



Factors Affecting Length of Stay of COVID-19 Patients

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ABSTRACT

Objective: The Coronavirus disease has caused millions of people to be hospitalized around the world. Studies in the literature are generally related to the mortality and hospitalization rates of the disease. The present study aims to determine the factors affecting the length of hospital stay of the patients.

Material and Methods: The study was designed as retrospective, cross-sectional, and descriptive. Eighty-eight patients hospitalized in the family medicine COVID service of our hospital were included. In addition to the sociodemographic data of the patients, the CO-RADS score of the thorax tomography during hospitalization, the Charlson Comorbidity Index (CCI) score evaluating the treatments received during hospitalization and comorbidities, and the length of stay in the hospital were collected. $p < 0.05$ was considered significant.

Results: The mean age of the patients was 62.17 years (range, 26 to 91). Of our participants, %57 were male. Of the patients, 51.1% were not vaccinated, and 50% had a CO-RADS score of 5. The average length of hospital stay was 13.3 days. There was no significant relationship found between the length of stay and variables such as age, gender, and vaccination status. Among married and single individuals, there were significantly longer hospitalization periods in favor of married individuals ($p < 0.05$), and between widows and singles, there were significantly longer hospitalization periods in favor of widows ($p < 0.05$). Patients who required steroids, pulse steroids, tazocin, or intensive care experienced significantly longer hospital stays compared to patients who did not require these treatments ($U = 220, p < .0001$; $U = 239.5, p < .0001$; $U = 197.5, p = .001$; $U = 70, p < .001$). In addition, there was a weak positive correlation between the length of stay and the CO-RADS score, and a moderate positive correlation with the CCI score ($r = .215, p = 0.44$; $r = .450, p < .0001$).

Conclusion: In the present study, the factors affecting the length of hospital stay of Coronavirus patients were investigated. No significant relationship was found between the gender, age, and vaccination status of the patients and the duration of hospitalization. Married and widowed patients were hospitalized more often than single patients. The factors affecting the duration of hospitalization included the CCI score, the CO-RADS score, steroids, pulse steroids, tazocin, and intensive care requirements.

Keywords: Length of stay, COVID-19, SARS-CoV-2, Charlson Comorbidity Index

ÖZ

COVID-19 Hastalarının Yatış Süresini Etkileyen Faktörler

Giriş: Koronavirüs hastalığı dünya genelinde milyonlarca kişinin hastaneye yatmasına sebep olmuştur. Literatürde yapılan çalışmalar genellikle hastalığın mortalite ve yatış oranlarıyla ilgilidir. Amacımız hastaların hastanede yatış süresini etkileyen faktörleri saptamaktır.

Gereç ve Yöntemler: Çalışma retrospektif, kesitsel ve tanımlayıcı olarak hazırlanmıştır. Hastanemizdeki aile hekimliği COVID-19 servisinde yatan 88 hasta dahil edilmiştir. Hastaların sosyodemografik verilerinin yanı sıra yatış sırasındaki toraks tomografilerinin CO-RADS skoru, yatış süresince aldıkları tedaviler ve yandaş hastalıkları değerlendiren Charlson Komorbidite İndeksi (CCI) skoru ile hastanede yatış süresi verileri toplanmıştır. Analizlerimizde $p < 0.05$ anlamlı kabul edilmiştir.

Bulgular: Yaşları 26 ile 91 arasında değişen hastalarımızın ortalama yaşları 62.17 yıldır. Katılımcılarımızın %57'si erkek cinsiyettedir. Hastalarımızın %51.1'i aşı olmamıştır, %50'sinin CO-RADS skoru 5'tir. Ortalama hastanede yatış süresi 13.3 gündür. Yatış süreleri ve yaş, cinsiyet, aşı olma durumları arasında anlamlı bir ilişki bulunamamıştır. Hastaların medeni hallerine bakınca, evliler ile bekarlar arasında evliler lehine ($p < .05$) ve dullar ile bekarlar arasında dullar lehine ($p < .05$) anlamlı olarak daha uzun süre yatış süreleri mevcuttur. Steroid ihtiyacı olan, pulse steroid ihtiyacı olan, tazocin ihtiyacı olan, yoğun bakım ihtiyacı olan hastaların, bu tedavilere ihtiyacı olmayan hastalara göre yatış süreleri anlamlı ölçüde daha uzun olmuştur ($U = 220, p < .0001$; $U = 239.5, p < .0001$; $U = 197.5, p = .001$; $U = 70, p < .001$). Ek olarak, yatış süresi CO-RADS skoru ile pozitif yönde zayıf korelasyon ve CCI skoru ile pozitif yönde orta düzeyde korelasyon bulunmaktadır ($r = .215, p = 0.44$; $r = .450, p < .0001$).

Sonuç: Sunulan bu özgün çalışmada Koronavirüs hastalarının hastanede yatış süresini etkileyen faktörler araştırılmıştır. Hastaların cinsiyetleri, yaşları ve aşı olma durumlarıyla hastane yatış süreleri arasında anlamlı bir ilişki saptanmamıştır. Evli ve dul hastalar ise bekar hastalara göre daha uzun süre hastanede yatmıştır. Hastane yatış sürelerini etkileyen faktörler, CCI skoru, CO-RADS skoru, hastanın steroid, pulse steroid, tazocin ve yoğun bakım ihtiyacına bağlı olarak artmıştır.

Anahtar Kelimeler: Yatış süresi, COVID-19, SARS-CoV-2, Charlson Komorbidite İndeksi

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INTRODUCTION

The Coronavirus disease emerged in Wuhan, China in 2019 and spread all over the world. It was declared a pandemic by the World Health Organization (WHO) on March 11, 2020. To date, it has caused more than 265 million cases and more than two million deaths worldwide (1).

The most common symptoms of the Coronavirus disease are fever, dry cough, and fatigue. As the disease progresses, symptoms such as dyspnea, diarrhea, headache, and muscle pain accompany the disease (2,3). The most common laboratory findings of the disease are leukopenia and lymphopenia (3). Abnormalities were identified in the thoracic computed tomography (CT) images of nearly all hospitalized patients. Among patients admitted to regular wards, these findings included bilateral ground glass and subsegmental consolidation areas, whereas patients requiring intensive care admission exhibited bilateral multiple lobular and subsegmental consolidation areas (3). CT findings of the patients were classified by the CO-RADS system (4).

While COVID-19 can often manifest as asymptomatic, approximately 14% of infected individuals require hospitalization, and 5% of patients necessitate intensive care (3). Approximately half of the hospitalized patients have comorbid diseases. Particularly, conditions such as hypertension, diabetes, coronary heart disease, asthma, and chronic obstructive pulmonary disease (COPD) elevate the likelihood of hospitalizations due to the Coronavirus (3,5,6). In addition to chronic diseases, advanced age, and obesity also have an impact on mortality (7).

In the treatment of Coronavirus, antivirals such as remdesivir, molnupiravir, and systemic steroids can be used in addition to oxygen support (7,8). In the recovery study, it was revealed that the use of glucocorticoids in patients receiving respiratory support has a significant contribution to reducing mortality (9). Furthermore, various treatments are employed, even though they lack robust evidence.

Studies in the literature are generally related to mortality and hospitalization rates. There are few studies on the length of hospital stay due to Coronavirus disease. The objective of the current study is to identify the factors influencing the duration of hospitalization for patients with Coronavirus.

MATERIALS and METHODS

The present study is a retrospective, cross-sectional, and descriptive study. Approval was obtained from Adana City Training and Research Hospital Ethics Committee. Patients who were hospitalized for a duration of one month in the

family medicine COVID service were included in the study. Oxygen support, favipiravir, proton pump inhibitors, and enoxaparin were administered as the initial treatment for COVID, unless contraindicated. In patients with secondary or co-infection findings, tazocin was administered unless there was an empirical contraindication. Six mg/day of dexamethasone or an equivalent corticosteroid treatment was administered to individuals with oxygen saturation below 93% on room air. Pulse steroid treatment (≥ 250 mg/day methylprednisolone, over three days) was provided for those with oxygen saturation below 90% who did not respond to the daily 6 mg/day dexamethasone treatment. Patients whose oxygen saturation did not reach 90% despite oxygen support, and those who did not exhibit improvement in laboratory parameters, were transferred to the intensive care unit.

In addition to sociodemographic data such as gender, age, and marital status, participants were queried about their prior COVID-19 vaccination status. The CO-RADS scores from thoracic tomography scans conducted during hospitalization, as well as the requirements for steroids, pulse steroid therapy, tazocin therapy, and intensive care during the hospital stay, were assessed. The Charlson Comorbidity Index (CCI), developed by Charlson et al., was employed to assess additional comorbidities among the patients. The overall length of hospital stay for each patient was also investigated.

Data were analyzed with SPSS Statistic Version 21 software (IBM SPSS Statistic for Windows, New York, United States). Initially, the mean and median values of the data were calculated. As the Shapiro-Wilk test yielded a p-value of < 0.001 during the normality test, non-parametric tests were subsequently employed. The Mann-Whitney U test was utilized for comparing two groups, while the Kruskal-Wallis test was employed for comparisons involving three or more groups. Spearman correlation analysis was conducted to explore relationships between variables. A significance level of $p < 0.05$ was established.

RESULTS

Eighty-eight people participated in the present study. The ages of our participants ranged from 26 to 91 years, with a mean age of 62.17 ± 13.61 years. Of the participants, 55.7% ($n = 49$) were male and 44.3% ($n = 39$) were female. Of the participants, 12.5% ($n = 11$) were single, 65.9% ($n = 58$) were married and 21.6% were widowed. The health status of the patients is shown in Table 1.

CCI scores range from 0 to 12, with a mean of 4.13 ± 2.36 points. The mean duration of hospitalization was 13.3 ± 5.76 days, ranging from a minimum of three days to a maximum of 33 days. Table 2 shows the conditions influencing the

Table 1. The health status of the patients

		n	%
Gender	Female	39	55.7
	Male	49	44.3
Marital status	Single	11	12.5
	Married	58	95.9
	Widow	19	21.6
Vaccination status		43	48.9
CO-RADS scores	1	4	4.5
	2	0	0
	3	6	6.8
	4	34	38.6
	5	44	50
Steroids requirement		67	76.1
Pulse steroids requirement		17	19.3
Piperacillin-tazobactam requirement		13	14.8
Intensive care requirement		10	11.4

length of stay of the patients. No significant correlation was found between the patients' age, gender, vaccination status, and length of stay. Based on the results of the Mann-Whitney U test, patients requiring steroids, pulse steroids, tazocin, and intensive care demonstrated a significantly longer duration of hospitalization compared to patients who did not require these treatments ($U= 220, p< .0001$; $U= 239.5, p< .0001$; $U= 197.5, p= .001$; $U= 70, p< .001$). According to the outcomes of the Kruskal-Wallis test, as depicted in Table 2, there are statistically significant differences in hospitalization periods between married and single individuals, favoring the married category ($p< 0.05$), as well as between widows and singles, with longer hospitalization periods favoring widows ($p< 0.05$). Table 2 shows the conditions related to the length of stay of the patients according to the Spearman correlation test. According to the results of the test, there is a weak positive correlation with the CO-RADS score and a moderate positive correlation with the CCI score ($r= .215, p= 0.44$; $r= .450, p< .0001$). A moderate correlation is observed between the duration of hospitalization and the need for steroids, pulse steroid, tazocin treatment, and intensive care ($r= .510, p< .0001$; $r= .414, p< .0001$; $r= .367, p= .001$; $r= .453 p< .0001$).

DISCUSSION

The current study has demonstrated an association between the length of hospital stay for patients admitted to the family medicine COVID service at our hospital and factors such as the patient's CO-RADS score, CCI score, as well as the administration of steroids, pulse steroid, and tazocin treatments, along with the requirement for intensive care. It

is suggested that treatment needs contribute to the extension of hospitalization duration.

In the literature, it is documented that patients aged 70 and above experience higher mortality rates and longer intensive care stays in comparison to individuals under the age of 60 (10). In the current study, however, no significant correlation was observed between age and the duration of hospital stay. This lack of significance may be attributed to the relatively limited sample size of our patient population.

Similar to findings from studies conducted in China and Italy, male patients exhibited a higher rate of hospitalization compared to female patients in the present study (5,11). In the present study, the average length of hospital stay was 13 days. However, in the study of Zhou et al., the average length of hospital stay was 22 days (5). The authors suggest that this difference may be attributed to the distinct periods during which the respective studies were conducted. Given that the current study was conducted approximately one year later and more information about the Coronavirus was acquired during this interval, the average length of hospital stay was reduced.

Although it has been stated in the literature that hospitalizations and vaccination rates are low due to Coronavirus disease (12,13), no significant difference was found between the duration of hospitalization and vaccination status in the present study.

CCI is one of the most successful parameters in evaluating mortality in the intensive care unit (14). An increment of 1

Table 2. The conditions related to the length of stay

			Length of stay
Age		$r^{(a)}$.163
		p	.130
Gender	Female	n	49
		Min-Max (median) (day)	3-33 (8)
	Male	n	39
		Min-Max (median) (day)	6-23 (9)
		p	.061 ^(b)
	Marital status	Single	n
Min-Max (median) (day)			4-12 (5)
Married		n	58
		Min-Max (median) (day)	3-33 (9)
Widow		n	19
		Min-Max (median) (day)	5-22 (9)
	p	.007 ^(c)	
Vaccination status		n	43
		Min-Max (median) (day)	3-33 (7)
		p	.163 ^(b)
CCI score		$r^{(a)}$.450
		p	<.001*
CO-RADS score		$r^{(a)}$.215
		p	.044*
Steroids requirement		n	67
		Min-Max (median) (day)	5-33 (10)
		p	<.001 ^(b)
Pulse steroids requirement		N	17
		Min-Max (median) (day)	7-28 (12)
		p	<.001 ^(b)
Piperacillin-tazobactam requirement		n	13
		Min-Max (median) (day)	9-28 (12)
		p	.001 ^(b)
Intensive care requirement		n	10
		Min-Max (median) (day)	12-33 (19)
		p	<.001 ^(b)

^(a)= Spearman correlation coefficient.

^(b)= Mann-Whitney U test.

^(c)= Kruskal-Wallis test.

*p< .05

Min: Minimum, Max= Maximum, CCI= Charlson Comorbidity Index.

point in the CCI score is associated with a 32% increase in the probability of mortality (15). The findings of the current study align with previous literature. The elevation of the CCI score correlates with an extended duration of hospitalization (16). It is postulated that patients with higher scores

experience longer hospital stays due to the presence of more severe pneumonia and an increased risk of mortality.

In their study, Gündoğdu et al. reported that the use of pulse steroids did not result in a reduction in the length of

hospital stay (17). Batrel et al. stated that the use of high-dose steroids (6 mg/day dexamethasone equivalent) shortened the hospitalization duration, while the use of pulse steroids shortened the duration of intensive care unit stay (18). The current study has indicated that the utilization of both high-dose steroids and pulse steroids did not lead to a decrease in the duration of hospitalization. These variations in findings between studies are thought to stem from the varying disease severity of the selected sample populations.

One of the limitations of the current study is that it was conducted in a tertiary hospital and confined to a single service, resulting in a relatively small number of participants.

CONCLUSION

The COVID-19 disease has turned into a pandemic worldwide, causing millions of people to be hospitalized. In this original research, no significant relationship was found between patients' gender, age, vaccination status, and length of hospital stay. Married and widowed patients are hospitalized more often than single patients. The factors affecting the duration of hospitalization increased depending on the CCI score, the CO-RADS score, the patient's need for steroids, pulse steroids, tazocin, and intensive care.

Ethics Committee Approval: This study was approved by Adana City Training and Research Hospital Clinical Research Ethics Committee (Decision Number: 1970, Date: 09.06.2022).

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Conflict of Interest: All authors declare that they have no conflict of interest.

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