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Clinical Characteristics of Patients in a Tertiary Non-COVID-19 Intensive Care Unit During the Pandemic: What Has Changed?

ABSTRACT

INTRODUCTION: The COVID-19 pandemic profoundly impacted healthcare systems, necessitating rapid reallocation of resources, which significantly affected the management of non-COVID-19 intensive care unit (ICU) patients. This study aimed to examine the clinical characteristics and outcomes of patients admitted to a tertiary non-COVID-19 ICU before and during the pandemic.

METHODS: A retrospective cohort study was conducted, including 528 patients admitted between March 2019 and March 2021. Patients were divided into pre-pandemic (Non-COVID group, n=196) and pandemic (COVID group, n=332) cohorts. Demographic data, comorbidities, ICU admission details, and outcomes were analyzed. Statistical analyses included t-tests, chi-square tests, and Mann-Whitney U tests, with significance set at $p<0.05$.

RESULTS: The mean patient age was 72 years, with a higher proportion of males in the Non-COVID group (57.7% vs. 48.8%, $p=0.049$). The COVID group had significantly shorter ICU stays (median 6 vs. 9 days, $p=0.048$) and higher emergency department admissions (77.7% vs. 42.3%, $p<0.001$). Comorbidities such as hypertension, diabetes, and coronary artery disease were significantly more common during the pandemic period ($p<0.001$). Despite these differences, ICU mortality rates remained consistently high (82.3%) across both periods.

DISCUSSION AND CONCLUSION: The pandemic led to notable shifts in ICU admissions, with more critically ill patients presenting from emergency departments and with multiple comorbidities. Despite shorter ICU stays, high mortality rates persisted, underscoring the need for resilient critical care strategies during future health crises.

Keywords: Non-COVID-19 ICU, COVID-19 pandemic, clinical characteristics, comorbidities, ICU mortality

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Introduction

The COVID-19 pandemic introduced unprecedented challenges to healthcare systems globally, primarily due to the rapid increase in intensive care unit (ICU) admissions over a short period. Managing ICU capacity—already limited in numerous healthcare institutions—became even more critical as the demand for intensive care surged. In response, hospitals were compelled to swiftly restructure their infrastructure, reassign medical personnel, and establish dedicated COVID-19 ICUs to manage critically ill patients. This extensive reallocation of resources had significant repercussions for the care of non-COVID-19 patients who required intensive care services.

During this time, hospital admissions for non-COVID-19 conditions declined markedly. This reduction was likely influenced by government-imposed lockdown measures, patient reluctance to seek hospital care, and the reallocation of healthcare resources prioritizing COVID-19 patients. As a result, many elective procedures were postponed, and routine healthcare services were disrupted, leading to delays in diagnosis and the worsening of chronic conditions. Consequently, non-COVID-19 patients

who eventually required ICU admission often presented with advanced stages of illness due to these delays in accessing appropriate medical care.

By September 27, 2021, the COVID-19 pandemic had resulted in 232,522,770 confirmed cases and 4,748,539 deaths globally. In our country, the total number of confirmed cases reached 7,039,500, with 63,166 reported deaths (1). A comprehensive meta-analysis encompassing 24 observational studies estimated the intensive care unit (ICU) mortality rate among COVID-19 patients at 41.6% (2). The unprecedented demand for critical care beds, coupled with shortages of medical supplies and healthcare personnel, significantly disrupted healthcare services during this period. As a result, a considerable proportion of ICU capacity was designated for COVID-19 patients, compelling many healthcare institutions to expand their ICU facilities to meet the growing demand (2,3).

While the primary focus of healthcare systems was directed toward managing COVID-19 patients, intensive care units (ICUs) designated for non-COVID-19 cases continued to operate. However, these units encountered significant challenges, including shortages of healthcare personnel, stricter infection control protocols, and modifications to standard ICU admission policies. The resulting strain on hospital infrastructure raised concerns regarding shifts in patient demographics, disease severity, and mortality rates within these units (2,3). Several studies have highlighted that the profile of ICU admissions evolved during the pandemic, marked by a higher proportion of elderly patients, greater illness severity, and altered treatment protocols driven by resource limitations.

Beyond the immediate disruptions, the pandemic's long-term effects on ICU patient outcomes remain a critical area of inquiry. Delayed hospital admissions and postponed elective procedures may have led to higher morbidity and mortality rates among non-COVID-19 patients. Furthermore, the heightened workload for healthcare professionals, sustained stress, and limited resources may have indirectly compromised the quality of patient care. Gaining a deeper understanding of these changes is essential for refining healthcare resource distribution and enhancing ICU management strategies in future pandemics.

This study aims to examine the impact of the COVID-19 pandemic on critically ill patients admitted to a tertiary non-COVID-19 ICU by analyzing their clinical characteristics and outcomes. The insights gained from this analysis could inform strategies for optimizing ICU resource allocation and preparedness, ultimately contributing to the development of more resilient healthcare systems capable of withstanding future global health emergencies.

MATERIALS and METHODS

Study Design and environment

This study was approved by the institutional ethics committee, and all procedures were conducted in accordance with the principles of the Declaration of Helsinki. Since the study was retrospective and involved the review of anonymized patient records, informed consent was not required. All patient data were handled in compliance with data protection regulations and were used solely for research purposes. This study was performed per Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) criteria.

This retrospective cohort study was conducted in a tertiary care center and included patients who were admitted to the medical and surgical intensive care units (ICUs) between March 2019 and March 2021. To assess the impact of the COVID-19 pandemic on ICU admissions and outcomes, patients were divided into two groups based on the onset of the pandemic: the Non-COVID group (March 2019–March 2020), consisting of patients admitted before the pandemic, and the COVID group (March 2020–March 2021), which included patients admitted during the pandemic period.

Study data

Patient data were collected retrospectively from the hospital information management system and ICU assessment forms. The following variables were recorded for each patient: demographic characteristics (age and gender), comorbidities (hypertension, diabetes mellitus, coronary artery disease, arrhythmia, chronic kidney disease, neurologic diseases, respiratory diseases, heart failure, and cancer), and admission details, including ICU admission source (emergency department, hospital wards, or transfers from external centers) and patient type (medical or surgical). The primary ICU admission diagnoses were also noted, including conditions such as sepsis, cardiac diseases, respiratory failure, trauma, and postoperative surgical conditions. Additionally, data on ICU length of stay (LOS) and clinical severity scores, particularly the Acute Physiology and Chronic Health Evaluation II (APACHE II) score, were extracted to assess the severity of illness upon admission.

To evaluate patient outcomes, hospital discharge records were reviewed, and ICU mortality, discharge rates, and interhospital transfers were documented. The study aimed to identify potential differences in patient characteristics, disease severity, and clinical outcomes between the two periods, providing insights into the indirect effects of the pandemic on critically ill patients requiring intensive care.

Ethical statement

Ethics committee approval for this study was received from the Ethics Committee of the Yozgat Bozok University following the Declaration of Helsinki (date: 01.10.2021; no: 189_2021.10.13_08).

Statistical analysis

All statistical analyses were performed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA). The normality of continuous variables was assessed using

the Kolmogorov-Smirnov test. Normally distributed variables were presented as mean ± standard deviation (SD), while non-normally distributed variables were expressed as median [minimum–maximum]. Categorical variables were summarized as frequencies (n) and percentages (%). Differences between the Non-COVID and COVID groups were analyzed using the independent samples t-test or Mann-Whitney U test for continuous variables and the chi-square (χ^2) test for categorical data. A p-value < 0.05 was considered statistically significant.

RESULTS

A total of 528 patients were included in the study, with 196 patients (37.1%) in the Non-COVID group and 332 patients (62.9%) in the COVID group (Table 1). The mean age of all patients was 72 years (SD = 16), with no significant difference between the two groups (p = 0.561). The overall male-to-female ratio was 52.1% to 47.9%, with a higher proportion of males in the Non-COVID group (57.7% vs. 48.8%, p = 0.049).

Table 1. Demographic and Clinical Characteristics of the Groups

Variables	Overall (n=528)	Non-COVID (n=196)	COVID (n=332)	p value
Age (years)	72 (16)	71 (17)	72 (15)	0.561[b]
Gender, Female/Male	253/275 (47.9/52.1)	83/113 (42.3/57.7)	170/162 (51.2/48.8)	**0.049**[a]
Length of ICU stay (days)	7 [1 to 22]	9 [2 to 27]	6 [1 to 20]	**0.048**[c]
Patient type				
Medical	431 (81.6)	152 (77.6)	279 (84.0)	0.063[a]
Surgical	97 (18.4)	44 (22.4)	53 (16.0)	
Referring unit				
Emergency service	341 (64.6)	83 (42.3)	258 (77.7)	**<0.001**[a]
Wards	61 (11.6)	40 (20.4)	21 (6.3)	
External transfers	126 (23.9)	73 (37.2)	53 (16.0)	
Admission diagnosis				
Sepsis	36 (6.8)	11 (5.6)	25 (7.5)	-
Post-CPR	115 (21.8)	45 (23.0)	70 (21.1)	-
Respiratory diseases	103 (19.5)	37 (18.9)	66 (19.9)	-
Cardiac diseases	29 (5.5)	10 (5.1)	19 (5.7)	-
Neurological diseases	98 (18.6)	39 (19.9)	59 (17.8)	-
Renal failure	42 (8.0)	11 (5.6)	31 (9.3)	-
Trauma	34 (6.4)	21 (10.7)	13 (3.9)	-
Cardiac surgery	1 (0.2)	1 (0.5)	0 (0.0)	-
Abdominal surgery	3 (0.6)	1 (0.5)	2 (0.6)	-
Other surgical conditions	15 (2.8)	9 (4.6)	6 (1.8)	-
Other medical conditions	46 (8.7)	7 (3.6)	39 (11.7)	-
Intoxication	6 (1.1)	4 (2.0)	2 (0.6)	-
Outcomes				
Mortality	433 (82.3)	162 (82.7)	271 (82.1)	0.245[a]
Discharge	26 (4.9)	13 (6.6)	13 (3.9)	
Transfer	67 (12.7)	21 (10.7)	46 (13.9)	

Data are presented as the mean ± SD and median [interquartile range] for continuous variables and number and percentage for categorical variable. [a]Compared by Pearson's chi-square test. [b]Compared by independent sample t-test. [c]Compared by Mann-Whitney U test. P values in bold text indicate statistical significance at P < 0.05. CPR: cardiopulmonary resuscitation; ICU: intensive care unit.

Comparison of clinical characteristics between the COVID and Non-COVID group

The median ICU length of stay (LOS) was significantly shorter in the COVID group (6 days, IQR: 1–20) compared to the Non-COVID group (9 days, IQR: 2–27), p = 0.048. In terms of patient type, the majority of ICU admissions were medical patients (81.6%), with a slightly higher proportion in the COVID group (84.0% vs. 77.6%, p = 0.063), though this difference did not reach statistical significance.

The ICU admission source differed significantly between the groups (p < 0.001). The proportion of patients admitted from the emergency department was notably higher in the COVID group (77.7%) compared to the Non-COVID group (42.3%). In contrast, patients transferred from hospital wards were significantly more common in the Non-COVID group (20.4% vs. 6.3%). Moreover, the proportion of patients transferred from external centers was markedly higher in the Non-COVID group (37.2% vs. 16.0%).

Regarding primary ICU admission diagnoses, the most common reasons for admission were post-cardiopulmonary resuscitation (21.8%), respiratory diseases (19.5%), and neurological diseases (18.6%). There were no statistically significant differences between the groups for these primary diagnoses. However, trauma-related ICU admissions were significantly more frequent in the Non-COVID group (10.7% vs. 3.9%), whereas patients admitted for "other medical conditions" were more common in the COVID group (11.7% vs. 3.6%).

Comorbidities of the Groups

In terms of comorbidities, the COVID group had significantly higher rates of hypertension (35.2% vs. 16.3%, p < 0.001), diabetes mellitus (28.1% vs. 8.7%, p < 0.001), and coronary artery disease (25.0% vs. 7.2%, p < 0.001) (Table 2). Similarly, the prevalence of arrhythmia, chronic kidney disease, neurological disease, respiratory disease, and heart failure was significantly greater among patients in the COVID group (p < 0.01 for all comparisons). There was no statistically significant difference in the prevalence of cancer (p = 0.575) between the groups.

ICU outcomes were comparable between the two groups. The overall mortality rate was 82.3%, with no significant difference between the Non-COVID (82.7%) and COVID (82.1%) groups (p = 0.245). Similarly, the proportion of patients discharged from the ICU (4.9%) and those transferred to another facility (12.7%) did not differ significantly between the groups.

DISCUSSION

The findings of this study reveal substantial differences in the clinical characteristics and outcomes of patients admitted to a tertiary non-COVID-19 ICU before and during the COVID-19 pandemic, aligning with previous literature. Kömürcü et al. and Shankar et al. highlighted that the pandemic posed significant challenges to hospital operations, particularly in ICU settings (1,4).

A notable increase in ICU admissions from emergency departments during the pandemic (77.7% vs. 42.3%) was observed, reflecting resource reallocation towards COVID-19 care, as highlighted by Al-Omari et al. (5). In another study, Ozguner et al. attributed this shift to constrained healthcare resources and altered admission protocols, resulting in fewer admissions from hospital wards and external transfers (6).

The median ICU length of stay (LOS) was significantly shorter during the pandemic (6 vs. 9 days), a finding mirrored by Lee T. et al. and Divya A. et al, who linked this reduction to the

Table 2. Comorbidities of the Groups

Comorbidities	Overall (n=528)	Non-COVID (n=196)	COVID (n=332)	p value[a]
Hypertension	69 (35.2)	54 (16.3)	123 (23.3)	**<0.001**
Diabetes mellitus	55 (28.1)	29 (8.7)	84 (15.9)	**<0.001**
Coronary artery disease	49 (25.0)	24 (7.2)	73 (13.8)	**<0.001**
Arrhythmia	19 (9.7)	10 (3.0)	29 (5.5)	**0.001**
Chronic kidney disease	28 (14.3)	21 (6.3)	49 (9.3)	**0.002**
Neurologic disease	80 (40.8)	48 (14.5)	128 (24.2)	**<0.001**
Respiratory disease	34 (17.3)	20 (6.0)	54 (10.2)	**<0.001**
Heart failure	37 (18.9)	15 (4.5)	52 (9.8)	**<0.001**
Cancer	9 (4.6)	19 (5.7)	28 (5.3)	0.575
Others	93 (47.4)	65 (19.6)	158 (29.9)	**<0.001**

Data are presented as the number and percentage for categorical variable. [a]Compared by Pearson's chi-square test. P values in bold text indicate statistical significance at p < 0.05. CPR: cardiopulmonary resuscitation; ICU: intensive care unit.

necessity for rapid patient turnover due to high ICU occupancy rates (4,7). Despite shorter LOS, ICU mortality remained high in both periods, emphasizing the severity of illness and the strain on critical care services. Kömürcü et al. noted that mortality rates were influenced by the influx of critically ill patients with multiple comorbidities, leading to complex management challenges (1).

Higher rates of comorbidities, including hypertension, diabetes, and coronary artery disease, were prevalent among pandemic admissions, similar to findings by Ulusoy O. et al. and another study (1,8). This trend reflects a selection bias where only the most critically ill non-COVID patients were prioritized for ICU care during resource-limited times. Al-Omari et al. emphasized that patients with pre-existing conditions faced delayed care during the pandemic, exacerbating their severity upon ICU admission (5).

A significant shift in admission diagnoses was also noted, with fewer trauma cases and an increase in 'other medical conditions,' attributed to lockdown measures and reduced mobility, as reported by Kömürcü et al. (1). In another study, highlighted that patients with chronic diseases often deferred medical visits during the pandemic, leading to worsened conditions upon hospital admission (7).

The consistently high ICU mortality rates during both periods, despite operational adjustments, underscore the need for resilient ICU strategies, as emphasized by Shankar et al. (4). Kömürcü et al. and Divya A. et al. stressed the importance of optimizing resource allocation, enhancing staff training, and implementing adaptive protocols during health crises (1,4). Another analysis further suggested that future pandemics necessitate robust contingency plans for both COVID and non-COVID patient management (9). Notably, in a recent study, in-hospital and 30-day mortality rates of elderly patients undergoing surgery for hip fracture were not different between pandemic and prepandemic periods. Rates of delayed hospital admission, length of hospital stay, and refusal of treatment were higher in the pandemic. Patients tended to avoid routine outpatient appointments (10).

This study, supported by findings from Terry L. et al. and Ozguner Y. et al., contributes to the growing body of evidence on the pandemic's impact on non-COVID ICU patients, highlighting the critical need for enhanced ICU management strategies and resource allocation during health crises (6,7). Future research should focus on developing adaptable critical care frameworks to improve patient outcomes under similar challenges. Studies advocate for multicenter trials to assess the long-term effects of pandemic-induced changes on ICU operations and patient outcomes, ensuring that healthcare systems are better prepared for future global emergencies (1,8).

Limitations

This study has several limitations that should be acknowledged. First, as a retrospective single-center study, the findings may not be generalizable to other healthcare settings, especially those with different resource allocations during the pandemic. Additionally, the study did not assess functional outcomes or long-term survival beyond ICU discharge, which limits our understanding of the broader impact of the pandemic on non-COVID critical care patients. Finally, potential unmeasured confounders, such as differences in treatment protocols, ICU staffing, and the availability of advanced life-support measures, may have influenced the observed outcomes. For this purpose, we believe that the results of our study will contribute to the literature.

Conclusions

This study provides valuable insights into how the COVID-19 pandemic reshaped ICU admissions, patient demographics, and clinical outcomes for non-COVID critically ill patients. The findings suggest that during the pandemic, ICU patients were more likely to have pre-existing comorbidities, present through the emergency department, and have shorter ICU stays. Despite these changes, the high ICU mortality rates persisted, highlighting the need for more resilient critical care strategies in future health crises. Further research, including multicenter studies and long-term outcome analyses, is essential to fully understand the indirect impact of the pandemic on non-COVID critical care and to develop improved ICU resource allocation strategies in future global emergencies.

Author contributions

This study was approved by the institutional ethics committee, and all procedures were conducted in accordance with the principles of the Declaration of Helsinki. Since the study was retrospective and involved the review of anonymized patient records, informed consent was not required. All patient data were handled in compliance with data protection regulations and were used solely for research purposes. This study was performed per Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) criteria.

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