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Re-hospitalisation Rate of Patients Hospitalised with a Diagnosis Of COVID-19: A Training And Research Hospital Example

COVID-19 Tanısı İle Yatışı Yapılan Hastaların Tekrar Yatış Oranı: Eğitim Ve Araştırma Hastanesi Örneği

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ÖZET

Amaç: Wuhan'da ortaya çıkan COVID-19 vakaları küresel bir sorun haline gelmiştir. Çalışmanın amacı, COVID-19 tanısı alan hastalar için tıbbi tedavilerinin tamamlanmasından sonraki 30 gün içinde yeniden hastaneye yatış oranını incelemektir.

Yöntem: Bu çalışmada 30 gün içinde tekrar hastaneye yatırılan COVID-19 hastalarının sonuçları incelenmiştir. Hastaların genel ve klinik özellikleri ile laboratuvar sonuçları parametrik ve non-parametrik testlerle değerlendirilmiştir.

Bulgular: Çalışmaya, COVID-19 tanısına sahip 14 erkek ve 8 kadın olmak üzere 22 hasta dahil edilmiştir. Hastaların 30 gün içinde yeniden hastaneye yatış oranı % 0.6 saptanmıştır. Yeniden hastaneye yatırılan hastaların ortalama yaşı 56,45'tir. Hastaneye yeniden yatırılan hastaların başlıca klinik semptomları sırasıyla; öksürük, nefes darlığı ve ateş idi. İlk yatış ile ikinci yatış karşılaştırıldığında, LYM sayısında ve N / L oranında artış tespit edilmiş ve istatistiksel olarak anlamlı fark bulunmuştur.

Sonuç: Hastaneye yeniden yatış oranını azaltmak için hastaların semptomatik şikayetleri ve komorbiditeleri değerlendirilerek bütüncül bir hasta değerlendirme ve bakım yaklaşımı benimsenmelidir.

Anahtar Kelime: Yeniden hastaneye yatış, Covid-19, Sağlık bakımı.

ABSTRACT

Background/aim: COVID-19 cases originated in Wuhan and it has become a global problem. The purpose of study to examine the rate of re-hospitalisation within 30 days after the completion of medical treatments for patients suffering from COVID-19.

Materials and methods: In this study, the results of COVID-19 patients who were re-admitted to the hospital within 30 days were examined. The general and clinical characteristics of the patients and laboratory results were evaluated using parametric and nonparametric tests.

Results: Included in this study were 22 patients, comprising 14 males and 8 females, with re-hospitalisation rate within 30 days and a diagnosis of COVID-19 that was 0.6%. The mean age of the patients who were re-hospitalised was 56.45 years. The major clinical symptoms of the patients who were re-hospitalised, respectively, were cough, shortness of breath, fever. When the levels from the first hospitalisation and the second hospitalisation were compared, an increase in the LYM count and N/L ratio was detected and the difference was statistically significant.

Conclusion: A holistic patient assessment and care approach should be adopted by evaluating the symptomatic complaints as well as the comorbidities of the patients, so as to reduce the number of re-hospitalisations.

Key words: Rehospitalization, covid-19, health care.

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INTRODUCTION

In December 2019, pneumonia cases of unknown origin emerged in Wuhan, where the new virus was named SARS-CoV-2, and the disease it causes is known as coronavirus disease 2019 (COVID-19). COVID-19 disease, which spread around the world very quickly, was accepted as a pandemic by the World Health Organization (WHO) on March 11, 2020 (Mo et al.1–4) . According to the data of 25 January 2021, the number of confirmed COVID-19 cases around the world was 98,794,942 and the number of people who have died was 2,124,193. On the same date, the total number of cases in Turkey was 2,435,247(covid19.tubitak.gov.tr 2020; Durmus- Guneysu 2020, 1690). COVID-19 presents with a clinical picture that can progress to death due to asymptomatic infection or mild upper respiratory tract infection, respiratory failure, and severe viral pneumonia (Motawea et al. 2021, 1). Symptoms of infection include respiratory symptoms, which include fever, cough, and dyspnea; diarrhea (Pan vd., 2020, 767; SB 2020). Of COVID-19 patients, 20%–51% have been reported to have at least 1 comorbidity. Among these diseases, diabetes mellitus (DM) (10%–20%), hypertension (HT) (10%–15%), and other cardiovascular and cerebrovascular diseases (7%–40%) have been reported to be common (Guan et al. 2020, 2;Yeo, et al. 2021, 1). The recovery process of COVID-19 differs based on the severity of the disease and patient-specific reasons. The most efficient use of hospital beds should be aimed at the measures taken in such epidemics (Parra et al. 2020, 1359; TÜBA 2020, 30).

The re-hospitalization rate is an important indicator of patient safety and quality performance of the hospital, and is also used as an indicator of quality of care (Uyaroğlu et al. 2020, 1). It is thought that re-hospitalizations can be prevented by determining the risk factors of the patients (Cooksley et al. 2015, 1). Unplanned re-hospitalizations create a significant financial burden on the healthcare system. It was estimated that 7.8 million (20%) of COVID-19 patients who are discharged from hospitals in the USA will then later be re-admitted to the hospital (Zhou et al. 2016, 1).

Re-hospitalization occurs as the result of changes in the general condition of the patient, exacerbation of a known chronic disease, current disease or adverse effects caused by drugs given during discharge or conditions resulting from early discharge from the hospital (Silverstein et al. 2008, 363). Re-hospitalizations are more frequent within a few days after discharge, especially in elderly patients(Shebeshi et al. 2020,1; Wong et al. 2011, 1). Approximately one-third of re-hospitalizations occur within a month after discharge, half within 90 days, and 80% within a year. However, there are limited studies on whether these patients recover completely or whether they are re-hospitalized (Yeo et al. 2021, 1). Some studies have examined the reasons for the re-hospitalization of elderly and patients with chronic diseases (Uyaroğlu et al. 2020, 1). In studies examining the re-hospitalization of COVID-19 patients and their causes, the rate of readmission of these patients within the first week after discharge was reported as 2%–5%. The most common reason for re-hospitalization in COVID-19 is respiratory distress (Atalla et al. 2020,2; Desai et al. 2009, 500). While studies have generally been focused on the epidemiological, clinical, and radiological features of COVID-19 patients, less focus has been placed on the rates of re-hospitalization and the reasons for the re-hospitalization of these patients (Chen et al. 2020,1). This research, which was conducted in a pandemic hospital, aimed to examine the rate of re-hospitalization within 30 days after the completion of medical treatments for patients suffering from mild, moderate, and severe COVID-19, who had been discharged from a tertiary education and research hospital. The time of admission, characteristics, and results of the patients were collected in an effort to develop recommendations for improvement in terms of hospitalization rates in line with the findings. Knowing the reasons for 30-day re-hospitalization in patients hospitalized as a result of COVID-19 infection is important for efficient use of the workload and resources of hospitals.

MATERIALS AND METHODS

This research was designed as a descriptive, cross-sectional, and retrospective study, as well as a single center study. It included all patients who were hospitalized with the diagnosis of COVID-19 and then subsequently re-hospitalized within 30 days in a training and research hospital, which was serving as a 1270-bed pandemic hospital, between 1 March and 31 December 2020. Patients younger than 18 years of age were excluded from the study. Computed tomography (CT) findings were grouped according to the COVID-19 Reporting and Data System (CO-RADS) category that was determined. According to the CT findings, the degree of COVID-19 infection was graded from 1 to 5, from very low to very high (Motawea et al. 2021, 1).

The data were obtained from the hospital information management system (HIMS). Laboratory evaluations utilized the results of the complete blood count, cardiac enzymes, liver and kidney function, C-reactive protein (CRP), procalcitonin, ferritin, and D-dimer. Scoring of the disease severity was based on the COVID-19 (SARS-Cov-2 Infection) Guide, which was published by the Ministry of Health Scientific Committee (SB 2020b); hence, uncomplicated disease was classified from mild pneumonia to severe pneumonia.

Statistical analyses were conducted using SPSS Statistics for Windows 23.0. The normality assumptions were analyzed using the Shapiro-Wilk test. Descriptive analyses were presented as the mean ± SD, median [interquartile range (IQR)], or number (%), where appropriate. The Mann-Whitney U test was used for analysis of the non-normally distributed numerical data. The McNemar's test and McNemar-Bowker test were used to compare the paired categorical data. The paired samples t-test was used for comparison of the parametric measurements and the Wilcoxon signed-rank test was used for nonparametric comparison of the repeated measurements. The Spearman

correlation test and Pearson correlation test were applied to investigate the correlation between the continuous variables. P<0.05 was considered statistically significant (Hayran-Hayran 2018).

RESULTS

Herein, the general and clinical characteristics of patients hospitalized with the diagnosis of COVID-19 in a training and research hospital. Of these patients, 3775 had been diagnosed with COVID-19. Moreover, 22 of these patients were re-hospitalized within 30 days after they had been discharged as a result of complaints. The re-hospitalization rate was found to be 0.6%. Clinical characteristics of the 22 patients who were re-hospitalized are presented in Tables 1 and 2. The mean age of the 22 patients who were re-hospitalized was 56.45 ± 14.18. They comprised 14 males and 8 females, who were between 25 and 78 years of age. The average time between the first and second hospitalizations was 10.68 days, and the ALHS for the second hospitalization varied between 3 and 28 days. While the mean ALHS was 4.31 days at the first hospitalization, it was 6.45 days at the second hospitalization. The majority (86%) of the patients who had been diagnosed with COVID-19 and were re-hospitalized had comorbidities. When the patients were evaluated based on their accompanying diseases, and it was determined that 40.9% had DM, 36.4% had HT, 22.7% had asthma, 22.7% had chronic kidney disease (CKD), 4.5% had cardiac disease, Moreover, 18.2% had malignancy and 9.1% had other comorbid diseases.

While the PCR tests of 14 patients were positive at the first hospitalization, only 3 patients were positive at the second hospitalization. When the CT scores were examined, it was determined that 14 patients were CO-RADS category 5 at the first hospitalization, and 16 patients were determined as CO-RADS category 5 at the second hospitalization. It was observed that they had applied to the hospital and were re-hospitalized. Additionally, 3 patients were re-hospitalized due to poor general condition. When their disease severity scores were examined, 19 patients at the first hospitalization and 22 patients at the second hospitalization showed a picture of severe pneumonia (Tables 1 and 2).

Table 1 Descriptive characteristics of the re-hospitalised patients

Variables	n: 22
Age	56.45 ± 14.18
<49 years of age	6 (27.3)
50–64 years of age	8 (36.4)
>65 years of age	8 (36.4)
Gender	
Male	14 (63.6)
Female	8 (36.4)
Time between the first and second admissions	10.68 (3–28)
1–5 days	9 (40.9)
6–10 days	4 (18.2)
>11 days	9 (40.9)
Additional diseases	18 (81.8)
Asthma	5 (22.7)
HT	8 (36.4)
DM	9 (40.9)
Chronic renal failure	5 (22.7)
Cardiovascular diseases	1 (4.5)
Malignancy	4 (18.2)
Other	2 (9.1)
None	3 (13.6)
Final situation	
Discharged	18 (81.8)
Transferred	2 (9.1)
Expired	2 (9.1)

The results are presented as the mean ± SD, median (IQR), or number (%)

Table 2 General characteristics of the re-hospitalised patients

First hospitalisation											Second hospitalisation							
Patient	**Age**	**Gender**	**Comorbidity**	**Symptoms**	**RT-PCR**	**CT score**	**Disease score**	**Treatment**	**ALHS, days**	**First and second hospitalisation period/day**	**Symptoms**	**RT-PCR**	**CT score**	**Disease score**	**Treatment**	**ALHS, days**	**Final situation**	**Reason for second hospitalisation**
1	53	M	Asthma	Vomiting, nausea, cough	+	CO-RADS 5	1	Supportive treatment	3	4	Cough, shortness of breath, sore throat	+	CO-RADS 5	2	FAV/10	6	Discharged	Respiratory distress
2	40	F	Asthma	Cough, shortness of breath, joint pain	+	CO-RADS 3	2	FAV/10	5	13	Shortness of breath	–	CO-RADS 5	1	Supportive treatment	1	Discharged	Respiratory distress
3	69	F	Asthma, HT, DM	Nausea, cough, joint pain, headache,	+	CO-RADS 5	2	FAV/10	8	10	Vomiting, diarrhoea	–	CO-RADS 5	2	Supportive treatment	3	Transferred	Respiratory distress
4	49	F	CKD, DM, HT, Vaskülit	Cough, shortness of breath	–	CO-RADS 3	0	FAV/10	4	28	Shortness of breath	–	CO-RADS 4	2	Supportive treatment	2	Transferred	Need for dialysis
5	54	M	HT	Weakness	+	CO-RADS 5	2	HCQ	1	12	Vomiting, nausea, cough, diarrhoea	No	CO-RADS 5	2	Supportive treatment + FAV	6	Discharged	Lack of oral intake
6	66	M	None	Shortness of breath, altered consciousness	–	CO-RADS 5	2	FAV/5	3	16	Shortness of breath	–	CO-RADS 5	2	FAV + HCQ	30	Expired	Respiratory distress
7	41	M	None	Joint pain, weakness	+	CO-RADS 5	2	HCQ	5	13	Cough, shortness of breath, sore throat	–	CO-RADS 5	2	Supportive treatment + FAV	4	Discharged	Respiratory distress
8	37	M	AML	Cough, shortness of breath	–	CO-RADS 5	2	Supportive treatment	1	25	Cough, shortness of Breath	–	CO-RADS 3	2	Supportive treatment	4	Expired	Respiratory distress
9	42	M	DM, liver transplant, hyperthyroidis	Cough, sore throat	+	CO-RADS 1	0	FAV/5	4	4	Cough, sore throat	+	CO-RADS 5	2	Supportive treatment	4	Discharged	Respiratory distress
10	75	M	DM	Cough, shortness of breath, fatigue, fever	–	CO-RADS 5	2	FAV/5	2	19	Cough, weakness	–	CO-RADS 4	2	Supportive treatment	1	Discharged	Respiratory distress
11	72	M	CKD, HT, cardiovascular disease	Cough, shortness of breath, sore throat	–	CO-RADS 3	2	Supportive treatment	3	27	Shortness of breath	–	CO-RADS 4	2	Supportive treatment	8	Discharged	General condition disorder

Table 2 Continued

12	58	M	None	Joint pain, weakness, fever	+	CO-RADS 5	2	FAV/5	8	3	Shortness of breath, fever	–	No CT	2	Supportive treatment	3	Discharged	Antibiotherapy
13	50	M	Asthma	Nausea-headache, weakness, fever, sore throat	+	CO-RADS 4	2	HCQ	2	13	Cough, fever, shortness of breath	No	CO-RADS 5	2	FAV + HCQ	4	Discharged	Respiratory distress
14	71	M	CVD, cardiovascular diseases	Shortness of breath, weakness	+	CO-RADS 4	2	FAV/5	6	6	Cough, fatigue, loss of taste	No	CO-RADS 5	2	Supportive treatment + FAV/5	9	Discharged	Respiratory distress
15	72	M	CKD, DM, HT	Shortness of breath, weakness	+	CO-RADS 5	2	FAV/5	5	5	Shortness of breath	–	CO-RADS 5	2	Supportive treatment	12	Discharged	General condition disorder
16	54	F	Asthma, DM	Nausea, cough, diarrhoea, weakness	+	CO-RADS 5	2	HCQ	3	9	Cough-shortness of breath	No	CO-RADS 5	2	FAV/10	6	Discharged	Respiratory distress
17	69	F	DM	shortness of breath, joint pain	+	CO-RADS 5	2	FAV/5	7	3	Shortness of breath, joint pain, weakness	No	No CT	2	Supportive treatment	10	Discharged	General condition disorder
18	64	F	DM, HT	Cough	–	CO-RADS 5	2	FAV/5	4	4	Cough-shortness of breath	–	CO-RADS 5	2	Supportive treatment + HCQ	6	Discharged	Respiratory distress
19	51	F	Malignancy	Cough, shortness of breath	+	CO-RADS 5	2	FAV/5	11	5	Shortness of breath	+	CO-RADS 5	2	Supportive treatment	10	Discharged	Respiratory distress
20	25	M	DM	Cough, shortness of breath	–	CO-RADS 5	2	FAV/5	5	10	Shortness of breath	–	CO-RADS 5	2	Supportive treatment	1	Discharged	Respiratory distress
21	58	M	DM, HT, CKD, CABG	Fever	–	CO-RADS 3	2	HCQ	2	3	Cough, shortness of breath	–	CO-RADS 5	2	FAV + HCQ	4	Discharged	Diabetic food operation
22	52	F	HT, CKD	Cough, fever	+	CO-RADS 4	2	FAV/10	3	3	Cough, fever	No	CO-RADS 5	2	Supportive treatment +FAV 5	8	Discharged	Respiratory distress

CVD: Cerebrovascular disease, CKD: chronic kidney disease, ASHD: arteriosclerotic heart disease, CABG: coronary artery bypass grafting, HCQ: hydroxychloroquine, FAV/5–10: Favipiravir supportive therapy: hydration, therapeutic treatments, extent of oxygenation, ALHS: average length of hospital stay, disease severity score 0: uncomplicated, 1: mild pneumonia, 2: severe pneumonia, -: Negative +: Positive CT: Computerized Tomography No: Sample no

The fever temperature of the patients who were re-hospitalized varied between 36 and 39.5 °C at the first hospitalization and between 36.2 and 37.2 °C at the second hospitalization. A statistically significant difference was found between the first and second hospitalizations with regards to the fever temperature (p= 0.012). There was no statistically significant difference between the first and second hospitalizations in terms of the heart rate or arterial oxygen saturation (SpO_2) (p≥ 0.05). The clinical symptoms of the 22 patients at the second admission, comprised cough (63.6%–54.5%), shortness of breath (50%–63.6%), fever (22.7%–18.2%), weakness (40.9%–13.6%), joint pain (18.2%–9.1%), nausea (18.2–4.5%), sore throat 13.6%–13.6%), diarrhea (9.1%–9.1%), and loss of taste (4.5%–4.5%). There was no statistically significant difference between symptoms and hospitalizations.

When the CT scores were evaluated, while 63.6% of the patients were CO-RADS 5 at the first hospitalization, 72.7% of the patients were CO-RADS 5 at the second hospitalization. A statistically significant difference was found in terms of the CT score at the first and second hospitalizations (p= 0.034). While 63.6% of the patients had positive RT-PCR results at the first hospitalization and 36.4% had negative RT-PCR results, at the second hospitalization, 13.6% of the patients had positive RT-PCR results, 59.1% had negative RT-PCR results, and the RT-PCR test was not performed in 27.3% of the patients. A statistically significant difference was found in terms of the RT-PCR test results of the patients at the first and second hospitalizations (p= 0.001). When the ALHS of the patients was examined, it was determined that 45.5%–23.1% had an ALHS that was between 1 and 3 days, 36.4%–23.1% had an ALHS that was between 4 and 6 days, and 18.2%–53.8% had an ALHS that was over 7 days. The average ALHS at the first hospitalization was 4.31 days, while at the second hospitalization it was 6.45 days. There was no statistically significant difference between the first and second hospitalizations (Table 3).

Table 3 Clinical findings of the re-hospitalised patients

Variables	First admission	Second admission	Test value	P-value
Fever	36.8 (36–39.5)	36.4 (36.2–37.2)	Z = –2.506	**0.012**
Pulse	94.33 ± 22.49	96.85 ± 15.08	t = –0.678	0.517
SpO_2	94.95 ± 2.72	95.1 ± 3.32	t = –0.001	0.999
Symptoms				
Vomiting	1 (4.5)	2 (9.1)	-	0.999
Nausea	4 (18.2)	1 (4.5)	-	0.375
Cough	14 (63.6)	12 (54.5)	-	0.774
Shortness of breath	11 (50)	14 (63.6)	-	0.549
Joint pain	4 (18.2)	2 (9.1)	-	0.500
Diarrhoea	2 (9.1)	2 (9.1)	-	0.999
Headache	2 (9.1)	0 (0)	-	0.500
Weakness	9 (40.9)	3 (13.6)	-	0.070
Altered consciousness	1 (4.5)	0 (0)	-	0.999
Loss of taste	1 (4.5)	1 (4.5)	-	0.999
Fever	5 (22.7)	4 (18.2)	-	0.999
Sore throat	3 (13.6)	3 (13.6)	-	0.999
CT results	5 (4–5)	5 (5–5)	Z = –2.124	**0.034**
CO-RADS 1	1 (4.5)	0 (0)	-	-
CO-RADS 2	0 (0)	0 (0)		
CO-RADS 3	4 (18.2)	1 (4.5)		
CO-RADS 4	3 (13.6)	3 (13.6)		
CO-RADS 5	14 (63.6)	16 (72.7)		
PCR results				
Negative	8 (36.4)	13 (59.1)	-	**0.001**
Positive	14 (63.6)	3 (13.6)		
No PCR	0 (0)	6 (27.3)		
Disease severity score	2 (2–2)	2 (2–2)	Z = –1.633	0.102
Uncomplicated disease	2 (9.1)	0 (0)	-	-
Mild pneumonia	1 (4.5)	0 (0)		
Severe pneumonia	19 (86.4)	22 (100)		
ALHS	4.31 (1–11)	6.45 (1–30)	Z = –1.501	0.133
1–3 days	10 (45.5)	3 (23.1)	MNB = 5.000	0.172
4–6 days	8 (36.4)	3 (23.1)		
>7 days	4 (18.2)	7 (53.8)		

Results are presented as the mean ± SD, median (IQR), or number (%). Paired samples t test, Wilcoxon signed-rank test, McNemar test, McNemar-Bowker test.

The routine blood test, CRP, interleukin 6 (IL-6), procalcitonin, troponin, myoglobin, D-dimer, and neutrophil (NEU): lymphocyte (LYM) ratio (N/L) values of the patients were evaluated to determine their inflammatory response in COVID-19. When compared with the first hospitalization, it was determined that there was an increase in the LYM count and N/L ratio, and the difference was statistically significant ($p< 0.014$, $p< 0.033$). There was a decrease in the aspartate aminotransferase (AST) and hematocrit (HCT) values at the second hospitalization and the difference was statistically significant ($p< 0.046$, $p< 0.013$) (Table 4).

Table 1 Laboratory parameters of the re-hospitalised patients

Variables	Reference range	First admission	Second admission	Test value	P-value
IL-6	0–7 ng/mL	27.69 (1.99–31.25)	27.89 (8.75–70.8)	-	-
Low		0 (0)	0 (0)	-	-
Normal		1 (33.3)	0 (0)		
High		2 (66.7)	3 (100)		
Procalcitonin	0.00–2.00 ng/mL	0.14 (0.11–0.28)	0.08 (0.05–3.71)	Z = –1.289	0.197
Normal		8 (88.9)	9 (75)	-	0.999
High		1 (11.1)	3 (25)		
D-dimer	0–242 µg/L	248 (133–505)	505 (179–865)	Z = –1.569	0.117
Normal		9 (47.4)	6 (40)	-	0.999
High		10 (52.6)	9 (60)		
Ferritin	23.9–336.2 µg/L	139 (84–1027)	315.5 (120–846)	Z = –0.561	0.575
Normal		8 (53.3)	8 (57.1)	-	0.999
High		7 (46.7)	6 (42.9)		
CRP	0–5 mg/L	70 (25.5–98.5)	100.4 (44.4–160.8)	Z = –1.790	0.073
Normal		1 (4.5)	3 (14.3)	-	0.500
High		21 (95.5)	18 (85.7)		
Haemoglobin	13.5–18 g/dL	12.38 ± 2.8	12.07 ± 2.74	t = 0.546	0.591
Low		17 (77.3)	16 (72.7)	-	0.999
Normal		5 (22.7)	6 (27.3)		
Leukocyte	4–10.5 10^3/mm^3	8.45 (5.4–15.7)	9.7 (6.5–12.9)	Z = –0.666	0.506
Low		1 (4.5)	1 (4.5)	MNB = 1.600	0.449
Normal		14 (63.6)	10 (45.5)		
High		7 (31.8)	11 (50)		
LDH	<248 U/L	277 (234–352)	282 (238–315)	Z = –0.871	0.384
Normal		7 (36.8)	7 (33.3)	-	0.999
High		12 (63.2)	14 (66.7)		
Troponin	0–14 ng\L	7 (3–26)	8 (3–44)	Z = –1.836	0.066
Normal		13 (65)	10 (55.6)	-	0.999
High		7 (35)	8 (44.4)		
Myoglobin	25–72 ng/mL	67.5 (32–215)	21 (21–124)	Z = –0.867	0.386
Low		2 (11.1)	7 (53.8)	MNB = 6.000	0.112
Normal		7 (38.9)	1 (7.7)		
High		9 (50)	5 (38.5)		
Lymphocyte	16.4%–57.7%	14.27 (2.6–29.20)	14.25 (2.9–29.80)	Z = –0.191	0.848
Low		15 (68.2)	15 (68.2)	-	-
Normal		7 (31.8)	7 (31.8)		
NEU	40.3%–74.8%	69.27 (7.2–91.6)	17.95 (4.4–81.10)	Z = –2.468	**0.014**
Low		1 (4.5)	21 (95.5)	-	0.999
Normal		11 (50.0)	0 (0)		
High		10 (45.5)	1 (4.5)		
PLT	150–450	186 (139–276)	245 (155–347)	Z = –1.669	0.095
Low		6 (27.3)	5 (22.7)	MNB = 1.333	0.721
Normal		15 (68.2)	14 (63.6)		
High		1 (4.5)	3(13.6)		
AST	10–50 U/L	34.5 (26–68)	27 (20–43)	Z = –1.997	**0.046**
Low		0 (0)	1 (4.5)	-	-
Normal		15 (68.2)	16 (72.7)		
High		7 (31.8)	5 (22.7)		
ALT	0–50 U/L	28 (15–56)	34.5 (19–65)	Z = –0.097	0.922
Normal		15 (68.2)	13 (59.1)	-	0.687
High		7 (31.8)	9 (40.9)		
BUN	8–20 mg/dL	19.5 (13–37)	22 (13–38)	Z = –0.504	0.614
Low		0 (0)	1 (4.5)	-	-
Normal		13 (59.1)	9 (40.9)		

High		9 (40.9)	12 (54.5)		
HCT	42%–52%	37.95 ± 6.41	35.63 ± 7.5	t = 2.721	**0.013**
Low		16 (72.7)	16 (72.7)	-	0.999
Normal		6 (27.3)	6 (27.3)		
Fibrinogen	200–400 mg/dL	567 (396–684)	486.5 (395–550)	Z = –0.560	0.575
Normal		4 (26.7)	3 (25)	-	0.999
High		11 (73.3)	9 (75)		
N/L		4.44 (2.55–8.45)	6.56 (3.85–11.34)	Z = –2.133	**0.033**
Normal		7 (35)	5 (22.7)	-	0.250
High		13 (65)	17 (77.3)		
Creatine	0.81–1.44 mg/dL	1 (0.9–1.8)	1 (0.9–3.41)	Z = –0.280	0.779
Low		3 (14.3)	4 (18.2)	MNB = 1.000	0.801
Normal		12 (57.1)	11 (50)		
High		6 (28.6)	7 (31.8)		

Results are presented as the mean ± SD, median (IQR), or number (%). Paired samples t test, Wilcoxon signed-rank test, McNemar test, McNemar-Bowker test.

N%: NEU ratio, LYM%: LYM ratio, PLT: blood platelet, ALT: alanine transaminase, LDH: lactic dehydrogenase, HGB: haemoglobin

Correlation analysis was performed to determine the linear relationship between the ages of the patients and their first and second hospitalization laboratory values. According to the data obtained, moderate, statistically significant (p= 0.026) positive correlation was found between age and the first admission ferritin levels. A moderate, statistically significant (p= 0.031) positive correlation was found between age and the CRP values. A moderate, statistically significant (p= 0.028) positive correlation was found between age and the troponin values. A very good, statistically significant (p= 0.002) positive correlation was found between age and the fibrinogen values. A moderate, statistically significant (p= 0.016) positive correlation was found between age and the N/L ratio. When the relationship between the laboratory values at second hospitalization and age was examined, moderate, statistically significant (p= 0.036) positive correlation was found between age and the troponin ratio. A moderate, statistically significant (p= 0.013) positive correlation was found between age and the N/L ratio (Table 5).

Table 5 Relationship between age and the laboratory parameters of the re-hospitalised patients

	First admission		Second admission	
Variables	**r**	**P-value**	**r**	**P-value**
Procalcitonin	0.333	0.381	0.112	0.729
D-dimer	0.247	0.309	0.350	0.201
Ferritin	0.570	**0.026**	0.352	0.217
CRP	0.461	**0.031**	0.362	0.107
HGB	–0.211	0.346	-0.164	0.466
WBC	0.258	0.246	0.077	0.735
LDH	0.118	0.631	0.059	0.799
Troponin	0.490	**0.028**	0.496	**0.036**
Myoglobin	0.337	0.172	0.329	0.273
LYM	0.049	0.829	–0.090	0.692
NEU	0.350	0.111	–0.221	0.323
PLT	0.261	0.241	0.246	0.269
AST	–0.346	0.114	–0.068	0.763
ALT	–0.047	0.837	–0.118	0.602
BUN	0.292	0.188	0.286	0.197
HCT	–0.291	0.189	–0.113	0.616
Fibrinogen	0.723	**0.002**	0.400	0.198
N/L	0.531	**0.016**	0.520	**0.013**
CRE	0.362	0.107	0.395	0.069

Spearman correlation test, Pearson correlation test

DISCUSSION

We successfully determined the proportion and clinical characteristics of patients who were re-hospitalization within 30 days after the completion of medical treatments for patients suffering COVID-19. The rate of re-hospitalization within 30 days was found to be very low, the majority of patients are 50 years or older and male gender. The majority of the patients who had been diagnosed with COVID-19 and were re-hospitalized had comorbidities, mainly DM, HT, and asthma. On re-hospitalization the average day of stay in the hospital was longer. According to the CT findings, the majority of the patients were CO-RADS category 5. The reason for re-hospitalization of the patients was respiratory distress. When the levels from the first hospitalization and the second hospitalization were compared, an increase in the N/L ratio was detected and the difference was statistically significant. A positive correlation was found between age and ferritin, CRP, troponin, fibrinogen values of re-hospitalization patients.

The re-hospitalisation rate is an important indicator of patient safety and the quality performance of the hospital, and is also used as an indicator of the quality of care(Uyaroglu et al. 2020, 1). Consistent with previous literature research, we found studies to determine the rates of patients who were re-hospitalized due to COVID-19. Similar studies have found a higher rate of re-hospitalization. During literature research, we found studies to determine the rates of patients who were re-hospitalized due to COVID-19. However, studies have found a higher rate of re-hospitalization was reported to be between 4% and 7% (Atalla et al. 2020; Parra et al. 2020; Uyaroglu et al. 2020; Yeo et al. 2021). It was shown in the study conducted by Donnelly et al. (Desai vd., 2009); Within 60 days of being discharged with the diagnosis of COVID-19, he was re-hospitalised, the majority of whom were between the ages of 65–79, 95.5% were men, Parra et al. the average age of the patients was 67, 73.8% was male. It was reported that 60 patients were re-hospitalised with the diagnosis of COVID-19. It was shown that 56.7% of these patients were female and 43.3% were male and the mean age of the patients was 56.9 (±22.5). From the literature review with regards to COVID-19 infection and hospitalisation, it can be said that the average age of the patients is high and male gender is more common (Guan et al. 2020; Yeo et al. 2021). Guan et al. was reported that 25.1% of COVID-19 patients had at least 1 comorbidity, 16.9% had HT, 8.2% had DM, 3.7% had cardiovascular diseases, and 1.9% had cerebrovascular diseases. Uyaroglu et al. malignancy and HT were determined to be common comorbidities among COVID-19 patients who were re-hospitalised. In other studies, reported that among the reasons for re-hospitalisation, HT, DM, chronic lung disease, liver disease, cancer. The results of the current study were similar to those in the literature(Atalla et al. 2020; Parra et al. 2020). In a study conducted by Durmus and Guneysu, COVID-19 patients were re-hospitalised for an average of 4.6 days, the mean time to re-hospitalisation after discharge was 6.8 days, and the mean ALHS at the second hospitalisation of patients was 7.4 days. In another studies; it was shown that 49% of the patients had an ALHS that was less than 7 days, first ALHS was reported as 22.27 days, second ALHS was 7.00 days (Atalla et al. 2020; Chen et al. 2020; Donnelly et al. 2020). In the literature, it has been stated that respiratory distress is among the most common reasons for re-admission(Atalla et al. 2020, 2). It was found that the majority of the patients had CT results that were compatible with COVID-19 at both hospitalisations like a similar study, CT findings were identified in more than 70% of the patients(Guan et al., 2020). In many studies that have been conducted on COVID-19 infection, an increase in the WBC, NEU, D-dimer, CT, activated partial thromboplastin time, CRP, AST, ALT, LDH, total bilirubin, CK, and creatinine values has been observed, whereas a decrease in the LYM, PLT, and albumin values was (Chen et al. 2020; Liu et al., 2020; Yang et al. 2020). This study results are similar to the literature data, except for the re-hospitalization rate.

This study is among the first to evaluate the proportion of patients' re-hospitalisation due to COVID-19 and clinical characteristics in a training and research hospital. We experienced several challenges obtaining data. The data that could not be taken from the HIMS were taken from the public health management system. Another limitation; there are 3 public hospitals serving as pandemic hospitals in in Antalya. The study was conducted only in a training and research hospital, which is a public hospital. And we didn't compare the results of the study with the rate and reasons for readmission to other hospitals. The strengths of this study; about 100 results in teaching and research hospital by monitoring these indicators was comparable with the same status in Turkey. Standardization can be achieved by making changes in the guidelines according to the results.

Health quality standards in Turkey started in 2003, it is administered by the public and private sectors. Standards and indicators focused on structure, process and result; aims to improve patient and employee safety, patient and employee satisfaction and continuous improvement. There are limited studies on whether COVID-19 patients recover completely or reasons for re-hospitalization. It may be recommended to pay attention to these practices for other hospitals. Measures can be taken for changes by monitoring the hospitalization rate as a monthly indicator. Not only the rate of re-hospitalization of COVID-19 patients, but also the rate of re-admission to the emergency department can be monitored as an indicator.

CONCLISION

The low rate in the training and research hospital suggests that the quality of care is good, it has high compliance with the ministry of health guidelines and has experienced health professionals. The re-hospitalisation rate is an important indicator of patient safety and the quality performance of the hospital, as well as an indicator of the quality of care. Treatment and discharge planning can be reviewed, especially in patients with comorbidities. Hence, a holistic patient assessment and care approach should be adopted by evaluating not only the symptomatic complaints of the

patients, but also their comorbidities, so as to reduce the number of re-hospitalisations. Similar studies should be conducted in hospitals providing tertiary healthcare services.

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