

## Evaluation of the impact of the COVID-19 Pandemic on Nonhospital Cardiac Arrest Rates

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### ABSTRACT

**Objective:** This study aimed to investigate whether the coronavirus disease 2019 (COVID-19) pandemic resulted in delayed access to acute medical conditions and an increase in nonhospital cardiac arrests.

**Material and Methods:** In this retrospective cross-sectional study, emergency department admissions of nonhospital cardiac arrest patients during the pre-pandemic period (11/03/2019-31/01/2020) and the pandemic period (11/03/2020-31/01/2021) were examined. Demographic data, comorbidities, pre-arrest complaints and onset of complaints, return of spontaneous circulation, and duration of stay in the emergency department were compared.

**Results:** Although there was a 49% decrease in general hospital admissions and a 28% decrease in emergency department admissions between the two defined periods, there was a 38% increase in out-of-hospital cardiac arrests during the pandemic period. There was no statistically significant difference between the patients who underwent cardiopulmonary resuscitation in both periods in terms of gender ( $p=0.06$ ), age ( $p=0.15$ ), and comorbidity ( $p=0.14$ ). Pre-arrest chest pain and dyspnea were more common in the pandemic period than in the pre-pandemic period ( $p=0.02$ ). Patients who achieved spontaneous return during the pandemic period had longer intensive care unit waiting times ( $p<0.001$ ).

**Conclusions:** Limitations such as the risk of transmission of the COVID-19 disease, the desire to protect social distance, and curfews caused people with chronic diseases to delay their follow-up and avoid the need to seek emergency health care in case of acute exacerbations.

**Keywords:** cardiac arrest, cardiopulmonary resuscitation, COVID-19 pandemic, emergency department,

### INTRODUCTION

While managing the COVID-19 pandemic, the focus is on protecting other people seeking health care from infection, while trying to provide the best medical care to those with the disease (1). The pandemic has dramatically changed the rates of admission to the emergency department. Quarantine measures have resulted in a sudden and dramatic reduction in infectious infections, which make up a large proportion of emergency room visits (2).

Fear of contracting the disease during the pandemic has also reduced the admission rate to emergency services. The desire not to increase the demand in the health sector further can be cited as one of the reasons for avoiding hospital visits despite worsening symptoms (3). One of the effects of the pandemic is that clinical care in the hospital is largely geared towards COVID-19 patients. Such situations have led to undesirable outcomes such as out-of-hospital cardiac arrest in people with chronic diseases (4,5).

This study aimed to examine the change in out-of-hospital cardiac arrest rates during the pandemic period.

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## MATERIAL and METHODS

This study retrospectively examined patients who underwent cardiopulmonary resuscitation (CPR) for non-traumatic and non-COVID-19 reasons in the emergency department. Approval was obtained from the local ethics committee for this study (Date: 23.12.2021, Decision no: 2021/228).

**Study design:** A computer-based Hospital Information Management System program, in which patient records are kept, was used to collect data on patients who were brought to the emergency department after cardiac arrest at the scene or in the ambulance. In addition, information about the first examination of the patients and possible causes of death were obtained from the patient files and detailed examination documents kept for the patients with cardiac arrest in the emergency department archive. The emergency department, where the study was conducted, is a third-level emergency department that admits approximately 150000 patients annually and can provide acute care in all specialties. During the pandemic, all provincial hospitals provided medical care and treatment services to all patients who applied, including COVID-19 patients.

**Study Data:** Patients older than 18 who were admitted to cardiac arrest (non-trauma and non-COVID-19) according to the updated New York University Emergency Department Algorithm and underwent CPR in the red area were included in the study (6). The period between 11.03.2020-31.01.2021 is defined as a “pandemic period” (because the first COVID-19 case across the country was detected on 11.03.2020), and the period between 11.03.2019-31.01.2020 is defined as “pre-pandemic period”. The data were recorded in the study form created.

**Data analysis:** Data analysis was performed using the R-based Jamovi statistical program (The Jamovi Project 2021: version 2.3). Normality analysis of the data was evaluated using histogram, QQ charts, and Shapiro Wilk test. Descriptive statistics were given as median, quartile range (IQR: interquartile range), frequency, and ratio values for data that did not show normal distribution. Mann-Whitney U test was used in the analysis of non-parametric quantitative independent data, and Student's T-test was used in the analysis of parametric data. In all statistical analyses,  $p < 0.05$  was considered statistically significant.

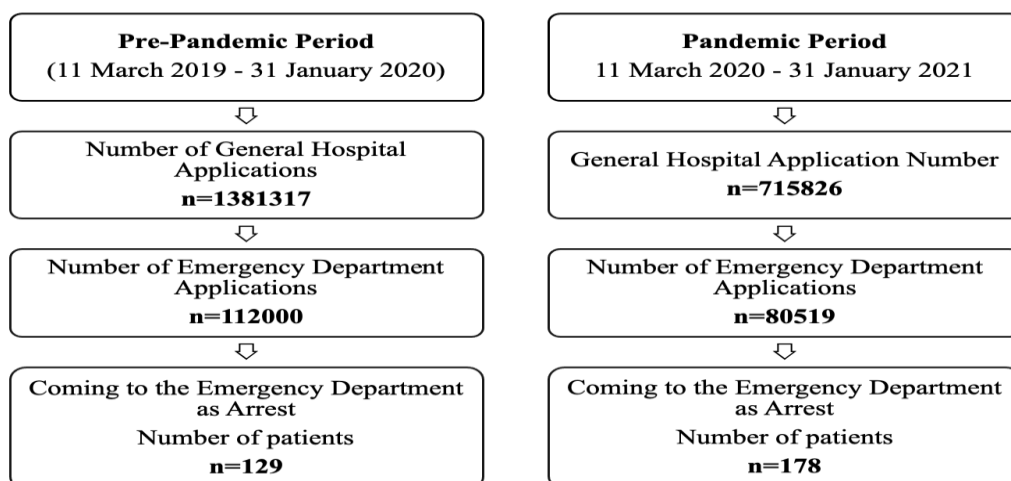
## RESULTS

A total of 307 patients who underwent CPR in the emergency department due to non-COVID-19 disease and non-traumatic reasons were included in the study. Although there was a 49% decrease in general hospital admissions and a 28% decrease in emergency department admissions between the two defined periods, there was a 38% increase in the number of patients who underwent CPR in the emergency department during the pandemic period (**Figure 1**).

Considering the gender distribution of the patients, the number of patients with the male gender was higher in both periods. When the age distribution of the patients was examined, it was seen that the median age was 73 (IQR: 61-81) in the pre-pandemic period and 74 (IQR: 65-83) during the pandemic period ( $p=0.152$ ). It was determined that the coexistence of hypertension and coronary artery disease (HT+CAD) in patients who underwent CPR increased during the pandemic period compared to the pre-pandemic period.

During the pandemic period, dyspnea among the patient's complaints before the cardiac arrest was found to have increased significantly compared to previous years ( $p=0.02$ ). It was determined that the time between the onset of the patients' complaints and their arrival to the emergency department ranged from 1 hour to 30 days. Arrest rhythms at admission were most commonly asystole in both periods (pre-pandemic period 61.2%  $n=79$ , pandemic period 66.9%  $n=119$ ). In 18.6% of the patients who underwent CPR (pre-pandemic period 9.3%  $n=12$ ; pandemic period 25.3%  $n=45$ ), ROSC (Return of Spontaneous Circulation) was achieved after the intervention ( $p < 0.001$ ).

The median value of patients' stay in the emergency department in the pre-pandemic period was 45 minutes (IQR: 30-70), and it was 60 minutes during the pandemic period (IQR: 35-206) ( $p < 0.001$ ). A comparison of demographic and clinical characteristics of patient groups according to periods is given in **Table 1**.



**Figure 1.** Number of patient admissions according to study periods

**Table 1.** Comparison of demographic and clinical characteristics of patient groups according to periods

	Pre-Pandemic Period (n=129)	Pandemic Period (n=178)	p
<b>Gender, n (%)</b>			
Male	83 (4.3)	110 (61.8)	0.06
Female	46 (35.7)	68 (38.2)	
<b>Age, median (IQR)</b>	73 (61-81)	74 (65-83)	0.152
<b>Additional Disease, n (%)</b>			
HT	18 (14.0)	16 (9.0)	0.143
HT + CVD	14 (10.9)	18 (10.1)	
HT + CAD	14 (10.9)	26 (14.6)	
<b>Pre-Arrest Complaint, n (%)</b>			
Chest pain	29 (22.5)	28 (15.7)	<b>0.02</b>
Dyspnea	39 (30.2)	70 (39.3)	
<b>Duration of Complaint, n (%)</b>			
<1 hour	26 (20.2)	42 (23.6)	0.151
1 hour - 1 day	19 (14.7)	19 (14.7)	
1 - 14 days	3 (2.3)	7 (3.9)	
14 - 30 days	-	7 (3.9)	
<b>ED LOS (min), median (IQR)</b>	45 (30-70)	60 (35-206)	<b>&lt;0.001</b>
<b>ROSC, n (%)</b>	12 (9.3)	45 (25.3)	<b>&lt;0.001</b>

IQR: Interquartile range, HT: Hypertension, CVD: Cerebrovascular disease, CAD: Coronary artery disease, ROSC: Return of Spontaneous Circulation, ED: Emergency Department, LOS: Length of Stay

## DISCUSSION

Reducing the death rates associated with out-of-hospital cardiac arrest depends on the success of a range of actions, from prompt and effective first aid to early neurological care after resuscitation. A pandemic can disrupt these action steps in various ways (decreased use of bystander CPR and automated external defibrillator, increased use of supraglottic airway, prolonged time from call to ambulance arrival, etc.) and reduce survival rates. Another negative effect of pandemics is that patients delay their treatment due to fear of contamination. One consequence of this situation is an increase in prehospital arrest rates. In a meta-analysis by Lim et al. found a more than twofold increase in the incidence of out-of-hospital cardiac arrests during the COVID-19 pandemic (7). In this study, there was a 38% increase in the number of patients who underwent CPR in the emergency department during the pandemic period.

Although COVID-19 can be detected in all age groups, the elderly and patients with comorbidities are at risk of serious illness. Studies show that older adults with COVID-19 have higher hospitalization rates, intensive care unit admissions, and higher mortality rates (8). However, there are studies that argue that there is no significant difference in age and gender in OHCA patients compared to the pre-pandemic period (9,10). Similarly, in our study, no significant difference was found in terms of age and gender. It has also been reported that comorbidities such as cardiovascular disease, diabetes mellitus, chronic respiratory disease, hypertension, and cancer are associated with adverse outcomes (fatality) (11). During the COVID-19 pandemic period, it was observed that people with any comorbid disease preferred to apply to the emergency department in case of acute changes in their current diseases by disrupting their routine medical care due to the risk of transmission (12,13). This situation has brought about an increase in the prehospital emergency aid needs of patients with serious and life-threatening conditions (3).

In the study of Unal et al., it was determined that there was an increase in deaths due to respiratory causes during the pandemic period (14). Our study determined that chest pain and shortness of breath were the most common complaints of patients before cardiac arrest. In the presence of these complaints, the earlier the emergency care is reached, the lower the mortality and morbidity rate experienced (15). According to the information received from the relatives of the patients, the time elapsed between the onset of the complaints and their arrival to the emergency department varies between 1 hour and 30 days. Although there was no statistical significance between the duration of the complaints, it was determined that 7 patients had complaints for 30 days in the pandemic period and 3 patients had complaints for 14 days in the pre-pandemic period. The increase in the time between the onset of complaints and the cardiac arrest can be interpreted as an indicator of patients' desire to maintain social distance and avoid contact with infected people.

In the study of Shekhar et al., during both pandemic and non-pandemic periods, most of the arrest rhythms were VF and a minority of them were VT (81–84% VF, 16–19% VT). During non-pandemic periods, rates of ROSC achievement were consistently around 47% each year. During the pandemic period, ROSC success rates decreased to 42.95% ( $p < 0.05$ ) (16). In this study, arrest rhythms at admission were most commonly asystole in both periods. Post-intervention ROSC was achieved in 25.3% of patients who underwent CPR during the pandemic period.

COVID-19 pandemic, which affected the whole world, caused the health system resources to be shifted to pandemic services (17). This situation led to a decrease in the number of non-pandemic intensive care beds, where critical patient follow-ups were made. As a result, the follow-up times in the emergency department were prolonged.

In our study, it was determined that the duration of stay in the emergency department was prolonged in patients who achieved ROSC after CPR during the pandemic period. The reason for this that, the follow-up and treatment of these patients continue in the emergency department due to the lack of appropriate places in the intensive care units.

## CONCLUSION

Several possible factors contribute to the increase in nonhospital arrest rates along with the decrease in emergency department admissions in this study. Some limitations such as the risk of transmission of the COVID-19 disease, the desire to protect social distance, and curfews, have caused people with chronic diseases to delay their follow-up and avoid the need to seek emergency health care in case of acute exacerbations. This result may partly explain the increase in non-COVID-19 related mortality for acute life-threatening conditions. In the event of a public health problem that affects the whole world, such as the COVID-19 pandemic, people with chronic diseases should be able to access emergency care without delay and be informed that they can benefit from all kinds of health services.

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**Ethical approval:** All procedures performed in studies involving human participants were in accordance with the institutional and/or national research committee's ethical standards and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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