

# Acute Myocardial Infarction in Argentina. CONAREC XVII Register

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## ABSTRACT

### Introduction

Acute myocardial infarction (AMI) is a major cause of morbidity and mortality in our country. It is very important to have data on the reality of this entity in Argentina as a starting point for the development of prevention policies and treatment improvement.

### Objective

The aim of the study was to describe demographic variables, situations associated to stress, established treatments, implementation times, in-hospital complications and medication at discharge of patients with AMI admitted to centers associated to the Argentine Council of Residents in Cardiology (CONAREC).

### Methods

Between December 2009 and July 2010, 1182 consecutive patients admitted to 45 centers across the country with a diagnosis of AMI with or without ST segment elevation were included in the study.

### Results

Mean age was  $64 \pm 12$  years; 705 patients presented ST-segment elevation myocardial infarction (STEMI) and 477 non-ST-segment elevation myocardial infarction (NSTEMI). In the STEMI group, reperfusion rate was 92% of eligible patients, with primary angioplasty in 80% of cases. In this group, prehospital time delay was 165 minutes and door-to-balloon time was 80 minutes. In the NSTEMI group, coronary angiography was performed in 75% of patients and 46% underwent angioplasty. The main complication was the development of heart failure (22% in the STEMI group and 11% in the NSTEMI group), followed by bleeding and arrhythmias. Mortality was 8.8% in the STEMI group and 5.1% in the NSTEMI group.

### Conclusions

Patients with AMI admitted to centers with medical residency present a high rate of reperfusion and treatment at hospital discharge, in agreement with international recommendations. Aspects to be improved are the high prevalence of risk factors and prolonged prehospital time delays, situations which have not changed in the last 15 years.

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## Key words

> Myocardial infarction - Myocardial reperfusion - Coronary artery disease

## Abbreviations

> AMI	Acute myocardial infarction	Ht	Hematocrit
AV	Atrioventricular	KK	Killip and Kimball
CK-MB	Creatine kinase MB fraction	MRI	Magnetic resonance imaging
CRF	Chronic renal failure	NSTEMI	Non-ST-segment elevation acute myocardial infarction
CT	Computed tomography	STEMI	ST-segment elevation acute myocardial infarction
ECG	Electrocardiogram		
Hb	Hemoglobin		

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## INTRODUCTION

Cardiovascular disease is the leading cause of morbidity and mortality worldwide. In our country the estimated mortality rate is 227.4 per 100000 inhabitants, representing 30% of overall mortality. Most alarming is that these figures have not declined during recent years. (1)

Within this group of diseases, acute myocardial infarction (AMI) is one of the most important entities. Its incidence is estimated at 9 patients per 10000 inhabitants per year, which represents approximately 40000 events annually. (2)

Over the years, there has been great progress in the knowledge of AMI, thus helping to modify diagnosis, prevention and treatment concepts. (3) However, most data have been obtained from study populations far from the "real world". This limitation is solved with the registers as they allow seeing the pathology in its "real" condition, making it possible to find errors, weaknesses and applicability of evidence-based procedures.

The Argentine Council of Residents in Cardiology (CONAREC) has conducted surveys on acute coronary syndrome with different approaches since 1992. (4-7) The last ones took place seven years ago, (7) and due to the changes which occurred in the field of Cardiology during that period we assumed a new survey was needed to provide valuable updated information on the knowledge, treatment and in-hospital outcome of patients with AMI.

## METHODS

A prospective register was performed with data collected from hospitalized patients consecutively admitted between December 2009 and July 2010. Centers with cardiology residency associated to CONAREC from all over the country participated in the study. As patients were admitted to the different institutions, data were recorded filling an Access form uploaded from the official CONAREC page in internet ([www.conarec.org](http://www.conarec.org)).

Patients > 18 years admitted with presumptive diagnosis of AMI with or without ST-segment elevation considered as primary thrombotic event (type I or III according to the new AMI definition) (8) were included in the study. Both AMI conditions required elevated myocardial injury markers (preferably troponin) with at least one of the following signs of ischemia: symptoms, electrocardiographic (ECG) changes (ST-T or left bundle branch block, occurrence of new Q waves or motility disorders in the echocardiogram. Demographic data, educational level, stressful situations associated with the event, cardiovascular risk factors, comorbidities, patient symptoms, hemodynamic condition at admission, applied treatments, times in which they were implemented, in-hospital complications and discharge medications were collected.

### Statistical Analysis

Submitted data were incorporated into an Excel database and analyzed using Statistix 8.0 software package. Continuous variables were expressed as mean and standard deviation or median and interquartile range, as appropriate, and were analyzed using the Kruskal Wallis method. Categorical variables were expressed as percentages and were analyzed with the chi-square test adjusted with Fisher's test. A two-tailed p value < 0.05 was considered as statistically significant.

## DEFINITIONS

### Risk factors

- Dyslipidemia: total cholesterol levels > 200 mg/dL, triglycerides > 150 mg/dL, treated with hypolipidemic drugs or self-reported.
- Diabetes: fasting blood glucose > 126 mg/dL, oral glucose tolerance test > 200 mg/dL at 2 hours or at random blood glucose > 200 mg/dL prior to the event. Patients treated with hypoglycemic drugs or insulin or self-reported.
- Smoking: Routine or occasional smoking within the year prior to the event.
- Ex-smoker: at least one years of tobacco abstinence.
- Hypertension: self-reported arterial pressure  $\geq$  140/90 mm Hg [130/80 mmHg in basal conditions of diabetic and chronic renal failure (CRF) patients], or patients under antihypertensive treatment.
- Gout: patients with at least one acute episode of gout.
- Sedentarism: self-reported lack of regular physical activity.

### Stressful situations

Patients were asked about daily life situations generating distress and/or excessive anxiety, within 3 months prior to the analyzed event. Stressful situations comprised: death of a loved one, employment instability, family conflicts, divorce, violent situations and surgeries.

### Complications

- Post-AMI angina: angina 24 hours after and within 30 days post-infarction in the case of AMI with ST-segment elevation.
  - Re-AMI: 24 hours after the event and within the next 7 days, angina lasting > 20 minutes and/or new or recurrent ECG changes (elevated ST or depressed ST-segment > 1 mm in two or more contiguous leads) and CK-MB  $\times$  2 or 50% increase from previous value .
- TIMI (Thrombosis in Myocardial Infarction) bleeding:
1. Major: hemoglobin (Hb) decrease > 5 g/dL or hematocrit (Ht) decrease > 15% or fatal hemorrhage, or cardiac tamponade, or brain hemorrhage confirmed by computed tomography (CT) or magnetic resonance imaging (MRI).
  2. Minor: Hb decrease > 3 mg/dL and  $\leq$  5 mg/dL or Ht decrease > 10% with known bleeding site, hematuria, hematemesis, hemoptysis or absence of bleeding with Hb decrease > 4 g/dL or Ht reduction > 12%.
- Stroke: new neurologic focus of more than 24 hour duration and/or TC or MRI compatible image.
  - Sustained ventricular tachycardia: regular tachycardia with QRS > 120 ms compatible with ventricular tachycardia according to Brugada criteria, lasting more than 30 s or with hemodynamic decompensation.

## RESULTS

A total of 1182 patients from 45 centers throughout the country (40% from the Autonomous City of Buenos Aires, 60% from the rest of the country) were included in the study. Among these patients, 705 presented ST-segment elevation myocardial infarction (STEMI) and 477 non-ST-segment elevation myocardial infarction (NSTEMI) (Appendix).

Table 1 shows population characteristics divided according to the type of acute coronary syndrome. Mean age was  $64 \pm 12$  years, with a majority of male patients (77%). Hypertension and smoking were the

most prevalent risk factors and only 3% of patients presented no risk factor. Fifty six percent of patients referred dyslipidemia and only 29% were already receiving statins.

Fifty eight percent of patients had no history of cardiovascular diseases; however, 22% were under antiplatelet treatment. Forty-two percent had history of cardiovascular disease and only 65% received antiplatelet treatment. Patients with NSTEMI presented greater history of coronary and/or cerebrovascular events ( $p < 0.001$ ) than patients with STEMI.

A stressful life situation was identified as trigger of myocardial infarction in 28% of patients. The most stressful situation was employment instability with more than 40% of cases, followed by family situations and/or divorce (32%) and death of a loved one (14.5%) (Table 2).

The most frequent presentation was precordial oppression (76%) followed by vagal symptoms (31%) and pain in the upper limbs (22%), without differences between the type of AMI or genders.

#### STEMI: delays, treatment and outcome

Among STEMI patients, 74% of cases presented Killip and Kimball classification (KK) A, 16% KK B, 4% KK C and 6% KK D.

The ECG showed ST-segment elevation in 99% of patients, which was more frequent in the anterior wall (49%) followed by the inferior (29%), inferodorsolateral (16%), right ventricular (2%) and lateral (4%)

territories. One percent of patients without ST-segment elevation presented complete left bundle branch block or pacemaker.

Median prehospital delay was 165 minutes (69-360) with patient unawareness that symptoms corresponded to infarction as the main cause for this delay (68%). Regarding gender, men experienced a delay of 155 minutes (60-340) and women 180 (90-360) ( $p = ns$ ).

Door-to-balloon time was 80 minutes (56-130) with 42% of patients above 90 minutes, while door-to-needle time was 40 minutes (30-60). When patients were divided according to the presence of the interventional cardiologist in the center at the moment of patient arrival, door-to-balloon time was 65 minutes (45-120) when the physician was in the center and 100 minutes (65-150) when he/she was not present ( $p < 0.01$ ).

Seventy four percent of patients underwent reperfusion therapy, representing 92% of eligible patients, since 18% that did not receive emergency reperfusion had evolving myocardial infarction or with normal ST-segment after the first measures adopted. Only 8% of patients with emergency reperfusion criteria did not receive it.

Among patients treated with reperfusion therapy, 80% underwent primary angioplasty and the remaining 20% received thrombolytics (Figure 1), mainly streptokinase (85%).

In patients with emergency coronary angiography, 93% received primary angioplasty, 50% had one-vessel

Table 1. Population characteristics

Variable	Overall (n = 1.182) n (%)	STEMI (n = 705) n (%)	NSTEMI (n = 477) n (%)	p
Age, years (mean $\pm$ SD)	64 $\pm$ 12	62 $\pm$ 12	65 $\pm$ 12.5	0.4
Male	910 (77.2)	552 (78.4)	357 (75)	0.35
Educational level:				
- None	109 (9.3)	-	-	
- Complete primary level	375 (31.7)	-	-	
- Complete secondary level	512 (43.3)	-	-	
- Complete university level	186 (15.7)	-	-	
Smoking	755 (63.9)	467 (66.3)	288 (60.4)	0.09
Dyslipidemia	658 (55.7)	364 (51.7)	292 (61.4)	0.3
Diabetes	267 (22.6)	155 (22.1)	111 (23.3)	0.001
Hypertension	808 (68.4)	449 (63.8)	357 (75)	0.3
Gout	26 (2.2)	12 (1.7)	14 (3)	0.4
Sedentarism	596 (50.5)	362 (51.4)	234 (49.2)	0.06
Heredofamilial	210 (17.8)	135 (19.2)	71 (15)	0.04
Chronic angina	109 (9.3)	53 (7.6)	55 (11.7)	0.02
Unstable angina	169 (14.3)	94 (13.4)	74 (15.6)	0.33
Previous AMI	224 (19)	94 (13.4)	127 (26.8)	0.001
Stroke	42 (3.6)	19 (2.8)	22 (4.7)	0.10
MRS	56 (4.8)	17 (2.5)	39 (8.2)	0.001
Coronary angioplasty	146 (12.4)	65 (9.3)	80 (16.9)	0.001
Previous hemorrhage	28 (2.44)	18 (2.6)	11 (2.4)	0.34

STEMI: ST-segment elevation myocardial infarction. NSTEMI: Non-ST-segment elevation myocardial infarction. SD: Standard deviation. AMI: Acute myocardial infarction. MRS: Myocardial revascularization surgery.

Table 2. Stressful situations

Triggering situations	n = 1145 n (%)
Not reported	849 (71.8)
Unable to answer*	37 (3)
Reported	332 (28)
Death of a loved one	48 (14.5)
Family/divorce	106 (32)
Employment instability	139 (41.8)
Surgery	14 (4.2)
Violent situations	25 (7.5)

\* Patients in cardiogenic shock, impaired consciousness.

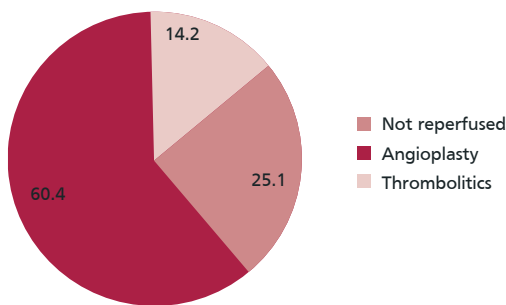


Fig. 1. Acute myocardial infarction with ST-segment elevation. Reperfusion therapy.

disease, 43% 2-vessel disease, 7% left main coronary artery disease and 1.5% (7 patients) no significant lesions.

Twenty-three patients (4%) required myocardial revascularization surgery, 2 (9%) in emergency and 21 (91%) during hospitalization.

Dual antiplatelet therapy was used in 94% of cases, aspirin-clopidogrel association in 88%, aspirin-prasugrel in 5% and IIb/IIIa antagonists in 8% (Table 3).

Seventy-three patients (10.4%) required mechanical respiratory assistance, 28 patients (4%) intra-aortic balloon pump, 64 patients (9.1%) use of Swan-Ganz catheter, 14 patients (2%) urgent hemodialysis and 34 patients (4.8%) transitory pacemaker. Main in-hospital complications were heart failure (22%), TIMI major and minor bleeding (9.3%), ventricular tachycardia (8%), post-infarction angina (6.3%), atrial fibrillation (5%), myocardial reinfarction (2.4%) and mechanical complications (2%).

Median hospital stay was 6 days (4-7) with 13% of patients exceeding 7 days of hospitalization. In-hospital infections were the main cause for this delay (44%).

Mortality was 8.8%, with heart failure as the main cause with 52% of the cases, followed by arrhythmias (34%), infections (9%) and mechanical complications (5%). Elderly patients had significantly higher mortality (18.2% in patients > 70 years vs. 5.7% in patients with ages between 69-50 years;  $p < 0.00001$ , and 0% in patients < 50 years), while there were no significant differences for gender (7.9% in men vs. 9.4% in women;  $p = ns$ ).

Medications prescribed at discharge were: statins (93%), aspirin (92%), angiotensin-converting-enzyme inhibitors/angiotensin II receptor blockers (ACEI/ARB) (82%), beta blockers (89%) and clopidogrel (73%) (Table 4).

#### NSTEMI: treatment and outcome

Eighty-six percent of patients were in KK A, 9% in KK B, 3% in KK C and 2% in KK D. The ECG showed ST-segment depression as the most prevalent evidence of myocardial injury in 37% of patients, followed by subepicardial ischemia (changes in the T wave) in 30%, complete left bundle branch block in 2%, and no ischemic changes in 31% of patients.

Prehospital delay was 195 minutes (93-540), with patient unawareness as the main cause for the delay (76%).

Upon admission, 98% of patients received aspirin, 82% clopidogrel, 75% heparin (52% low molecular weight heparin and 48% sodium heparin), 8% fondaparinux and 2% IIb/IIIa antagonists (see Table 3).

Seventy-five percent of patients underwent coronary angiography during hospitalization, revealing one-vessel disease in 30%, 2-vessel and 3-vessel disease in 58% and left main coronary artery disease in the remaining 12%. Myocardial revascularization was performed in 45% of patients (77% received angioplasty and 23% myocardial revascularization surgery).

During hospital evolution, 11% of patients presented with heart failure, 9% TIMI bleeding (66% major bleeding), 6% atrial fibrillation, 5% infections and 2% reinfarction, ventricular tachycardia and grade 2-3 AV block. Median hospital stay was 5 days (4-8); with 17% of patients exceeding 7 days of hospitalization mainly due to delay while awaiting coronary surgery.

Mortality was 5.1%, with arrhythmias as the main cause in 39% of cases, followed by heart failure (33%), infections (15%) and mechanical complications (13%).

At discharge, prescription of aspirin, statins and betablockers was greater than 90% (95%, 94% and 90%, respectively), that of ACEI/ARB was 79% and that of clopidogrel 64% (Table 4).

#### DISCUSSION

The registers provide detailed information about the prevalence, management and outcome of a disease in a given region, which often differs from that reported in research studies. With reference to AMI, different surveys have been made to help understand the changes over time, reporting on the reality of our clinical practice and allowing its improvement. However, the most important limitation is that they do not include all the country's health institutions that treat patients with AMI. They are generated from nonprofit scientific societies, people or health institutions interested in epidemiological research that incorporate centers in an absolutely voluntary manner. (9) The Argentine cardiologists have a pending task: to generate a real "national" register including all the centers throughout the country.

The XVII CONAREC register is not exempt from this bias, as it was conducted by cardiology residents in high complexity centers, where 89% had cardiovascular surgery and hemodynamic facilities. Moreover, the study population presented a high educational

**Table 3.** Medications at hospital admission

Medication	STEMI (n =705) n (%)	NSTEMI (n = 477) n (%)
Aspirin	688 (97.7)	467 (97.9)
Clopidogrel	625 (88.7)	390 (81.8)
300 mg	265 (42.4)	203 (52.1)
600 mg	275 (44)	64 (16.6)
75 mg	71 (11.5)	117 (30.2)
“CURRENT” strategy	11 (1.9)	6 (1.5)
Prasugrel	35 (5.1)	8 (1.8)
Heparin	430 (61.1)	398 (83.5)
- Sodium	260 (60.5)	171 (43.2)
- Low molecular weight	158 (36.8)	190 (47.9)
- Fondaparinux	11 (2.7)	35 (8.8)
Anti-IIb/IIIa	55 (7.9)	11 (2.4)
Nitroglycerine	463 (65.8)	323 (67.8)
Diuretics	137 (19.5)	69 (14.6)
ACEI/ARB	308 (43.8)	261 (54.8)
Betablockers	381 (54.1)	374 (78.4)
Inotropics	79 (11.3)	12 (2.6)

STEMI: ST-segment elevation myocardial infarction. NSTEMI: Non-ST-segment elevation myocardial infarction. ACEI: angiotensin converting enzyme inhibitors. ARB: angiotensin II receptor blockers. CURRENT: Antiplatelet strategy, 600-mg clopidogrel loading dose, then 150 mg daily for the next 7 days, followed by 75 mg daily.

level, a fundamental point to interpret the results. On the other hand, the registers have more credibility and significance when there is continuity in data collection and auditing, something we were not able to achieve due to the simple fact of lack of sufficient financial resources. However, it is still a contribution to the knowledge of AMI in our country, with a significant number of enrolled patients and with data not previously evaluated.

The population baseline characteristics, such as age, sex and risk factors have not changed compared to previous registers. Most striking is that modifiable risk factors such as hypertension and smoking are still the most prevalent, a fact that in more than 20 years we have not managed to reduce. (10) Obviously, a population strategy to raise awareness about cardiovascular prevention, similar to that implemented in other pathologies, as in breast cancer prevention, is necessary.

For the first time in a national register with these characteristics, psychosocial factors were included and it was found that one in four patients reported experiencing a situation of extreme distress or anxiety within 3 months prior to the event, which in many cases can be considered as probable trigger. Ever since 2004, the INTERHEART study (11) associated these factors to the occurrence of myocardial infarction (odds ratio [OR] 2.67), even over diabetes (OR 2.37) and hypertension (OR 1.91). These are the first data in our country of psychosocial factors in the context of coronary events and they should be considered in future analyses.

Prehospital delay is one of the determining factors in the outcome of patients with AMI. The time of 2.7 hours (1.1-6) for STEMI and 3.2 hours (1.5-9)

for NSTEMI in our registers are similar to those reported by Japan, the United States or England. (12, 13) In Argentina, the latest survey of the Argentine Society of Cardiology shows a median time of 4 hours (2-11), (9) while in the CONAREC II register (1992) prehospital delay was similar to that of the present registration. (4) The main causes of delay were patient unawareness that symptoms corresponded to a heart attack and the emergency transportation system to the hospital, similar to those found in the rest of the world. (12-14) However, unlike other countries that have managed to reduce this time by educating the public and reorganizing the emergency system, (15, 16) this has not occurred in our country.

With regard to in-hospital delay, the door-to-balloon time in the present register was similar to that described in the American register (2007) with a mean time of 79 minutes (17, 18). Forty percent of patients were outside the 90 minutes recommended in good clinical practice guidelines, (19) and one reason for this delay was the interventional cardiologist's absence at the time of patient admission. (20)

The rate of reperfusion was similar to that of developed countries, as shown in the United States ACTION register (21) (78%), and higher than that found in the latest SAC 2005 survey (9) (53%) or ACCESS register (22) that included developing countries, where the rate of reperfusion was very low (40%).

Four out of five patients underwent primary angioplasty as reperfusion method. This high rate of mechanical reperfusion reflects the high level of complexity of the participating centers and the constant growth experienced by primary angioplasty in the last 20 years, both nationally and internationally.

With regards to in-hospital outcome, patients with

**Table 4.** Medications at hospital discharge

Medication	STEMI (n = 705) n (%)	NSTEMI (n = 477) n (%)
Aspirin	651 (92.4)	453 (95)
ACEI/ARB	580 (82.4)	376 (78.9)
Betablockers	626 (88.9)	433 (90.9)
Statins	652 (92.6)	450 (94.4)
Clopidogrel	515 (73.1)	305 (64.1)
Prasugrel	34 (4.9)	7 (1.5)
Calcium channel blockers	14 (1.99)	33 (7)
Spirolactone	74 (10.5)	30 (6.3)
Furosemide	60 (8.6)	48 (10.1)

STEMI: ST-segment elevation myocardial infarction. NSTEMI: Non-ST-segment elevation myocardial infarction. ACEI: angiotensin converting enzyme inhibitors. ARB: angiotensin II receptor blockers.

STEMI had heart failure rate similar to that found in the GRACE register (23) (25%) and higher than that in the ACTION register (21) (6.8%), which can be explained by differences in their definition. There are discrepancies regarding postinfarction angina rates of 6.3% in our register, versus 11.3% in the SAC 2005 survey (9) and 29% in the GRACE register, (23) which could be related to the existing differences in the rates of mechanical reperfusion therapy (60% vs. 58% and 40%, respectively) and to the increased use of dual antiplatelet therapy in our register (94% vs. 55.3% and 37%). However, this benefit was not reflected in myocardial reinfarction, probably because the pathophysiological mechanisms involved in each of these situations are different.

Mortality rate of 8.8% in STEMI seems lower than that shown in the last SAC survey (9) (14.1% of all patients, 12.6% of eligible patients), probably associated to the higher rate of reperfusion and lower prehospital delay. However, it seems higher than the mortality reported by American centers (6%), which had slightly increased reperfusion rates and more aggressive intravenous antiplatelet therapy, without disregarding that the number of patients in that register was significantly higher. (21)

It is noteworthy that nosocomial infections were the third leading cause of death in this group of patients and the major cause of discharge delay, surpassing mechanical complications. This disturbing fact was not reported in previous registers and it probably reflects the care undertaken by the health team with patients presenting a complicated infarction requiring prolonged hospitalizations.

In NSTEMI, treatment did not differ from that of developed countries in terms of percutaneous intervention or oral antiplatelet therapy rates, but with a significantly lower use of IIb/IIIa (almost 40% in the United States data) and bivalirudin (10%), without significant differences in mortality. The death rate in this group of patients was 5.1%, with almost 70% due to arrhythmias and heart failure, and remarkably, infections ranked in the third place.

Our register showed an acceptable level of medications prescribed at hospital discharge, which is currently used as indicator of care in patients with infarction, (24) with a high rate of use of double antiplatelet

scheme, beta blockers and statins, according to current recommendations. (25)

## CONCLUSION

Centers with residency associated with CONAREC appear to provide adequate treatment of AMI, with a high rate of reperfusion and recommended treatment at hospital discharge. Delay times are still far from the ideal, partially associated to population unawareness, which may be modified with educational and political measures, as those implemented in other countries. (16)

The XVII CONAREC register is an important contribution to Argentine cardiology, since it shows an elemental part of AMI care reality, as are the centers with residency. Despite the good results obtained in high complexity centers, there remain aspects to improve, especially with regards to control of risk factors, population education and emergency system organization to reduce time-to-treatment.

## RESUMEN

### Infarto agudo de miocardio en la República Argentina. Registro CONAREC XVII

#### Introducción

El infarto agudo de miocardio (IAM) representa una de las principales causas de morbimortalidad en nuestro país. Tener datos sobre la realidad de esta entidad en la Argentina es de suma importancia como punto de partida para el desarrollo de políticas de prevención, así como para mejorar su tratamiento.

#### Objetivo

Describir variables demográficas, situaciones de estrés asociadas, tratamientos instaurados, tiempos en los que se implementaron, complicaciones intrahospitalarias y medicación al alta de pacientes ingresados con IAM en centros asociados al Consejo Argentino de Residentes de Cardiología (CONAREC).

#### Material y métodos

Entre diciembre de 2009 y julio de 2010 se incluyeron 1.182 pacientes consecutivos ingresados en 45 centros de todo el país con diagnóstico de IAM con o sin supradesnivel del segmento ST.

## Resultados

La edad promedio fue de  $64 \pm 12$  años; 705 pacientes presentaron IAM con supradesnivel del segmento ST (IAMCEST) y 477 IAM sin supradesnivel del segmento ST (IAMSEST). En el IAMCEST, la tasa de reperfusión fue del 92% de los pacientes elegibles, con la angioplastia como principal método (80%), con una demora prehospitalaria de 165 minutos y un tiempo puerta-balón de 80 minutos. En el IAMSEST se realizó coronariografía al 75% de los pacientes, con angioplastia al 46% de ellos. La principal complicación fue el desarrollo de insuficiencia cardíaca (22% en IAMCEST y 11% en IAMSEST), seguida por el sangrado y las arritmias. La mortalidad resultó del 8,8% en los IAMCEST y del 5,1% en los IAMSEST.

## Conclusiones

Los pacientes con IAM que ingresan en centros con residencia médica presentan una tasa alta de reperfusión y tratamiento al egreso hospitalario, acorde a las recomendaciones internacionales. Encontramos aspectos para mejorar, como la elevada prevalencia de los factores de riesgo y los tiempos prehospitalarios prolongados, situaciones que no se han modificado en los últimos 15 años.

**Palabras clave** > Infarto del miocardio - Reperfusión miocárdica - Enfermedad coronaria

## Conflicts of interest

None declared.

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**APPENDIX. Geographical site of participating centers**

City/province	n (%)
Autonomous city of Buenos Aires	18 (40)
Córdoba	6 (13.5)
Buenos Aires	5 (11.3)
Santa Fe	4 (8.4)
Mendoza	2 (4.4)
Corrientes	2 (4.4)
Salta	2 (4.4)
Tucumán	1 (2.2)
Neuquén	1 (2.2)
Río Negro	1 (2.2)
La Rioja	1 (2.2)
Jujuy	1 (2.2)
Entre Ríos	1 (2.2)

**Register Participants.**

PROVINCE	CITY	POSITION	CENTER	RESEARCHERS
Buenos Aires	Capital Federal	General Coordinator	Sanatorio Trinidad Mitre	Ricardo Iglesias
		Director	Sanatorio Trinidad Mitre	Gonzalo Pérez
		Subdirector	ICBA	Juan Pablo Costabel
		Subdirector	Hospital Italiano Buenos Aires	Nicolás González
		Assessment committee	Fundación Favalaro	Juan Manuel Filipuzzi
		Assessment committee	Fundación Favalaro	Juan Alberto Moukarzel
		Assessment committee	Fundación Favalaro	Mariano Pipkin
		Assessment committee	Fundación Favalaro	Facundo Verón
		Assessment committee	Hospital Británico	Miguel Schiavone
		Assessment committee	Hospital Británico	Christian Smith
		Assessment committee	Hospital Churruca	Lucrecia Secco
		Assessment committee	Hospital Churruca	Silvana Mettini
		Assessment committee	Hospital Naval	Marcos Sobre
		Assessment committee	Sanatorio Güemes	Ariel Sosa
		Buenos Aires	GCBA	Researcher
Researcher				Fernando Soler
Researcher	Clínica Modelo de Quilmes			María Victoria Conosciuto
Mar del Plata	Researcher		H.I.G.A. Dr. Oscar Alende	Maribel Córdova
	Researcher			Sebastián Paz
	Researcher			Nicolás Esteybar
	Researcher		Hospital Posadas	Andrea Liffourrena
Capital Federal	Researcher		Malvinas Argentinas	Andrés D'Amico
	Researcher		Clínica Bazterrica	Aldo Carrizo
	Researcher			Federico Cruz
	Researcher		Clínica Santa Isabel	Martín Grimau
	Researcher		Denton Cooley	Verónica Lizbona
	Researcher		FLENI	Mariana Carnevalini
	Researcher		Hospital Alemán	Jimena Gambarte
	Researcher		Hospital Argerich	Ezequiel Zaidel
	Researcher	Hospital César Milstein	María Florencia Cerda	
	Researcher		Pablo Elissamburu	
	Researcher	Hospital Churruca Visca	Gisela Cirone	
	Researcher		Mariano Morales	
Researcher		Germán Urricelqui		



PROVINCE	CITY	POSITION	CENTER	RESEARCHERS
		Researcher	Hospital Durand	Hernán Pérez Núñez
		Researcher	Hospital Fernández	Pablo Miguelez
		Researcher	Hospital Italiano	María Gabriela Matta
		Researcher	Hospital Naval	Nadia Jorge
		Researcher	Hospital Santojanni	Alicia Terragno
		Researcher	ICBA	Andrea Corrales Barboza
		Researcher		Pablo Dono
		Researcher		Gustavo Pedernera
		Researcher	Instituto Sacre Coeur	Federico Piancola
		Researcher	Sanatorio Güemes	Arturo González
		Researcher		Efraín Herrero
		Researcher	Sanatorio Méndez	Cristian Drunday
		Researcher	Sanatorio Otamendi-Miroli	Daniel Quattropiani
		Researcher	Sanatorio Trinidad Mitre	Matías Failo
		Researcher		Andrés Rosende
Córdoba		Researcher	Clínica Reina Fabiola	Guido Muelle Vizcarra
		Researcher	Clínica Privada Vélez Sarsfield	Federico Baldiviezo
		Researcher		Lucas Corradi
		Researcher		Santiago Trejo
		Researcher	Clínica Sucre	Francisco Canllo
		Researcher	Hospital Córdoba	Juan Jordan Clementi
		Researcher	Hospital Privado	Adolfo Ferrero Guadagnoli
		Researcher		Gustavo Parisi
		Researcher	Instituto Modelo de Cardiología	Julián Olmedo
		Researcher	Sanatorio Mayo	Celeste Sánchez Ominetti
Corrientes		Researcher	Hospital Escuela - Corrientes	José Francisco Albisu
		Researcher	Instituto Juana Cabral	Omar Darío Álvarez
		Researcher		Fernando Echeverría
		Researcher		Juan Manuel Lange
Entre Ríos	Paraná	Researcher	Hospital San Martín	Daniel Jáuregui
Jujuy		Researcher	Nuestra Sra. del Rosario	Guillermina Eleit
La Rioja		Researcher	INCOR	Javier Hugo Díaz
		Researcher		Cinthia Páez
Mendoza		Researcher	Hospital Español	Natalia Nella
		Researcher	Hospital Italiano de Mendoza	Liliana Rodríguez
Neuquén		Researcher	Hospital Castro Rendón	Marianela Gutiérrez
Río Negro	Cipolletti	Researcher	Fundación Médica de RN y NQN	Pablo García
Salta		Researcher	Cordis	Guillermo Von Leipzig
		Researcher	Hospital San Bernardo	Oswaldo Ruiz
		Researcher		Pablo Torres
Santa Fe		Researcher	Clínica de Nefrología	Emilio Alagibe
		Researcher	Clínica de Nefrología	Agustín Picolini
		Researcher	Sanatorio Diagnóstico	Daniel Croce
		Researcher	Sanatorio Diagnóstico	Matías Esquivel
	Rosario	Researcher	Sanatorio Plaza - Rosario	Mariela Borrachetti
		Researcher	Sanatorio San Gerónimo	Agustín Fernández
Tucumán		Researcher	Instituto de Cardiología	Daniel Fernández
		Researcher	ITEC	Mario Burgos