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Original Research Article

CARDIOPULMONARY RESUSCITATION OUTCOME AND PREDICTORS AMONG HOSPITALISED ADULT PATIENTS IN A TERTIARY HEALTH CARE HOSPITAL IN SOUTH INDIA

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ABSTRACT

Background: Sudden cardiac arrest (SCA) remains a significant cause of mortality both in prehospital and in-hospital settings. High-quality cardiopulmonary resuscitation (CPR) is the primary intervention for reversing cardiac arrest and achieving return of spontaneous circulation (ROSC). However, there is limited data on CPR outcomes in Indian hospitals, particularly in tertiary care centres. **Objectives:** This study aimed to determine (1) the proportion of patients achieving ROSC, (2) hospital discharge rates, and (3) predictors of outcomes among adults undergoing CPR at a tertiary care hospital in South Kerala. **Materials and Methods:** A prospective observational study was conducted at Pushpagiri Institute of Medical Sciences, Kerala, from March 2017 to August 2018. A total of 110 adult in-hospital cardiac arrest patients who received CPR were included using consecutive sampling. Data on demographics, comorbidities, time and rhythm of arrest, and outcomes were collected. Statistical analysis was performed using SPSS v20. **Result:** Among 110 patients, 61.8% were male, and the mean age was 66.5 ± 16.18 years. The most common comorbidities were hypertension (61.8%) and diabetes (59.1%). ROSC was achieved in 40.9% of cases, and survival to hospital discharge was 17.3%. Shockable rhythms had better ROSC rates (47.1%) compared to non-shockable rhythms (39.8%). Survival was significantly higher during evening shifts (p=0.003). Cardiac etiology was noted in 30% of cases; these patients had better survival outcomes than non-cardiac cases. **Conclusion:** The initial rhythm and time of cardiac arrest are strong predictors of CPR outcome. Survival was notably higher for shockable rhythms and events occurring in the evening. No significant association was observed with age, sex, or comorbidities. Larger multicentre studies are recommended to validate these findings.

INTRODUCTION

Sudden cardiac arrest remains a leading cause of prehospital and in-hospital death.[1] Cardiopulmonary resuscitation (CPR) is a lifesaving intervention and the cornerstone of resuscitation from cardiac arrest.[2,3,4]
CPR is an emergency procedure that combines chest compressions often with artificial ventilation. The purpose of CPR is to temporarily provide effective oxygenation of vital organs, especially the brain and heart, through artificial circulation of oxygenated blood until the restoration of normal cardiac and respiratory activity occurs.[5] The intended effect is to stop the degenerative processes of ischemia and anoxia caused by inadequate circulation and inadequate oxygenation.
"2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care" increased the focus on methods to ensure that high-quality CPR is performed in all resuscitation attempts immediately for the optimal patient outcome. Cardiac arrest with nonperfusing rhythms requires defibrillation. Even after defibrillation, most victims demonstrate asystole or pulseless electrical activity for several minutes, and high-quality CPR immediately the following defibrillation can convert nonperfusing rhythms to perfusing rhythms. Successful management of cardiac arrest depends on high-quality CPR,

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vasopressor treatment (i.e., epinephrine), defibrillation, and rapid reversal of underlying causes results in Return of spontaneous circulation (ROSC).[6]

The return of spontaneous circulation, a favourable short-term indicator, should not necessarily be seen as a sign of a favourable medium- or long-term outcome in itself.

There are limited studies regarding outcomes of CPR in Indian hospitals. This study was undertaken to assess the demographics, clinical parameters and outcomes of hospitalised patients undergoing CPR by the resuscitation team at our centre.

Objectives

To find out the proportion of patients achieving ROSC following cardiopulmonary resuscitation at a tertiary care hospital in south Kerala.

To find out hospital discharge rate in patients who underwent a cardiopulmonary resuscitation at a tertiary care hospital in south Kerala.

To find out the possible predictors for ROSC and hospital discharge, among patients who underwent a cardiopulmonary resuscitation at a tertiary care hospital in south Kerala.

MATERIALS AND METHODS

Study Design: Prospective observational study.
Study Period: From March 2017 to August 2018.
Study Setting: Pushpagiri Institute of Medical Sciencesand Research Centre, Tiruvalla, Kerala.
Study Population: All adult patients (age ≥18years) who underwent cardiopulmonary resuscitation.
Ethics Approval and Consent: Ethics approval was obtained from the Pushpagiri Institute Research and Ethics Committee.
Sample Size: Assuming that 50% of the patients undergoing cardiopulmonary resuscitation will achieve Return of Spontaneous Circulation (ROSC), with a relative precision of 20% and an alpha error of 5%, the sample size is 100 patients. To account for patients lost to follow-up, we will include 10% more samples in our study. Therefore the final sample size will be 110 patients who are undergoing cardiopulmonary resuscitation at a tertiary care hospital in south Kerala.
Sampling Method: Consecutive sampling
Inclusion Criteria

- Adult patients (≥18 years of age) at the time of hospital admission who received chest compression and/or defibrillation and advanced airway management were included in the study.

Exclusion Criteria

- Outpatients.
- Patients receiving only resuscitation drugs or positive pressure ventilation without chest compression or defibrillation.
- Patients subject to palliative treatment or to a "do not resuscitate (DNR)" order.
- Patients experiencing a second or subsequent cardiac arrest.

- Patients with pre-existing tracheostomy or mechanical ventilation.

Methodology

This study was carried out in a 900-bedded medical college hospital in South Kerala, India. An SCA was defined as the absence of a pulse in an unconscious individual with no respiration or with agonal breaths only. A "code blue" alarm is triggered off for all SCAs in the hospital. The Emergency department consultant or registrar attends to SCAs immediately at all times of the day and heads the resuscitation team. The American Heart Association's Advanced Cardiac Life Support (ACLS) protocol is adhered to. All the ED consultants and registrars are ACLS certified, and most of the members of the team are basic life support (BLS) certified.

All adult patients >18 years old who had an SCA and underwent CPR in the hospital between March 2017 and August 2018were included in the study. Patients who were brought and declared dead on arrival and those with a standing "do not resuscitate" order with prior consent were excluded from the study. A person was declared dead on arrival if there is no electrical activity of the heart and pupils are dilated or if there are signs of rigor mortis. The patients were identified using the cardiac arrest audit register maintained by the ED. A retrospective chart review was performed on all the above said patients using the hospital's medical record database.

The following data were extracted: demographic details, first documented rhythm, the return of spontaneous circulation (ROSC), outcome in ED, in-hospital outcome before discharge from the hospital.

Statistical Analysis: All data were entered using Microsoft Excel and analyzed using SPSS 20.0. The baseline clinical and demographic correlates will be found out and tabulated as frequency/percentages. The proportion (95% confidence interval) of patients achieving ROSC and hospital discharge will be found out from the data. The possible risk factors for not achieving ROSC or successful hospital discharge will be found and an odds ratio (95% confidence interval) will be calculated. A binary logistic regression analysis will be done to account for possible confounding factors. p-value <0.05 was taken as statistically significant.

RESULTS

Age and gender distribution: The study sample included 110 subjects who met the inclusion criteria. The sample population analyzed consisted of both males and females, of which 68(61.8%) were males and 42(38.2%) were females. The mean age of the study sample was 66.51 with a standard deviation of 16.18.

Comorbidities of Patients underwent CPR: Most patients had at least one comorbid condition while diabetes mellitus (59.1%) and hypertension (61.8%) were the most common comorbidities.

Table 1: Comorbidities of Patients underwent CPR

Comorbidities	Frequency(n)	Percentage
Diabetes Mellitus	65	59.1
Hypertension	68	61.8
Dyslipidaemia	26	23.6
Coronary Heart Disease	53	48.2
Chronic Kidney Disease	24	21.8
Chronic Liver Disease	4	3.6
COPD	18	16.4
Malignancy	8	7.3
Sepsis	17	15.5
Post-surgery	2	1.8
Trauma	15	13.6

Comparison of CPR incidents & Outcome among various shifts: The incidence of cardiac arrests more during the evening shifts (50%) as compared to the morning (32.7%) or night (17.3%) shifts. The outcome is good and statistically significant (p=0.003) in the evening compared to night and morning.

Table 2: Comparison of CPR incidents in various shifts

Shift	Frequency	Dead	Alive
Morning(8am-4pm)	36(32.7%)	33	3
Evening(4pm-11pm)	55(50.0%)	39	16
Night(11pm-8am)	19(17.3%)	19	0
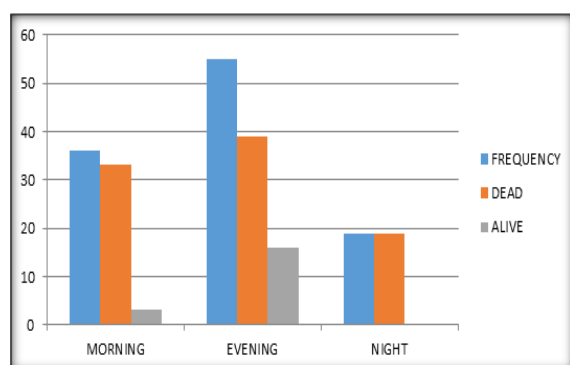
**Figure 1: Analysis of CPR incidents in various shifts**

Analysis of Initial rhythm and outcome

The initial documented rhythm was a pulseless electrical activity (PEA) or asystole in the majority (84.5%) of cases while shockable rhythms (pulseless ventricular tachycardia [VT]/ventricular fibrillation [VF]) were noted in only 15.5% (17/110) of cases. ROSC was achieved better in shockable rhythm 47.1%(8/17) than non-shockable rhythm39.8%(37/93).
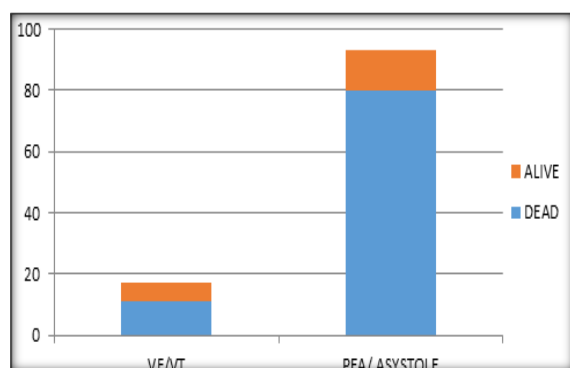
Figure 2: Comparison of initial rhythm and Outcome

Comparison of initial diagnosis and Outcome results

In this study, the majority of cases (70%) are of non-cardiac and the remaining 30% are cardiac in etiology. Of these, 48.1% (37/77) of non-cardiac cases had attained ROSC and 19.5% (15/77) had survival at discharge.
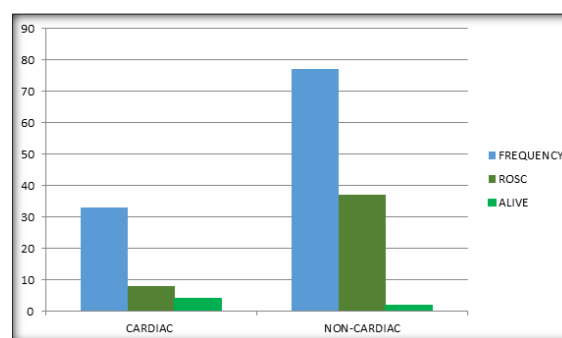
Figure 3: Analysis of Outcome in cardiac & Non-cardiac cases

Comparison of ROSC and Outcome

After initial CPR, 40.9% (45/110) cases survived the event (ROSC achieved). Out of ROSC achieved, survival at discharge is 42.2 % (19/45). The overall SCA survival to discharge from the hospital rate is 17.3%.

DISCUSSION

This study was conducted in the Department of Emergency Medicine of Pushpagiri Institute of Medical Sciences and Research Centre, which is a tertiary care hospital in Kerala. The study was done between March 2017 and August 2018. A total of 110 cases were included.

In this study, out of 110 patients included of which, 68(61.8%) were males and 42(38.2%) were females. The mean age of the study sample was 66.51 with a standard deviation of 16.18. This finding corresponds

to a similar study with a mean age of 66.2 with SD17.1.[7]

In the present study, out of 110 patients, 68(61.8%) were males and 42(38.2%) were females, which shows a male predominance in the study population. This finding is similar to a study conducted by Pandian et al (2016) in south India.[8]

Initial rhythm and outcome

In our study, the majority of the cases show an initial non-shockable rhythm (84.5%) while shockable rhythms (pulseless ventricular tachycardia [VT]/ventricular fibrillation [VF]) were noted in only 15.5% of cases. Pandian G et al (2016) study shows similar results with the majority of non-shockable rhythm.[8] Most previous studies have shown shockable rhythms to be the predominant initial rhythms during an SCA.[9,10]

In this study among survivors, 68% had a non-shockable rhythm compared to 36% with a shockable rhythm. This is in contrast to many other studies where the majority of survivors had a shockable rhythm.[11,12] Asystole/PEA is considered an agonal rhythm and has seldom been shown to be associated with a successful outcome as compared to VF/VT as the initial rhythm.[13] The predominance of non-shockable rhythms in our study can be explained by the fact that in our study, only 30% of the patients had a presumed cardiac etiology.

Time of CPR and Outcome

In our study, there is a significant change in survival relative to the time of the day at which CPR was performed. The outcome is better during evening shift. In other studies the time of the day of cardiac arrest has been shown to affect the outcome of cardiac arrest with better survival among patients who underwent cardiac arrest and CPR during morning or evening shifts.[14,15,16,17,18,19] Brindley et al,[20] and Rakić et al,[21] suggested that it could be because of the increase in the number of unwitnessed arrests in the night, but Matot et al,[22] found that prognosis remains poor independent of the witnessed status of the event.

Initial ROSC and final Outcome

In the present study initial ROSC achieved is 40.9% achieved, while the overall SCA survival to discharge from the hospital rate is 17.3%. A report from 115 studies showed survival to discharge rate of 15.2% (USA 15%, Canada 16%, UK 17%, other European countries 14%).[23]

CONCLUSION

1. In the present study, overall survival following cardiopulmonary resuscitation in the hospital depends on the type of initial rhythm during the arrest.
2. Time of SCA had a strong association to the outcome which is statistically significant.
3. Age, sex and other co-morbidities do not show any statistical correlation in predicting the outcome.

Limitations

1. The study was conducted in a single tertiary care hospital. The findings are likely to be different in non-teaching private hospitals and in state-run hospitals with a much larger load of patients and limited resources.
2. Another limitation of the present study was the size of the sample studied; the large sample would have resulted in a more precise estimation of the accuracy of the variables.

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