Cardiac Arrests and Outcomes at Accident and Emergency (A&E) Department in A Tertiary Care Hospital of Sri Lanka.

Priyamali Jayasekera (✉ priyamja@yahoo.com)

General Sir John Kotelawala Defence University Faculty of Medicine <https://orcid.org/0000-0002-6699-7937>

Gayani Dassanayake

Provincial General Hospital Kurunegala

Kasthuri Bandara

Provincial General Hospital Kurunegala

Wiraj Vithanage

Provincial General Hospital Kurunegala

Original research

Keywords: Accident and Emergency, Witnessed Cardiac Arrest, Resuscitation, Survival

Posted Date: September 22nd, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-78874/v1>

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Cardiac Arrests and Outcomes at Accident and Emergency (A&E) Department in a Tertiary Care Hospital of Sri Lanka.

Madduma Mudiyanseelage Priyamali Thusharika Jayasekera – Corresponding author-
priyamja@yahoo.com Department of Medicine, General Sir John Kotelawala Defence University.
Knadawala estate, Ratmalana, Sri Lanka

Gayani Dasanayake - gayanigcv@gmail.com Provincial General Hospital Kurunegala. Sri Lanka
Kasthuri Bandara – bandarakasthuri5@gmail.com Provincial General Hospital Kurunegala, Sri Lanka

Wiraj Vithanage – wirajvithanage@gmail.com Provincial General Hospital Kurunegala, Sri Lanka

Abstract

Background: Witnessed cardiac arrest is a common occurrence in an A&E department. The reported incidence of witnessed cardiac arrest is variable around the world. The overall unadjusted survival to hospital discharge rate was 18.4% at the time of performing this study [1].

Methods: This descriptive study was conducted between January 1, 2016 to December 31, 2016 (one year) at the A&E department of Provincial General Hospital Kurunegala. The objective was to assess the aetiology, factors associated in outcomes of witnessed cardiac arrests, and the rate of occurrence of cardiac arrest at the A&E of Provincial General Hospital Kurunegala (PGHK). Survivors were followed up on for a one-year period following the study's conclusion.

Results: There were 123 witnessed cardiac arrests (mean age 64 (+/- 15.9) years, 64% male), out of which 25 patients were successfully resuscitated and transferred to intensive care units for further care. However, only 6 (4.9%) patients were discharged from the hospital. The three-month and one-year survival numbers were 6 (4.9%) (males: 4, females: 2) and 4 (3.3%) (males: 3, female: 1) respectively. The age of the sole female survivor after one year was 43 years and the ages of the three male survivors were 46, 54, and 55 years respectively. The most common aetiology for cardiac arrest was myocardial infarction (43.1%) while the most common initial rhythm was non-shockable (82%). The initial rhythm was shockable in all 6 survivors.

Conclusion: The overall ratio of survival to discharge in this study was much lower in comparison to international figures. The poor survival rate in this study may be due a very high rate of cardiac arrests with initial non-shockable rhythms in this study's population.

Keywords: Accident and Emergency, Witnessed Cardiac Arrest, Resuscitation, Survival

1. Background

Unexpected and expected cardiac arrests are common in an A&E department. In a hospital, cardiac arrests often represent a failure of optimal clinical care and the severity of the illness. The reported incidence of in-hospital cardiac arrests (IHCA) is variable around the world. The overall incidence of IHCAs in the United Kingdom [2014] was 1.6 per 1000 hospital admissions, with a median across-hospital incidence of 1.5 [1]. The overall unadjusted survival to hospital discharge rate was 18.4%

[1, 2]. Outcome data for cardiac arrests in the A&E department is not available except in one study done in 1987 [3]. The outcome after a cardiac arrest and cardiopulmonary resuscitation (CPR) depends on several factors such as patient-related and resuscitation-related factors, critical intervention (particularly early defibrillation depending on initial cardiac rhythm), and delivery of good quality CPR with effective uninterrupted chest compressions and assisted ventilation [1, 3]. Despite considerable efforts to improve the treatment of cardiac arrest, most of the reported survival outcome data is poor. Within the available data, the first documented pulseless arrest rhythm was typically asystole or pulseless electrical activity (PEA) in both children and adults [4]. The intra-arrest factors of ventricular fibrillation/ventricular tachycardia (VF/VT) as the first recorded rhythm and shorter intervals between CPR or defibrillation are associated with higher survival chances. However, VF/VT is present in only 25-35% of IHCAAs [5]. If patient outcomes are to improve, then the evaluation of the contribution of all of the potential risk factors and interventions is essential [6, 7]. Cardiac arrest is the cessation of mechanical cardiac activity as confirmed by the absence of signs of circulation. A witnessed cardiac arrest is one that is seen or heard by another person or an arrest that is monitored [3]. CPR is an attempt to restore spontaneous circulation by performing chest compressions with or without ventilation. Assisted ventilation is the act of inflating a patient's lungs by rescue breathing with or without a bag-mask device or any other mechanical device.

When there is a witnessed cardiac arrest at A&E, advanced cardiac life support can be started in seconds by the in-house CPR team. This consists of effective cardiac compressions, ECG monitoring, advanced airway management, and the setting up of intravenous/intraosseous accesses. The first monitored rhythm is the first cardiac rhythm present when a monitor or a defibrillator is attached to a patient after a cardiac arrest. The first monitored rhythm should be classified simply as shockable or non-shockable. Shockable rhythms include ventricular fibrillation and pulseless ventricular tachycardia and the non-shockable rhythms include pulseless electrical activity and asystole [7]. If the ECG shows a shockable rhythm, then an unsynchronized shock of 200 joules (J) from a biphasic defibrillator (or 360 J from a monophasic defibrillator) is delivered without delay via paddles or self-adhesive pads followed immediately by CPR for 2 minutes. For a non-shockable rhythm, two minutes of CPR is delivered with 1 mg of intravenous adrenaline. For both algorithms, it is necessary to maintain CPR, ensure oxygenation, and to exclude/treat reversible causes [7].

2. Methods

2.1 Design and setting

This was a descriptive observational study with an analytical component. The study was conducted in the A&E department of Provincial General Hospital Kurunegala, Sri Lanka which serves 2.4 million people in the North Western Province and part of the Sabaragamuwa Province.

The objective was to assess the aetiology, outcomes, and the incidence of cardiac arrest at an A&E department in a tertiary care hospital of Sri Lanka.

This study was carried out in a specific venue (PGHK's A&E department) and for a specific presentation (witnessed cardiac arrest). There were no rigid criteria for the discontinuation of CPR and the decision to stop CPR was taken by a senior A&E doctor who took the duration of CPR, the patient's age, any pre-existing comorbidities, and the cardiac rhythm into account. CPR was carried out according to the European Resuscitation Council Guidelines of 2015. Survivors were transferred to an intensive care unit, coronary care unit, or a general medical ward for further management. Where possible, post mortem examinations were carried out on patients who died and had no obvious cause for the cardiac arrest.

2.2 Study population

All the patients with witnessed cardiac arrests in the A&E department from January 1, 2016 to December 31, 2016 (one year) were included in the study. Patients with cardiac arrests due to trauma, pregnant women, re-arrests, and patients younger than 14 years were excluded.

2.3 Study design

This study had two components.

1. Component 1 - All the patients who had cardiac arrests and were included in the study that were followed-up till discharge or death.

2. Component 2 - All the survivors of the indexed cardiac arrest who were followed-up by teleconference or through meetings at the clinic by the principal investigator in one month, three months, and one year.

2.4 Study instruments

1. Component 1- A data form, which comprised of a combination of a simplified version of the National Health Service of the United Kingdom cardiac arrest resuscitation form and an Ulstein-style cardiac arrest resuscitation form. Additionally, the demographic data of the patient, rhythm of the cardiac arrest, information on aetiology of the arrest, comorbidities, interval between initiation of CPR and recovery time, and the time taken to transport the patient to the intensive care unit, coronary care unit, or ward was obtained. A data form was pretested.
2. Component 2 - data sheets based on the Glasgow coma scale and functional status assessment of the patient to gather data on outcome during the first year after the cardiac arrest at specified intervals.

2.5 Statistical analysis

Data are expressed as mean $\pm$ standard deviation (SD). Descriptive statistics were generated for aetiology and outcome. The statistical analysis was done using the SPSS 21 software package.

3 Results

There were 29,005 admissions (excluding trauma) to the A&E department during the study period. and 123 (0.42%) of them (age range 20-92 years) had witnessed cardiac arrests and had CPR performed on them. The patients who had witnessed cardiac arrests included 79 (64%) males (mean age 61 $\pm$ 14.6 years) and 44 females (mean age 69 $\pm$ 16.9 years). The average time from the cardiac

arrest to the initiation of CPR and to establish a patent airway was 62.4 +/- 11.8 seconds and 60 +/- 9.6 seconds respectively. The time to intubation was 12.3 +/- 5.5 minutes and the time to first defibrillation was 2.03 +/-1.7 minutes. The time to first adrenaline dose was 2.1 +/-1.6 minutes. The rhythm of the cardiac arrests included asystole (n=97, 78.9%), pulseless electrical activity (n=4, 3.3%), ventricular fibrillation (n=6, 4.9%), and ventricular tachycardia (n=16, 13%)

(Table 1) – Rhythms of cardiac arrests

Rhythm	Percentage (%)
Asystole	97
Pulseless electrical activity (PEA)	4
Ventricular fibrillation (VF)	6
Ventricular tachycardia (VT)	16

There were 61 patients with cardiac aetiology for the cardiac arrests. They included 53 (43%) myocardial infarctions, six (4.8%) acute heart failures, one myocarditis, and one ruptured thoracic aortic aneurysm (Table 2). Patients with a non-cardiac aetiology for cardiac arrest included 10 sepsis, nine suppurative lung diseases (eight pneumonia + one lung abscess), nine cerebro vascular accidents (six ischaemic strokes + three haemorrhagic strokes), 10 liver diseases (seven cirrhosis + three liver malignancy), five renal failures (three acute kidney injury + two chronic kidney injury), three cancers (other than liver cancer), and one anaphylaxis (Table 3).

(Table 2) – Cardiac causes of death

Aetiology	Number
Myocardial Infarction	53
Acute heart failure	6
Myocarditis	1
Ruptured thoracic aortic aneurysm	1

(Table 3) Causes of death

Aetiology	Number
Cardiovascular diseases	61
Sepsis	10

Suppurative lung diseases	9
Cerebrovascular accidents	9
Liver diseases	10
Renal failure	5
Malignancy	3
Anaphylaxis	1
Other	9
Total	117

Fifty-one of them had comorbidities and only eight had multiple comorbidities. Diabetes mellitus (n=21) was the most common, followed by hypertension (n=16). Ischaemic heart disease left ventricular failure, chronic obstructive pulmonary disease, chronic kidney disease, bronchial asthma, and cerebrovascular disease were among the comorbidities. But there was no significant association of comorbidities with the deceased and only two survivors had comorbidities which were bronchial asthma and diabetes.

The initial non-shockable rhythm had a worse prognosis ($P=0.0001$). All survivors had ventricular fibrillation as the initial rhythm. All six survivors had a CPR duration less than 20 minutes, except for one patient who had survived at one year who was 54 years old and had STEMI who had a resuscitation time of 40 minutes with 24 defibrillations.

Mortality of cardiac arrests in the A&E department was 80% (98/123) while the in-hospital mortality rate was 95% (117/123). The overall survival of the witnessed cardiac arrest was 6 (4.9%) at the time of discharge from the hospital, 6 (4.9%) at 30 days, 6 (4.9%) at 90 days, and 4 (3.2%) at the one-year mark.

4 Discussion

Cardiac arrests are complex scenarios to assess. It is very difficult to find background information when a patient is in a life and death condition. Short, targeted history-taking during resuscitation is the only opportunity to document any comorbidities. It is a very difficult and emotional task to ask for detailed comorbidity history from the bystander while a patient is being resuscitated. A majority

of cardiac arrests in this study were due to cardiovascular causes. Although an immediate outcome of cardiac arrest was considerable at the A&E department, the survival outcome at discharge was very low. This is mainly due to an increased occurrence of initial non-shockable rhythms when compared to other studies [4,5] which led to a longer duration of resuscitation (>20 minutes).

Cope AR assessed the 100 consecutive cardiac arrests at the A&E department but not all of them were witnessed arrests. Out of them, 49% arrested at the hospital while 51% arrested in their communities and in the midst of transfer to the hospital. Forty patients were able to leave the A&E department due to successful CPR outcomes, though only 13 left the hospital alive with only three cases of asystole survivors among them. These figures are somewhat comparable with this study but 51% of them were brought from the community.

However, in the National Cardiac Arrest Audit (NCAA) UK and Ireland database, overall unadjusted survival to hospital discharge was 18.4%. The presenting rhythm was shockable in 16.9% and non-shockable in 72.3%; rates of survival to hospital discharge associated with these rhythms were 49.0% and 10.5%, respectively, but varied substantially across hospitals [1]. In *Nadkarni et al*, the non-shockable rhythm was 23% and the overall survival rate was 18% irrespective of the initial rhythm. In *Sandroni et al*, the shockable rhythm was 25-35% with an overall survival rate of 15-20%. In *Rajram et al* (India), 18.5% of patients (out of a survivor group making up 14.5% of study subjects) had a shockable rhythm. Although the percentage of shockable rhythm of this study was 17.9% (which is similar to *Rajram et al*), the survival rate was still very low. This study also had lower successful outcomes when compared to other studies; however, those studies were on inward patients, with larger participant numbers and non-A&E patients. The *Hertliz* Swedish outcome study had only 75% of participants survive for two years [8]. Only the number of patients were comparable with Indian study (*Rajram*) but still there data also compatible with rest of the European figures. A&E patients are a different cohort of patients who usually attend with more dire emergencies than inward patients. CPR durations of less than 20 minutes and people with shockable rhythms had better outcomes. It is difficult to arrive at a conclusion because the number of survivors was very low. Patient and the rescuer characteristics can have influence on a case-by-case basis.

5 Conclusions

This study shows very low survival rates mainly secondary to non-shockable rhythm. Without much data on CPR in our setup, it is very difficult to understand the deficiencies and potential improvement

areas of the subject. Maintaining special resuscitation forms for the documentation of CPR rather than documenting them in the patient's notes (with detailed comorbidities) and having supervisors at the time of CPR will increase the efficacy and accuracy of the management of CPR. Although time consuming, analyzing each event with the team involved in CPR will provide good feedback and a positive attitude for future events. Maintaining special forms and having supervisors will help to better understand how patients' characteristics interface with rescuer training, experience, technical tools, and skills to address and overcome specific challenges during resuscitation. Timely, advanced life support and basic life support training and retraining along with updating the knowledge of the health care team will improve the quality and effectiveness of CPR. Redesigning a similar study with a multicenter dataset is mandatory to assess the real situation of the country and this can be achieved once a nationwide uniform system of documenting cardiac arrests is established.

Limitations

This study was unable to comment on cardiac arrests secondary to trauma, children, and pregnant women as they were excluded from this study's population.

Declaration

Ethical approval

Ethical approval was obtained from the ethical review committee of Provincial General Hospital, Kurunegala.

Consent for publication Not applicable

Availability of data Electronic and hard data is available with the corresponding author on request and all the data were published under results.

Conflict of interest None

Author's contribution

Jayasekera MMPT, corresponding author and principal investigator, developed the research concept and was involved in the supervision of data collection, the verification of the accuracy of data,

funding, statistical analysis, and the preparation of the final document. Dasanayake GKG, Bandara PMK and Vithanage WSA aided with the data collection and verified the accuracy of the data.

Acknowledgements

We acknowledge all the patients and their relatives who contributed to the study.

Authors information Senior lecturer in Internal Medicine, Faculty of Medicine, General Sir John Kotelawala Defence University and a Consultant physician University hospital KDU Sri Lanka.

References

- [1] Nolan JP, Soar J, Smith GB, Gwinnutt C, Parrott F, Power S, Harrison DA, Nixon E, Rowan K. Incidence and outcome of in-hospital cardiac arrest in the United Kingdom National Cardiac Arrest Audit. *Resuscitation*. 2014 Aug 1;85(8):987-92.
- [2] Rajaram R, Rajagopalan RE, Pai M, Mahendran S. Survival after cardiopulmonary resuscitation in an urban Indian hospital. *NATIONAL MEDICAL JOURNAL OF INDIA*. 1999 Jan 1;12:51-4.
- [3] Cope AR, Quinton DN, Dove AF, Sloan JP, Dave SH. Survival from cardiac arrest in the Accident and Emergency Department. *Journal of the Royal Society of Medicine*. 1987 Dec;80(12):746-9.
- [4] Nadkarni VM, Larkin GL, Peberdy MA, Carey SM, Kaye W, Mancini ME, Nichol G, Lane-Truitt T, Potts J, Ornato JP, Berg RA. First documented rhythm and clinical outcome from in-hospital cardiac arrest among children and adults. *Jama*. 2006 Jan 4;295(1):50-7.
- [5] Sandroni C, Nolan J, Cavallaro F, Antonelli M. In-hospital cardiac arrest: incidence, prognosis and possible measures to improve survival. *Intensive care medicine*. 2007 Feb 1;33(2):237-45.
- [6] Jacobs I, Nadkarni V, ILCOR Task Force on Cardiac Arrest and Cardiopulmonary Resuscitation Outcomes, CONFERENCE PARTICIPANTS, Bahr J, Berg RA, Billi JE, Bossaert L, Cassan P, Coovadia A, D'Este K. Cardiac arrest and cardiopulmonary resuscitation outcome reports: update and simplification of the Utstein templates for resuscitation registries: a statement for healthcare professionals from a task force of the International Liaison Committee on Resuscitation (American Heart Association, European Resuscitation Council, Australian Resuscitation Council, New Zealand

Resuscitation Council, Heart and Stroke Foundation of Canada, InterAmerican Heart Foundation, Resuscitation Councils of Southern Africa). *Circulation*. 2004 Nov 23;110(21):3385-97.

[7] European Resuscitation council guidelines 2015 (usually ERC guidelines are published every 5 years in October. Last one was in 2015 and next is 2020, which is going to be delayed due the COVID-19 epidemic))

[8] Herlitz J, Eek M, Holmberg M, Engdahl J, Holmberg S. Characteristics and outcome among patients having out of hospital cardiac arrest at home compared with elsewhere. *Heart*. 2002 Dec 1;88(6):579-82.