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Research Article

Vaccination and Clinical Status in Patients Hospitalized for Covid-19 Infection in a Tertiary Hospital

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Abstract

Objectives: In this study, we aimed to examine the vaccination status of patients hospitalized in our hospital due to Covid-19 infection and its relationship with clinical status.

Methods: Patients who were hospitalized in wards and intensive care units due to Covid-19 infection in the last two months were included in the study. The clinical status, vaccination status and demographic findings of the patients were recorded from the patient files.

Results: The research population consisted of 1725 patients between the ages of 15 and 96 (mean age: 65.5±16.0 years) hospitalized due to Covid-19. Of the patients, 52.9% (n=912) were hospitalized in the ward, 47.1% (n=813) in the intensive care unit. It was determined that 27.5% (n=475) of the patients did not have the Covid vaccine. The rate of those who received the missing dose vaccine was 28.7% (n=495), and the rate of those who received the full dose vaccine was 43.8% (n=755). The median time between vaccination and hospitalization was 151 days (range: 3-572).

Conclusion: As a result, we can say that vaccination is effective to prevent infection, and timely booster doses reduce hospitalization, clinical status and mortality.

Keywords: Comirnaty, Coronavac, Hospitalization, Mortality, SarsCov – 2, Vaccination

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Vaccination is known as the most effective method in the fight against infections. The importance of the vaccine is better understood when the chronological processes of all infectious diseases, infections and pandemics from history to today are examined.[1] If we look at the current situation, there is still no effective fight against the Covid-19 infection, which was accepted as a pandemic in March 2020.[2] Serious case numbers are still seen with new mutations emerging all over the world. In January 2022, the number of new detected Covid-19 cases all over the world is around 4 million. The death toll is around 12 thousand.[3]

Vaccines have become very important because the Covid-19 pandemic has negatively affected social life, health systems, economy and in short everything around the World.[4] Currently, 7-8 Covid-19 vaccines have been used all over the world. While some of these vaccines are inactivated vaccines produced with old technologies; some of them are modern vaccines produced with new techniques.[5] Vaccination rates have increased in almost all countries, especially in developed countries. As time passed, there were some cases where his vaccines were insufficient.[6] With the emerging new SarsCov-2 mutations, the protectiveness and efficacy of these vaccines were questioned. But the main problem all over the world is, rather than the effectiveness of existing vaccines against emerging new mutations; We think that it is because people have access to the vaccine and the vaccination rates are low.[7]

We think that in societies with effective vaccination, severe disease, hospitalization and mortality will be lower. We think that the most common cause of admission to the

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intensive care unit, the need for respiratory support and mortality in hospitalized patients is due to not being vaccinated effectively.[8] Therefore, in this study, we aimed to examine the vaccination status of patients hospitalized in our hospital due to Covid-19 infection and its relationship with clinical status.

Methods

Study Design and Population

This study was carried out retrospectively in Ankara City Hospital Internal Diseases Clinic on February 1 – 15, 2022. The study was planned according to the Declaration of Helsinki and the Good Clinical Practices Guidelines. Approval for the study was obtained from the Ankara City Hospital Ethics Committee (Date/No: 02.2022/E2-22-1351).

Patients who were hospitalized in wards and intensive care units due to Covid-19 infection in the last two months were included in the study. The clinical status, vaccination status and demographic findings of the patients were recorded from the patient files. Patients whose vaccination status was unknown and whose clinical status was not recorded in the files were excluded from the study.

The term full-vaccinated patient was used for those who received two consecutive doses of inactivated or new technology vaccines and subsequently received booster doses 3-4 months after the 2 inactivated vaccines and 4-6 months after the mRNA vaccines. Those who did not have any vaccination were said to be unvaccinated. The term incomplete vaccination was used for those who did not receive their primary vaccine or who did not receive the booster dose vaccines.

Statistical Analysis

Statistical analyzes 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). The categorical variables were expressed as numbers and percentages. Chi-square and Yates correction tests were used for comparison of categorical data. $P<0.05$ was taken as statistical significance.

Results

The research population consisted of 1725 patients between the ages of 15 and 96 (mean age: 65.5±16.0 years) hospitalized due to Covid-19. Of the patients, 52.9% (n=912) were hospitalized in the ward, 47.1% (n=813) in the intensive care unit. It was determined that 27.5% (n:475) of the patients did not have the Covid vaccine. The rate of those who received the missing dose vaccine was 28.7% (n=495), and the rate of those who received the full dose vaccine was 43.8% (n=755). The median time between vaccination and hospitalization was 151 days (range: 3-572). The elapsed time between vaccination status and date of administration and hospitalization is shown in Figure 1. The clinical features of the patients are shown in Table 1 in detail.

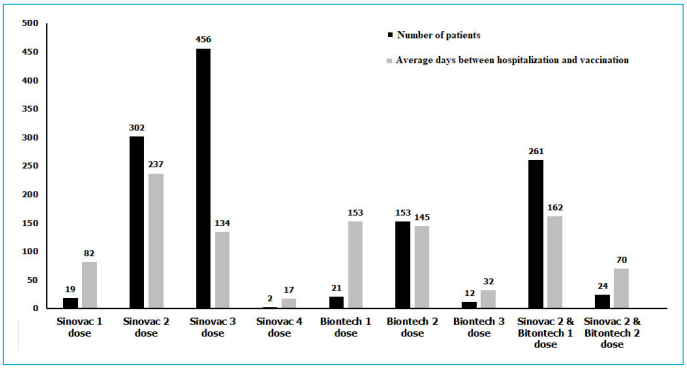

Figure 1. The number of Covid-19 inpatients and the elapsed time between the time of hospitalization and the last vaccination.

Table 1. Covid-19 patients characteristics

Variables	All population n=1725
Age, years	65.5±16.0
Vaccination status, n(%)	
Unvaccinated	475 (27.5)
Sinovac 1 dose	19 (1.1)
Sinovac 2 dose	302 (17.5)
Sinovac 3 dose	456 (26.4)
Sinovac 4 dose	2 (.1)
Biontech 1 dose	21 (1.2)
Biontech 2 dose	153 (8.9)
Biontech 3 dose	12 (.7)
Sinovac 2 & Bitontech 1 dose	261 (15.1)
Sinovac 2 & Bitontech 2 dose	24 (1.4)
Incomplete vaccination, n(%)	495 (28.7)
Complete vaccination, n(%)	755 (43.8)
Vaccination to hospitalization time, days	151 (3-572)
Hospital place, n(%)	
Service	912 (52.9)
ICU	813 (47.1)
Oxygen requirement, n(%)	
Intubated	410 (23.8)
Naval	491 (28.5)
Mask	157 (9.1)
Reservoir	171 (9.9)
High flow	207 (12.0)
Oxygen-free	354 (20.5)

Numerical variables were presented as mean±standard deviation or median (min-max), and categorical variables as numbers (%); ICU: intensive care unit.

In hospitalized patients, 26.2% of those who received oxygen support with nasal cannula were unvaccinated, 18% Sinovac 2 doses, 26.7% Sinovac full dose, 12.1% Biontech 2 doses, 14.3%. It was determined that Sinovac 2 doses and Biontech 1 dose, 1.2% of them had Sinovac 2 doses and biontech 2 doses. Those who received oxygen support by mask 15.5% were unvaccinated, 20.6% Sinovac 2 doses, 33% Sinovac full dose, 8.2% Biontech 2 doses, 20.6% Sinovac 2 doses and Biontech 1 dose, 1% Sinovac 2 doses and Biontech 2 doses. Those who received oxygen support with a reservoir mask, 17.3% were unvaccinated, 13.5% Sinovac 2 doses, 38.5% Sinovac full dose, 15.4% Biontech 2 doses, 7.7% It was determined that Sinovac 2 doses and Biontech 1 dose, 5.8% of them had Sinovac 2 doses and Biontech 2 doses. Those who received oxygen support with high flow were 19.9% unvaccinated, 18.4% Sinovac 2 doses, 27.9% Sinovac full dose, 12.5% Biontech 2 doses, 17.5% It was determined that Sinovac 2 doses and Biontech 1 dose, 0.6% Sinovac 2 doses and biontech 2 doses vaccine (Table 2).

Among the intubated patients in the intensive care unit, 33.9% were unvaccinated, 15.1% Sinovac 2 doses, 26.8% Sinovac full dose, 3.4% Biontech 2 doses, 14.6%' It was determined that 2 doses of Sinovac and 1 dose of Biontech, and 1.7% of them had 2 doses of Sinovac and 2 doses of Biontech. Those who received oxygen support via nasal cannula were unvaccinated 36%, 16.3% Sinovac 2 doses, 22.1% Sinovac full dose, 9.3% Biontech 2 doses, 12.8% Sinovac 2 dose and Biontech 1 dose, 2.3% of them had Sinovac 2 doses and Biontech 2 doses. Those who received oxygen support by mask 23.3% were unvaccinated, 21.7% Sinovac 2 doses, 25% Sinovac full dose, 6.7% Biontech 2 doses, 15% Sinovac 2 doses and Biontech. It was determined that 1 dose, 1.7% had 2 doses of Sinovac and 2 doses of biontech. Those who received oxygen support with a reservoir mask were 28.6% unvaccinated, 21% Sinovac 2 doses, 23.5% Sinovac full dose, 6.7% Biontech 2 doses, 16% Sinovac 2 doses and It was determined that Biontech 1 dose, 1.7% Sinovac 2 doses and biontech 2 doses vaccine. Of those who received high flow support, 35.2% were unvaccinated, 16.82% Sinovac 2 doses, 19.9% Sinovac full dose, 8.2% Biontech 2 doses, 15.8% Sinovac 2 doses and It was determined that Biontech 1 dose, 1% Sinovac 2 doses and biontech 2 doses vaccine (Table 2).

In the whole population, the intubated rate, high flow rate, and oxygen-free treatment rate were found to be lower in the unvaccinated compared to the incomplete or full vaccinated patients. The intubated rate, mask rate, and high flow treatment rate were found to be higher in those who had incomplete vaccination compared to those who received a full vaccination. The rate of nasal treatment was found to be higher in patients who were hospitalized in the ward,

Table 2. Vaccination chart of service and ICU hospitalized patients

Oxygen requirement	Patients	Unvaccinated	Sinovac				Biontech			Sinovac 2 & Bitontech 1 dose	Sinovac 2 & Bitontech 2 dose
			1 dose	2 dose	3 dose	4 dose	1 dose	2 dose	3 dose		
Service, n(%)											
Naval	405	106 (26.2)	1 (0.2)	73 (18.0)	108 (26.7)	0	5 (1.2)	49 (12.1)	0	58 (14.3)	5 (1.2)
Mask	97	15 (15.5)	1 (1.0)	20 (20.6)	32 (33.0)	0	0	8 (8.2)	0	20 (20.6)	1 (1.0)
Reservoir	52	9 (17.3)	1 (1.9)	7 (13.5)	20 (38.5)	0	0	8 (15.4)	0	4 (7.7)	3 (5.8)
High flow	11	4 (36.4)	0	3 (27.3)	2 (18.2)	0	0	2 (18.2)	0	0	0
Oxygen-free	337	67 (19.9)	3 (0.9)	62 (18.4)	94 (27.9)	0	2 (0.6)	42 (12.5)	6 (1.8)	59 (17.5)	2 (0.6)
Total	902	201 (22,3)	6	165	256	0	7	109	6	141	11
ICU, n(%)											
Intubated	410	139 (33.9)	7 (1.7)	62 (15.1)	110 (26.8)	0	10 (2.4)	14 (3.4)	1 (0.2)	60 (14.6)	7 (1.7)
Naval	86	31 (36.0)	0	14 (16.3)	19 (22.1)	0	0 (0.0)	8 (9.3)	1 (1.2)	11 (12.8)	2 (2.3)
Mask	60	14 (23.3)	1 (1.7)	13 (21.7)	15 (25.0)	0	2 (3.3)	4 (6.7)	1 (1.7)	9 (15.0)	1 (1.7)
Reservoir	119	34 (28.6)	2 (1.7)	25 (21.0)	28 (23.5)	0	1 (0.8)	8 (6.7)	0	19 (16.0)	2 (1.7)
High flow	196	69 (35.2)	3 (1.5)	33 (16.8)	39 (19.9)	1 (0.5)	1 (0.5)	16 (8.2)	1 (0.5)	31 (15.8)	2 (1.0)
Oxygen-free	17	6 (35.3)	0	2 (11.8)	3 (17.6)	0	0	0	0	6 (35.3)	0
Total	888	293	13	149	214	1	7	50	4	136	14

Categorical variables were presented numbers (%); ICU: intensive care unit.

compared to those who received incomplete or full vaccination, and the distribution of other oxygen treatment rates did not differ according to the vaccination status. No statistically significant difference was found between the oxygen requirements of the patients hospitalized in the intensive care unit, compared to the patients who did not receive the vaccine or those who received complete or incomplete vaccination (Table 3).

Discussion

Vaccination is the most effective approach in the fight against infectious diseases today. The purpose of vaccination is to prevent epidemics by providing individual and social protection. During pandemic periods, there are serious health costs and great problems in reaching the vaccine. The vaccine is first used in the country where it was produced.[9] Afterwards, economically developed countries reach the vaccine more quickly. In this process, developing countries have difficulties in accessing vaccines.[10] Another problem with vaccines is that there is a developed opposition to vaccines since history. According to some opinions, there is a belief that the vaccine causes infertility and therefore should not be used.[11] According to another view, there is a belief that some substances included in the content of the vaccine may cause diseases such as cancer and therefore should not be used.[12] Due to all these reasons, effective vaccination cannot be done all over the world, where there are serious casualties and social life is severely affected.

In this study, we aimed to examine the vaccination status of our recently hospitalized ward or intensive care patients and its relationship with the clinical situation. Because despite the intensive vaccination in our country and the decrease in the virulence of the virus through mutations, we still have serious hospitalization and mortality rates.[13] When we look at the vaccination status of the patients included in the study population, we see that 27.5% of our study population were not vaccinated. However, we found that 28.7% of them were incompletely vaccinated. In other words, we can accept that almost 56.2% of these hospitalized patients are unvaccinated. So, so many people have not been vaccinated, does the vaccine really protect from hospitalization and mortality? If we look at the answer to the question: When we look at the intubated patients, we

Table 3. The relationship between vaccination status and oxygen demand status in patients hospitalized in the service and ICU

Oxygen requirement	Vaccination status			p
	Unvaccinated	Incomplete	Complete	
All population, n(%)	**n=475**	**n=495**	**n=755**	
Intubated	139 (29.3)	93 (18.8)	178 (23.6)	0.001*
Naval	137 (28.8)	150 (30.3)	204 (27.0)	0.448
Mask	29 (6.1)	49 (9.9)	79 (10.5)	0.023*
Reservoir	43 (9.1)	52 (10.5)	76 (10.1)	0.732
High flow	73 (15.4)	58 (11.7)	76 (10.1)	0.022*
Oxygen-free	73 (15.4)	111 (22.4)	170 (22.5)	0.003*
Services, n(%)	**n=203**	**n=292**	**n=417**	
Naval	106 (52.2)	128 (43.8)	171 (41.0)	0.034*
Mask	15 (7.4)	29 (9.9)	53 (12.7)	0.129
Reservoir	9 (4.4)	16 (5.5)	27 (6.5)	0.612
High flow	4 (2.0)	5 (1.7)	2 (0.5)	0.146
Oxygen-free	67 (33.0)	109 (37.3)	161 (38.6)	0.401
ICU, n(%)	**n=272**	**n=203**	**n=338**	
Intubated	139 (51.1)	93 (45.8)	178 (52.7)	0.294
Naval	31 (11.4)	22 (10.8)	33 (9.8)	0.816
Mask	14 (5.1)	20 (9.9)	26 (7.7)	0.142
Reservoir	34 (12.5)	36 (17.7)	49 (14.5)	0.286
High flow	69 (25.4)	53 (26.1)	74 (21.9)	0.455
Oxygen-free	6 (2.2)	2 (1.0)	9 (2.7)	0.434

Categorical variables were presented numbers (%); *P<0.05 indicates statistical significance; ICU: intensive care unit.

see that most of them are from the unvaccinated group. Likewise, we found that the majority of patients using high flow were in the unvaccinated group. When we look at the studies, we can see that there is a relationship between the severe clinical conditions of the patients and their incomplete vaccination, both in hospitalization.[13-17]

Previous studies conducted in the United States, it was determined that hospitalization, attachment to a mechanical ventilator, and mortality rates were lower in those who received an effective dose of mRNA vaccine.[18, 19] This has also been demonstrated in studies with other vaccines.[20, 21] The relationship of vaccines to hospitalization, the severity of the disease and mortality may differ from each other. We expect this, but we think that since any vaccine affects cellular immunity, it has positive effects on the severe course of the disease, albeit partially. In other words, although the vaccines differ from each other in the protection against the disease, the main problem is that the vaccination was not done in time.[22-24]

When we look at our study population, it is seen that 302 patients received 2 doses of sinovac vaccine. However, we see that the time between their second dose and their hospitalization is 237 days. When we look at the effectiveness of inactivated vaccines, it is recommended to give a booster dose until 3 months after the 2nd dose. Because the effectiveness of inactivated vaccines decreases 3 months after the 2nd dose. Likewise, after 3 doses, a booster dose should be given again 3 months later. In our study, the total number of those who received the 3rd dose vaccine was 456. However, their time to get their booster dose was quite late. In other words, 3 months after the 3rd dose, they should have their booster dose; After the 3rd dose, we see that 134 days have passed. In fact, these patients are in a process where the effectiveness of the vaccines they make decreases.

In this study, 153 patients received 2 doses of Biontech vaccine and an average of 145 days passed after the 2nd dose. This means that the booster dose should not be delayed too long in mRNA vaccines. We have 261 patients who do 2 doses of Biontech + 1 dose of Sinovac. 162 days have passed since the last dose of Sinovac. In other words, these patients gave their booster doses to 1 dose of Sinovacla after 2 doses of Biontech. However, after the booster dose, 162 days, that is, approximately 5.5 months, passed. This shows that its effectiveness at a booster dose has passed.

In our study, approximately 40% of our patients seem to have fully vaccinated. We think that it is related to why they are hospitalized despite their full vaccination, whether the booster dose vaccines are administered on time, the effectiveness of the vaccine against new mutations of the virus, and accompanying comorbid conditions.

The main limitation of our study is its retrospective nature. In addition, another limitation of ours is that it is not known how long after the primary dose the patients who administered the booster dose administered the booster dose. Another limitation is that we do not know the comorbid conditions of the patients, their immune status and other accompanying risk factors.

As a result, we can say that vaccination is effective to prevent infection, and timely booster doses reduce hospitalization, clinical status and mortality.

Disclosures

Ethics Committee Approval: Ankara City Hospital Ethics Committee, Decision Date/No: 02.2022/E2-22-1351. All the procedures in this study were in accordance with the 1975 Helsinki Declaration, updated in 2013. Informed consent was obtained from all participants included in the study.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – E.S.S., O.I.; Design - E.S.S., O.I.; Supervision – E.S.S.; Data collection &/or processing – E.S.S., O.I.; Analysis &/or interpretation – E.S.S., O.I.; Data collection &/or processing – E.S.S., O.I.; Literature search – E.S.S., O.I.; Data collection &/or processing – E.S.S., O.I.; Writing – E.S.S.; Critical review – O.I.

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