RESEARCH ARTICLE

Journal of Anatolian Medical Research
JAMER 2025;10(3):62-66
DOI: 10.55694/jamer.1734064

Retrospective Investigation of Patients Undergoing Cardiopulmonary Resuscitation in the Emergency Department

Acil Serviste Kardiyopulmoner Resüsitasyon Uygulanan Hastaların Retrospektif İncelenmesi

Muhammed İslam Özer[1], Elif Öztemür Özer[2], Necmi Baykan[1], İbrahim Toker[1]

[1] Kayseri City Hospital, Department of Emergency Medicine, Kayseri, Türkiye
[2] Kayseri City Hospital, Department of Radiology, Kayseri, Türkiye

ABSTRACT

Aim: *In this study, in-hospital cardiac arrest and out-of-hospital cardiac arrest cases in which cardiopulmonary resuscitation was applied in our clinic were analyzed and their similarities and differences with other studies in the literature were evaluated.*

Materials and Methods: *A retrospective study was conducted at Kayseri City Hospital's Emergency Department between 01.01.2024-31.12.2024. The study examined data from patients aged 18 years and older who underwent cardiopulmonary resuscitation due to in-hospital cardiac arrest or out-of-hospital cardiac arrest. Of the 567 patients included in the study, age, gender, setting of cardiac arrest (in-hospital & out-of-hospital), date and time of arrival to the emergency department.*

Results: *The median age was 72 years. The demographic composition of the patient population is as follows: 56.3% of the patients were male. While 69.3% (n=393) of the patients were out-of-hospital cardiac arrest cases, 30.7% were in-hospital cardiac arrest cases. When analyzed in terms of emergency department mortality, a statistically significant difference emerged in relation to age and gender (p values <0.001 and 0.013, respectively). When analyzed in terms of emergency department mortality, no statistically significant differences were observed in relation to arrival time and seasonal groups or in-hospital or out-of-hospital arrest groups (0.224, 0.159, 0.218, respectively).*

Conclusion: *This study revealed that age and gender factors had an effect on mortality in patients who received cardiopulmonary resuscitation in the emergency department.*

Keywords: *Cardiopulmonary resuscitation, in-hospital cardiac arrest, out-of-hospital cardiac arrest*

ÖZET

Amaç: *Bu çalışmada kliniğimizde kardiyopulmoner resüsitasyon uygulanan hastane içi kardiyak arrest ve hastane dışı kardiyak arrest vakaları analiz edildi ve literatürdeki diğer çalışmalarla benzerlikleri ve farklılıkları değerlendirildi.*

Gereç ve Yöntemler: *Kayseri Şehir Hastanesi Acil Servisi'nde 01.01.2024-31.12.2024 tarihleri arasında retrospektif bir çalışma yürütüldü. Çalışmada hastane içi kardiyak arrest veya hastane dışı kardiyak arrest nedeniyle kardiyopulmoner resüsitasyon uygulanan 18 yaş ve üzeri hastaların verileri incelendi. Çalışmaya dahil edilen 567 hastanın yaşı, cinsiyeti, kardiyak arrestin yeri (hastane içi ve hastane dışı), acil servise geliş tarihi ve saati kaydedildi.*

Bulgular: *Hastaların medyan yaşı 72 idi. Hasta popülasyonunun demografik yapısı şu şekildedir: Hastaların %56,3'ü erkekti. Hastaların %69,3'ü (n=393) hastane dışı kardiyak arrest vakalardı. Acil servis mortalitesi açısından analiz edildiğinde, yaş ve cinsiyete göre istatistiksel olarak anlamlı bir fark ortaya çıktı (sırasıyla p değerleri <0,001 ve 0,013). Acil servis mortalitesi açısından analiz edildiğinde, varış zamanı ve mevsimsel gruplar veya hastane içi veya hastane dışı arrest gruplarıyla ilgili olarak istatistiksel olarak anlamlı bir fark gözlenmedi (sırasıyla p değerleri 0,224, 0.159, 0.218).*

Sonuç: *Bu çalışma, yaş ve cinsiyet faktörlerinin acil serviste kardiyopulmonr resüsitasyon alan hastalarda mortalite üzerinde etkili olduğunu ortaya koydu.*

Anahtar Kelimeler: *Hastane dışı kardiyak arrest, hastane içi kardiyak arrest, kardiyopulmoner resüsitasyon*

Corresponding Author: Necmi Baykan, Kayseri City Hospital, Department of Emergency Medicine, Kayseri, Türkiye ***Email:*** drnecmibaykan@gmail.com
Cite this article as: Özer İM, Özer Öztemür E, Baykan N, Toker İ. Retrospective Investigation of Patients Undergoing Cardiopulmonary Resuscitation in the Emergency Department. JAMER 2025;10(3):62-66.

Received: 03.07.2025
Accepted: 21.08.2025
Online Published: 31.12.2025

INTRODUCTION

Cardiac arrest is defined as the inability of the heart to fulfill its pump function and the cessation of cardiac activity. The cessation of cardiac activity results in a deficiency of blood flow to the tissues, ultimately leading to death without early intervention. Cardiopulmonary resuscitation (CPR) encompasses a set of practices that adhere to specific principles aimed at restoring vital circulatory and respiratory functions for the patient (1, 2).

Cardiopulmonary resuscitation is a critical intervention that should be comprehensively understood by all healthcare professionals. Therefore, CPR should be started as soon as possible in cases of cardiac arrest and if the event occurs outside the hospital environment, emergency medical services should be notified immediately and the necessary intervention of the patient should be continued in the meantime (2).

In this study, in-hospital cardiac arrest (IHCA) and out-of-hospital cardiac arrest (OHCA) cases in which CPR was applied in our clinic were analyzed and their similarities and differences with other studies in the literature were evaluated.

MATERIAL and METHODS

A retrospective study was conducted at Kayseri City Hospital's Emergency Department between January 1 and December 31, 2024. This study was conducted in accordance with the Declaration of Helsinki and received approval from the Kayseri City Hospital Non-Interventional Clinical Research Ethical Committee (decision no: 404, date: 15.04.2025).

The study examined data from patients aged 18 years and older who underwent CPR due to IHCA or OHCA. The data of 647 patients were analyzed, and the data were compiled by examining the hospital electronic data system and manual file records.

Patients with traumatic cardiac arrest, those who achieved return of spontaneous circulation (ROSC) but had an unknown outcome due to transfer to the intensive care unit (ICU) of another hospital, and those with incomplete data were excluded from the study. Of the 567 patients included in the study, age, gender, setting of cardiac arrest (in-hospital & out-of-hospital), date and time of arrival to the emergency department, emergency department outcome, and in-hospital outcome of patients with ROSC were analyzed.

Emergency department outcomes were assessed in terms of ICU admission and mortality, while hospital outcomes were evaluated based on discharge status and in-hospital mortality.

Statistical Analysis

The data obtained were statistically analyzed with IBM SPSS 27 (Statistical Package for Social Sciences) program. Kolmogorov-Smirnov test was used to determine whether the distributions of continuous variables were normal. In descriptive statistics of continuous variables, median value, IQR (interquartile range) and minimum maximum values were given. In the comparison of continuous variables between two groups, Mann Whitney U test was used since the age variable did not fit the normal distribution. In comparisons of more than two groups, Kruskall Wallis-H tests were used because the age variable did not show normal distribution. Qualitative variables are given as percentages and frequencies. Differences between categorical variables were analyzed with Chi-square test. Statistical significance value $p<0.05$ was accepted.

RESULTS

The median age of the 567 patients included in the study was 72 years (IQRs: 61-80, min: 18, max: 96) (Figure 1).

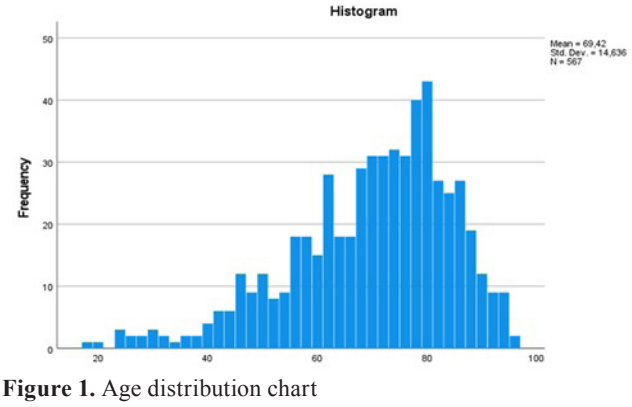

Figure 1. Age distribution chart

The demographic composition of the patient population is as follows: 56.3% (n=319) of the patients were male. While 41.4% (n=235) of the patients were brought to the emergency department between 16:00 and 23:59.

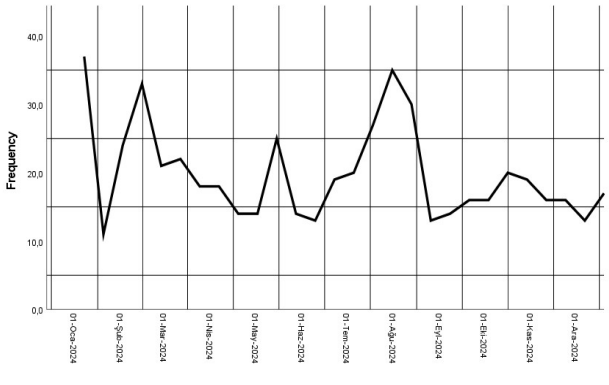

Figure 2. Distribution graph of patients according to application data

While 27.9% (n=158) of the patients were admitted during the summer months, 27.7% (n=157) were admitted during the winter months. Furthermore, an analysis of the distribution of patients according to the dates of their presentations revealed a peak in cases observed in January and August (Figure 2).

While 69.3% (n=393) of the patients were OHCA cases, 30.7% were IHCA cases. The emergency department mortality rate was 78.5% (n=445), and the in-hospital mortality rate was 77.9% (n=95). Furthermore, the overall survival rate was recorded at 4.8% (n=27) (Table 1).

Table 1. Demographic data of patients.

	n	%
Age, median (IQR*)	72±SD	61- 80 (min:18, max:96)
Gender		
Female	248	43.7
Male	319	56.3
Arrival Time		
08:00- 15:59	214	37.7
16:00- 23:59	235	41.4
00:00- 07:59	118	20.8
Season		
Winter	157	27.7
Spring	133	23.5
Summer	158	27.9
Autumn	119	21.0
Location of Cardiac Arrest		
Out-of-hospital	393	69.3
In-hospital	174	30.7
Emergency department outcome		
ICU* admission	122	21.5
Death	445	78.5
Hospital outcome		
Death	95	77.9
Discharged	27	22.1
Overall mortality rate	540	95.2
Overall survival rate	27	4.8

ICU: Intensive care unit, ***IQR:*** Interquartile range

When analyzed in terms of emergency department mortality, a statistically significant difference emerged in relation to age and gender (p=0.013). Consequently, patients who died in the emergency department were older. Furthermore, the emergency department mortality rate was higher in female patients compared to the survival rate.

When analyzed in terms of emergency department mortality, no statistically significant differences were observed in relation to arrival time and seasonal groups or in-hospital or out-of-hospital arrest groups (p=0.268, p=0.159, p=0.224, respectively) (Table 2). There were no statistically significant differences in age, gender, season, IHCA or OHCA groups, emergency department mortality and hospital mortality when examined in terms of hospital

Table 2. Comparative data for emergency department mortality.

	Alive n (%)	Death n (%)	p
Age, median, (IQR*)	67 (57.5- 76)	73 (62- 81)	**<0.001**[#]
Gender			
Female	41 (33.6)	207 (46.5)	**0.013**[##]
Male	81 (66.4)	238 (53.5)	
Arrival Time			
08:00- 15:59	50 (41.0)	164 (36.9)	0.224
16:00- 23:59	53 (43.4)	182 (40.9)	
00:00- 07:59	19 (15.6)	99 (22.2)	
Location of Cardiac Arrest			
Out-of-hospital	79 (64.8)	314 (70.6)	0.218[##]
In-hospital	43 (35.2)	131 (29.4)	
Season			
Winter	39 (32.0)	118 (26.5)	0.159
Spring	26 (21.3)	107 (24)	
Summer	26 (21.3)	132 (29.7)	
Autumn	31 (25.4)	88 (19.8)	

IQR: Interquartile range. #Mann-Whitney U test. ##Fisher's exact test Other p values were calculated with Pearson chi-square test.

Table 3. Comparison data in terms of arrival time.

	08:00-15:59 n (%)	16:00-23:59 n (%)	00:00-07:59 n (%)	p
Age, median, (IQR*)	72 (61-79.25)	71 (61-81)	73.5 (60.75-79.25)	0.977[#]
Gender				
Female	89 (41.6)	101 (43.0)	58 (49.2)	0.394
Male	125 (58.4)	134 (57.0)	60 (50.8)	
Season				
Winter	59 (27.6)	67 (28.5)	31 (26.3)	0.195
Spring	54 (25.2)	51 (21.7)	28 (23.7)	
Summer	62 (29.0)	56 (23.8)	40 (33.9)	
Autumn	39 (18.2)	61 (26.0)	19 (16.1)	
Location of Cardiac Arrest				
Out-of-hospital	149 (69.6)	172 (73.2)	72 (61.0)	0.064
In-hospital	65 (30.4)	63 (26.8)	46 (39.0)	
Mortality in the ED*	164 (76.6)	182 (77.4)	99 (83.9)	0.268
Mortality in the hospital	40 (80)	39 (73.6)	16 (84.2)	0.566

IQR: Interquartile range. ***ED:*** Emergency department. [#]Kruskal Wallis test. Other p values were calculated with Pearson chi square test.

arrival time groups (p values were 0.977, 0.394, 0.195, 0.064, 0.268 and 0.566, respectively) (Table 3). OHCA cases were more likely to arrive between 16:00 and 23:59, but the difference was not statistically significant. IHCA cases were more likely to arrive between 00:00 and 07:59 but not statistically significant.

DISCUSSION

The response to CPR varies depending on many factors. The patient's age, gender, medical history, initial arrest rhythm, duration of access to the necessary treatment, etiology leading to cardiac arrest, and the location of the arrest are the primary factors that must be considered (3).

According to the extant literature, the mean age of the 502 patients who underwent CPR was 67 years. Of these patients, 65.5% were male. The rate of ROSC in the emergency department was 39%, and the discharge rate was 9.2%. In a similar vein, a study by Tekin et al. examined a sample of 1,616 patients, revealing a mean age of 66 years and a male prevalence of 62.6%. The study documented a resuscitation rate of 26.1% and a discharge rate of 3.8% (5). In the present study, the median age was 72 years, suggesting that the cohort of patients who underwent CPR was relatively older. In contrast, the studies conducted by Gür, Başol, and Kozacı did not implement any age restrictions, whereas the studies by Erişen and Tekin, as well as our own study, exclusively included patients aged 18 years and over (Table 4) (4-8). This finding suggests that the observed variations in mean age across studies may be attributable to methodological discrepancies. When evaluated in terms of gender distribution, while the literature indicated a higher proportion of male patients (4,5), the proportion of male and female patients in our study was found to be more similar. In the literature review, there are also studies in which the male patient ratio was close to our study, but only IHCA cases were included in this study (6).

Table 4. Comparison of our study with literature.

Studies	### City Hospital	Gür et al.*	Kozacı et al.*	Erişen **	Tekin et al.***	Başol et al.
Total number of patients, n	567	502	290	552	1616	96
Duration of the study (Year), n	1	2	2	2	5	2
Average age (Year), n	72	67	63	79	66	65
Male, n (%)	319 (%56.3)	329 %65.5)	189 %65.2)	296 (%53.6)	1012 %62.6)	59 (%61.5)
Female, n (%)	248 (43.7)	173 %34.5)	101 (%34.8)	256 (%46.4)	604 (%37.4)	37 (%38.5)
ROSC# in ED##, n (%)	122 (%21.5)	196 (%39)	102 (%35.2)	180 (%32.6)	421 (%26.1)	36 (%37.5)
Overall Survival, n (%)	27 (%4.8)	46 (%9.2)	15 (%5.2)	17 (%3.1)	61 (%3.8)	10 (%10.5)

:** Cases of cardiac arrest due to trauma were included in the study. *:**Out-of-hospital cardiac arrest cases were not included in the study. *****:**In-hospital cardiac arrest cases were not included in the study. ***#ROSC:*** Return of spontaneous circulation ***##ED:*** Emergency department

Gür et al. (4) reported that mortality rates in cases of cardiopulmonary arrest were higher during the winter (28.1%) and summer (27%) seasons than during other seasons. In congruence with these findings, our study demonstrated that mortality rates were elevated during the winter months (26.5%) and summer (29.7%). These findings suggest that both low and high environmental temperatures may increase mortality compared to mild climatic conditions (9,10). The elevated mortality rate observed during influenza epidemics, pneumonia, and cardiovascular diseases, particularly during the winter months, can be identified as a primary contributing factor to the observed disparities (11-13).

In studies in the literature, ROSC rates after CPR in the emergency department vary between 26.1% and 39% (4-8). In our study, this rate was found to be 21.5%, revealing a lower success rate compared to previous studies. The overall survival rate was 4.8%, which is compatible with the values between 3.1% and 10.5% reported in the literature, but relatively close to the lower limit. The factors affecting ROSC rates in the literature include the presence or absence of witnessed arrest, arrest rhythm and early defibrillation opportunities (14,15). Our study was retrospective and could not be evaluated in detail because of the lack of these data. This is one of the limitations of our study.

The fact that our study has a single-center and retrospective design, that the patient population includes different age ranges in similar studies in the literature, that some studies have evaluated only in-hospital or out-of-hospital cardiac arrest cases, and that some studies included traumatic cardiac arrest cases, unlike our study, make comparison with the literature difficult. Moreover, the absence of crucial clinical data, including the initial arrest rhythm, the witnessing of the event, and the duration of CPR, hinders the ability to draw comparisons between the study's findings and existing literature. Considering these limitations, multicenter, prospective and more detailed clinical data are needed in the future studies.

Conclusion

This study revealed that ROSC rates in patients receiving CPR in the emergency department were lower than in the literature, and that age, gender, and seasonal factors had an effect on mortality. The findings indicate the need for studies to increase CPR success rates.

Ethics Committee Approval: This study was conducted in accordance with the Declaration of Helsinki and received approval from the Kayseri City Hospital Non-Interventional Clinical Research Ethical Committee (decision no: 404, date: 15.04.2025).

Conflict of Interest: The authors declare no conflict of interest in this study.

Financial Disclosure: No financial support was received from any institution or organization for this study.

Author Contributions: Concept-M.,İ.,Ö., N.,B.,; Design- M.,İ.,Ö., E.,Ö.,Ö.; Supervision-N.,B.; Resources-M.,İ.,Ö.; Materials-M.,İ.,Ö.,E.,Ö.,Ö.; Data Collection and/or Processing-İ.,T.; Analysis and/or Interpretation-İ.,T.; Literature Search-M.,İ.,Ö., E.,Ö.,Ö.; Writing Manuscript-M.,İ.,Ö., E.,Ö.,Ö.; Critical Review-N.,B., İ.,T.

REFERENCES

1. Travers AH, Rea TD, Bobrow BJ, Edelson DP, Berg RA, Sayre MR, et al. Part 4: CPR overview: 2010 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation. 2010;122(18 Suppl 3):S676-684.
2. Meaney PA, Bobrow BJ, Mancini ME, Christenson J, Caen AR, Bhanji F, et al. CPR quality: Improving cardiac resuscitation outcomes both inside and outside the hospital. Circulation. 2013;128(4):417-435.
3. Sasson C, Rogers MA, Dahl J, Kellermann AL. Predictors of survival from out-of-hospital cardiac arrest: A systematic review and meta-analysis. Circ Cardiovasc Qual Outcomes. 2010;3(1):63-81.
4. Gür A, Tekin E, Özlü İ, Bilgili MA, Kaptan HM. Acil serviste resüsitasyon yapılan hastaların retrospektif değerlendirilmesi: İki yıllık analiz. Van Med J. 2021;28(3):421-427.
5. Tekin FC, Köylü R, Köylü O, Kunt M. Factors related to resuscitation success and prognosis of cardiopulmonary arrest cases. Indian J Crit Care Med. 2023;27(1):26-31.
6. Erişen M. Türkiye'de bir üniversite hastanesi acil servisi içinde arrest olan hastalarda öngörücüler ve sonlanım [tez]. İzmir: Dokuz Eylül Üniversitesi; 2023.
7. Kozacı N, Ay MO, İçme F, Aktürk A, Satar S. Kardiyopulmoner resüsitasyonda başarılı mıyız? Cukurova Med J. 2013;38(4):601-609.
8. Başol N, Çelenk Y, Karaman S, Şahin F, Savaş AY. Tokat ili üniversite hastanesi acil servisinde kardiyopulmoner resüsitasyon uygulanan hastaların geriye dönük olarak değerlendirilmesi: iki yıllık analiz. Gaziosmanpasa Univ. Tip Fak.Derg. 2014;6(2):91-100.
9. Zhang Y, Li C, Feng R, Zhu Y, Wu K, Tan X, et al. The short-term effect of ambient temperature on mortality in Wuhan, China: A time-series study using a distributed lag non-linear model. Int J Environ Res Public Health. 2016;13(7):722.
10. Guo Y, Li S, Zhang Y, Armstrong B, Jaakkola JJ, Tong S, et al. Extremely cold and hot temperatures increase the risk of ischaemic heart disease mortality: Epidemiological evidence from China. Heart. 2013;99(3):195-203.
11. Jury MR, Kerr J. Seasonal climate effects on influenza–pneumonia mortality and public health. Weather Clim Soc. 2022;14(2):551-560.
12. Langford IH, Bentham G. The potential effects of climate change on winter mortality in england and Wales. Int J Biometeorol. 1995;38(3):141-147.
13. Ogbebor O, Odugbemi B, Maheswaran R, Patel K. Seasonal variation in mortality secondary to acute myocardial infarction in england and wales: A secondary data analysis. BMJ Open. 2018;8(7):e019242.
14. Gräsner JT, Herlitz J, Tjelmeland IBM, Wnent J, Masterson S, Lilja G, et al. European resuscitation council guidelines 2021: Epidemiology of cardiac arrest in Europe. Resuscitation. 2021;161:1-60.
15. Gräsner JT, Wnent J, Herlitz J, Perkins GD, Lefering R, Tjelmeland I, et al. Survival after out-of-hospital cardiac arrest in Europe: Results of the EuReCa TWO study. Resuscitation. 2020;148:218-226.