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Covid-19 Hastalarının Acil Servise Tekrar Başvuru Oranı ve Klinik Özellikleri: Tek Merkezli Çalışma

Readmission to the Emergency Room and Clinical Characteristics of Patients with Covid-19: A Single-Center Trial

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ÖZ

Amaç: Bu araştırmada, COVID-19 tanısıyla 72 saat içerisinde bir eğitim ve araştırma hastanesi acil servisine tekrar başvuran hastaların demografik ve klinik özelliklerini belirlemek amaçlanmıştır.

Materyal ve Metot: Araştırma tanımlayıcı ve tek merkezli planlandı. COVID-19 tanısıyla acil servise başvuran hastaların verileri geriye dönük olarak Hastane Bilgi Yönetim Sisteminden elde edildi.

Bulgular: Acil servise COVID-19 tanısıyla toplam 56.497 hasta başvurmuş ve bu hastalardan %0,4'ü 72 saat içinde benzer şikayetlerle acil servise tekrar başvuru yapmıştır. Tekrar başvuru yapan hastaların %51,4'ü kadın ve yaş ortalaması 41,67 olduğu tespit edildi. Tekrar başvuran kişilerin %30,8'inde en az bir komorbidite olduğu saptandı, komorbiditesi olan hastalarda en sık başvuru nedeni bulantı ve öksürük idi.

Sonuç: COVID-19 hastalarının güvenli bir şekilde eve gönderilme kriterlerinin oluşturulması ve tekrar başvuru oranlarının düşürülüp bakım kalitesinin artırılması için ileri çalışmaların tasarımına ihtiyaç vardır.

Anahtar Kelimeler: Acil servis, COVID-19, tekrar başvuru

ABSTRACT

Objective: This study aims to determine the demographic and clinical characteristics of patients admitted to the emergency department of a training and research hospital within 72 hours of the diagnosis of COVID-19.

Materials and Methods: The study was designed as descriptive and single-centered. The data of patients who presented to the emergency room with the diagnosis of COVID-19 were obtained retrospectively from the Hospital Information Management System.

Results: 56.497 patients diagnosed with COVID-19 presented to our emergency room, and 0.4% returned to the emergency room with similar complaints within 72 hours. Among those who returned, 51.4% were female, and the mean age was 41.67. This study found that 30.8% of readmitted people had at least one comorbidity. It was found that 30.8% of the readmission had at least one comorbidity; nausea and cough were the most common reasons for admission in patients with comorbidities.

Conclusion: There is a need to design further studies to establish the criteria for the safe return of COVID-19 patients to home, to reduce the re-admission rates, and increase the quality of care.

Keywords: COVID-19, emergency service, readmission

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INTRODUCTION

Emergency rooms (ER) are the health services provided in inpatient health facilities for medical intervention and treatment of health problems that occur in sudden illness, accident, injury, and similar unexpected situations. Türkiye is at the front in the number of ER admissions, especially when compared to Europe.[1] While the number of applications to the emergency service in our country was 82.308.086 in 2013 and 101.445.329 in 2017.[2] Especially during the pandemic, the admissions to emergency care services have increased even more.[3] The rate of admission to ER is frequently used in performance measurement in various health systems worldwide.[4] The rate of early ER readmission is associated with the quality-of-care indicator, which also serves as an indicator for ways of improvement in the quality of care provided to ER patients.[5,6] Studies have shown that the number of preventable readmissions to the ER varies between 1.9% and 32.3%.[5-9] Such readmissions can be prevented by evaluating their reasons.[7] Readmission to the ER result from various reasons varying from chronic diseases and chronic drug use to substance abuse.[8] The evaluation of studies examining the reasons for readmission to the ER showed that patients who were readmitted to the ER within 30 days after discharge between 2004 and 2010 with a rate of 7%.[9] Similarly, another study examined the readmissions of geriatric patients over 65 to the ER and reported that 6% of them returned to the ER within 72 hours.[5] In the study by Friedmann et al.[10] the readmission rate within 90 days of discharged patients was 27%. Patient flow control was attempted to be achieved by establishing preliminary triage areas, separating pandemic hospitals, establishing new polyclinics for outpatients with suspected coronavirus disease 2019 (COVID-19), preparing necessary protocols for patient transfer to radiology, and inpatient services and intensive care units, besides the separation of areas used by patients with COVID-19 from other patients. However, it is not yet known how often and to which hospital patients with COVID-19 return after the initial evaluation in the ER.

This study aimed to find out the demographic and clinical characteristics of patients who presented with the diagnosis of COVID-19 to the ER at a training and research hospital serving as a pandemic hospital but who returned within 72 hours after being discharged from medical treatment.

MATERIALS AND METHODS

Ethics Committee Approval: Permission was obtained from the Ethics Committee Approval for the study from the Clinical Research Ethics Committee of the Health Sciences University, Antalya Training and Research Hospital (Date: 18.03.2021, decision no: 3/30). The study was conducted following the Principles of the Declaration of Helsinki.

Design: This study was designed as a descriptive and a single-center trial.

Data Collection: The data were collected from the Hospital Information Management System.

It included all patients who presented to the ER at a training and research hospital serving as a pandemic hospital from 01 March 2020 to 31 December 2020 with the diagnosis of COVID-19 and returned within 72 hours. Patients younger than 18 years of age were excluded from the study. The first admission of COVID-19 patients within 72 hours was taken into account.

Statistical Analysis: All analyses were done using IBM SPSS Statistics for Windows, Version 23.0. A two-sided p-value less than 0.05 was considered statistically significant. Descriptive studies were presented with mean ± SD and median (0.25-0.75 percentile) for the continuous variables and frequency and percentage for categorical variables. The Shapiro–Wilk test was used to assess the normality of the data, and categorical data were analyzed by Pearson's chi-square or Fisher's Exact test. Mann–Whitney U test and Student's t-test were used to analyze non-normally and normally distributed numerical data, respectively.

RESULTS

Fifty-six thousand four hundred ninety-seven patients diagnosed with COVID-19 presented to the ER in our training and research hospital, and 253 of them returned to the ER with the same diagnosis within 72 hours. The rate of admission to the ER with a diagnosis of COVID-19 was 0.4%. The study included patients, 28.5% of whom were under 30 years old, 42.3% between 30-49 years old, and 29.2% over 50 years old, with a mean age of 41.7±15.9 years. The demographic data showed that 51.4% of the patients were female and 48.6% were male. The average time between two admissions was found to be 49.6±12.6 hours. The mean age of patients with comorbidity (mean: 53.2) was higher than those without one (mean: 36.5), and likewise, the rate of patients with comorbidities was higher in patients aged 50 and over ($p<0.001$). No statistically significant difference was observed in the gender distribution of the groups ($p=0.571$). SpO_2 values of patients with comorbidities were found to be relatively lower ($p=0.014$). (The mean rank was 72.8 in those with comorbidity and 90.9 in those without comorbidity). The distribution of the reasons for hospitalization of the patients across the groups was statistically similar (Table 1).

Table 1. Characteristic features of patients.

Variables		All patients (n:253)	COVID-19 patients with comorbidities (n:78)	COVID-19 patients without comorbidities (n:175)	p-value
Time between two admissions (hours), mean±SD		49.6±12.6	48.9±13.6	49.8±12.2	0.599[1]
Age, mean±SD		41.7±15.9	53.2±16.0	36.5±12.9	**<0.001**[1]
Age groups n (%)	<30 years of age	72(28.5)	7(9.0)[a]	65(37.1)[b]	**<0.001**[3]
	30–49 years of age	107(42.3)	26(33.3)[a]	81(46.3)[a]	
	>50 years of age	74(29.2)	45(57.7)[a]	29(16.6)[b]	
Gender n (%)	Female	130(51.4)	38(48.7)	92(52.6)	0.571[3]
	Male	123(48.6)	40(51.3)	83(47.4)	
Fever (C^0), median(IQR)		36.5(36.3-36.8)	36.5(36.2-37.0)	36.5(36.3-36.7)	0.695[2]
SpO_2 (%), median(IQR)		98.0(97.0-99.0)	98.0(96.0-99.0)	98.0(97.0-99.0)	**0.014**[2]
Reason for hospitalization, n (%)	CT Progression	25 (41.0)	13(39.4)	12(42.9)	0.770[3]
	Poor general condition	18(29.5)	11(33.3)	7(25.0)	
	Shortness of breath	18(29.5)	9(27.3)	9(32.1)	

[1]: Student's t-test; [2]: Mann-Whitney U test; [3]: Pearson's chi-square test; Different lowercase letters in a row indicate a statistically significant difference between groups; DM: Diabetes mellitus; HT: Hypertension; CT: Computed tomography.

A total of 78 patients had comorbidities; one comorbidity in 54 patients, two in 14, and three or more in 10 patients. The most common comorbidities were diabetes mellitus (DM) (9.5%), hypertension (HT) (9.1%), cardiovascular disease (7.9%), and asthma (chronic obstructive pulmonary disease=COPD) (7.5%), respectively (Table 2).

The clinical features, including nausea (p=0.012) and cough (p<0.001), were more common in patients with comorbidities. At the same time, diarrhea and loss of taste were observed at a higher rate in patients without comorbidities (p<0.001). The rate of using favipiravir (FAV) in patients with comorbidity (67.9%) was higher than in patients without (48%) (p=0.024). The rate of negative polymerase chain reaction (PCR) results in patients without comorbidity (45.7%), and the rate of patients who did not provide samples (65.4%) among those with comorbidity were significantly higher (p=0.001). The percentage of patients having computed tomography (CT) scan findings compatible with COVID-19 was higher in patients with comorbidity (p<0.001) (Table 3).

Table 2. Comorbidity of patients.

		All patients (n:253) n (%)	COVID-19 patients with comorbidities (n:78) n (%)
Number of comorbidities	1 comorbidity	54 (21.3)	54 (69.2)
	2 comorbidities	14 (5.5)	14 (17.9)
	3 or more	10 (4)	10 (12.8)
Additional diseases	Asthma	19 (7.5)	19 (24.4)
	HT	23 (9.1)	23 (29.5)
	DM	24 (9.5)	24 (30.8)
	Chronic renal failure	5 (2)	5 (6.4)
	Cardiovascular diseases	20 (7.9)	20 (25.6)
	Malignancy	5 (2)	5 (6.4)
	Other	16 (6.3)	16 (20.5)

DM: Diabetes mellitus; HT: Hypertension.

Table 3. Clinical features of patients.

Variables		All patients (n:253) n (%)	COVID-19 patients with Comorbidities (n:78) n (%)	COVID-19 patients without comorbidities (n:175) n (%)	p
Symptoms	Vomiting	21 (8.3)	7 (9.0)	14 (8.0)	0.795[1]
	Nausea	27 (10.7)	14 (17.9)	13 (7.4)	**0.012**[1]
	Cough	55 (21.7)	40 (51.3)	15 (8.6)	**0.001**[1]
	Shortness of breath	92 (36.4)	32 (41.0)	60 (34.3)	0.303[1]
	Joint pain	58 (22.9)	16 (20.5)	42 (24.0)	0.542[1]
	Diarrhea	70 (27.7)	7 (9.0)	63 (36.0)	**0.001**[1]
	Headache	28 (11.1)	11 (14.1)	17 (9.7)	0.304[1]
	Weakness	63 (24.9)	23 (29.5)	40 (22.9)	0.260[1]
	Loss of taste	71 (28.1)	6 (7.7)	65 (37.1)	**0.001**[1]
	Fever	20 (7.9)	5 (6.4)	15 (8.6)	0.556[1]
	Sore throat	21 (8.3)	8 (10.3)	13 (7.4)	0.452[1]

Table 3. Continue.

Treatment	No treatment	90 (35.6)	21 (26.9)[a]	69 (39.4)[a]	**0.024**[2]
	FAV	137 (54.2)	53 (67.9)[a]	84 (48.0)[b]	
	FAV+HCQ	9 (3.6)	1 (1.3)[a]	8 (4.6)[a]	
	HCQ	15 (5.9)	2 (2.6)[a]	13 (7.4)[a]	
	Antibiotic	2 (0.8)	1 (1.3)[a]	1 (0.6)[a]	
PCR results	Negative	100 (39.5)	20 (25.6)[a]	80 (45.7)[b]	**0.001**[1]
	Positive	33 (13.0)	7 (9.0)[a]	26 (14.9)[a]	
	No Sample	120 (47.4)	51 (65.4)[a]	69 (39.4)[b]	
CT Results	Non-compatible	168 (66.4)	31 (39.7)	137 (78.3)	**0.001**[1]
	Compatible with	85 (33.6)	47 (60.3)	38 (21.7)	

[1]: Pearson's chi-square test, [2]: Fisher's Exact test. Different lowercase letters in a row indicate a statistically significant difference between groups; FAV: Favipiravir; HCQ: Hydroxychloroquine; PCR: Polymerase chain reaction; CT: Computed tomography.

Blood urea nitrogen (BUN) (p<0.001), creatinine (p=0.041), lactate dehydrogenase (LDH) (p=0.009), C-reactive protein (CRP) (p=0.001), troponin (p<0.001), myoglobin (p=0.020), D-dimer (p) (0.011), and fibrinogen (p=0.020) values were higher in patients with comorbidities. Haemoglobin (mean: 12.39 g/dL) and haematocrit (HCT) mean (mean: 37.22%) values of patients with comorbidities were found to be lower than those without (mean: 13.65 g/dL and mean: 40.47%) (p<0.001) (Table 4).

Table 4. Laboratory results of patients.

Variables	**Reference range**	**All patients (n:253) Mean±SD/Median (IQR)**	**COVID-19 patients with comorbidities (n:78) Mean±SD/Median (IQR)**	**COVID-19 patients without comorbidities (n:175) Mean±SD/Median (IQR)**	**p**
BUN (mg/dL)	8.0–20.0	13.0 (10.0-17.0)	18.0 (11.5-21.0)	12.0 (9.0-14.0)	**0.001**[2]
Creatinine (mg/dL)	0.81–1.44	0.9 (0.8-1.1)	0.93 (0.8-1.13)	0.9 (0.79-1.09)	**0.041**[2]
ALT (U/L)	0.0–35.0	28.0 (18.0-44.0)	28.5 (19.0-40.0)	27.0 (17.0-53.0)	0.683[2]
AST (U/L)	10.0–50.0	31.0 (24.0-42.5)	33.0 (26.0-55.0)	28.0 (22.0-40.0)	0.074[2]
LDH (U/L)	<248 .0	219.0 (178.0-323.0)	271.5 (202.0-368.0)	209.0 (173.0-287.0)	**0.009**[2]
CRP (mg/L)	0–5	24.8 (4.3-82.5)	47.95 (9.15-152.5)	12.3 (3.2-48.9)	**0.001**[2]
Leukocyte (10^3/mm^3)	4.0–10.5	6.3 (5.0-8.2)	6.6 (4.9-10.5)	6.3 (5.1-7.5)	0.121[2]
Hemoglobin (g/dL)	12.5–16.0	13.2±2.0	12.4±2.2	13.7±1.7	**0.001**[1]
HCT (%)	37.0–47.0	39.2±4.9	37.2±5.8	40.5±3.6	**0.001**[1]
PLT (10^3/mm^3)	150.0–450.0	203.5 (168.0-242.0)	186.5 (150.0-236.0)	208.5 (175.0-249.0)	0.086[2]
NEU (%)	42.5–73.2	65.4±15.1	67.6±16.7	63.9±13.9	0.154[1]
Lymphocyte (%)	18.2–47.4	24.6 (14.6-31.9)	23.2 (12.0-30.9)	25.1 (16.9-32.4)	0.127[2]
N/L	3.1	2.7 (1.8-5.2)	2.9 (1.9-6.5)	2.5 (1.8-4.6)	0.119[2]
Troponin (ng\L)	0.0–14.0	3.0(3.0-6.0)	6.0 (3.0-13.0)	3.0 (3.0-3.0)	**0.001**[2]
Myoglobin (ng/ml)	25.0-72.0	40.0 (21.5-91.0)	74.0 (39.0-123.0)	32.0 (21.0-44.0)	**0.020**[2]
D-dimer (µg/L)	0.0–242.0	176.0 (96.0-291.0)	207.0 (116.0-460.0)	172.0 (84.0-251.0)	**0.011**[2]
Fibrinogen (mg/dL)	200.0–400.0	394.0 (300.0-493.0)	414.5 (372.0-585.0)	387.0 (283.0-474.0)	**0.020**[2]

[1]: Student's t-test: [2]: Mann-Whitney U test; BUN: Blood urea nitrogen; ALT: Alanine aminotransferase; AST: Aspartate aminotransferase; LDH: Lactate dehydrogenase; CRP: C-reactive protein; HCT: Hematocrit; PLT: Platelet; NEU: Neutrophils; N/L: Neutrophil/Lymphocyte.

DISCUSSION AND CONCLUSION

The readmission rate was determined as 0.4% of our hospital, which serves as a tertiary referral hospital in our region and plays an important role in managing the pandemic. Patients who were mainly between the ages of 30-49 were female, yet no statistically significant difference was found in gender. 30.8% of readmitted patients had at least one comorbidity; the most common comorbidities were DM and HT. The rate of receiving FAV in patients with comorbidity was higher than in patients without. In our study, patients with comorbidities had higher BUN, creatinine, LDH, CRP, troponin, myoglobin, D-dimer, and fibrinogen values.

A second admission to the ER for the same reason is a significant criterion used to measure hospital performance and evaluate the quality of care.[11] Studies have shown that reducing preventable hospital admissions increases the quality of health care services and decreases patient care costs.[12] Our study revealed that patients were mainly between the ages of 30-49 (42.3%). Unlike the current study, Jeon et al.[13] reported that the risk of readmission increased with age, with those over 65 having the highest readmission rate. Ye et al.[14] and Wang et al.[15] and Durmus et al.[16] found higher readmission rates in patients over 60. In our study, 42.3% of the patients who were readmitted were in the age range of 30-49 years, which is a younger mean age compared to other studies. Readmissions to the ER are shifted to the younger age group because the severity of the COVID-19 disease and the rate of hospitalization at first admission are higher in elderly patients.

Regarding the gender distribution of the readmitted patients, Jeon et al.[13] revealed that the readmission rates of male patients were 1.3 times higher than those of female patients; likewise, Somani et al.[17] and Parra et al.[18] detected the difference as approximately twice as high in men than women. However, 51.4% of the readmitted patients were female, whereas 48.6% were male, yet no statistically significant difference was found in gender. This insignificant difference may be because the 72-hour readmission period we took as a basis for our study was shorter than in other studies, and comorbidities were less common in the younger age group.

The literature review demonstrated that the first 24 hours, 72 hours, 14 days, and 30 days after the initial admission were evaluated in studies examining the readmission of patients with COVID-19. In our study, we examined readmissions within the first 72 hours. Examining readmission rates within 72 hours, Margus et al.[19] found this rate to be 1.9%, and Ye et al.[14] as %5. This rate was determined as 0.4% for the ER of our hospital, which serves as a tertiary referral hospital in our region and plays an important role in the management of the pandemic. This rate is also considered a perfect criterion in terms of quality criteria. We believe that following properly planned pandemic management strategies and informing the patients comprehensively at discharge are effective in reducing readmissions.

The studies examining the readmission rates have also shown increased morbidity and mortality in patients with COVID-19 and comorbidities. In a study conducted in Switzerland, readmission rates were higher, especially in patients with coronary artery disease, atrial fibrillation, and aortic stenosis.[13] Another study in New York classified HT and COPD as risky comorbidities, a study in Spain classified HT, and a study in China classified pulmonary fibrosis.[20,21] Similarly, Ye et al.[14] found HT and obesity, and Uyaroglu et al.[20] concluded that HT and COPD increased the readmission rate. In the study of Durmus et al.[16] 19 (31.6%) patients had no comorbidity, while 41 (68.4%) patients had at least one comorbidity. All these studies concluded that having comorbidity increased the rate of readmission. In our study, 30.8% who were readmitted had at least one comorbidity, and the most common comorbidities were DM (9.5%), HT (9.1%), cardiovascular disease (7.9%), and asthma/COPD (7.5%), respectively. Our comorbidity rate is incompatible with other studies in the literature because the physicians working in our hospital tended to treat patients with more than one comorbidity as an inpatient at the first admission. Another reason could be that patients with comorbidities have a more severe course of COVID-19 and usually require hospitalization at the first admission.

We found that patients with comorbidities were older, and no statistical difference was observed between the groups regarding gender. Although comorbidity is expected to increase with age, relevant literature data vary in gender distribution. Regarding the studies evaluating patients' vital signs at admission, Margus et al.[19] reported that low oxygen saturation was not associated with readmission. In the study of Ye et al.[14] hypoxia was found to be one of the factors increasing the risk of readmission. In our study, the saturation values were lower in readmissions of those with comorbidities. ($p=0.014$). The reasons for this are disease progression after discharge, drug incompatibility, advanced age, and comorbidities.

Among the authors examining the symptoms that cause patients to return to the ES, Margus et al.[19] reported that gastrointestinal symptoms are the most common, while Chen et al.[21] reported cough and fever, Durmus et al.[16] cough and dyspnoea, and Somani et al.[17] only dyspnoea. In our study, the most common reasons for admission in patients without comorbidities were diarrhea and loss of taste, while the most common complaints in patients with

comorbidities were nausea and cough. In general, we believe that patients returned because they could not tolerate gastrointestinal complaints such as nausea and vomiting. Still, further studies are needed to examine the relationship between comorbidity and readmission symptoms.

Upon the diagnosis of COVID-19, favipiravir (FAV), hydroxychloroquine, and antibiotic drugs are often prescribed in our hospital. FAV is considered one of the potential candidates for the treatment of COVID-19 and is used in many countries. Although there are several ongoing randomized controlled trials in China, there is still no concrete evidence showing which drug should be administered primarily in which patient group.[22] In our study, the rate of receiving FAV in patients with comorbidity was higher than in patients without (p=0.024). Considering that patients with comorbidities are generally elderly, physicians tend to start treatment right after the diagnosis to prevent disease progression, which may be the reason for that difference.

PCR test results can also be negative in infected people and usually give late results; typical involvement in thorax CT is considered high risk for COVID-19 (Ministry of Health Guidelines). In the study by Jeon et al.[13] lung involvement on the CT scan at the first admission or a positive PCR result was associated with a high readmission rate. In line with the literature, our study revealed that the rate of negative PCR results (45.7%) was found to be significantly higher in patients without any comorbidities than in those with comorbidities, and likewise, the rate of those patients with comorbidities who provided no samples (65.4%) was also found considerably higher. In addition, lung involvement was observed on CT scanning, which is compatible with COVID-19, more in patients with comorbidities. These results suggest that comorbidity increases the severity, prevalence, and viral load of the disease. When we look at the studies examining the laboratory characteristics of readmitted patients, Margus et al.[19] found a relationship between high glucose levels, low lymphocyte and platelet counts, and the severity of the disease. Somani et al.[17] detected high leukocyte and platelet counts in readmitted patients, indicating that the underlying inflammation continued. Our study found that patients with comorbidities had higher BUN, creatinine, LDH, CRP, troponin, myoglobin, D-dimer, and fibrinogen values while having lower haemoglobin and HCT averages. This difference was directly associated with comorbidities.

Ethics Committee Approval: The research was approved by the Clinical Research Ethics Committee of Health Sciences University, Antalya Training and Research Hospital. (Date: 18.03.2021, decision no: 3/30).

Conflict of Interest: No conflict of interest was declared by the authors.

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