ISSN 001-6012
Rev. Acta Médica Costarricense
Edited by: Colegio de Médicos y Cirujanos de Costa Rica
2021 / april-june; 63 (2): 1-6

Original

Clinical and angiographic profile of women with acute myocardial infarction in a national hospital

Andrés Acuña-Román, Manuel Antonio Vindas-Villarreal, Donato A. Salas-Segura

Traducción artículo original: Acuña-Román R, Vindas-Villarreal M, Salas-Segura D. Perfil clínico y angiográfico de las mujeres con infarto agudo al miocardio en un hospital nacional. Acta méd. costarric. 2021;63:97-103. DOI: 10.51481/amc.v63i2.1186

Abstract

Aim: Ischemic heart disease is the main cause of death of women in Costa Rica, and its incidence has increased over the years. Despite this, there are few clinical studies in this respect in our country.

The aim of this paper is to present the main clinical and angiographic characteristics of a group of patients with acute myocardial infarction to establish not only their particularities but also to allow comparisons with other populations.

Methods: An observational, descriptive, and retrospective study was carried out over a period of five years, in which patients admitted with myocardial infarction to the Intensive Care Unit were included.

Demographic data, clinical evolution, complications, angiographic findings, treatment, and outcome were recorded.

Statistical analysis was quantitative and descriptive, performed with SPSS v.21 software (IBM Corp., USA), and consisted of calculations of frequency, central tendency, measures of variability, percentiles, and chi-square.

The Ethical Committee of the Hospital Rafael Angel Calderon Guardia approved the research protocol (DG-3380-2020).

Results: A total of 54 out of 190 patients were included. The average age was 60 years, with a mortality rate of 17.9%, which was 5.4% higher than in men.

Most of the patients suffered from arterial hypertension (74%), 24 (44.5%) were smokers and 23 (42.5%) had diabetes mellitus.

The most frequent symptoms were chest pain, cryodiaphoresis, and dyspnea. It was considered that there was atypical chest pain in 8 cases (15%).

Forty-eight patients were taken for coronary angioplasty and only 35% received it in time. Pharmacological thrombolysis was applied to 17 patients, and it was successful in only 3 patients.

The right coronary artery and the anterior descending artery were the vessels responsible in most cases (19 cases (39.5%) each).

Conclusion: This population had clear ischemic symptoms, with severe coronary disease and higher mortality than men. In general, pharmacological as well as mechanical therapy was applied late.

Keywords: Myocardial infarction, women, coronary angiography, angioplasty, streptokinase.

Received Date: *January 13, 2021* ***Approved Date:*** *August 09, 2021*

Authors' affiliation: Hospital San Rafael de Alajuela, Servicio de Cardiología, Hospital Rafael Ángel Calderón Guardia, Unidad de Cuidados Intensivos, Hospital Rafael Ángel Calderón Guardia, San José. Costa Rica

Abbreviations:
AMI: Acute myocardial infarction.
ICU: Intensive Care Unit

Sources of support: No sources to declare.
Conflicts of interest: There are no conflicts of interest to declare.

✉ dasscom@gmail.com

Ischemic heart disease is the leading cause of death in women in Costa Rica and in the so-called western world. Although mortality has gradually decreased in recent years, its incidence tends to increase,[1-3] among other reasons due to the aging of the population, the decrease in infectious-contagious diseases, the increase in sedentary lifestyles, and chronic nondegenerative diseases such as arterial hypertension and diabetes mellitus.

Ischemic heart disease behaves differently in women than in men. In women, symptoms tend to be different in intensity and location and sometimes more subtle; the rate of obstructive lesions in the coronary vessels is lower and there is greater morbidity and less recovery after infarction.[4-6]

The present study shows the main epidemiological and health characteristics of patients admitted with acute myocardial infarction (AMI), from a sample of patients obtained over 5 years. Its objective is to provide a demographic and clinical description (including evolution and outcome) of this population that can also be compared with similar data from their male counterparts in subsequent studies or with what has already been recorded.[2,5]

To the best of our knowledge, this is the first investigation of its kind in Costa Rica.

Method

This was an observational, descriptive, retrospective study, covering a total period of 5 years (2011 to 2015), in which all patients with the diagnosis of AMI admitted during that time period were selected from the Intensive Care Unit (ICU) database. The database contains clinical and epidemiological information on the patients, including their evolution, complications, outcome, and procedures performed. The rest of the information required was obtained by consulting the patients' clinical records.

Of the 190 patients diagnosed with AMI during this five-year period, we were able to collect complete information on 54 of them.

The information collected included demographic data, personal pathological history, symptoms, and signs of infarction, electrocardiographic, echocardiographic, and coronary angiographic findings, hospital stay, and mortality.

The statistical analysis was quantitative and descriptive and was performed with the SPSS v.21 software (IBM Corp., USA) and consisted of calculating frequency values, central tendency (mean, mode and median), measures of variability of range, percentiles, and chi-square as the main inferential statistical test.

Results

Of the 190 patients with a diagnosis of AMI admitted to the hospital during the study period, 34 died before hospital discharge and were therefore excluded from the analysis, and of the remaining 56, it was only possible to recover complete clinical information for 54 of them, who were finally included in the study.

The average age of the patients was 60 years with a range from 30 to 87 years and a mortality of 17.9%. Table 1 summarizes the main characteristics of the population.

Table No. 1. General characteristics of the population of women with AMI, Intensive Care Unit, 2011-2015. n=54 patients

Average age and percentiles	60 years p25: 50,8 p50: 61,5 p75: 69,5
Personal pathological history	Arterial hypertension 40 (74%) Smoking 24 (44.5%) Diabetes mellitus 23 (42.5%) Dyslipidemia 20 (37%) Previous heart disease 13 (24%) Alcoholism 6 (11%) Illicit drugs 3 (5.5%) Cancer 2 (3.7%) None 8 (15%
Aerage hospital stay and percentiles	8.7 days p25: 5 p50: 6,5 p75: 10
Overall mortality percentage for both sexes	13,9 %
Mortality rate for women	17,9% (p: 0,07)
Mortality rate for men [(a)]	12,5%
Average age and percentiles	60 years p25: 50,8 p50: 61,5 p75: 69,5

(a): Data obtained from the ICU database in the same period.

Table 2 summarizes the main symptomatic manifestations and physical signs that were considered most relevant at the time of admission for the diagnosis of infarction in the case of patients already hospitalized for another cause. Chest pain was the most common symptom and was present in 89% of the patients likewise, half of the patients presented with arterial hypertension while 37% presented with hypotension (systolic arterial pressure < 90 mmHg) or circulatory collapse.

Table No. 2. Symptoms and clinical signs of presenting infarction, 2011-2015. n=54 patients

Chest pain	48 (89%)	Hypertensive emergency	28 (52%)
Cryodiaphoresis	26 (48%)	Tachycardia	14 (26%)
Dyspnea	21 (39%)	Hypotension	11 (20.4%)
Atypical pain	8 (15%)	Circulatory collapse	9 (16,7%)
Palpitations	6 (11%)	Jugular ingurgitation	7 (13%)
Previous syncope	6 (11%)	Bradycardia	6 (11%)
Others	17 (31,5%)	Pulmonary crypts	1 (1,9%
No symptoms	1 (1,9%)		

Regarding electrocardiographic findings, 34 patients (63%) of the patients presented with ST-segment elevation infarction, but another 5 (9%) of them presented with ventricular fibrillation. Twelve patients (22%) presented with ST-segment elevation and 3 patients (5.5%) had bradyarrhythmias or atrioventricular block. From the point of view of electrical localization, 23 patients (42%) had anterior infarction, 19 (35%) inferior infarction, 11 (20%) lateral infarction, and only one right ventricular infarction.

Regarding the results of the use of thrombolytic therapy (specifical streptokinase) and its clinical efficacy in resolving myocardial ischemia, 37 patients (69%) were not thrombolysis versus 17 (31%) who were. Thrombolysis was effective in 3 patients. When the door-to-needle time (*i.e.*, the time elapsed between the patient's admission to the emergency department and the start of thrombolytic infusion) was considered, 9 patients were thrombolysis between the first 61 minutes to 60 hours, 4 of them were thrombolysis between the first 6 to 12 hours, 3 others between 12 to 24 hours and only one after 24 hours of symptom onset. All thrombolysis patients underwent angioplasty.

Table 3 shows the data collected through coronary angiography regarding the location of the culprit lesion, and the presence and location of other clinically important vascular lesions. It also shows the result of the angiography, i.e., how many were only diagnostic without intervention, how many were accompanied by balloon angioplasty, and how many intracoronary stents were placed. As in the previous table, we included information on the time elapsed since the patient was admitted to the emergency department or diagnosed with in-hospital AMI and taken to the catheterization laboratory. This time is known as door-to-balloon time.

Table No.3. Patients undergoing angioplasty with and without intravascular stenting, 2011-2015. n=54 patients

Angioplasty	Yes: 48 (89%)
	No: 6 (11%)
Door-to-balloon time	60 minutes - 12 hours: 17 (35%)
	12 hours to 24 hours: 12 (25%)
	> 24 hours: 19 (40%)
Guilty vessel	Right coronary artery: 19 (39.5%)
	Anterior descending artery: 19 (39.5%)
	Circumflex artery: 7 (14.5%
	Left common trunk: 1 (2%)
	Unidentified culprit vessels :2 (4%
Vessels with lesions	Right coronary artery: 30 (62.5%)
	Anterior descending artery: 30 (62.5%)
	Circumflex artery: 18 (37.5%)
	Left common trunk: 6 (12.5%)
	Vessels without lesions:1 (2%)
Intervened vessels	Anterior descending artery: 22 (46%)
	Right coronary artery: 20 (41.5%)
	Circumflex artery: 12 (25%)
	Left common trunk: 3 (6%)
	None: 4 (8.3%)

In addition, the coronary vessel considered to be the culprit of the infarction, the total number of vessels in which obstructive and luminographically significant atherosclerotic lesions were found (lesions that obstruct the coronary lumen by more than 50%) and the number of vessels intervened (some patients had 2 or more stents placed) during the same angiographic intervention are detailed. Multivessel disease was found to be present in most patients, with an average of 2 lesions per patient, with 30% of patients having 2-vessel disease and 18% having 3-vessel disease or involvement of the left main coronary artery.

A total of 37 stents were placed and only one of them was unmedicated ("bare metal").

Table 4 summarizes the main mechanical and non-mechanical complications of infarction in patients.

Table No.4. Main mechanical and non-mechanical complications of AMI in women, 2011-2015 n=54 patients	
Mitral valve dysfunction	16 (30%)
Cardiogenic Shock	10 (18,5%)
Pericardial tamponade or effusion	4 (7%)
Papillary muscle rupture	1 (1,9%)
Re-infarction	1 (1,9%)
There was no	35 (65%)

Two of the patients were rushed to cardiac surgery because of the severity of the lesions.

At discharge, transthoracic echocardiography was performed in 32 of the patients and showed that 16 (50%) of them had an ejection fraction (EF) of 40-59%, 10 (31%) had an EF between 21-39%, 3 patients had an EF greater than 60% and 3 patients had an EF of 20% or less.

Discussion

As reported in the world literature,[3,7] the patients who are infarcted are relatively young -practically ¾ of them are under 70 years of age- and although most of them certainly had a good in-hospital evolution judging by the length of stay, need for surgery, and mechanical and non-mechanical complications. However, according to our ICU database, their mortality rate was 6 points higher than that of men admitted with the same diagnosis and in the same period (17.9% in women vs. 12% in men) and nearly 1 in 6 did not survive the infarction. Comparatively speaking, only 1 in 8 men died of AMI during the same study period. Conspicuously similar findings have been described in the international literature, for example, *Wells*[3] explains that from 1979 to 2011 infarct mortality in men decreased by 17%, whereas in women it decreased by only 2.5%.

The specific reasons for the higher mortality in women merit a new study aimed at investigating this issue.

On the other hand, it should be noted, as always, that smoking is, after arterial hypertension, the main risk factor for ischemic heart disease. With these data, it is feasible to repeat this observation in the future in the hope that the new anti-smoking measures will improve these numbers (Law 9028, General Law for the Control of Tobacco and its Harmful Effects on Health, of 2012).[8]

In this study, there was no record of a true atypical presentation of infarction in women, although the correct term instead of atypical is different from that expected in men. Typical" chest pain was the cardinal manifestation in almost 90% of the patients, whereas, despite the high rate of diabetic patients, there was only one case of silent infarction. It has been described that one of the causes of increased mortality of AMI in women is the delay in treatment due to the different presentation of symptoms,[3,4,7,9] here this does not seem to have greater weight because the clinical presentation turned out to be quite like the classic description of the manifestations of myocardial ischemia.

Electrocardiographic findings showed that, as in men, anterior infarction was the most frequent but closely followed by inferior infarction. Coronary angiography found obstructive findings compatible with the electrical localization of the area of ischemia in most cases, demonstrating that electrocardiographic topography is precise, although not always accurate.

Both pharmacological and mechanical coronary reperfusion strategies were applied late.[10-12]

Streptokinase was administered to a few patients and to almost half of them after 6 hours of symptom onset; this is one of the reasons why its success rate was so low. Although most patients were taken for angioplasty, only 35% were taken before 12 hours, thus missing the best window of opportunity. There was no statistically significant relationship between door-to-balloon time and mortality, but these late openings could explain why 41% of patients were discharged with an ejection fraction of less than 40% ("time is muscle").

ISSN 001-6012 Rev. Acta Médica Costarricense 2021 / april-june; 63 (2): 1-6

Women with ST-elevation AMI have a higher short- and long-term mortality than men but seem to do better, at least in the short term, with thrombolytic therapy[11], with the caveat that there are no studies with streptokinase. Perhaps it would be better to favor the use of direct-acting thrombolytics over angioplasty in women, to improve mortality and reduce morbidity.

It has been described that the distribution and effect of coronary plaques differs according to sex, with about 60% of symptomatic women having no obstructive lesions found on angiography. [4,12-15] In our case, the presence of significant lesions was much higher due to the use of a small sample affected by detection bias and is not a true statistical finding.

On the other hand, Smilowitz *et al*.[14] in a study of autopsies, found 16% of patients who died of AMI to have significant lesions in 2 vessels and 20% of patients with significant lesions in 3 vessels (for this study, 75% of coronary artery obstruction was considered severe). When comparing these findings with the results of this sample, the incidence of obstructive lesions in 2 vessels is very high and reflects a more severe degree of ischemic heart disease.

In conclusion, female patients with AMI not only have a higher mortality than their male counterparts, but also have severe coronary artery disease. And although their ischemic symptoms were very clear and patent, they received reperfusion treatment, both pharmacological and mechanical, late according to ischemic disease management guidelines, which probably contributed to higher mortality and greater loss of viable myocardial tissue.

References

1. Ministerio de Salud. Análisis de Situación de Salud Costa Rica 2014. Dirección de Vigilancia en Salud, editor. Ministerio de Salud de Costa Rica. San José: Ministerio de Salud de Costa Rica; 2014. 1–193 p.

2. Rojas, M., Castellanos, F., Marín, C., Bustamante, X., Montiel, H. F. Salud de las mujeres en Costa Rica, un análisis desde la perspectiva de género. San José: OPS MINSA; 2005.

3. Wells M, Kalman M. Women & heart disease: Symptoms and treatment guidelines. Nurse Pract. 2011;36(9):22–7.

4. Aggarwal NR, Patel HN, Mehta LS, Sanghani RM, Lundberg GP, Lewis SJ, *et al*. Sex Differences in Ischemic Heart Disease: Advances, Obstacles, and Next Steps. Circ Cardiovasc Qual Outcomes. 2018;11(2):1–14.

5. Brewer LPC, Svatikova A, Mulvagh SL. The challenges of prevention, diagnosis and treatment of ischemic heart disease in women. Cardiovasc Drugs Ther. 2015;29(4):355–68.

6. Garcia M, Mulvagh SL, Merz CNB, Buring JE, Manson JAE. Cardiovascular disease in women: Clinical perspectives. Circ Res. 2016;118(8):1273–93.

7. George J, Rapsomaniki E, Pujades-Rodriguez M, Shah AD, Denaxas S, Herrett E, *et al*. How does cardiovascular disease first present in women and men? Circulation. 2015;132(14):1320–8.

8. Burke GM, Genuardi M, Shappell H, D'Agostino RB, Magnani JW. Temporal Associations Between Smoking and Cardiovascular Disease, 1971 to 2006 (from the Framingham Heart Study). Am J Cardiol [Internet]. 2017;120(10):1787–91. Available from: DOI: 10.1016/j.amjcard.2017.07.087

9. Gehrie ER, Reynolds HR, Chen AY, Neelon BH, Roe MT, Gibler WB, *et al*. Characterization and outcomes of women and men with non-ST-segment elevation myocardial infarction and nonobstructive coronary artery disease: Results from the Can Rapid Risk Stratification of Unstable Angina Patients Suppress Adverse Outcomes with Early . Am Heart J [Internet]. 2009;158(4):688–94. DOI:10.1016/j.ahj.2009.08.004

10. McSweeney JC, Rosenfeld AG, Abel WM, Braun LT, Burke LE, Daugherty SL, et al. Preventing and experiencing ischemic heart disease as a woman: State of the science: A scientific statement from the American Heart Association. Circulation. 2016;133(13):1302–31.

11. Ashley KE, Geraci SA. Ischemic heart disease in women. South Med J. 2013;106(7):427–33.

12. Sharaf B, Wood T, Shaw L, Johnson BD, Kelsey S, Anderson RD, *et al*. Adverse outcomes among women presenting with signs and symptoms of ischemia and no obstructive coronary artery disease: Findings from the National Heart, Lung, and Blood Institute-sponsored Women's Ischemia Syndrome Evaluation (WISE) angiographic core lab. Am Heart J [Internet]. 2013;166(1):134–41. DOI:10.1016/j.ahj.2013.04.002

13. Quyyumi AA. Women and ischemic heart disease: Pathophysiologic implications from the Women's Ischemia Syndrome Evaluation (WISE) study and future research steps. J Am Coll Cardiol [Internet]. 2006;47(3 SUPPL.):S66–71. DOI:10.1016/j.jacc.2004.11.075

14. Smilowitz NR, Sampson BA, Abrecht CR, Siegfried JS, Hochman JS, Reynolds HR. Women have less severe and extensive coronary atherosclerosis in fatal cases of ischemic heart disease: An autopsy study. Am Heart J [Internet]. 2011;161(4):681–8. DOI: 10.1016/j.ahj.2010.12.022

15. Pepine CJ, Ferdinand KC, Shaw LJ, Light-McGroary KA, Shah RU, Gulati M, *et al*. Emergence of Nonobstructive Coronary Artery Disease: A Woman's Problem and Need for Change in Definition on Angiography. J Am Coll Cardiol. 2015;66(17):1918–33.