9.2)	0.630

Numerical variables were presented as mean±standard deviation or median (min-max), and categorical variables as numbers (%). *P<0.05 indicates statistical significance.
Abbreviations: ICU: Intensive Care Unit, COPD: Chronic Obstructive pulmonary Disease

Table 2. Comparison of patients considering and not considering preventive vaccination

Variable	The idea of getting a preventive vaccine.		p
	No n=130	Yes n=383	
Gender, n (%)			0.330
Female	84 (64.6)	229 (59.8)	
Male	46 (35.4)	154 (40.2)	
Age, year	53.4±15.0	60.8±13.4	<0.001*
Education status, n (%)			0.065
Illiterate	13 (10.0)	35 (9.1)	
Primary school	52 (40.0)	202 (52.7)	
High school	32 (24.6)	79 (20.6)	
University	33 (25.4)	67 (17.5)	
History of Covid – 19, n (%)	42 (32.3)	172 (44.9)	0.012*
Hospitalization due to Covid – 9, n (%)	11 (8.5)	98 (25.6)	<0.001*
ICU hospitalization due to Covid – 19, n (%)	2 (1.5)	27 (7.0)	0.015*
COVID-19 vaccine history, n (%)			0.001*
No	23 (17.7)	28 (7.3)	
Yes	107 (82.3)	355 (92.7)	
Comorbidity, n (%)			
Diabetes	70 (53.8)	263 (68.7)	0.002*
COPD	15 (11.5)	47 (12.3)	0.878
Heart disease	43 (33.1)	135 (35.2)	0.653
Chronic kidney disease	9 (6.9)	36 (9.4)	0.475
Chronic liver disease	5 (3.8)	11 (2.9)	0.795
Immunodeficiency	8 (6.2)	25 (6.5)	0.999
Splenectomy	-	3 (0.8)	0.729
History of preventive vaccination, n (%)			<0.001*
No	95 (73.1)	200 (52.2)	
Yes	35 (26.9)	183 (47.8)	
Influenza vaccine	34 (26.2)	167 (43.6)	<0.001*
Pneumococcal vaccine	2 (1.5)	89 (23.2)	<0.001*
Factors in getting a preventive vaccine, n (%)			
Have been vaccinated before	-	137 (35.8)	-
Physician information	-	345 (90.1)	-
Having had Covid – 19	-	69 (18.0)	-
Hospitalization due to Covid – 19	-	41 (10.7)	-
ICU hospitalization due to covid – 19	-	11 (2.9)	-
Covid – 19 vaccine campaigns	-	58 (15.1)	-
Have had the Covid – 19 vaccine	-	43 (11.2)	-

Numerical variables were presented as mean±standard deviation or median (min-max), and categorical variables as numbers (%). *P<0.05 indicates statistical significance.
Abbreviations: ICU: Intensive Care Unit, COPD: Chronic Obstructive pulmonary Disease

DISCUSSION

In this study, we examined whether COVID-19 infection, hospitalization and intensive care unit admissions due to this, and vaccination campaigns carried out all over the world in this process, increased awareness of protective vaccines in patients in the risk group. In our study, it was found that 42.5% of the entire population had had a preventive vaccine before. With the COVID-19 pandemic, it was determined by the survey that 74.7% of the people would get their preventive vaccinations regularly from now on. After that, it was determined that the pandemic and COVID-19 vaccination processes were effective at a rate of 57.9% in the formation of this idea in the group that wanted to get a preventive vaccine.

Considering the data of the World Health Organization and CDC, influenza and pneumococcal infections in patients with chronic diseases seem to cause a serious increase in hospitalization, intensive care unit admission, mortality and health expenses compared to the normal population (12,13). While these infections can be overcome in healthy individuals, they can have a very severe course in people with chronic diseases, people over 65 years of age and those with immunodeficiency. Considering the health policies of developed countries, this issue is very important. In other words, influenza and pneumococcal vaccines are administered free of charge for those in the risk group (14-17). Despite this, the application rates of preventive vaccines such as influenza and pneumococcus are still not at the desired

level in patients in the risk group in the world (17). When we look at the results of our study, it was determined that only 42.5% of this population, which is in the risk group, made their preventive vaccinations.

There are many factors responsible for this situation. The worst thing is that when the studies in the literature are examined, it is seen that health professionals do not have enough awareness on this issue (18-21). However, there is still a serious opposition to vaccines in the world. In addition, the awareness level of patients on this issue is very low (22). Informing physicians about this issue, explaining to the patients that the vaccine is actually more beneficial than harming, and adequately explaining to the patients that chronic diseases will progress and result in mortality in case of infection will eliminate these problems and enable us to reach an adequate level of preventive vaccination. In the study of Altay et al., it was revealed that pneumococcal, influenza and hepatitis vaccination rates increased after education (21). As a matter of fact, in our study, we found that informing a physician was effective in 90.1% of those considering preventive vaccination. Along with these, we observe that the knowledge of both physicians and patients about infection and vaccinations has increased significantly with the COVID-19 pandemic that has been going on for about 2 years recently. Because in all media and social life, pandemic, job loss due to pandemic, hospitalization and death rates in case of infection, kept up to date every day. This constantly warned the population in the risk group to protect themselves against infection. And it was also dominated by everyone that the idea of vaccination was the biggest factor in preventing infection, reducing hospitalization and mortality. This has also led to increased awareness of protection from other infections. We see this in the results of our study.

While the rate of getting the preventive vaccinations before the pandemic was 42.5%, the idea of taking the preventive vaccination after the pandemic increased to 74.7%. And we see that the COVID-19 pandemic is clearly effective in increasing this rate. In some of these cases in the risk group, COVID-19 infection and hospitalization due to this were effective, while in others, we see that the covid-19 vaccination campaigns were effective.

The main limitation of our study is that it was cross-sectional and only the thoughts of getting the preventive vaccinations of the cases were evaluated. Evaluation of the rate of vaccination of the cases in the follow-up removes this limitation.

As a result, the idea of having a preventive vaccination compared to the period before the pandemic increased during the pandemic period in relation to the events experienced in the pandemic. In this, it was determined that catching COVID-19 infection, hospitalization and intensive care unit admission and COVID-19 vaccination campaigns were effective in the cases in the risk group..

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Ankara City Hospital No:2 Clinical Researches Ethics Committee (Date: 27.10.2021, Decision No: E2-21-970).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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