

# Comparison of demographic and clinical characteristics between pandemic and pre-pandemic period in non-COVID intensive care units: a retrospective study

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## ABSTRACT

**BACKGROUND:** A major problem of the coronavirus pandemic is the increase of patients requiring intensive care unit (ICU) support in an extremely limited period of time. As a result, most countries have prioritized coronavirus disease 2019 (COVID-19) care in ICUs and take new arrangements to increase hospital capacity in emergency department and ICUs. This study aimed to evaluate the changes in the number, clinical and demographic characteristics of patients hospitalized in non-COVID ICUs during the COVID-19 pandemic period compared to the previous year (pre-pandemic period), and to reveal the effects of the pandemic.

**METHODS:** Hospitalized patients in non-COVID ICUs of our hospital between 11 March 2019 and 11 March 2021 were included in the study. The patients were divided into two groups according to date of the start of the COVID period. Patient data were scanned and recorded retrospectively from hospital information system and ICU assessment forms. Information regarding demographics (age and gender), comorbidities, COVID 19 polymerase chain reaction result, place of ICU admission, the diagnoses of patients admitted to ICU, length of ICU stay, Glasgow coma scale and mortality rates, and the Acute Physiology and Chronic Health Evaluation II score were collected.

**RESULTS:** A total of 2292 patients were analyzed, including 1011 patients (413 women and 598 men) in the pre-pandemic period (Group 1) and 1281 patients (572 women and 709 men) in the pandemic period (Group 2). When the diagnoses of patients admitted to ICU were compared between the groups, there was a statistically significant difference between post-operation, return of spontaneous circulation, intoxication, multitrauma, and other reasons. In the pandemic period, the patients had a statistically significant longer length of ICU stay.

**CONCLUSION:** Changes were observed in the clinical and demographic characteristics of patients hospitalized in non-COVID-19 ICUs. We observed that the length of ICU stay of the patients increased during the pandemic period. Due to this situation, we think that intensive care and other inpatient services should be managed more effectively during the pandemic.

**Keywords:** Coronavirus disease 2019; intensive care; pandemic.

## INTRODUCTION

A novel coronavirus that causes the coronavirus disease 2019 (COVID-19) rapidly spread, resulting in an epidemic throughout China, followed by a global pandemic. There is a wide spectrum of disease ranging from asymptomatic presentation

to acute respiratory failure requiring invasive mechanical ventilator support and death.<sup>[1]</sup> Despite COVID-19 has a higher mortality rate among elderly patients with chronic diseases, fatal complications have also been detected in healthy young adults.<sup>[2]</sup>

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There was a major decrease in the rate of emergency department visits and hospital admissions due to the social isolation during COVID-19 measures of confinement.<sup>[3]</sup> While there was an important fall in each surgical specialty activity due to the decrease in hospital admissions and elective surgeries, the most affected surgical specialty was otolaryngology and maxillofacial surgery.<sup>[4]</sup>

A major problem of the coronavirus pandemic is the considerable burden imposed on National health systems worldwide and the increase of patients requiring intensive care unit (ICU) support in an extremely limited period of time.<sup>[5]</sup> New arrangements in the hospitals have taken to increase hospital capacity in emergency department and ICUs.<sup>[6]</sup> The number of admissions in cardiovascular ICUs decreased and delay in hospitalization for acute coronary syndromes was observed.<sup>[7]</sup> In addition, an increase was observed in the waiting times of the patients to be examined from consultant physician requested in hospital admissions and it was determined that this patients had higher intensive care, longer duration of mechanical ventilation, and length of ICU stay.<sup>[8]</sup>

The aim of this study was to evaluate the changes in the number, clinical, and demographic characteristics of patients hospitalized in non-COVID ICUs during the COVID-19 pandemic period compared to the previous year (pre-pandemic period) and to reveal the effects of the pandemic. We hypothesized that there would be a decrease in the number of trauma and post-operative patients and length of ICU stay during the pandemic period.

## MATERIALS AND METHODS

This study was approved by the Health Sciences University Dışkapı Yıldırım Bayezit Training and research hospital ethics committee. (No: 126/13, Date: December 13, 2021). Hospitalized patients in the Anesthesiology and Reanimation ICU of our hospital between March 11, 2019, and March 11, 2021, were included in the study. The patients were divided into two groups as Group 1 (pre-pandemic period) between the dates of March 11, 2019, and March 11, 2020, and Group 2 (pandemic period) March 11, 2020, to March 11, 2021. The date of March 11, 2020, was chosen as the start of the COVID period, as this was the date of the first COVID-19 case in Turkey.

Patient data were scanned and recorded retrospectively from hospital information system and ICU assessment forms. All patients over 18 years of age who had been hospitalized in ICU over the 24-h period were eligible. Information regarding demographics (age and gender), comorbidities, COVID-19 polymerase chain reaction (PCR) result, ICU admission sources, the diagnoses of patients admitted to ICU, length of ICU stay, Glasgow coma scale (GCS) and mortality rates, and the Acute Physiology and Chronic Health Evaluation II (APACHE II) score were collected.

Patients in hospital admissions and during hospitalization are evaluated according to the COVID-19 guidelines of the Ministry of Health of the Republic of Turkey. Patients who have any symptoms consistent with COVID-19, such as fever, cough, shortness of breath, sore throat, headache, muscle aches, loss of taste, or smell, diarrhea should be tested immediately. Patients who are in the preoperative period especially in major surgeries are required to obtain screening tests. Nasopharyngeal and oropharyngeal PCR samples are taken from these patients to rule out COVID-19. If COVID-19 is excluded in patients who need intensive care, they are transferred to non-COVID ICUs.

Patient isolation is ensured until the result is obtained by taking a COVID-19 PCR sample from critical care patients with suspected COVID-19. Extubated patients in critical care units are followed up with masks for isolation. Closed aspiration systems are also used for the aspiration of intubated patients.

## Statistical Analysis

SPSS 21.0 (Version 22.0, SPSS, Inc, Chicago, IL, USA) program was used for statistical analysis. After applying the Shapiro–Wilk test for normality, Student's t-test was used if the distribution was normal for the comparison of continuous variables between groups, and the Mann–Whitney U-test was used if the distribution was not normal. Chi-square test was used for categorical variables. Results  $P < 0.05$  were considered significant.

## RESULTS

In the study, 2292 (985 female and 1307 male) hospitalized patients in the anesthesiology and reanimation ICU of our hospital between March 11, 2019, and March 11, 2021, were included in the study. A total of 2743 patients admitted to ICU in the relevant period. Four hundred and fifty-one patients were excluded from the study. Because 98 patients were under the age of 18, 124 patients had missing data, 195 patients were hospitalized for  $< 24$  h, and 34 patients died within the first 24 h. A total of 2292 patients were analyzed, including 1011 patients (413 women and 598 men) in the pre-pandemic period (Group 1) 1281 patients (572 women and 709 men) in the pandemic period (Group 2) (Fig. 1).

The female male ratio was similar in both groups and there was no statistically significant difference between the groups ( $P = 0.068$ ) (Table 1).

The median age (range) of the patients was 71 years (81), in both Group 1 and Group 2. There was no difference in the median age between the two groups ( $P = 0.481$ ) (Table 1).

In Group 1, 786 patients (77.7%) from the hospital wards, 215 patients (21.3%) from the emergency department, and 10 patients (1%) from another hospital were transferred to

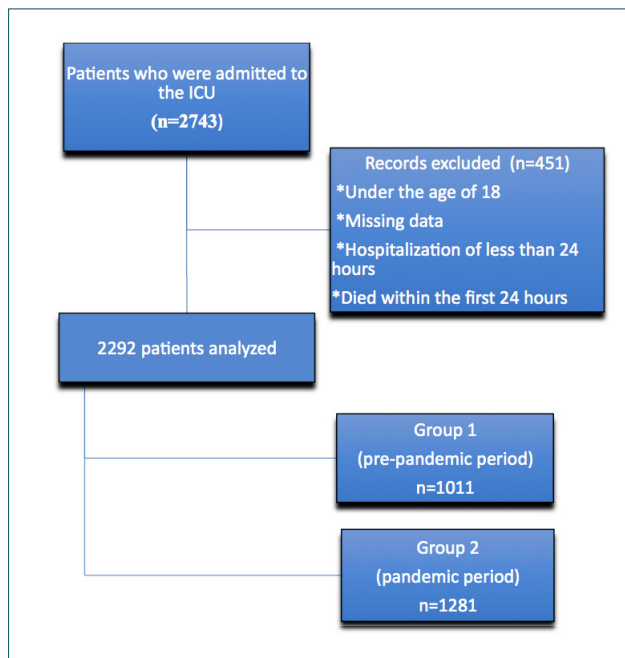


Figure 1. Working diagram

ICUs. In Group 2, 1047 patients (81.7) from the hospital wards, 171 patients (13.3%) from the emergency department, 48 patients (3.7%) from the COVID services, and 15 patients (1.2%) from another hospital were transferred to ICUs. There was a statistically significant difference between the groups in patient transfers from the hospital wards and the emergency department ( $P < 0.001$ ,  $P = 0.025$ ) (Table 1). While patient transfers from the hospital wards to ICUs were significantly higher during the pandemic period, transfers from the emergency department were significantly lower. There was no difference in patient transfers from another hospital ( $P = 0.317$ ) (Table 1).

In the pandemic period, COVID-19 PCR results of 17 out of 1281 patients were positive (1.3%) (Table 1).

While the median (range) length of ICU stay (range) was 1 day (83) in Group 1, it was 2 days (144) in Group 2. In the pandemic period, the patients had a statistically significant longer length of ICU stay ( $P < 0.001$ ) (Table 1).

Table 1. Demographic data

	Group 1 (Pre-pandemic) n=1011	Group 2 (Pandemic) n=1281	P
Age (year)*	71 (81)	71 (81)	0.481
Sex (n) female/male	413/598	572/709	0.068
Length of ICU stay (day) *	1 (83)	2 (144)	<0.001**
APACHE II score *	12 (48)	11 (38)	0.692
GCS*	15 (12)	15 (12)	0.278
ICU admission sources (n,%)			
Hospital wards/Emergency department/ COVID services / Another hospital)	786 (77.7)/215 (21.3)/0 (0)/10 (1)	1047 (81.7)/171 (13.3)/48 (3.7)/15 (1.2)	<0.05**
COVID PCR (n,%)			<0.001**
Positive/Negative	0 (0)/0 (0)	17 (1.3)/1264 (98.7)	
Diagnoses of patients admitted to ICU (n,%)			
Post-operation	663 (65.6)	925 (72.2)	<0.05**
ROSC	31 (3.1)	16 (1.2)	<0.05**
Neurological disease	31 (3.1)	37 (2.9)	0.467
Intoxication	11 (1.1)	26 (2)	<0.05**
Respiratory system disease	131 (13)	141 (11)	0.257
Renal disease	33 (3.3)	28 (2.2)	0.633
Heart failure	4 (0.4)	4 (0.3)	0.07
Other diseases	49 (4.8)	74 (5.8)	<0.05**
Multitrauma	58 (5.7)	30 (2.3)	<0.05**
Result (n,%)			
Exitus/Discharge/transfer to hospital wards/Refusal of treatment	176 (17.4)/31 (3.1)/798 (78.9)/6 (0.6)	179 (14)/20 (1.6)/1073 (83.8)/9 (0.7)	>0.05

APACHE II score: Acute Physiology and Chronic Health Evaluation II score; ICU: intensive care unit; PCR: Polymerase chain reaction; GCS: Glasgow coma scale; COVID: Coronavirus Disease; ROSC: Return of spontaneous circulation; \*: Median (Range); \*\*:  $P < 0.05$  was considered significant.

**Table 2.** Comparisons between comorbidities in patients

Comorbidity	Group 1 (Pre-pandemic) n=1011	Group 2 (Pandemic) n=1281	P
COPD	229 (22.7)	255 (19.9)	0.110
CAD	383 (37.9)	436 (34)	0.560
Serebrovascular disease	79 (7.8)	145 (11.3)	0.05
Diabetes mellitus	331 (32.7)	413 (32.2)	0.800
Hypertension	493 (48.8)	642 (50.1)	0.520
Dementia	90 (8.9)	121 (9.4)	0.655
Renal disease	124 (12.3)	135 (10.5)	0.195
Neuromuscular disease	8 (0.8)	9 (0.7)	0.806
Psychiatric Disease	50 (4.9)	50 (3.9)	0.225
Malignancy	162 (16)	255 (19.9)	0.170

P<0.05 was considered significant; CAD: Coronary artery disease; COPD: Chronic obstructive pulmonary disease.

The diagnoses of patients admitted to the ICU are listed in Table 1. When the diagnoses of patients admitted to ICU were compared between the groups, there was a statistically significant difference between post-operation, return of spontaneous circulation (ROSC), intoxication, multitrauma, and other reasons (P<0.01, P=0.029, P<0.01, P<0.01, P=0.024). While patients admitted to ICU due to postoperation and intoxication were higher in the pandemic period, patients admitted to ICU due to ROSC and multitrauma were higher in the pre-pandemic period. Patients admitted to ICU due to neurological diseases, respiratory system diseases, renal diseases, and heart failure were similar in both groups (P=0.467, P=0.257, P=0.633, P=0.07).

Comparisons between comorbidities in ICU patients are listed in Table 2. There was no statistical difference between the two groups (P>0.05).

The median (range) APACHE II score was 12 (48) in Group 1 and 11 (38) in Group 2. There was no difference between the two groups (P=0.692) (Table 1).

The median (range) GCS was 15<sup>[9]</sup> in both groups. There was no difference between the two groups (P=0.278) (Table 1).

In Group 1, 176 patients died in ICU, 31 patients were discharged, 798 patients were transferred to the hospital wards, and six patients refused treatment. In Group 2, 179 patients died in ICU, 20 patients were discharged, 1073 patients were transferred to the hospital wards, and nine patients refused treatment. When ICU mortality rates were compared between the two groups, there was no difference (P<0.05) (Table 1).

## DISCUSSION

In this study, we found an increase in patient transfers from

hospital wards to the ICU and a decrease in transfers from the emergency department during the pandemic period compared to the pre-pandemic period. In addition, while the number of patients admitted to ICU due to ROSC and multitrauma was decreased during the pandemic period, the number of patients admitted to ICU due to post-operation, intoxication, and other reasons was increased. In addition to all this, the patients had longer length of ICU stay in the pandemic period.

Gormeli Kurt and Gunes reported that there was a major decrease in the rate of emergency department visits in the pandemic period.<sup>[3]</sup> In addition, Vissio et al., reported that 34.9% decrease was detected in the context of all emergency department admission since the pandemic development.<sup>[9]</sup> Our data are consistent with these reports: In our study, we saw that there was more admission to ICU from the hospital wards than the emergency department because of the decrease in emergency service admissions.

Deo et al. reported that hospital admissions and surgeries for non-COVID-19 reasons decreased compared to the pre-pandemic period.<sup>[10]</sup> Yanaral and Öz reported that in the pandemic period, the number of patients undergoing emergency and elective surgery decreased compared to the pre-pandemic period.<sup>[11]</sup> Furthermore, Schöni et al., reported that surgical interventions decreased during the pandemic period.<sup>[12]</sup> Unlike the literature, in our study, the number of post-operative patients admitted to ICU was higher during the pandemic period. We think, the reason is that anesthesiology and reanimation ICU was the only non-COVID ICU for post-operative patients in our hospital and emergency and oncological surgeries were continued during the pandemic period.

Santi et al., reported that the pandemic caused a sudden drop of emergency department visits and hospitalizations of non-

COVID-19 patients and a concurrent increase in out-of-hospital mortality mainly driven by deaths for neoplasms, cardiovascular, and endocrine diseases.<sup>[13]</sup> In our study, we noted that patients admitted to ICU due to ROSC was higher in the pre-pandemic period than pandemic period.<sup>[5]</sup> We think that the reduction in hospital admissions and hospitalizations due to the social isolation during COVID-19 measures of confinement is effective for the reason for this.

Christey et al. reported that there was 43% decrease in admissions due to trauma in the pandemic period.<sup>[14]</sup> In our ICU, while the rate of multitrauma patients was 5.7% in the pre-pandemic, it was 2.3% in the pandemic period. We think, the reason for this situation is the restrictions within the scope of the COVID-19 pandemic measures.

Ilagan-Ying et al. reported that patients undergoing endoscopy during the pandemic had higher proportions of ICU admission, more urgent indications, and higher rates of 30-day mortality.<sup>[15]</sup> Faizul Huq et al. noted that there was a significant reduction in hospital admissions and hospitalizations due to liver diseases.<sup>[16]</sup> In our study, the number of patient admissions to ICU due to oral intake disorder, gastrointestinal bleeding, and liver disease was higher during the pandemic period. We think, the reason for this is increase in intensive care needs of these patients due to the delay in hospital admissions during COVID-19 measures of confinement.

Caballero-Domínguez et al. reported that in an online questionnaire study of a total of 700 adults, 7.6% of participants reported a high suicide risk associated with high perceived stress related to COVID-19, risk of depressive episode, and insomnia.<sup>[17]</sup> Social isolation and economic difficulties during COVID-19 increase the risk of suicidal behavior.<sup>[18]</sup> Especially health-care professionals, elderly patients living alone, children, and adolescents are in the higher risk group. In our study, we observed an increase in the number of patients admitted to ICU due to intoxication during the pandemic period. We think, the reason for this increase may be social isolation, economic reasons, fear of getting sick, and death.

During the pandemic period, elective surgical interventions were stopped according to the COVID-19 guidelines of the Ministry of Health of the Republic of Turkey. Only emergency, trauma and oncological surgical interventions were continued. Pulmonary aspiration of gastric contents during the perioperative period is higher in patients undergoing general anesthesia for emergency surgery than elective surgery. This may be associated with post-operative mortality or pulmonary morbidity.<sup>[19]</sup> Other problems in patients undergoing emergency surgery are hemodynamic irregularity, bleeding, and additional trauma. These difficulties in emergency surgery cause an increase in post-operative complications, length of hospital stay, and mortality rates.<sup>[20]</sup> The need for intensive care and length of ICU stay of the patients who undergoing oncological surgery were increased due to the advanced age

and the higher incidence of comorbidities.<sup>[21,22]</sup> We think that the length of ICU stay was higher in our study because of the patient admissions to ICU after undergoing oncological and emergency surgeries during the pandemic period.

There are limitations of this study. First, we were able to access the patient data in our study from the hospital information system and ICU assessment forms. However, we could not reach waiting times of the patients to be examined from consultant physician in emergency visits and waiting times of ICU admission in emergency departments from the hospital information system. Therefore, we could not evaluate these parameters. Second, this is a single-center and retrospective study.

## Conclusion

The arrangements in the hospitals which taken to increase hospital capacity in emergency department and ICUs and the reduction in hospital admissions due to the pandemic also affected the care of non-COVID patients and the services serving these patients. Changes were observed in the clinical and demographic characteristics of patients hospitalized in non-COVID-19 ICUs. We observed that the length of ICU stay of the patients increased during the pandemic period due to the delays in hospital admissions and the majority of hospitalized patients in ICU being post-operative patients undergoing emergency and oncological surgeries. Due to this situation, we think that intensive care and hospital wards should be managed more effectively during the pandemic.

**Ethics Committee Approval:** This study was approved by the Diskapi Yıldırım Beyazıt Training and Research Hospital Clinical Research Ethics Committee (Date: 13.12.2021, Decision No: 126/13).

**Peer-review:** Externally peer-reviewed.

**Authorship Contributions:** Concept: Y.Ö., S.A.; Design: Y.Ö., J.E., F.A.; Supervision: Y.Ö., Y.E.; Fundings: Y.Ö., F.A., Y.E.; Materials: S.A., F.A., M.M.S.; Data: Y.Ö., Y.E., F.A.; Analysis: Y.Ö., J.E., M.M.S.; Literature search: Y.Ö., S.A., J.E.; Writing: Y.Ö., S.A.; Critical revision: Y.Ö., J.E., M.M.S.

**Conflict of Interest:** None declared.

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## ORİJİNAL ÇALIŞMA - ÖZ

### COVID-19 dışı yoğun bakım ünitelerinde pandemi ve pandemi öncesi dönem arasındaki demografik ve klinik özelliklerin karşılaştırılması: Retrospektif bir çalışma

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**AMAÇ:** Koronavirüs pandemisinin önemli bir sorunu, yoğun bakım ünitesi (YBÜ) desteğine ihtiyaç duyan hastaların son derece sınırlı bir süre içinde artmasıdır. Sonuç olarak, çoğu ülke yoğun bakım ünitelerinde (YBÜ) COVID-19 bakımına öncelik vermiş ve acil servis ve yoğun bakım ünitelerinde hastane kapasitesini artırmak için yeni düzenlemeler yapmıştır. Bu çalışmada, COVID-19 pandemisi döneminde (pandemi öncesi dönem) COVID-19 dışı yoğun bakımlarda yatan hasta sayısı, klinik ve demografik özelliklerindeki değişikliklerin bir önceki yıla göre değerlendirilmesi ve pandeminin etkilerinin ortaya konulması amaçlanmıştır.

**GEREÇ VE YÖNTEM:** 11 Mart 2019-11 Mart 2021 tarihleri arasında hastanemizin COVID-19 dışı yoğun bakım ünitelerinde yatan hastalar çalışmaya dahil edildi. Hastalar COVID döneminin başlama tarihine göre iki gruba ayrıldı. Hasta verileri geriye dönük olarak hastane bilgi sistemi ve YBÜ değerlendirme formlarından taranarak kaydedildi. Demografik bilgiler (yaş ve cinsiyet), komorbiditeler, COVID 19 PCR sonucu, yoğun bakım yatış yeri, yoğun bakıma yatan hastaların tanıları, yoğun bakımda kalış süreleri, Glasgow koma skalası ve ölüm oranları ile APACHE II skoru toplandı.

**BULGULAR:** Pandemi öncesi dönemde (Grup 1) 1011 hasta (413 kadın, 598 erkek) ve pandemi döneminde (Grup 2) 1281 hasta (572 kadın, 709 erkek) olmak üzere toplam 2292 hasta analiz edildi. YBÜ'ye başvuran hastaların tanıları gruplar arasında karşılaştırıldığında, postoperatif, spontan dolaşımın geri dönüşü (ROSC), zehirlenme, multitravma ve diğer nedenler arasında istatistiksel olarak anlamlı fark vardı. Pandemi döneminde hastaların yoğun bakımda kalış süresi istatistiksel olarak anlamlı şekilde daha uzundu.

**TARTIŞMA:** COVID-19 dışı yoğun bakımlarda yatan hastaların klinik ve demografik özelliklerinde değişiklikler gözlemlendi. Pandemi döneminde hastaların yoğun bakımda kalış sürelerinin arttığını gözlemledik. Bu durum nedeniyle pandemi döneminde yoğun bakım ve diğer yataklı servislerin daha etkin yönetilmesi gerektiğini düşünüyoruz.

**Anahtar sözcükler:** COVID-19; pandemi; yoğun bakım.

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