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Outcomes Of Cardiac Arrests in ICU Patents with COVID-19: A Single Centre Study From Sri Lanka

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ABSTRACT

Introduction: Cardiac arrests (CA) in patients with COVID-19 carry poor prognoses in hospital (1). In ICUs, CAs are witnessed arrests and it is a better place to study the clinical details of CA to improve outcomes. This study is to assess the incidence, clinical details, and details related to CAs in a single centre in Sri Lanka.
Methodology: A retrospective study was done at a COVID-designated ICU in Base Hospital- Teldeniya, Sri Lanka from the 1st January to the 31st December 2021. All patients who suffered CAs were included in the study. Details related to disease severity, comorbid disease and CA were collected using a Performa and analysed using SPSS software.
Results: 202 patients with COVID-19 were admitted to the ICU during the period. 92 patients suffered CAs and out of them, 60 were unexpected. 51.08% were male and 48.91% were female, in the cardiac arrest group. 67% of patients suffered more than two co-morbid diseases. Non-shockable rhythms were the commonest and the commonest cause of CA is hypoxaemia. Out of the 60 patients who suffered unexpected CAs in ICU, only 2 patients survived.
Conclusion: Despite having a controlled environment in the ICU, this cohort's outcome of cardiac arrest resuscitation was poor.

Keywords: Cardiac arrest, COVID-19, Cardiopulmonary resuscitation, Intensive care unit

INTRODUCTION

SARS-CoV-2 infection has caused a great burden to the critical care units over all continents of the world. The infection causes a multisystem disorder with significant mortality among critically ill patients. Several studies have shown that cardiac arrest is common among hospital patients and critically ill patients with COVID-19 (2,3). Same studies have shown that survival after cardiac arrest is poor even with cardiopulmonary resuscitation. The survival rates in these patients

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were extremely low (4). This is a comparatively low value compared to the survival of non-COVID-19 critically ill patients suffering cardiac arrests. These poor survival rates have prompted discussions on the futility of cardiopulmonary resuscitation in this patient population. Factors like a significant lack of resources, fear of infection, and limited availability of personal protective equipment (PPE) added to the discussions related to the appropriateness of performing cardiopulmonary resuscitation (CPR) in patients with COVID-19 who suffered in-hospital cardiac arrest (5).

However, with time several guidelines were developed to perform CPR in this cohort (6,7). Most guidelines included statements ensuring the personal protection of the health care worker. SARS-CoV-2 infection is transmitted primarily by respiratory droplets and aerosols (8,9). CPR is considered an aerosol-generating procedure(10). Therefore personal protective equipment (PPE) is mandatory when performing CPR.

In the ICU set-up, cardiac arrests are witnessed arrests and therefore it is a good place to assess the event in detail. Knowing the details of events related to cardiac arrests and CPR will provide adequate insight as to what factors will contribute to the outcome of respective patients. This knowledge can be used to improve patient care.

Sri Lanka was also affected by the COVID-19 pandemic some needing ICU care. The intensive care unit of Base Hospital – Teldeniya was a dedicated facility used to provide critical care facility to ICU patients. Although there was a significant number requiring ICU care facilities and 204 recorded deaths in Sri Lanka due to COVID-19 by 31st December 2020. There are no reported data related to their clinical details and outcomes. The purpose of this study is to assess the incidence, clinical details, and details related to CA and CPR in a single centre in Sri Lanka.

METHODOLOGY

A retrospective survey was conducted at COVID designated intensive care unit in Base Hospital-Teldeniya- Sri Lanka. The duration of the study was from the 1st of January to the 31st of December 2021. The study was approved by the ethical review committee of National Hospital Kandy, Sri Lanka. All patients who were diagnosed with COVID-19 and suffered CAs were included in the study. Pregnant patients, children under 16 years and patients who had doubtful COVID-19 testing status were excluded from the study.

Protocol for resuscitation

Each patient admitted for ICU care with severe COVID-19 was analysed concerning the severity of the disease, co-morbid diseases and pre-morbid status. Depending on the condition of the patient, a decision was taken as to who should not receive CPR in case of cardiac arrest. Even in this group, if the cardiac arrest is due to a reversible cause and not primarily due to COVID-19, CPR was given. All patients with CAs received CPR. All patients were resuscitated according to European Resuscitation Council guidelines.

Details related to CAs and CPRs were collected using a Performa. The following data were obtained from the patient's medical records using the Performa: age, gender, co-morbidities, Investigation profiles and severity of SARS-CoV-2 infection. All patients had pre-planned decisions to resuscitate depending on their clinical and pre-morbid status. Clinical details related to cardiac arrest episodes and the resuscitation process were also collected.

Statistical analysis

Data were summarized as mean (standard deviation (SD), median (interquartile range (IQR)) or percentages. Continuous variables with normal distribution were compared with parametric tests. Mann-Whitney U test was used for skewed distribution. The chi-square test was used for the comparison of categorical variables. To determine the impact of a parameter on the outcome, a multivariate logistic regression analysis using mortality as the dependent factor. When appropriate, the odds ratio (OR) and 95% confidence intervals (CI) were calculated. A P value of <0.05 was considered statistically significant.

RESULTS

The study included 202 patients with COVID-19 who were admitted to ICU during the given period. 92 patients suffered CAs and out of them, 60 were unexpected. Patient characteristics of the 2 groups are summarised in Table 1. The mean age of the patients was 65.2 years. 55.6% were male and 44.4% were female. 67% of patients suffered more than 2 co-morbid diseases.

Table 1: Patient characteristics

	Cardiac arrests group N= 92	Non-cardiac arrest group N=110	Significance (p-value)
Mean age (yrs.)	62.59	56.29	0.02
Mean height (cm)	160.76	162.86	0.08
Mean Weight (in Kg)	70.71	73.64	0.18
Gender **Male** **Female**	 47 (51.08%) 45 (48.91%)	 57 (53.06%) 53 (48.18%)	0.36

Table 2: Co-morbid diseases

	Cardiac arrests group N= 92	Non-cardiac arrest group N=110	Significance (p-value)
No co-morbidities	10	57	0.001
1 to 2 co-morbidities	20	42	0.012
>2 co-morbidities	62	11	0.001

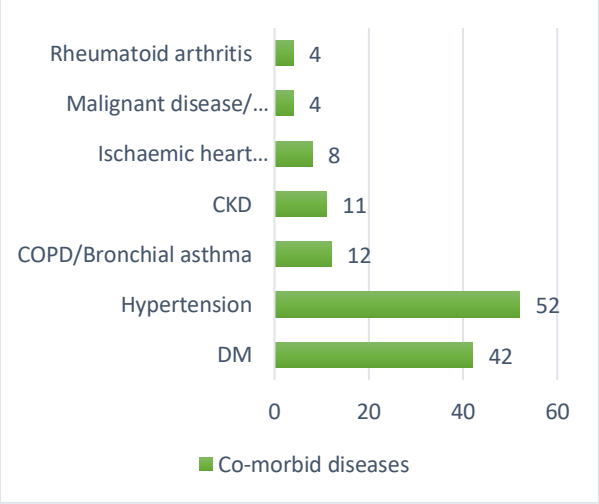

Figure 1: specific co-morbidities of patients in cardiac arrest group

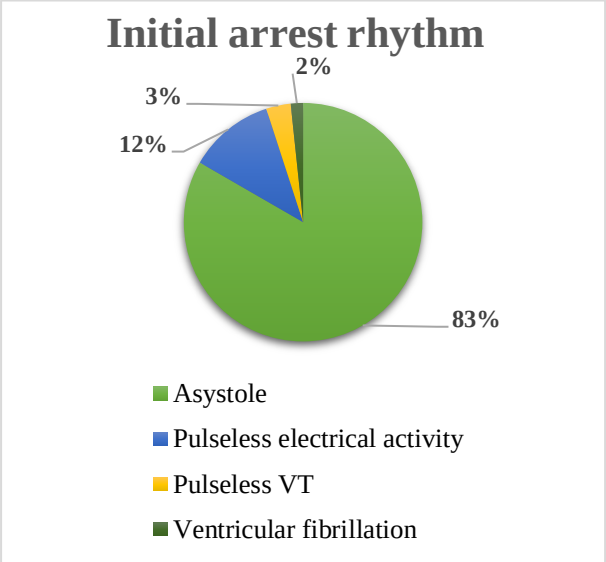

Figure 2: Rhythm associated with cardiac arrests in the cohort

Figure 1 depicts specific co-morbid diseases the patients in the cardiac arrest group had. Figure 2 shows initial cardiac arrest rhythms in the cohort. Figure 3 illustrates the immediate cause of CA. 81.8% of the patients had a return of spontaneous circulation and 57.1%of them had another episode of CA within 24 hours. Out of the 60 patients who suffered unexpected CAs in ICU, only 2 patients survived.

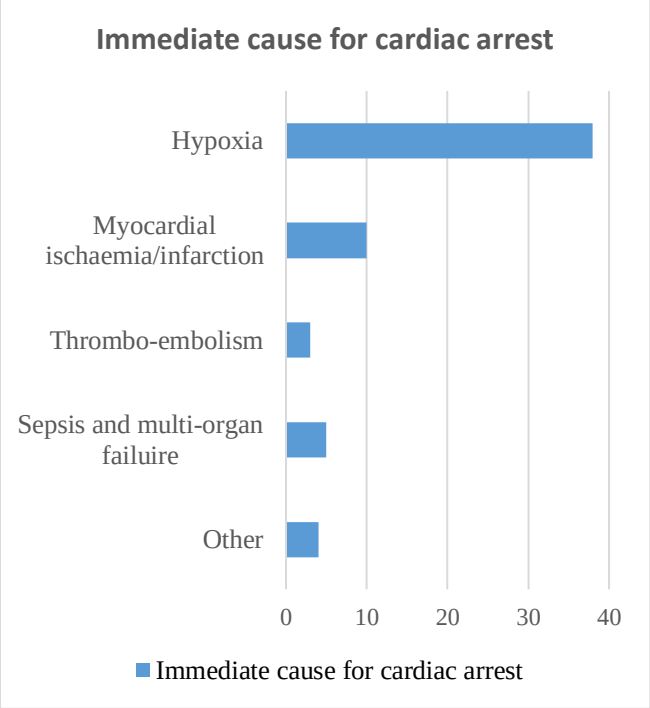

Figure 3: Immediate cause for cardiac arrests

DISCUSSION:

ICU set-up is a good place to assess cardiac arrests in detail because they are witnessed arrests. Details of events related to cardiac arrests and CPR will provide insight into the factors contributing to the outcome of the respective patient and that knowledge can be used to improve patient care.

This retrospective study, done on patients with SARS-CoV-2 infection, who were receiving ICU care at Base Hospital, Teldeniya, Sri Lanka, extensively reflects the incidence, clinical details, and details related to cardiac arrests and CPR.

Out of the 202 patients included in the study sample, 92 have suffered cardiac arrests during their ICU stay. That is 45.54%. A study done at the University of Pennsylvania in 2020[2], shows that 11% (9 patients) of patients admitted to the ICU (79 patients) due to severe COVID-19 illness have suffered cardiac arrests during the ICU stay. In this study group, all the patients who suffered cardiac arrests were ICU patients and no cardiac arrests were reported among non-ICU patients. A study done in New York State on in-hospital mortality in patients with COVID-19 (3), found that around 13% of in-hospital patients have suffered from cardiac arrests. In addition, most studies have shown that the incidence of in-hospital cardiac arrests has increased and the place of cardiac arrests has shifted from ICU to the wardsOur study did not include inward patients; therefore, characteristics of inward cardiac arrests cannot be commented in our set up.

The mean age of patients who have suffered from cardiac arrests is 62.59 years while the mean age of the non-cardiac arrest group is 56.29 years. The p-value is 0.02, which is statistically significant. This implies that the risk of a patient infected with SARS-CoV-2 suffering a cardiac arrest increases with age i.e. older population is more prone to suffer a cardiac arrest when infected with SARS-CoV-2. Similarly, in a study done in New York State among patients with COVID-19, the highest percentage of cardiac arrests (18.1%) is shown by the age group of 65 years and older [3]. A study done on the impact of the COVID-19 pandemic on in-hospital cardiac arrests in the UK suggests that the mean age of patients suffering in-hospital cardiac arrests has reduced during 2020 (66.5 years) during the period from 2016 to 2019 (71.4 years) (4). This depicts that the SARS-CoV-2 infection reduces the age of occurrence of cardiac arrests in in-hospital patients.

The cardiac arrest group of this study showed a male predominance with a percentage of 51% while the percentage of female patients who suffered cardiac arrests during ICU stay is 49%. Out of 104 male patients, 47 (45.19%) have suffered cardiac arrests and 45.91% of female patients admitted to the ICU have suffered cardiac arrests [3]. In the previously mentioned study done in New York State, 13% of in-hospital male patients and

11.6% of in-hospital female patients have suffered cardiac arrests.

When causes of cardiac arrests are considered, most patients suffer cardiac arrest secondary to hypoxaemia. SARS-CoV-2 predominantly being a respiratory illness, hypoxia and ventilatory insufficiency was the commonest cause for ICU admissions in many setups (11). Therefore, it is likely that most patients suffer hypoxia leading to cardiac arrests. This finding is compatible with the studies done in other countries (11,12). The studies have also shown that respiratory insufficiency can rapidly deteriorate leading to in-hospital cardiac arrests before reaching ICU (11).

In our study, of the initial cardiac arrest rhythms, the majority (83%) were asystole. 12% were PEA, 3% were pulseless VTs and 2% were VFs. Thus, 95% were non-shockable rhythms while only 5% were shockable rhythms. Data on the analysis of the initial rhythm of cardiac arrests are scarce. A meta-analysis performed on cardiac arrest showed that the incidence of shockable rhythm in COVID-19 patients is less compared to non-COVID-19 patients (13). We have not made a comparison between non-COVID and COVID-related cardiac arrests in our study. However, as hypoxia is the commonest cause of cardiac arrest in this cohort, therefore it is likely they all lead to non-shockable rhythms. Usually, shockable rhythms occur secondary to cardiac causes. Thromboembolism also leads to non-shockable rhythms (14). Therefore, when the causative factor for cardiac arrests is considered, the prevalence of non-shockable rhythms can be explained.

In our study, the survival rate after unexpected CAs was as low as 3.33%. When compared to studies from other parts of the world both rates of ROSC and survival were found to be low. The first study to report outcomes of in-hospital cardiac arrest (IHCA) in COVID-19 was from Wuhan, China, where the survival rate of patients with severe COVID-19 pneumonia and in-hospital cardiac arrest was very poor, with a return of spontaneous circulation (ROSC) rate of 13.2% and a 30-day survival rate of 2.9% (15). With time, studies have shown slight improvement in ROSC rates and mortality, but overall these values are low compared to cardiac arrests in non-COVID patients (1).

CONCLUSIONS

In conclusion, our research highlights the critical assessment of cardiac arrests in SARS-CoV-2 patients within the intensive care unit. It shows that non-shockable rhythms predominated among COVID-19 patients experiencing cardiac arrest, with hypoxemia emerging as the leading cause. Despite the controlled environment of the ICU, our study revealed a discouraging outcome for cardiac arrest resuscitation within this cohort. These findings resonate with data from other countries, highlighting the formidable challenges in managing cardiac events in COVID-19 patients, even under optimal clinical settings. Moving forward, further research and refined protocols are imperative to enhance the efficacy of resuscitative efforts, improve outcomes, and employ 'Do Not Resuscitate' orders (DNACPR) for this vulnerable population.

Author declaration

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Authors' contributions:
Study concept and design: A.R.; Acquisition of data: A.Raj., P.K., N.W., and H.D.; Analysis, and interpretation of data: A.Raj., P.K., N.W., H.D., G.L.G.S., H.M.C.D.B., and N.S.M.; Drafting of the manuscript: A.R., A.Raj., P.K., N.W., H.D., G.L.G.S., H.M.C.D.B., and N.S.M. Study supervision: A.R.

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The data that support the findings of this study are available upon reasonable request from the corresponding author. Restrictions may apply to the availability of this data, due to privacy or ethical considerations.

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