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Original Article

Comparison of Clinical Progress of COVID-19 Patients Followed in the Hospital by Vaccination Status

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ABSTRACT

Background Although COVID-19 vaccines cannot prevent infection with SARS-CoV-2, they do allow infected people to have a milder illness. In unvaccinated people, the disease progresses more severely and the disease can be fatal. Both inactivated (Sinovac) and mRNA (BioNTech-Pfizer) vaccines are used in Turkey. In this retrospective study, clinical course, radiological involvement and some laboratory parameters that are important for COVID-19 were compared in unvaccinated and vaccinated patients who were infected and followed up in the hospital.

Material and Methods Patients between the ages of 17-95 who were hospitalized in the COVID-19 isolation wards between June 2021 and November 2021 were included in the study. Various data of patients were scanned retrospectively from the hospital registry system.

Results While there was no difference in the mean age, highest fibrinogen, D-dimer, ferritin, creatinine, interleukin-6 (IL-6) values and COVID-19 PCR test negative times besides antibody levels, Group 2 (7.8 days) was found to be discharged significantly earlier than Group 1 (12.69 days) (p=0.046). There was a significant difference in low-dose thoracic computed tomography (CT) findings between the two groups (p=0.023).

Conclusions Our study results showed that regardless of the type of vaccine, vaccination against COVID-19 reduces hospitalization rates, length of stay and prevents serious involvement in the lungs.

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Introduction

Coronaviruses are important human and animal pathogens. At the end of 2019, it became a pandemic, starting with Wuhan in China's Hubei Province, it still continues today.[1] SARS-CoV-2 virus is a non-segmented, single-stranded, positive-sense RNA virus.[2] As of January 2022, COVID-19 infection had caused a total of 404,910,528 cases and 5,783,776 deaths worldwide.[3] In the majority of cases, the novel coronavirus SARS-CoV-2 causes respiratory illness that does not require special medical attention, but up to 20% of COVID-19 patients require hospitalization.[4] Severe COVID-19 infection triggers an unstable and uncontrolled cytokine response (termed cytokine storm), extreme endothelial inflammatory reactions, and vascular thrombosis. These, and possibly other yet unknown factors, may lead to the development of acute respiratory distress syndrome (ARDS), a major cause of death in COVID-19 patients.[5,6]

Although COVID-19 vaccines cannot prevent infection with SARS-CoV-2, they do allow infected people to have a milder illness. In unvaccinated people, the disease progresses more severely and the disease can be fatal. Messenger ribonucleic acid (mRNA)-based vaccines are the latest generation vaccines.[7] Current vaccines developed by companies Pfizer and Moderna use synthetic mRNA encoding the spike protein (S-protein) sequence of the coronavirus encapsulated in a lipid vesicle nanoparticle. In whole-pathogen-inactivated virus vaccines, which consist of killed/inactivated whole viruses or virus fragments, the genetic material of the pathogen is destroyed by heat, chemicals, or radiation so that they cannot reproduce, but their presence can still induce immunity. Sinopharm, SinoVac and Bharat Biotech's vaccines consist of inactivated virus.[7,8] Both inactivated (Sinovac) and mRNA (BioNTech-Pfizer) vaccines are used in Turkey. In this retrospective study, clinical course, radiological involvement and some laboratory parameters that are important for COVID-19 were compared in unvaccinated and vaccinated patients who were infected and followed up in the hospital..

Material and Methods

Patients between the ages of 17-95 who were hospitalized in the COVID-19 isolation wards between June 2021 and November 2021 were included in the study. Patients' symptoms, hematological and biochemical test results, radiological findings, clinical course, length of hospital stay, and negative time for COVID-19 polymerase chain reaction (PCR) were scanned retrospectively from the hospital registry system. Patients with missing data were excluded from the study. Single vaccinated and unvaccinated Group 1, double vaccinated or mixed vaccinated Group 2 was determined.

Statistical Analysis

Data obtained were analyzed using SPSS 24 software (IBM Corp, Armonk, NY). During the evaluation of study variables, descriptive statistical methods (mean, standard error, rate) were used. Data were analyzed using Student's t test, Mann-Whitney U test, Chi-square test and Fisher's exact test, as appropriate. A value of $p< 0.05$ was considered as statistically significant.

Results

The demographic characteristics, symptoms, clinical course and laboratory results of the patients are summarized in Table 1. 68 patients were included in the study. However, 14 patients with unknown vaccination status were excluded from the study. The female male ratio included in the study was 24/30. 55.6% of the patients were male, and the mean age of all patients was 50.76±16.82 years. The mean age was lower in male (47±18.39 years) patients than in female (55.46±13.58 years) patients, but no statistically significant difference was found ($p=0.06$).

When the vaccination status of the patients was evaluated, 26 (48.1%) patients were unvaccinated, 5 (9.3%) patients were single Sinovac, 3 (5.6%) patients were single BioNTech, 11 (20.4%) patients were double or more Sinovac and 7 (13%) patients had double BioNTech, 2 (3.7%) patients had mixed vaccine protocol. 2 (3.7%) patients were exitus. One of these patients was unvaccinated and the other had a mixed vaccine protocol. Group 1 (34 patients) was determined as single vaccinated and

Table 1. Comparison of patients according to their vaccination status.

Variables	Group 1 (n=34)					Group 2 (n=20)					p value
	Mean	SD	Median	Min	Max	Mean	SD	Median	Min	Max	
Age (year)	48.65	19.42	45.50	4	83	54.35	10.61	53.0	40	78	0.169
Fibrinogen (mg/dL)	624.44	152.55	596.50	301	892	579.21	147.04	574.0	339.0	879.0	0.299
D-dimer (mg/L)	3.93	6.98	1.31	0.20	35	3.24	7.88	0.82	0.24	35.0	0.185
Ferritin (ng/mL)	1071.44	1522.77	629.50	14	8827	942.21	1231.06	426.0	25.0	3898.0	0.266
CRP (mg/dL)	13.50	10.60	11.31	0.05	41.12	10.54	11.41	7.16	1.72	50.49	0.210
IL-6 (pg/mL)	48.87	77.01	18.30	4.17	417	31.13	40.77	9.12	2.0	133.0	0.197
Discharge time (day)	12.69	11.14	10.0	3.0	48.0	7.80	6.72	6.50	2.0	34.0	0.046
Negative time (day)	15.71	7.71	14.0	6.0	41.0	11.54	2.30	11.0	9.0	16.0	0.102
Antibody (U/mL)	94.68	67.0	107.05	14.6	150	305.86	312.64	150.0	22.30	750	0.245

SD: standard deviation, Min: minimum, Max: maximum.

unvaccinated, and Group 2 (20 patients) as double vaccinated or mixed vaccinated. While the rate of women in Group 1 was 44.1%, the rate of women in Group 2 was 45%, and there was no significant difference in gender distribution between the two groups (p=0.950).

While there was no difference in the mean age, highest fibrinogen, D-dimer, ferritin, creatinine, interleukin-6 (IL-6) values and COVID-19 PCR test negative times besides antibody levels, Group 2 (7.8 days) was found to be discharged significantly earlier than Group 1 (12.69 days) (p=0.046) (*Table 1*). There was a significant difference in low-dose thoracic computed tomography (CT) findings between the two groups (p=0.023) (*Table 2*). It was observed that the patient group without thorax CT involvement was in Group 2. While severe bilateral involvement was 58.8% in Group 1, it was 25% in Group 2.

When their comorbidities were evaluated, 17 (50%) patients in Group 1 and 9 (45%) patients in Group 2 had comorbidities. In Group 1, 7 (20.6%) patients had type 2 diabetes mellitus (T2DM), 3 (8.8%) patients had cancer, 9 (26.5%) patients had hypertension (HT), and in Group 2, 4 (20%) patients had T2DM, 2 (10%) patients had cancer, 3 (15%) patients had HT. Other comorbidities such as asthma, rheumatologic, neurologic, cardiac and thyroid diseases were seen at lower rates. When all comorbidities were compared, no significant difference was found between the two groups.

Discussion

In this study, in which COVID-19 positive cases, who were hospitalized in the same period, were fully vaccinated and the vaccine doses were insufficient or were not vaccinated, we found that the vaccine significantly shortened the hospitalization period. Although there was no difference in comorbidity, age and sex ratios between the two groups, we found that low-dose thoracic CT involvement was not significantly present or was less severe in the group with full vaccinations.

A placebo-controlled phase III study in more than 36,000 participants aged 16 years and over with a median follow-up of two months showed that the mRNA vaccine had 95 percent efficacy in preventing symptomatic COVID-19 infection after the second dose and 7 days after that (95% CI 90.3-97.6; 8 vs 162 subjects on placebo).[9] According to the interim results of a phase III study in Turkey

Table 2. Findings of thoracic computed tomography

Group 1 (n=34)		Group 2 (n=20)	
Finding	Frequency n (%)	Finding	Frequency n (%)
Bilateral severe	20 (58.8%)	Bilateral severe	5 (25%)
Bilateral intermediate	7 (20.6%)	Bilateral intermediate	6 (30%)
Bilateral mild	5 (14.7%)	Bilateral mild	4 (20%)
Unilateral severe	1 (2.9%)	Unilateral mild	1 (5%)
Unilateral mild	1 (2.9%)	No involvement	4 (20%)

which 10,000 participants participated, the vaccine effectiveness of the inactivated virus vaccine, which started 14 days after the full vaccination, was 83.5 percent.[10]

In our study, 28 patients who were hospitalized and followed-up because vaccines could not prevent symptomatic infection and 26 patients who had never been vaccinated were examined. Although the vaccine was insufficient to prevent symptomatic COVID-19 infection in some patients, it improved the clinical outcome and shortened the length of hospital stay.

Conclusions

Our study results showed that regardless of the type of vaccine, vaccination against COVID-19 reduces hospitalization rates, length of stay and prevents serious involvement in the lungs.

Acknowledgment

This study has been presented in 18th Uludag Internal Medicine National Winter Congress, 7th Bursa Family Medicine Association National Congress, 12th Uludag Internal Medicine Nursing Congress, 3-6 March 2022, Bursa, Turkey.

Conflict of interest

The authors declared that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Authors' Contribution

Study Conception: SEY, IBG; Study Design: SEY, IBG; Supervision: SEY, IBG; Data Collection and/or Processing: IK, SEY; Statistical Analysis and/or Data Interpretation: IK, YO; Literature Review: IK, YO; Manuscript Preparation: IK, YO; and Critical Review: IK, YO.

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