

## Cardiac Arrest in Patients with Acute Myocardial Infarction

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### Abstract

**Introduction:** Sudden cardiac arrest is the third leading cause of death in Europe. A significant number of out-of-hospital sudden cardiac arrests are associated with acute myocardial infarction. Cardiac arrest is a complication of an acute myocardial infarction caused by malignant rhythm disorder, in most cases ventricular tachycardia or ventricular fibrillation. They result in sudden death in 25%-50% of patients with prior acute myocardial infarction. Sudden cardiac arrest in these patients occurs during the first hours after the onset of symptoms.

**Aim:** Show from the total number of out-of-hospital resuscitations in the given period in canton Sarajevo the number of successful resuscitations (return of spontaneous circulation – ROSC) and the number of successful resuscitations in patients that went into sudden cardiac arrest with prior acute myocardial infarction. Show the out-of-hospital management of these patients.

**Material and Methods:** a retrospective descriptive study that includes all out-of-hospital sudden cardiac arrests in the period from January 1, 2019, to December 31, 2021, in Canton Sarajevo that is associated with acute myocardial infarction in which there was the return of spontaneous circulation (ROSC). All patients from the abovementioned period were included in the study without exclusion criteria related to their age or gender. Data was extracted from the data registry of the Centre for Education of the Emergency Medical Center of Canton Sarajevo.

**Conclusion:** Acute myocardial infarction remains associated with a high level of mortality and represents one of the leading public health problems despite all advances in the field of diagnostics and treatment of patients with AMI that resulted in a significant reduction of mortality in time.

**Keywords:** out-of-hospital cardiac arrest, cardiopulmonary resuscitation, acute myocardial infarction, return of spontaneous circulation (ROSC).

### Introduction

Sudden cardiac arrest caused by malignant rhythm disorder is the leading cause of natural death in the USA, causing 400.000 cases of deaths of adults yearly. In Europe, cardiac

arrest is the third leading cause of mortality. Sudden cardiac arrest is not the same as Acute Myocardial Infarction (AMI) but can arise as a complication of AMI. If prompt urgent treatment is not provided, it can result in death. Urgent treatment implies starting cardiopulmonary resuscitation (CPR) and defibrillation [1]. AMI is associated with a high level of mortality and still represents a significant public health problem despite all progress in the therapy field. During the 70s and 80s, acute myocardial infarction with an ST elevation (STEMI AMI) represented a fatal condition, and the survival rate was only 20%. Today, despite progress in therapy and implementing specific protocols, the mortality of patients with STEMI is almost 50% [2, 3]. AMI complicated with an out-of-hospital cardiac arrest is a severe life-threatening condition. Statistics show that the mortality

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rate in these patients is ten times higher than in patients who did not have a complication of an out-of-hospital cardiac arrest [4, 5, 6]. In most cases, out-of-hospital cardiac arrest is associated with AMI, and the cardiac arrest itself is caused by malignant rhythm disorder; ventricular tachycardia or ventricular fibrillation are the most common. Because of these critical cases, implementing clearly defined protocols and a good healthcare network is crucial in providing adequate advanced life support. [7].

**Material and Methods**

A retrospective study. Data that was used includes all out-of-hospital sudden cardiac arrests in the period from January 1, 2019, to December 31, 2021, in Canton Sarajevo that are associated with acute myocardial infarction in which there was the return of spontaneous circulation (ROSC). All patients from the abovementioned period were included in the study without exclusion criteria related to their age or gender. Data was extracted from the data registry of the Centre for Education of the Emergency Medical Center of Canton Sarajevo.

**Results**

Emergency medical teams on the territory of Canton Sarajevo in the period January 1, 2019, to December 31, 2021, had a total of 599 reanimations. Of that number, 95 were successful reanimations, which is 16%. (Diagram 1)

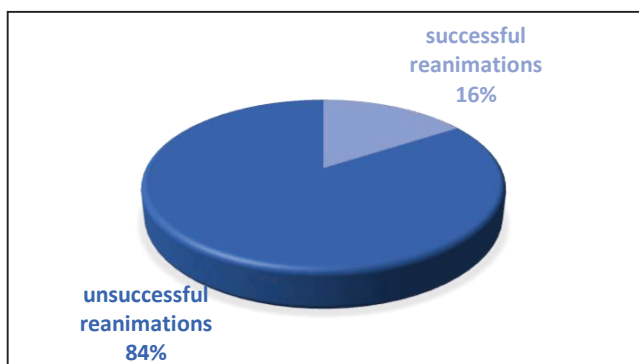


Diagram 1. Total number of reanimations in Canton Sarajevo in the period 2019-2021

From the total number of successful reanimations in 56 cases, sudden cardiac arrest was associated with acute myocardial infarction. That presents 59% of the total number of successful reanimations. (Diagr.2)

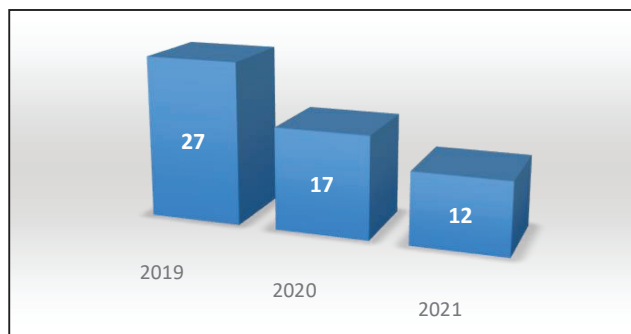


Diagram 2. Successful reanimations associated with AMI per year

Of the 56 successfully reanimated patients with a return of ROSC (return of spontaneous circulation) that had AMI in the background, 79% or 44 patients were male. Moreover, in 12 cases, the patient was female. (Diagram 3)

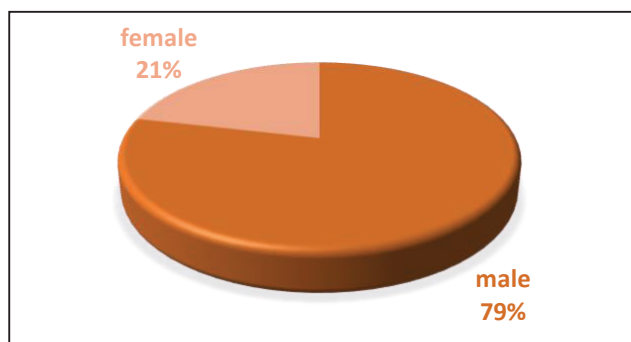


Diagram 3. Successful reanimations associated with AMI by gender

In Tables 1 and 2, successfully reanimated patients that had AMI in the background are shown by gender and age groups. We can see that in females, the age group 50-59 is most represented, with five patients. In males, the age group 60-69 is most represented, with 15 patients, which represents 35%. The age group 50-59 years is followed by 9 patients.

In 20 cases, it was a witnessed cardiac arrest; the emergency medical team was on site managing the patient with AMI when the patient went into cardiac arrest. All patients were treated according to the reanimation protocol and algorithms. (Diagram 4)

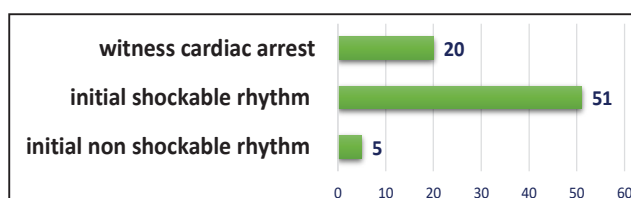


Diagram 4. Initial rhythm

In 51 cases, the first registered rhythm required defibrillation, and the protocol treated these patients for shockable rhythms. In 5 cases, the initial rhythm did not

Age Male	Jan.	Feb.	March	April	May	June	July	August	Sept.	Octo.	Nov.	Dec.
<19												
20-29												
30-39		1	1									
40-49	2				1	2	1					1
50-59	1		1	3	2			1		1		1
60-69	2	2	1	1	2	3	1	2	1			
70-79		1	1	1			2	2	1			
80-89												
Unkn.			1									
<b>Total 43</b>	<b>5</b>	<b>4</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>4</b>	<b>5</b>	<b>2</b>	<b>1</b>	<b>-</b>	<b>2</b>

Table 1. Male patients by age groups

Age Female	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oktober.	Nov.	Dec.
<19												
20-29												
30-39												1
40-49				1								
50-59		1		1			1					2
60-69							1				1	
70-79		2							1			
80-89												
Unkn.												
<b>Total 12</b>	<b>-</b>	<b>3</b>	<b>-</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>-</b>	<b>1</b>	<b>-</b>	<b>1</b>	<b>3</b>

Table 2. Female patients by age groups

require defibrillation, and the protocol treated these patients for non-shockable rhythms. In 19 cases, the patient was endotracheal intubated, and in 9 cases, a transport respirator was used. (Diagram 5)

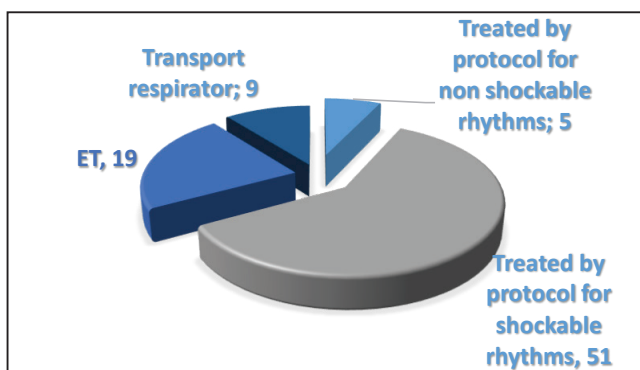


Diagram 5. Treatment of patients with an out-of-hospital cardiac arrest

In most cases, for 38 patients, the medical team could not get information for past medical history; 6 patients had HTA, 5 had DM, and 7 patients had a previous cardiovascular incident. (Diagram 6)

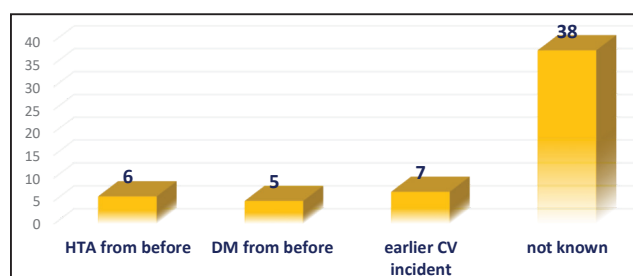


Diagram 6. Previous medical conditions

### Discussion

In the period from January 1, 2019, to December 31, 2021, emergency medical teams in Canton Sarajevo had a total number of successful reanimations in 56 cases; in 59% of the cases, sudden cardiac arrest was associated with acute myocardial infarction (AMI), as a complication of AMI. That presents a significantly higher number of out-of-hospital sudden cardiac arrests than earlier, where the data shows almost 50% of out-of-hospital sudden cardiac arrests were associated with AMI (7, 8).

From the total number, 79% of the patients were males, and 39% were in the age group 60-69 years. Of the female patients, 42% were in the age group 50-59 years. All patients are treated out-of-hospital by the protocols whether it was a case of an initial shockable rhythm (ventricular fibrillation and ventricular tachycardia without a pulse), patients were treated with momentary defibrillation, CPR was performed, IV access was established, Adrenalin was applied, Amiodarone and an open airway was also established. Alternatively, it was a case of an initial non-shockable rhythm (PEA-pulseless electrical activity or asystole). CPR was performed, IV access was established, Adrenalin was applied, and an open airway was established.

Of 20 patients, 39% it was a case of witnessed cardiac arrest, where it was determined that they had an acute myocardial infarction, were out of the hospital during treatment or transport, and went into sudden cardiac arrest.

In most cases, 68% of the medical team could not obtain information about past medical history. For those patients for whom they obtained information from the patient or the family, their past medical history included HTA, Diabetes mellitus, and a previous cardiovascular incident.

## Conclusion

Acute myocardial infarction still stays associated with a high level of mortality. It represents one of the leading public health problems, despite all advances in the field of diagnostics and treatment of patients with AMI that resulted in a significant reduction of mortality in time.

Sudden cardiac arrest caused by ventricular fibrillation or ventricular tachycardia that can arise as a complication of AMI still results in death in 25% to 50% of cases. That shows the significance of out-of-hospital treatment of patients with acute myocardial infarction.

One of the crucial steps for patients with AMI is out-of-hospital treatment, diagnostics, and transport to an appropriate medical facility. As a complication, a malignant rhythm disorder or cardiogenic shock can arise in these patients. Immediate recognition and treatment are needed.

It would help if you had a good emergency medical team that works in the out-of-hospital site, with good knowledge and adequate equipment. That is best explained by the case of 39% of witnessed cardiac arrest patients who were successfully reanimated. Patients with AMI who, during the exam or transport, went into cardiac arrest, and if they were not immediately treated, it would have resulted in their death. There is much work to be done in the prevention and availability of the health system for checkups and exams to be equally accessible to all in Bosnia and Herzegovina.

Also, regular training in CPR and advanced life support is needed for all medical personnel, especially those who work in emergency medical teams and hospital emergency centers. Acquiring good, adequate equipment and training in its use are also needed.

To provide better treatment for our patients, we as medical professionals must always aim to be better and

more trained to be the best. There is no higher award for us than when we save a patient's life.

**COI Statement:** This paper has yet to be submitted in parallel, presented fully or partially at a meeting, podium, or congress, published, or submitted for consideration beforehand.

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**Patient consent:** The patient's consent was obtained for the publication of the case.

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