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ARAŞTIRMA YAZISI / ORIGINAL ARTICLE

Out-of-Hospital Cardiac Arrest Cases: A Secondary Care Emergency Department Experience

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ABSTRACT

Objectives: The aim of this study was to investigate the characteristics of the patients who received cardiopulmonary resuscitation (CPR) in the emergency department (ED).

Study Design: This retrospective study was carried out in a secondary care emergency department of a state hospital between January and December 2017. Patients with out-of-hospital cardiac arrest (OHCA) aged 18 years and older were included in the study. Patients with rhythm at admission after successful resuscitation, and patients with trauma or pregnancy were excluded.

Results: During the study period, 100 cases of OHCA that met the acceptance criteria were evaluated. Among all cases, the male gender was 59% (n=59) and the median age was 69 (IQR 58–78). Successful resuscitation was achieved in 27% (n=27) of the cases and these patients were hospitalized. Of all patients, 22 died within the first month of the presentation. In our study, only 5 patients lived more than one month. PH values were lower in the non-resuscitated patients than those of resuscitated patients (p<0.008) (6.95 IQR [6.85–7.07] and 7.05 [6.95–7.17] respectively).

Conclusion: Survival rates are quite different in studies conducted in Turkey. It was seen that these rates were lower in secondary care hospitals. For this purpose, in order to increase survival in OHCA cases, both national and institutional CPR interventions need to be improved.

Keywords: Resuscitation, arrest, emergency department

HASTANE DIŞI KARDİYAK ARREST OLGULARI: İKİNCİ BASAMAK ACİL SERVİS DENEYİMİ

ÖZET

Amaç: Bu çalışmada, acil servis (AS) hastaları içerisinde en önemli ve hayati yeri tutan kardiyopulmoner resüsitasyon uygulanan olguların incelenmesi ve özelliklerinin saptanması amaçlandı.

Çalışma Planı: Bu retrospektif çalışma Ocak - Aralık 2017 tarihleri arasında ikinci basamak bir devlet hastanesi acil servisinde gerçekleştirildi. Hasta dışı kardiyak arrest (HDKA) olguları içerisinden 18 yaş ve üzeri olan olgular çalışmaya dâhil edildi. Travma, gebelik ve başarılı resüsitasyon sonrası başvuruda ritmi olan olgular dışlandı.

Bulgular: Çalışma periyodu boyunca kabul kriterlerine uyan 100 HDKA olgusu değerlendirilmeye alındı. Tüm olguların içerisinde erkek cinsiyet oranı %59 (n=59) ve ortanca yaş 69 (IQR 58-78) idi. Olguların %27'sinde (n=27) başarılı resüsitasyon sağlandı ve hastalar hospitalize edildi. 22 hasta ilk bir ay içerisinde tekrar arrest gelişerek kaybedildi. Çalışmamızda sadece 5 hasta bir aydan fazla yaşadı. Kan laboratuvar değerleri içerisinde, Ph değeri başarısız resüsitasyon olgularında diğer gruba göre daha düşük izlendi (p<0,008) (6,95 IQR [6,85-7,07] ve 7,05 [6,95-7,17] sırasıyla).

Sonuç: Sağ kalım oranları ülkemizde yapılan çalışmalarda oldukça farklılık göstermektedir. Bu oranın ikinci basamak hastanelerde daha düşük olduğu görülmüştür. Bu amaçla HDKA olgularında sağ kalımın arttırılması için hem ulusal hem de kurumsal düzeyde KPR uygulamalarının iyileştirilmesi gerekmektedir.

Anahtar sözcükler: Resüsitasyon, arrest, acil servis

The technique used for ensuring airway clearance by pushing back the head and providing mouth-to-mouth ventilation was first described by Peter Safar in 1957, whereas the technique used for external cardiac massage was first described by Kouwenhoven, Jude, and Knickerbocker in 1960. These two techniques constitute the current basis of critical care in emergency departments (EDs). Following their development, rescue operations performed with the combined use of mouth-to-mouth ventilation and closed chest compressions were first defined by Safar as cardiopulmonary resuscitation (CPR) in 1963 (1).

The need for CPR application or a case of cardiac arrest is a crucial and serious situation that any physician may encounter. Nowadays, CPR application is being taught to and practiced by not only physicians but also members of a community who can intervene in such situations (2, 3), mainly because out-of-hospital cardiac arrest (OHCA) cases have the largest share and importance among all cardiac arrest cases. While cardiac arrest cases can receive the necessary intervention with appropriate methods in a hospital environment, inadequate and incomplete interventions are often performed during the pre-hospital period. As a result, OHCA success rates tend to vary among countries and regions of the same country (4–6).

Therefore, the aim of this study was to examine uninvestigated OHCA cases in Nevşehir Province by determining characteristic features, comorbidities, and follow-up mortality rates.

Methods

This study was retrospectively performed over a 1-year period (January–December 2017) in a secondary care ED of a public hospital, which is the largest hospital in Nevşehir Province, Turkey, with a total of 247,000 ED visits in 2017. Patients aged ≥18 years who were presented to the ED for non-traumatic cardiac arrest reasons were included in the study. The data of patients who received CPR were recorded from the hospital registry and automation system. In addition, the date and time of admission, age, sex, comorbidities, laboratory parameters on admission, final status at the ED, and 1-month mortality status were noted. The 1-month mortality status of the patients was checked and recorded from the identity information query screen/portal of the civil registry office, which can be accessed from the hospital automation system.

Among the individuals; trauma-related admissions, admissions of individuals aged below 18 years or those with in-hospital cardiac arrests; cases with rhythm during admission following pre-hospital CPR or with missing records; pregnancy-related admissions; and dead cases admitted to the ED by 112 emergency health services were excluded from the study.

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows (version 21; IBM Corp., Armonk, NY, USA) and MedCalc® (version 15.8; MedCalc Software bvba, Ostend, Belgium). Continuous data are expressed as median and interquartile range (IQR) and categorical data as frequency and percentages. Normality analysis between the two groups was conducted using Shapiro–Wilk test. In the comparison of continuous data in two independent groups, the Mann-Whitney U test was used when the variables were not compatible with the normal distribution. Categorical data were compared using Pearson's $\chi 2$ or Fisher's exact test. *P*-values of <0.05 were considered statistically significant.

Results

During the study period, a total of 100 OHCA cases that met the inclusion criteria were evaluated. Among these, 59% of the cases (n=59) were males and the median age was 69 (IQR: 58–78). Further, 19% of the cases were presented to the ED between 24:00 and 08:00, 40% between 08:00 and 16:00, and 41% between 16:00 and 24:00. The highest number of presentations was in January (14%), followed by March (13%) and July (12%). The distribution of cases by months is shown in Figure 1. The most common comorbidities were hypertension (43%), history of cardiac disease (24%), chronic obstructive pulmonary disease (22%), and diabetes mellitus (DM, 21%) (Figure 2).

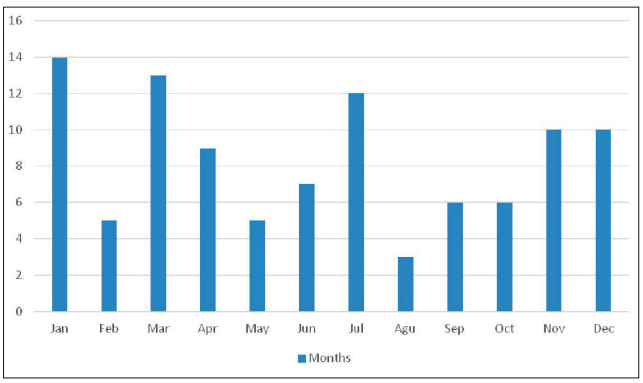

Figure 1. Rate of arrest cases according to months.

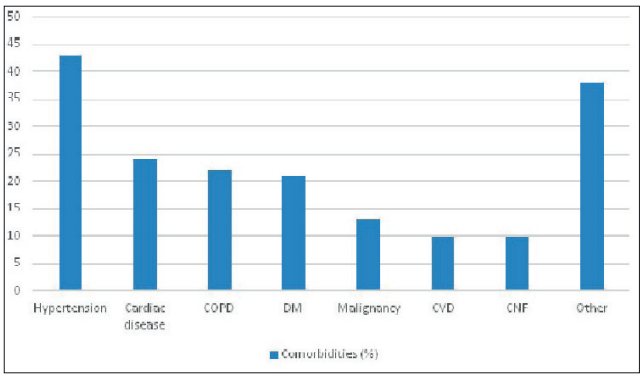

Figure 2. Comorbidities associated with arrest cases.

Successful resuscitation was achieved in 27% of the cases (n=27), and the patients were hospitalized. Of these, 13 patients experienced cardiac arrest again on the first day and died, 18 died in the first week, and 22 died in the first month. In the present study, only five patients survived for more than 1 month.

When patients who experienced successful resuscitation were compared to those who failed, no age– and gender-specific differences were observed between the two groups (Table 1). Analysis of comorbidities revealed that a history of hypertension was higher in cases with unsuccessful resuscitation than in those with successful resuscitation (50.7% and 22.2%, respectively; *P*<0.011). When laboratory parameters were analyzed, pH value was found to be lower in cases with unsuccessful resuscitation than in those with successful resuscitation (6.95 [IQR: 6.85–7.07] and 7.05 [IQR: 6.95–7.17], respectively; *P*<0.008).

Discussion

Approximately 50% –80% of the cases treated with CPR in EDs are OHCA cases (7–9), with an estimated incidence of OHCA cases being 50–100 per 100.000 person-year (10). Globally, including in Turkey, pre-hospital CPR applications vary widely, resulting in considerable variations in the prognosis of OHCA.

Table 1. Comparative analysis of cases according to resuscitation results

	Total n=100	*ROSC (+) n=27*	*ROSC (-) n=73*	*P*
Male gender, n (%)	59 (59%)	16 (59.3%)	43 (58.9%)	0.974
Age, median (IQR)	69 (58–78)	65 (44–77)	70 (61–78)	0.180
Comorbidities, n (%)				
• HT	43 (43%)	6 (22.2%)	37 (50.7%)	0.011
• Cardiac disease	24 (24%)	7 (25.9%)	17 (23.3%)	0.784
• COPD	22 (22%)	4 (14.8%)	18 (24.7%)	0.291
• DM	21 (21%)	6 (22.2%)	15 (20.5%)	0.855
• Malignancy	13 (13%)	4 (14.8%)	9 (12.3%)	0.744
• CVD	10 (10%)	2 (7.4%)	8 (11.0%)	0.725
• CRF	10 (10%)	1 (3.7%)	9 (12.3%)	0.202
• Other	38 (38%)	11 (40.7%)	27 (37.0%)	0.731
Laboratory parameters [a]				
pH	6.9 (6.8–7.1)	7.05 (6.95–7.17)	6.95 (6.85–7.07)	0.008
Lactat (mmol/L)	11.9 (7.9–15.0)	11.9 (7.5–13.5)	11.8 (9.7–15.0)	0.119
Urea (mg/dL)	48 (34–82)	40 (34–59)	51 (34–84)	0.270
Creatinin (mg/dL)	1.3 (1.0–1.7)	1.2 (0.9–1.6)	1.4 (1.0–1.7)	0.236
AST (U/L)	49 (27–137)	53 (26–216)	48 (27–124)	0.800
ALT (U/L)	49 (20–95)	47 (26–102)	49 (19–84)	0.545
Troponin I (pg/mL)	62 (16–202)	37 (9–121)	69 (21–344)	0.083

[a] Laboratory parameters were evaluated in 79% (n=79) of the cases.
ROSC, return of spontaneous circulation; **HT,** hypertension; **COPD**, chronic obstructive pulmonary disease; **DM,** diabetes mellitus; **CVD,** cerebrovascular disease; **CRF,** chronic renal failure; **IQR,** interquartile range.
Ph, power of hydrogen; **AST,** Aspartate aminotransferase; **ALT,** alanine aminotransferase.
Continuous data were analysed using Mann-Whitney test. Categorical data were compared using Pearson's χ^2 or Fisher's exact test.

In Turkey, 60% –65% of OHCA cases are of males aged between 62 and 67 years (4, 10, 11). In a Swiss study, the median age of OHCA cases was 65 years (12) and that in a multicenter study conducted in Pakistan was 60 years (5). In both studies, the proportion of males was higher than females. In agreement with these studies, median age of 69 years and the proportion of males of 59% were observed in the present study.

In the present study, 80% of the OHCA cases were presented to the ED between 08:00 and 24:00, consistent with the proportion of 77.4% observed in a study conducted in the United States, which reported that the highest number of presentations occurred in December (13). In a study of ED arrest cases, Karataş et al. showed that the highest number of presentations occurred in July–August and December–January (14). In the present study, the highest number of presentations was observed in January, March, and July.

Analysis of the comorbidities in cardiac arrest cases revealed differences across studies and regions. In a study examining in-hospital and OHCA cases in Istanbul, the most common comorbidities were hypertension (82%), DM (67%), and coronary artery disease (33%) (8). In a study examining OHCA cases only in Ankara Province, Turkey, the most common comorbidities were coronary disease (56%), hypertension (33%), and DM (27%) (15). In the present study, the most common comorbidities were hypertension (43%), history of cardiac disease (22%), and DM (21%).

The rate of successful resuscitation after CPR, i. e., the re-establishment of vital values, differs among studies conducted in Turkey. Özmete et al. reported a successful resuscitation rate of 62.6% among all OHCA cases admitted to the ED of a tertiary care university hospital (15). In a study examining OHCA cases in university and state hospitals of Denizli Province, Turkey, Erdur et al. reported a successful resuscitation rate of 38.3% (11). In a tertiary care ED, Kozaci et al. reported a successful resuscitation rate of 51% in post-presentation arrest cases (6). In the present study conducted in a secondary care ED of a public hospital, the success rate of CPR was found to be 27%. These varying success rates may be related to the different hospitals (level of care, intensity) or patient characteristics (level of education, comorbidities).

In the present study, 13 patients died on the first day after successful resuscitation, 18 died in the first week, and 22 in the first month. Finally, 5% of the patients lived for more than 1 month. In a study conducted in Turkey, only 5.3% of OHCA cases were reported to be discharged from the hospital (15). In another study conducted in Turkey, the hospital discharge rate was 11.2% and the 9-month survival rate was 9.4% (11). Regarding international data, the 1-month survival rate of OHCA cases without cardiac origin is 5.3% in Japan (16). A multicenter study conducted in Pakistan reported that the hospital discharge rate was 1.6% and the survival rate decreased to 0% within 2-month (5).

In Turkey, few studies have examined the relationship between successful resuscitation and blood parameters. Balci et al. showed that only high troponin levels are significant in OHCA cases with successful resuscitation (10). In a multicenter study conducted by Shin et al., the initial pH value obtained during CPR was independently associated with hospital discharge and good neurological outcomes. In addition, a low pH value (<6.8) was not observed in any neurologically intact patient (17). In the present study, pH value was higher in cases with successful resuscitation than in those with unsuccessful resuscitation.

In conclusion, the successful resuscitation rate obtained in this study is lower than those observed in other studies conducted in Turkey. However, highly variable resuscitation and survival rates were seen in the studies. Reduction of inter-hospital and inter-regional differences and standardization of health care quality can be achieved through appropriate and up-to-date pre– and post-hospital CPR applications.

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