

Out-of-hospital adult cardiac arrests in a university hospital in central Saudi Arabia

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ABSTRACT

الأهداف: تسجيل تقرير عن نماذج للمرضى البالغين الذين تعرضوا لتوقف قلبي خارج المستشفى والنتيجة النهائية لهم في المملكة العربية السعودية وتحديدًا الرياض.

الطريقة: دراسة وصفية محتملة عن المرضى البالغين الذين تعرضوا لتوقف قلبي مسبقاً قبل نقلهم إلى مستشفى الملك خالد الجامعي في الرياض خلال الفترة ما بين يوليو 2012م وسبتمبر 2013م.

النتائج: كان مجموع عدد المرضى المشمولين بالدراسة 96 مريضاً، وتشكل نسبة الذكور منهم 62.5%، وكان المعدل العمري لكل المرضى المشمولين بالدراسة 58.9 سنة، وبشكل أكثر تحديداً كان المعدل العمري للمرضى المصابين بحوادث 30.8 سنة، والمرضى غير المصابين بحوادث 62.9 سنة. بلغ معدل الوفيات العام 95.8%، كما تم تسجيل معدل منخفض لمحاولات تطبيق الانعاش القلبي التنفسي، وقد تم نقل معظم الحالات إلى المستشفى من قبل أحد أفراد عائلة المريض.

الخاتمة: أظهرت الدراسة إنخفاض معدل البقاء على قيد الحياة للمرضى المصابين بتوقف قلبي خارج المستشفى نتيجة الإصابات، كما أظهرت بأن معدل الوفيات كان 100% للمصابين بتوقف قلبي خارج المستشفى لأسباب أخرى غير الإصابات.

Objectives: To report the characteristics of adult out-of-hospital arrest patients and their outcomes in Riyadh, Saudi Arabia.

Methods: This is a prospective descriptive study of out-of-hospital adult arrests incident transported to King Khalid University Hospital, Riyadh, Saudi Arabia between July 2012 and September 2013.

Results: A total of 96 adult patients were enrolled in this study. Males represented 62.5% of the participants. The mean age of the study population was 58.9 years, and specifically 30.8 years for traumatic arrests, and 62.9 for non-traumatic. An over-all mortality rate of 95.8% was documented, as well as a low rate of bystander cardiopulmonary resuscitation being performed, and a family member transported most patients to the hospital.

Conclusion: A low survival rate for non-traumatic out-of-hospital adult arrest patients and a 100% mortality rate in traumatic arrests were discovered.

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Out-of-hospital arrest incidence and outcomes vary greatly throughout the world.¹ The incidence of treated out-of-hospital arrests have been shown to be higher in North America than Europe, Asia, and Australia.² Data collected on survival rates show that out-of-hospital arrest patients who receive bystander cardiopulmonary resuscitation (CPR) have a greater chance of survival than those who do not.¹ Recent data identifying and analyzing survival rates of out-of-hospital arrests in Saudi Arabia were not found from a literature search using PubMed and Medline. One study by Conroy and Jolin³ researched out-of-hospital arrests in Riyadh, Saudi Arabia from 1989 to 1995, which identified clinical variables and survival rate in patients arresting out-of-hospital and in the Emergency Department (ED) at a single hospital in Riyadh, Saudi Arabia. A total of 61 adult arrested patients with an average age of 55.4 years were included, and males accounted for 57.3% of the arrested adult patients.³ Thirty-nine of the adult patients arrested out-of-the hospital and 6 (15.4%) of these patients received out-of-hospital CPR.⁴ Of the out-of-hospital patients with primary cardiac arrest, 86.2% were transported by private vehicle compared with 13.8% by Emergency Medical Services (EMS).³ The low reliance on EMS

was attributed to the lack of a comprehensive system of advance out-of-hospital care, which most likely resulted most arrest patients being transported to the hospital by a private vehicle.³ Furthermore, a low level of public confidence in EMS and awareness of its role were additional factors discussed as contributing to the lack of reliance on EMS in Saudi Arabia.⁵ A low reliance on EMS is problematic during out-of-hospital cardiac arrest because of the low availability and public awareness on how to use automated external defibrillators (AED).⁴ Additionally, the low reliance on EMS in Saudi Arabia is concerning due to the number of road traffic accidents and resulting high rates of patient mortality.⁵ Traumatic injuries suffered from road traffic accidents (RTA), which require a response from EMS, result in 80-85% of the trauma deaths in young age groups in Saudi Arabia.⁵ Traffic data for 2005 reported 5,883 deaths from RTAs and half of these deceased individuals were less than 30 years of age.⁵ Head and facial injuries suffered during RTAs attributed to 26% of these traumatic deaths.⁵ Clinical variables and the survival rate of patients arresting out-of-hospital and in the ED in Riyadh, Saudi Arabia has been researched, but excluded arrests associated with trauma.³ In addition, literature published since Conroy and Jolin's³ study on non-traumatic arrests have continued to raise concerns on the topic of out-of-hospital arrests in Saudi Arabia. This descriptive study aimed to identify patient characteristics and outcomes of all adult out-of-hospital arrests presenting to King Khalid University Hospital (KKUH) in Riyadh, Saudi Arabia.

Methods. This study received Institutional Review Board approval from King Saud University College of Medicine. A prospective cohort study design was applied to the study of all presenting adult cases of out-of-hospital cardiac arrests between July 2012 and September 2013 at KKUH, ED, Riyadh, Kingdom of Saudi Arabia. The KKUH is an urban tertiary care hospital, and a designated trauma center affiliated with King Saud University. The annual patient census of KKUH is approximately 165,000 visits with varying acuities. The hospital is located near to major roads, businesses, and neighborhoods.

All adult cases of out-of-hospital cardiac arrests brought to the KKUH ED during the time of this

study were included in this study. Cardiac arrest was defined as cessation of cardiac mechanical activity that was confirmed by the absence of a palpable pulse, unresponsiveness, and absence of spontaneous respirations at the site of arrest. Physicians and nurses who cared for the patients in the ED completed data collection forms specifically designed for this study, which were then reviewed by a study investigator. Excluded from this study were all pediatric patients and adult patients who arrested in the ED. Postmortem examinations were not performed.

The Statistical Package for Social Sciences (IBM SPSS, Armonk, NY, USA) version 20 was used. Descriptive statistical analysis was performed to determine distribution, and frequency, and percentages were used to describe and report variables and patient characteristics.

Results. A total of 96 out-of-hospital adult patients in cardiac arrest who presented to KKUH ED were enrolled in this study. Patients ranged from 16-96 years of age, with a mean of 58.9 years. The distribution and frequency of patient ages are shown in **Figure 1**. Males represented 62.5% of the patients. Patients enrolled in this study with known chronic illnesses represented 78.1% of the study population. Reported chronic illnesses included known history of: cardiovascular disease, diabetes mellitus, stroke, connective tissue disease, and chronic respiratory disease. Other patient characteristics are reported in **Table 1**. Seasonal variations of patient enrollments are reported in **Table 2**. Seventy-four percent of the patients arrested at home. Public places were reported as the site of arrest for 14.6% of the patients. Four patients arrested at a rehabilitation center, which had limited abilities to treat cardiac arrest, and therefore still dependent on EMS or their own private ambulance to treat and transport arrested patients. Family transported 51 patients to KKUH ED, and this mode of arrival represented 53.1% of the study population. Thirty-four patients arrived by EMS and represented 35.5% of the study population. A total of 20 patients were reported to have received bystander CPR. Additional out-of-hospital cardiac arrest information is reported in **Table 3**. The highest reported presumed cause of arrest was of cardiac origin for 82.3% of patients, and trauma was second at 12.5% (**Table 3**). The presumed cause of arrests in the absence of postmortem examinations, which were not performed for religious and cultural reasons, were determined based on physician judgment and clinical data available at presentation, which include symptoms suggestive of cardiac origin, medical and surgical history along with

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absence of other clear causes of arrest. The mean age of arrested patients with a presumed cause of trauma was 30.8 years compared with 62.9 years for non-traumatic presumed causes of arrest. Traumatic arrests were transported by EMS 66.7% of the time compared with 31% for non-traumatic. Bystander CPR was performed on 25% of the traumatic arrests compared with 20.2% for non-traumatic. In this study, 100% of the traumatic arrests were pronounced deceased in the ED with 66.7% not receiving CPR by ED staff.

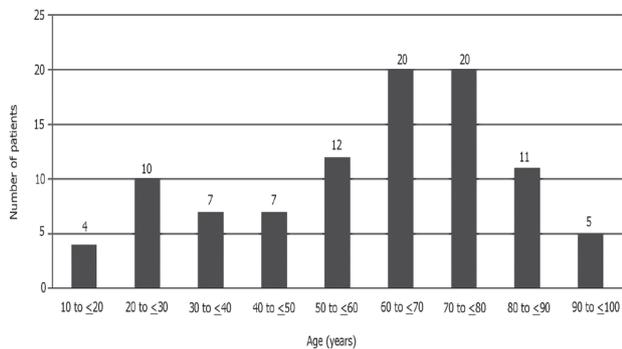


Figure 1 - Age distribution and frequency of 96 out-of-hospital adult patients in cardiac arrest presented to the Emergency Department, King Khalid University Hospital, Riyadh, Saudi Arabia.

Table 1 - Characteristics of 96 out-of-hospital adult patients in cardiac arrest presented to the Emergency Department, King Khalid University Hospital, Riyadh, Saudi Arabia.

Variables	Result n (%)
Gender	
Male	60 (62.5)
Female	36 (37.5)
Chronic illness	
Yes	75 (78.1)
No	17 (17.7)
Unknown	4 (4.2)

Table 2 - Seasonal variation among 96 out-of-hospital adult patients in cardiac arrest presented to the Emergency Department, King Khalid University Hospital, Riyadh, Saudi Arabia.

Season	Result n (%)
Spring	23 (23.9)
Summer	24 (25.0)
Fall	29 (30.2)
Winter	20 (20.8)

Cardiopulmonary resuscitation was provided in the ED for 48.8% of non-traumatic arrest patients. Four of the non-traumatic arrest patients had a spontaneous return of circulation while in the ED. Further results for traumatic and non-traumatic patient arrests are reported in Table 4. Patient care provided at KKUH ED for enrolled patients, and their dispositions are reported in Table 5. Cardiopulmonary resuscitation was performed on 46.9% of all enrolled patients while in ED care. Asystole was the first recorded cardiac rhythm in 94.8% of the patients. A total of 4 patients had a spontaneous return of circulation in the ED compared with 92 patients, or 95.8% of the study population, which were pronounced deceased.

Discussion. The results of this study correlated well with the limited available data published on out-of-hospital arrests in Riyadh, Saudi Arabia. Data from this study found an average of 58.9 years of age in out-of-hospital cardiac arrest, which is only 3.5 years greater than the previously reported average age of 55.4 years.³ Adult males represented the majority of the arrests both in this study and in previously reported research in Riyadh, Saudi Arabia.³ Data from this study discovered 74% of arrests occurred at home, which was discussed previously as the most likely site for arrest site.³ A low but increased use of EMS was discovered in this study.

Table 3 - Out-of-hospital cardiac arrest information of 96 out-of-hospital adult patients in cardiac arrest presented to the Emergency Department, King Khalid University Hospital, Riyadh, Saudi Arabia.

Variables	Result n (%)
Arrest site	
Home	71 (74.0)
Public place	14 (14.6)
Rehabilitation center	4 (4.2)
Other	7 (7.2)
Arrival mode	
Family	51 (53.1)
Emergency medical services	34 (35.5)
Rehabilitation center private ambulance	3 (3.1)
Other	8 (8.3)
Bystander CPR provided	
Yes	20 (20.8)
No	76 (79.2)
Presumed cause of arrest	
Cardiac	79 (82.3)
Trauma	12 (12.5)
Respiratory	3 (3.1)
Other	2 (2.1)

CPR - cardiopulmonary resuscitation

Table 4 - Traumatic versus non-traumatic cause of arrest of 96 out-of-hospital adult patients in cardiac arrest presented to the Emergency Department (ED), King Khalid University Hospital, Riyadh, Saudi Arabia.

Variable	Results	
	Traumatic	Non-traumatic
Mean age (years)	30.8	62.9
<i>Distribution</i>	12 (12.5)	84 (87.5)
<i>Brought by EMS</i>		
Yes	8 (66.7)	26 (31.0)
No	4 (33.3)	58 (69.0)
<i>Bystander CPR performed</i>		
Yes	3 (25.0)	17 (20.2)
No	9 (79.0)	67 (79.8)
<i>CPR Performed in ED</i>		
Yes	4 (33.3)	41 (48.8)
No	8 (66.7)	43 (51.2)
<i>ED disposition</i>		
Death pronounce	12 (100)	80 (95.2)
Return of spontaneous circulation	0	4 (4.8)

Data are expressed as number and percentage (%).
 CPR - cardiopulmonary resuscitation,
 EMS - emergency medical services

Previous data on out-of-hospital arrests in Riyadh reported 86.2% of the patients were transported by family to the hospital and 13.8% by EMS.³ This study discovered the family transported 53.1% of the out-of-hospital arrest patients and EMS transported 35.5%.

This study confirmed a low rate of bystander CPR being performed during out-of-hospital arrests in Riyadh, Saudi Arabia.³ Bystander CPR was performed on 25% of the out-of-hospital traumatic arrests compared to 20.2% of non-traumatic arrests. The first cardiac rhythm in the ED was recorded as asystole in 94.8% of the patients, which is similar to other reported data on out-of-hospital arrest in Riyadh.³ An overall mortality rate of 95.8% was discovered with CPR in the ED not being provided to 66.7% of traumatic and 51.2% non-traumatic arrest patients. As discussed in the literature, cultural norms regarding death at home and being taken to the hospital could influence these rates and data.³

Specifically for arrests associated with trauma, 100% of these patients did not have a return of spontaneous circulation and were subsequently pronounced deceased. The average age of traumatic arrests was 30.8 years. Cardiopulmonary resuscitation in the ED was not performed on 66.7% of these patients. This certainly supports a high rate of mortality resulting from trauma, and affecting a younger age group in Saudi Arabia.⁵

This study was limited to the data collected at a single designated trauma center and University Hospital in

Table 5 - Summary of emergency department (ED) care of 96 out-of-hospital adult patients in cardiac arrest presented to the ED, King Khalid University Hospital, Riyadh, Saudi Arabia.

Intervention	Result n (%)
<i>CPR provided</i>	
Yes	45 (46.9)
No	51 (53.1)
<i>First recorded cardiac rhythm</i>	
Asystole	91 (94.8)
Ventricular tachycardia	3 (3.1)
Other	2 (2.1)
<i>Defibrillation</i>	
Yes	5 (5.2)
No	91 (94.8)
<i>ED disposition</i>	
Death pronounced	92 (95.8)
Return of spontaneous circulation	4 (4.2)

CPR - cardiopulmonary resuscitation

Riyadh, Saudi Arabia. Limited data was obtained on pre hospital variables, such as time from arrest to hospital, why EMS was not utilized, and performed EMS interventions. The cause of arrest was not confirmed by postmortem examination because of cultural standards.

In general, further research is needed on the topic of out-of-hospital arrests in Saudi Arabia as the current body of knowledge on the topic is limited. This study discovered a higher rate of out-of-hospital arrest patients being transported by EMS and a lower rate in the use of family compared with another study.³ These 2 findings and possible factors contributing to, or associated with an increased use of EMS in out-of-hospital arrests in Riyadh, Saudi Arabia requires further investigation. Identifying pre hospital variables and frequency of EMS interventions performed during out-of-hospital cardiac arrests in Riyadh, Saudi Arabia is needed to better understand this topic. Though both percentages were low, more non-traumatic arrest patients received bystander CPR than traumatic arrest patients. The decision making process and factors contributing to or associated with bystanders providing CPR on non-traumatic and traumatic arrests requires further investigation.

In conclusion, emergency medical and out-of-hospital professionals in Riyadh, Saudi Arabia should find relevance in the characteristics and outcomes for out-of-hospital arrests that were documented and analyzed in this study. Data collected in this study discovered a low survival rate for non-traumatic out-of-hospital adult arrest patients, and a 100% mortality rate in traumatic arrests. The findings of this study are similar to previously published results, which indicates

a continued low survival rate for out-of-hospital arrests in Riyadh, Saudi Arabia. This study was limited to a single university hospital and this limitation could be removed by establishing a national registry of out-of-hospital arrests in Saudi Arabia. Such a registry would allow for national research to identify risk factors, patient characteristics, and trends in Saudi Arabia. In addition, this study supports the continued efforts for public awareness campaigns related to out-of-hospital CPR and attempts to increase survival rates.

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