2013-9

Incidence, in-hospital case-fatality rates, and management practices in Puerto Ricans hospitalized with acute myocardial infarction

Juan C. Zevallos
University of Puerto Rico - Medical Sciences Campus

Et al.

Incidence, In-hospital Case-fatality Rates, and Management Practices in Puerto Ricans Hospitalized with Acute Myocardial Infarction

Juan C. Zevallos, MD*; Jorge Yarzebski, MD, MPH†; Juan A. González, MD‡; Héctor L. Banchs, MD‡; Mario García-Palmieri, MD‡; Hernando Mattei, PhD‡; José Ayala, MD‡; Marijesmar González, MD‡; Vanessa Torres, MD‡; Iris N. Ramos, RN‡; Luis R. Pericchi, PhD§; David A. Torres, MS§; María C. González, MPH‡; Robert J. Goldberg, PhD†

Objective: There are extremely limited data on minority populations, especially Hispanics, describing the clinical epidemiology of acute coronary disease. The aim of this study is to examine the incidence rate of acute myocardial infarction (AMI), in-hospital case-fatality rate (CFR), and management practices among residents of greater San Juan (Puerto Rico) who were hospitalized with an initial AMI.

Methods: Our trained study staff reviewed and independently validated the medical records of patients who had been hospitalized with possible AMI at any of the twelve hospitals located in greater San Juan during calendar year 2007.

Results: The incidence rate (# per 100,000 population) of 1,415 patients hospitalized with AMI increased with advancing age and were significantly higher for older patients for men (198) than they were for women (134). The average age of the study population was 64 years, and women comprised 45% of the study sample. Evidence-based cardiac therapies, e.g., aspirin, beta blockers, ACE inhibitors/angiotensin receptor blockers, and statins, were used with 60% of the hospitalized patients, and women were less likely than men to have received these therapies (59% vs. 65%) or to have undergone interventional cardiac procedures (47% vs. 59%) ($p<0.05$). The in-hospital CFR increased with advancing age and were higher for women (8.6%) than they were for men (6.0%) ($p<0.05$).

Conclusion: Efforts are needed to reduce the magnitude of AMI, enhance the use of evidence-based cardiac therapies, reduce possible gender disparities, and improve the short-term prognoses of Puerto Rican patients hospitalized with an initial AMI. [*P R Health Sci J 2013;3:138-145*]

Key words: Incidence, Community-based surveillance, Acute myocardial infarction

Heart disease has been the leading cause of death in the United States since the early 1920s and in Puerto Rico since the late 1940s (1, 2). Coronary Heart Disease (CHD) caused approximately 1 out of 6 deaths in the United States and 1 out of 10 deaths in Puerto Rico in 2008 (3, 4). Comparatively speaking, Puerto Rican Hispanics living in the United States have a higher CHD mortality rate (176 per 100,000 population) than do both Cuban Americans (167 per 100,000) and Mexican Americans (116 per 100,000) (5).

There has been a consistent decline in the death rate attributed to CHD in the United States since the mid- to late-1960s (1, 6, 7). From 1996 to 2006, the overall decline in CHD mortality in the United States was 36%, while it was 24% in Puerto Rico. (8) The reasons for the ongoing decline in CHD-related mortality are only partially understood, however, and represent the contribution of numerous factors, including improvements in diagnostic capabilities, early intervention for acute myocardial infarction (AMI), and the increasing use of highly effective treatments for CHD and its predisposing factors. Despite these encouraging declines in CHD death rate, data from several sources in the United States and Puerto Rico suggest that the prevalence of several important risk factors for CHD (among which are obesity, diabetes, and physical inactivity) continue to increase (9-16); these disturbing trends may be associated with future increases in the incidence rates of acute coronary disease.

Despite the magnitude and impact of CHD, there is little data (none on patients in Puerto Rico) regarding the incidence and case-fatality rates of patients of different races/ethnicities

*University of Puerto Rico Medical Science Campus San Juan, Puerto Rico/Florida International University Herbert Wertheim College of Medicine, Miami, Florida, United States of America; †Department of Quantitative Health Sciences, University of Massachusetts Medical School, Worcester, Massachusetts, United States of America; ‡University of Puerto Rico Medical Sciences Campus San Juan, Puerto Rico; §University of Puerto Rico Rio Piedras Campus San Juan, Puerto Rico

The authors have no conflict of interest to disclose.

Address correspondence to: Juan Carlos Zevallos MD, Division of Research & Information, Biscayne Bay Campus, Academic Center 1, Suite #241, Miami, FL 33181. E-mail: juan.zevallos@fiu.edu

who have been hospitalized because of AMI; in addition, data about the therapies used in the management of these patients remain limited. The objectives of this observational study were to examine, from a community-wide perspective, the overall, as well as age- and sex-specific, incidence rate, the in-hospital case-fatality rate, and the therapeutic management of initial AMI in Puerto Rican patients discharged from 12 hospitals in the greater San Juan area, Puerto Rico in 2007.

Methods

The study sample consisted of residents living in the greater San Juan (Puerto Rico) area (2010 census estimate = 858,207 adults ≥ 18 years old) who, in 2007, were hospitalized for a possible AMI at any one of the 12 academic or non-teaching medical centers. The greater San Juan area included the following 9 municipalities: Bayamón, Canóvanas, Carolina, Cataño, Guaynabo, Loíza, Río Grande, San Juan, and Trujillo Alto. This area was selected based on the review of data from the Puerto Rico Department of Health (DOH), which collects information on the admission of San Juan residents to any of the area hospitals and to any of the hospitals in neighboring towns. According to the Puerto Rico DOH, virtually all greater San Juan residents seek care for their AMIs at participating hospitals; the vast majority (~90%) of patients with a primary or secondary discharge diagnosis of AMI is hospitalized at 1 of the 6 tertiary care/university hospitals. This fact enhances the external validity of our findings as well as the comparability with other population-based studies (17, 18). Information on all 2007 hospital discharges in San Juan with International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code 410 in the principal and/or secondary diagnosis position and related acute and chronic coronary disease ICD-9 rubrics (e.g., 412 [old MI], 413 [angina pectoris], 414 [other forms of chronic CHD], and 786.5 [chest pain]) was obtained from each of the participating hospitals (all of which had emergency room capability and served non-institutionalized, non-military residents of greater San Juan). The incidence rate was calculated utilizing the number of validated cases of AMI in participating hospitals and the total number of adults residing in the greater San Juan area.

Once the computerized discharge diagnosis printouts were obtained from each of our 12 participating hospitals, the appropriate ICD-9-CM codes for CHD were reviewed for purposes of selection and case validation. Each participating hospital was able to provide us with a patient-specific zip code listing that allowed us initially to screen out patients hospitalized for suspected acute coronary disease but who lived outside of the greater San Juan. Once selected, a list of medical record numbers was given to the medical record department personnel at each of the participating hospitals. Trained nurse and physician abstractors reviewed the medical records of all of the identified patients meeting the pre-defined geographic inclusion criteria (e.g., residents of greater San Juan).

Since we were interested in documenting the incidence rates of newly diagnosed AMI, we restricted our study sample to patients hospitalized with an initial (incident) AMI that occurred in 2007. Patients initially hospitalized in one hospital and then transferred to another during the same event were counted only once. Data were abstracted from the applicable emergency medical record of the transferring hospital and from the applicable medical record of the receiving hospital. The records of any previous hospitalizations for CHD were reviewed when available and when the review of the hospital chart indicated that the present hospitalization was not the first for CHD, regardless of whether the patient was hospitalized in different hospitals for separate events. We excluded patients with ECG changes indicative of prior MI (old Q-waves on ECG) or with a documented history of MI. We excluded patients who developed AMI resulting from an interventional or surgical procedure.

In this study, each case was validated using the widely accepted diagnostic definition developed by the World Health Organization (WHO), which requires that at least 2 of 3 criteria be present for the confirmation of AMI. This schema uses information from the patient's clinical history that is suggestive of AMI, serum enzyme elevations, and serial ECG findings of AMI. These criteria have been utilized in a number of clinical and epidemiological investigations, e.g., the Worcester Heart Attack Study and the World Health Organization Multinational Monitoring of Trends and Determinants in Cardiovascular Disease (MONICA) Project (17-19). An autopsy confirmation of recent onset MI satisfied the study inclusion criteria, irrespective of the other diagnostic criteria. Patients who developed AMI resulting from an interventional procedure or surgery, other than for the treatment of an acute coronary event, were excluded from the study. Documentation for allergies or contraindications to the receipt of aspirin, beta-blockers, angiotensin converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARB), and lipid-lowering agents were specifically reviewed in each hospital medical record.

The receipt of evidence-based medicines that have shown to lower mortality during an AMI was defined as "beneficial secondary prevention cardiac therapy". Specifically, we estimated the percentage of patients who were given aspirin within 24 hours of admission and at the time of hospital discharge and the percentage of patients who were given beta-blockers, ACE inhibitors or ARBs, and/or lipid-lowering agents at their discharge.

Data collection

Demographic and clinical data and complete medical histories were abstracted from hospital medical records into a standardized case-report form by trained nurse and physician

abstractors. These data included each patient's age, sex, municipality of residence, coronary risk factors (e.g., diabetes, hypertension, smoking), comorbidities (e.g., history of angina, stroke, heart failure), physiologic parameters (e.g., heart rate, blood pressure, lipid profile, serum creatinine/glucose findings), AMI-associated characteristics (e.g., ST-elevation AMI, non-ST-elevation AMI), use of cardiac medications and secondary prevention practices, and survival status at the time of hospital discharge. All quality control measures were continuously monitored and any identified errors were discussed with each reviewer to ensure a high degree of accuracy and observer reliability so that documentation errors were minimized.

Data analysis

The age-adjusted (overall and sex-specific) incidence rates of initial AMI were calculated in a standard manner using U.S. census estimates of the greater San Juan (Puerto Rico) area population in 2000 (n = 866,000; 55% women). Means and frequency distributions of patient demographic and clinical characteristics were calculated in a standard fashion. A given patient's short-term outcome was examined by calculating the in-hospital case-fatality rates (CFRs). Since we were interested in possible sex-based differences in our principal study outcomes, differences in the distribution of demographic and clinical characteristics (e.g., comorbid conditions) and hospital management practices between men and women were examined by using chi-square tests of statistical significance for discrete variables and t tests for continuous variables. Logistic regression modeling was used to assess crude and age-controlled in-hospital case fatality rates. All analyses were performed using STATA® version 11.0 (20). The Committee for the Protection of Human Subjects at each participating hospital approved this study.

Results

A total of 1,839 patients were hospitalized with independently validated AMIs at participating hospitals in the greater San Juan area in 2007, of which approximately 65% (1,415) of the patients had an initial (de novo) episode. We excluded 417 cases: 415 had a history of documented MI and 2 had a history of post-surgical MI. The average age of the members of the study population was 64 years, 45% were women, and all were residents of greater San Juan (Table 1). The overall age-adjusted incidence rate (per 100,000 population) of AMI for Puerto Ricans was 163. The incidence rate of initial AMI was higher for older patients and was significantly higher for men (198) than they were for women (134) (Figure 1).

Baseline characteristics

The average hospital stay was 5.5 days. A history of diabetes and hypertension was frequently found in the members of this

Table 1. Characteristics of patients with an initial acute myocardial infarction

Characteristic	Male (n = 778)	Female (n = 637)	*p*-value
Demographics			
Age, years (mean +/- SD)	63.2 +/- 13.7	68.6 +/- 13.3	<0.001
Age (%)			
<55	26.1	15.4	<0.001
55-64	28.8	24.5	
65-74	22.8	24.2	
75-84	15.8	23.4	
>85	6.6	12.6	
Body Mass Index > 30 (%)	29.2	30.7	0.64
Medical history (%)			
Angina	3.6	3.6	0.98
Diabetes	40.7	54.0	<0.001
Hypertension	64.7	80.5	<0.001
Stroke	2.5	6.4	<0.005
Heart failure	4.4	10.8	<0.005
Current smoker	22.2	10.2	<0.001
Physiological parameters mean (+/- SD), at hospital presentation			
Initial heart rate	81.9 (+/- 20.2)	85.8 (+/- 23.2)	0.99
Systolic blood pressure, mmHg	141.7 (+/- 31.6)	144.8 (+/- 35.8)	0.95
Diastolic blood pressure, mmHg	80.8 (+/- 17.2)	78.4 (+/- 18.4)	<0.05
Initial cholesterol, mg/dL	167 (+/- 47.4)	179 (+/- 52.8)	1.00
Initial HDL-cholesterol, mg/dL	36.9 (+/- 18.4)	49.8 (+/- 22.0)	0.001
Initial LDL-cholesterol, mg/dL	96.0 (+/- 57.9)	86.3 (+/- 54.7)	0.001
Creatinine, mg/dL	37.1 (+/- 22.9)	33.3 (+/- 25.0)	0.005
Glucose, mg/dL	118.0 (+/- 107.2)	127.2 (+/- 104.2)	0.94
Hemoglobin, g/dL	14.3 (+/- 7.6)	12.5 (+/- 1.8)	<0.0001
Acute Myocardial Infarction Characteristics			
ST-segment elevation	35.2	24.4	<0.05
Length of hospital stay (mean days)	5.5 (+/- 3.0)	5.5 (+/- 3.7)	0.97

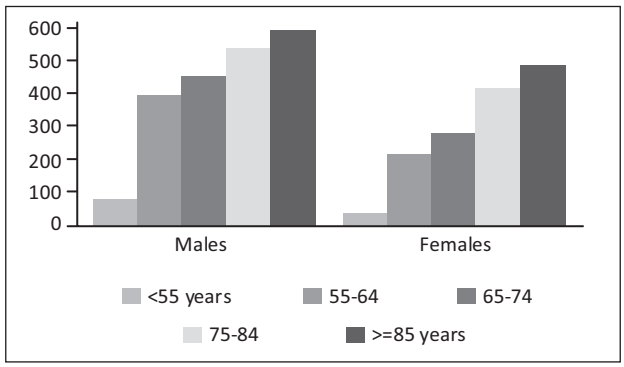

Figure 1. Incidence rates (per 100,000) of acute myocardial infarction by age and sex: The Puerto Rico heart attack study (Overall incidence rate for males: 198 per 100,000 population; for females: 134 per 100,000 population)

patient population. Compared to men, women were less likely to have smoked cigarettes, were more likely to have experienced an initial AMI at an older age, and were more likely to have a history of diabetes, hypertension, stroke, heart failure, or a combination of any or all of the previous. At the time of hospital admission, the women whose case histories were part of the study had higher average serum HDL-cholesterol levels than did the men, whereas the men presented with higher average levels of LDL-cholesterol, creatinine, and hemoglobin than the women did. Men were more likely than women to present with an ST-segment elevation AMI (Table 1).

Hospital management practices

At the time of admission for AMI, approximately 4 out of every 5 patients were treated with aspirin. At hospital discharge, approximately 3 out of every 5 patients were prescribed aspirin or ACE inhibitors, whereas only half of the patients were prescribed lipid-lowering medications and/or beta-blockers. Compared to men, women were significantly less likely both to have received aspirin within 24 hours of admission and upon being discharged and to have received each of the beneficial secondary prevention cardiac therapies and diagnostic/revascularization procedures (Table 2). Only one third of the current smokers received smoking cessation counseling at the time of hospital discharge.

Table 2. Hospital treatment practices

Medication (%)*	Male (n = 778)	Female (n = 637)	*p*-value
Aspirin within 24 hours of admission	83.3	76.2	<0.05
Aspirin at discharge	66.5	57.8	<0.005
ACE inhibitor/Angiotensin blockers (ARB) at discharge	64.8	54.9	0.58
Lipid-lowering agent at discharge	57.3	53.3	0.73
Use of β blocker at discharge	51.2	51.3	0.99
Overall beneficial secondary prevention therapies	64.6	58.7	<0.05
Procedure (%)			
Cardiac catheterization	68.2	57.5	<0.001
Percutaneous coronary intervention	51.6	37.6	<0.05
Coronary artery bypass graft	7.1	5.9	0.40
Lifestyle secondary prevention measures (%)			
Smoking cessation counseling	27.5	29.2	0.82

*Prescribed medications to patients without known drug contraindications

In examining the management of patients hospitalized with AMI (according to the type of AMI), men with either ST-segment elevation or non–ST-segment elevation AMI were more likely to have undergone cardiac catheterization or a PCI than were women under the same circumstances. Among patients with a non–ST-segment elevation AMI, men were more likely than women to have been prescribed aspirin at the time of hospital discharge (Figures 2 and 3).

In-hospital case-fatality rate

One hundred and two patients died in the hospital after developing an AMI. The overall in-hospital CFR after an initial AMI was significantly higher for women (8.6%) than it was for men (6.0%) ($p<0.05$). This difference remained significant after adjusting for age and other potential confounders such as medical history of diabetes, hypertension, stroke, heart failure, and smoking. The in-hospital death rate increased significantly with age in both men and women (Table 3).

Discussion

The results of this population-based study provide the latest insights into the magnitude and management of and short-term death rates associated with AMI among residents of greater San Juan and demonstrate sex-based differences in the incidence and in-hospital death rates of AMI as well as in its management.

Incidence rate of initial AMI

The frequency of AMI in Puerto Rican residents has not been published prior to this study. We found an overall incidence rate of 163 AMI events per every 100,000 individuals residing in the greater San Juan area in 2007. Puerto Rican men had significantly higher age-adjusted incidence rates of initial AMI than did Puerto Rican women, and the men in this sample were more likely to have been hospitalized with an initial AMI at a younger age than was the case with women. These age- and sex-based differences in the incidence rates of AMI are consistent with previously published findings (17, 21, 22). Data describing the incidence rates of CHD in Hispanics are limited and are based on small numbers (23). Indeed, an extremely limited number of CHD surveillance systems, including the Worcester Heart Attack Study (WHAS), Minnesota Heart Survey (MHS), and Olmsted County Study, remain operative in the U.S., and the number of Hispanic patients included in these observational studies is limited, as the vast majority of the populations studied in these community-based coronary disease registries are white (24-26). In comparison with other population-based studies, the incidence rate of AMI in residents of San Juan, Puerto Rico (163 per 100,000 population), is slightly lower than the incidence rate of initial AMI observed in the Worcester, MA, metropolitan area in 2005 (209 per 100,000 population) (24). In the MHS, the incidence rate of AMI was 188 per 100,000 population in 1995 (25), and the incidence rate of hospitalized AMI in Olmsted County was 182 per 100,000 population in 1998 (27).

To the best of our knowledge, this is the first report, from a community-wide perspective, describing the incidence rates of AMI for the residents of the Caribbean island of Puerto Rico. Additional studies in diverse population settings are needed to obtain a better understanding of the magnitude of AMI and the impact of well-accepted, and more novel, risk factors on the development of AMI in men and women of different ages.

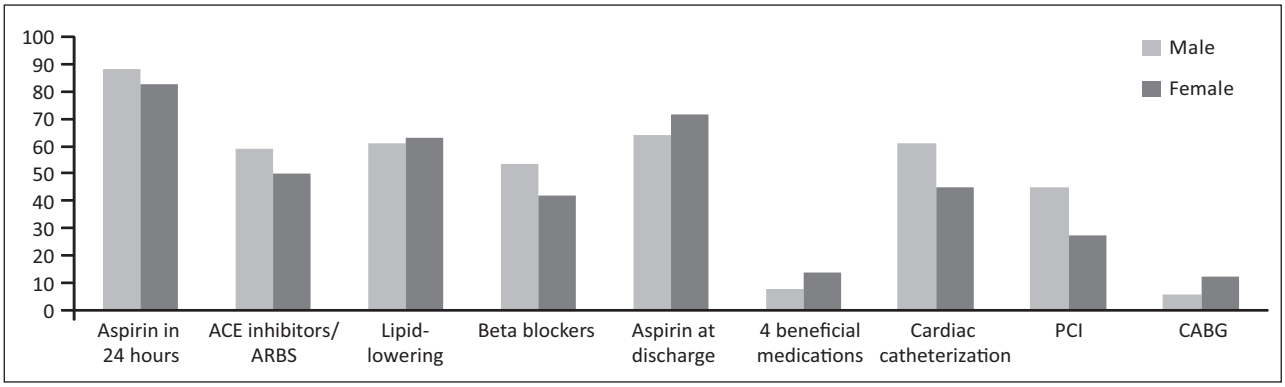

Figure 2. Cardiac medications and procedures used in patients hospitalized with **ST-Elevation** acute myocardial infarction. Legend: ACE= Angiotensin Converting Enzyme; ARBs = Angiotensin Receptor Blockers; PCI= Percutaneous Intervention; CABG= Coronary Bypass Artery Graft.

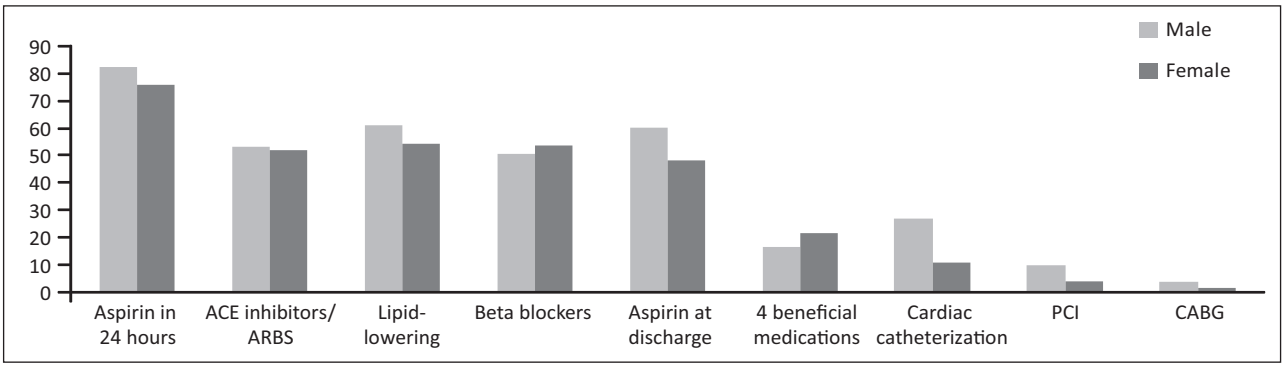

Figure 3. Cardiac medications and procedures used in patients hospitalized with **Non ST-Elevation** acute myocardial infarction. Legend: ACE= Angiotensin Converting Enzyme; ARBs = Angiotensin Receptor Blockers; PCI= Percutaneous Intervention; CABG= Coronary Bypass Artery Graft.

Table 3. In-Hospital case-fatality rates (CFR) according to age and sex

Males	n	Crude CFR (%)	Age-specific risk of Dying OR (95% CI)
Age (yrs)			
<55	203	1.5	1.0*
55-64	224	2.2	0.70 (0.18, 2.70)
65-74	177	10.7	0.14 (0.04, 0.45)
75-84	123	11.4	0.13 (0.04, 0.43)
>85	51	11.8	0.12 (0.03, 0.47)
Females			
<55	98	2.0	1.0*
55-64	156	9.6	0.24 (0.06, 0.92)
65-74	154	7.1	0.32 (0.08, 1.30)
75-84	149	15.4	0.14 (0.04, 0.53)
>85	80	5.0	0.44 (0.09, 2.13)

*referent category

Characteristics of patients hospitalized with AMI

The median age of a Puerto Rican resident of greater San Juan experiencing a first AMI (65 years) was considerably lower than the average age reported in the WHAS (71 years) in 2005 and the Rochester (MN) Epidemiology Project (69 years) during the years of 1979 to 1994 (28, 29). Similar to results from the Atherosclerosis Risk in Communities study (30), our findings show that the median age of persons having a first AMI was almost 5 years higher for women than it was for men. On the other hand, our data contrast with the findings noted in the INTERHEART study, which showed that an initial AMI occurred at relatively younger ages for both women and men (65 and 56 years, respectively) (21) who were enrolled in this international study. Although a history of diabetes (47%) and hypertension (72%) was frequent in our study's participants, higher percentages for both conditions were reported for women than they were for men. In agreement with these findings, it has been reported that, irrespective of age, women hospitalized with AMI were more likely to have a history of hypertension, diabetes, heart failure, and stroke than men were (31). In the population-based WHAS and in the National Registry of Myocardial Infarction (NRMI), approximately three quarters and two thirds of the patients hospitalized with AMI had a history of hypertension, respectively; the proportion of patients with a history of diabetes was identical (28%) in these 2 studies (25, 32). In addition, in our study prior histories of heart failure

and stroke were noted in a higher percentage of women than were noted in men.

The results of the present study suggest that the length of hospital stay was similar in Puerto Rican men and women hospitalized with AMI and is similar, as well, to that reported for patients hospitalized with AMI in 2005 in a large central New England metropolitan area (33). Our findings suggest that the initial presentation of an AMI occur at a younger age in the members of our study sample than is the case in non-Hispanic patients residing in the United States. In addition, women present with their first AMI at an older age and have more previously diagnosed comorbidities than men do. These data suggest that this particular, mostly Hispanic, population may have either a greater prevalence of or burden from CHD risk factors than do whites and that interventions designed to improve the lifestyle practices of Hispanics need to be undertaken at an early age to prevent, or at least delay, the onset of AMI at a later age.

Hospital management practices

The prescription of aspirin (both on admission and at the time of discharge), ACE inhibitors/ARBs, and beta blockers (discharge only) and the incidence of smoking-cessation counseling both fell below the levels recommended by the American Heart Association and the American College of Cardiology (34). In this study, approximately 6 out of every 10 patients received the 4 medications examined. This is important, given that our sample included patients without known drug contraindications. Findings from the WHAS suggest that similar prescribing rates were observed after patients with contraindications to cardiac medications were excluded (35). In that study, despite encouraging increases in the use of multiple evidence-based cardiac therapies from 1995 to 2005, slightly fewer than half of those patients with AMI were administered all 4 cardiac medications during the 2 most recent years under review. Indeed, a large percentage of patients (of all ages, both men and women) were not treated with all 4 beneficial secondary prevention cardiac therapies while being hospitalized for AMI (35).

Older women in our study were the least likely to receive beneficial secondary prevention cardiac therapies while being hospitalized for AMI. Although being of an advanced age and being female have both been associated (by not only the WHAS but also the multinational Global Registry of Acute Coronary Events) with the underutilization of beneficial secondary prevention cardiac therapies in AMI (35, 36), these findings are not consistent with a recent report from the MHS that failed to observe any gender-based differences in the management of patients hospitalized with AMI in the early 2000s (37).

Data from the Puerto Rico Heart Attack Study suggest a differential use of cardiac catheterization and percutaneous coronary intervention and indicate that, regardless of the type of AMI, women are less likely than men are to receive these interventions. In the MHS, women were less likely to be referred for coronary angiography than were men in 2001-2002, but this was not the case regarding the subsequent use of coronary revascularization procedures (37).

Several studies have shown that patients not receiving effective cardiac medications after an AMI have missed an important opportunity for more secondary prevention (38, 39). In our study, the reasons for the less-than-optimal use of these effective treatment regimens are unknown; the recommendations for the management of AMI are similar for both subtypes of AMI, although they differ with respect to the timing of cardiac catheterization and PCI. We did not collect information on the extent of pre-hospital delay from the time of onset of acute coronary symptoms to hospital arrival and were unable to determine whether differences in the receipt of diagnostic and revascularization procedures were related to more prolonged delay times in seeking medical care in women compared to such times in men. Further, more (and more systematic) studies are needed if we are to understand the reasons for the aforementioned less-than-optimal proportion of AMI patients discharged on effective cardiac medications after hospitalization for an initial AMI and if we are to design effective educational interventions aimed at increasing the use of these treatment modalities in hospitalized patients.

In-hospital case-fatality rates

The overall in-hospital CFR of our study (7.3%) is higher than the rate reported in the MHS for 2001 (5.4%) (31) and lower than that reported in the WHAS for 2005 (9.5%) (25). In the National Registry of Myocardial Infarction, the in-hospital death rate was 6.3% in 2006 (31). Older Puerto Rican patients were more likely to die while being hospitalized for AMI, which was also the case for female patients. A number of studies in populations composed primarily of white patients have shown advanced age to be an important factor in both the short- and long-term prognosis after AMI, and elderly individuals have been shown to be more likely to delay seeking timely medical treatment than are younger patients (41, 42). Other studies carried out in the U.S. have found that women also experienced higher rates of and earlier mortality than did men, which is similar to what has been seen in Puerto Rican women being hospitalized for AMI (32). Data from Olmsted County, Minnesota, suggest a poorer prognosis for women hospitalized with AMI than for men under like conditions. In that population-based study, the 28-day CFRs for the incident events of patients hospitalized with AMI were twofold higher for women than they were for men (29). Although the reasons for sex-based differences in the hospital death rates after AMI have not been fully elucidated, there is some concern that women might not be as rapidly and thoroughly managed as their male counterparts are and that men are more likely to complain of chest pain but less likely to present with nausea and neck, back, or jaw pain than women are (42).The continued monitoring of

both in-hospital and long-term endpoints of both clinical and public relevance needs to take place as well as the identification of high-risk groups and the increased use of effective cardiac medications in these at-risk individuals.

Study strengths and limitations

This community-based observational study has several strengths. The Puerto Rico Heart Attack Study is population-based, includes unselected patients, and documents real-life management practices in the treatment of patients hospitalized with AMI. However, our data have several limitations that need to be taken into consideration when interpreting our study findings. We were unable to collect information on pre-hospital deaths; data were collected in a single calendar year and only included patients hospitalized with AMI and not those with other manifestations of underlying CHD. Lastly, we studied Puerto Rican patients only, and our findings may not be generalizable to other racial or ethnic groups.

Conclusions

The findings of this study provide insights into the demographic and clinical profiles, therapeutic management, and in-hospital death rates of Puerto Rican men and women hospitalized with an initial AMI. At present, this is the only population-based study being conducted in Puerto Rico that describes the magnitude of AMI, its different clinical manifestations, the practices being utilized in its management, and in-hospital outcomes resulting from those practices. The design and implementation of population-based coronary disease surveillance studies is needed in order to obtain contemporary data that is necessary for the development of hospital and community-based planning measures for the more effective management, control, and prevention of AMI in these (i.e., Puerto Rican men and women) and other minority populations" or "in Hispanic and other minority populations.

Resumen

Objetivo: Existe información extremadamente limitada en poblaciones minoritarias, especialmente en hispanos, acerca de la epidemiología clínica de la enfermedad coronaria aguda. El objetivo de este estudio es examinar la incidencia de infarto agudo de miocardio (IAM), las tasas de mortalidad hospitalaria y el manejo terapéutico basado en evidencias en hispanos residentes en San Juan, Puerto Rico que fueron hospitalizados con un IAM inicial. Métodos: Personal del estudio debidamente entrenado obtuvo información de los récords médicos de pacientes hospitalizados con un posible IAM en doce hospitales localizados en San Juan durante el año calendario 2007. Resultados: La tasa de incidencia (# por 100,000 habitantes) de 1,415 pacientes hospitalizados con un diagnóstico independientemente validado de IAM aumentó con la edad y fue significativamente mayor en hombres (198) que en mujeres (134). El promedio de edad de la población bajo estudio fue de 64 años y 45% fueron mujeres. Las terapias cardiacas basadas en evidencia (aspirina, beta bloqueadores, inhibidores de la enzima convertora de la angiotensina/bloqueadores del receptor de la angiotensina y estatinas), se utilizaron en aproximadamente 60% de los pacientes hospitalizados. Las mujeres recibieron menos de estas terapias basadas en evidencia que los hombres (59% vs. 65%) y se sometieron a menos intervenciones coronarias percutáneas (47% vs. 59%) ($p<0.05$). La mortalidad hospitalaria se incrementó en pacientes de mayor edad y fue mayor en mujeres (8.6%) que en hombres (6.0%) ($p<0.05$). Conclusión: Es necesario disminuir la magnitud de IAM, aumentar el uso de terapias cardíacas basadas en evidencia, reducir las disparidades de género y mejorar el pronóstico de puertorriqueños hospitalizados con un IAM inicial.

Acknowledgments

This study was made possible through the cooperation of the administrations and cardiology departments of the following greater San Juan hospitals: Ashford, Auxilio Mutuo, El Maestro, HIMA San Pablo Bayamón, Hermanos Meléndez, Matilde Brenes, Metropolitan, Pavía-Santurce, Ruíz Arnau, San Francisco, UPR-Carolina, and the University Hospital and the Medical Center. If not for the access to medical records granted by the preceding institutions, it is doubtful that this study could have been successful. Grant support for this work was provided by the National Center for Minority Health and Health Disparities (grant 5S21MD000242) and the National Center for Research Resources (grant 5S21MD000138) of the National Institutes of Health (NIH); additional funding was provided through a scientific award from Merck, Sharp, and Dohme, Caribbean Region.

References

1. CDC. National Center for Health Statistics. Leading causes of death 1900-1998. Available at: Url: http://www.cdc.gov/nchs/data/dvs/lead1900_98.pdf. Accessed November 1, 2012
2. Rivera de Morales, N. Mortalidad en Puerto Rico 1888-1967. San Juan, PR: Biostatistics Section, School of Public Health, University of Puerto Rico; June 1970.
3. CDC. Vital Statistics Public Use Data Files - 2008 Mortality Multiple Cause Files. Available at: Url: http://www.cdc.gov/nchs/data_access/Vitalstatsonline.htm#Mortality_Multiple. Accessed November 1, 2012.
4. Tendencias Puerto Rico. Puerto Rico Department of Health. Available at: www.tendenciaspr.com. Accessed November 1, 2012.
5. Durazo-Arvizu RA, Barquera S, Lazo-Elizondo M, et al. Cardiovascular disease surveillance in Mexicans and Mexican Americans: a tale of two countries. Rev Panam Salud Pública 2008;23:119-24.
6. NCHS (National Center for Health Statistics). Summary health statistics for U.S. adults: National Health Interview Survey, 2008. Vital Health Statistics. 10(242) (Provisional); December 2009. Available at: Url: http://www.cdc.gov/nchs/data/series/sr_10/sr10_242.pdf. Accessed December 3, 2012.

7. American Heart Association. 2010 Heart Disease and Stroke Statistics Update. Dallas, TX: American Heart Association; 2010. Circulation 2010;121;e46-e215.
8. American Heart Association. Heart Disease and Stroke Statistics – 2010 Update. Dallas, Texas: American Heart Association. Available at: Url: http://www.americanheart.org/downloadable/heart/1265665152970DS-3241HeartStrokeUpdate_2010.pdf
9. Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: Department of Health and Human Services, Centers for Disease Control and Prevention; 2006-2010. Available at: Url: http://apps.nccd.cdc.gov/brfss/index.asp. Accessed December 5, 2012.
10. Rivera-Soto WT, Rodríguez-Figueroa L, Calderón G. Prevalence of childhood obesity in a representative sample of elementary school children in Puerto Rico by socio-demographic characteristics, 2008. P R Health Sci J 2010;29:357-63.
11. Fontaine KR, McCubrey R, Mehta T, et al. Body mass index and mortality rate among adults: a pooled analysis of multiple epidemiologic data sets. Int J Obes (Lond) 2012;36:1121-6. doi: 10.1038/ijo.2011.194.
12. Mattei J, Noel SE, Tucker KL. A meat, processed meat, and French fries dietary pattern is associated with high allostatic load in Puerto Rican older adults. J Am Diet Assoc 2011;111:1498-506.
13. Li C, Balluz LS, Okoro CA, et al. Centers for Disease Control and Prevention (CDC). Surveillance of certain health behaviors and conditions among states and selected local areas --- Behavioral Risk Factor Surveillance System, United States, 2009. MMWR Surveill Summ. 2011;60:1-250.
14. Pérez CM, Ortiz AP, Guzmán M, et al. Distribution and correlates of the metabolic syndrome in adults living in the San Juan Metropolitan Area of Puerto Rico. P R Health Sci J 2012;31:114-22.
15. Palacios C, Pérez CM, Guzmán M, et al. Association between adiposity indices and cardiometabolic risk factors among adults living in Puerto Rico. Public Health Nutr 2011;14:1714-23. Epub 2011 May 24.
16. Bautista LE, Casas JP, Herrera VM, et al. The Latin American Consortium of Studies in Obesity (LASO). Obes Rev 2009;10:364-70.
17. Goldberg RJ, Gorak EJ, Yarzebski J, et al. A communitywide perspective of sex differences and temporal trends in the incidence and survival rates after acute myocardial infarction and out-of-hospital deaths caused by coronary heart disease. Circulation 1993;87:1947-53.
18. Tunstall-Pedoe H, Kuulasmaa K, Amouyel P, et al. Myocardial infarction and coronary deaths in the World Health Organization MONICA Project. Registration procedures, event rates, and case-fatality rates in 38 populations from 21 countries in four continents. Circulation 1994;90:583-612.
19. Luepker RV, Apple FS, Christenson RH, et al. Case definitions for acute coronary heart disease in epidemiology and clinical research studies: a statement from the AHA Council on Epidemiology and Prevention; AHA Statistics Committee; World Heart Federation Council on Epidemiology and Prevention; the European Society of Cardiology Working Group on Epidemiology and Prevention; Centers for Disease Control and Prevention; and the National Heart, Lung, and Blood Institute. Circulation 2003;108:2543-9.
20. STATA Corp. Data Analysis and Statistical Software. Version 11, 2010. Available at: Url: http://www.stata.com.
21. Anand SS, Islam S, Rosengren A, et al. INTERHEART Investigators. Risk factors for myocardial infarction in women and men: insights from the INTERHEART study. Eur Heart J 2008;29:932-40.
22. Canto JG, Taylor HA Jr, Rogers WJ, et al. Presenting characteristics, treatment patterns and clinical outcomes of non-black minorities in the National Registry of Myocardial Infarction 2. Am J Cardiol 1998;82:1013-8.
23. The Hispanic Population: 2010. 2010 Census Briefs. Available at: Url: http://www.census.gov/prod/cen2010/briefs/c2010br-04.pdf. Accessed November 19, 2012.
24. Yarzebski J, Bujor CF, Lessard D et al. Recent and temporal trends (1975 to 1999) in the treatment, hospital, and long-term outcomes of and nonwhite patients hospitalized with acute myocardial infarction: a population-based perspective. Am Heart J 2004;147:690-7.
25. Floyd KC, Yarzebski J, Spencer FA, et al. A 30-year perspective (1975-2005) into the changing landscape of patients hospitalized with initial acute myocardial infarction: Worcester Heart Attack Study. Circ Cardiovasc Qual Outcomes 2009;2:88-95.
26. McGovern PG, Jacobs DR Jr, Shahar E, et al. Trends in acute coronary heart disease mortality, morbidity, and medical care from 1985 through 1997: the Minnesota Heart Survey. Circulation 2001;104:19-24.
27. Roger VL, Killian J, Henkel M, et al. Coronary disease surveillance in Olmsted County objectives and methodology. J Clin Epidemiol 2002;55:593-601.
28. Arciero TJ, Jacobsen SJ, Reeder GS, et al. Temporal trends in the incidence of coronary disease. Am J Med 2004;117:228-33.
29. Roger VL, Jacobsen SJ, Weston SA, et al. Trends in the incidence and survival of patients with hospitalized myocardial infarction, Olmsted County, Minnesota, 1979 to 1994. Ann Intern Med 2002;136:341-8.
30. Goff DC Jr, Howard G, Wang CH, et al. Trends in severity of hospitalized myocardial infarction: the Atherosclerosis Risk in Communities (ARIC) Study, 1987-1994. Am Heart J 2000;139:874-80.
31. Vaccarino V, Parsons L, Every NR, et al. Sex-based differences in early mortality after myocardial infarction. National Registry of Myocardial Infarction 2 Participants. N Engl J Med 1999;341:217-25.
32. Rogers WJ, Frederick PD, Stoehr E, et al. Trends in presenting characteristics and hospital mortality among patients with ST elevation and non-ST elevation myocardial infarction in the National Registry of Myocardial Infarction from 1990 to 2006. Am Heart J 2008;156:1026-34.
33. Saczynski JS, Lessard D, Spencer FA, et al. Declining length of stay for patients hospitalized with AMI: impact on mortality and readmissions. Am J Med 2010;123:1007-15.
34. Roe MT, Chen AY, Cannon CP, et al. CRUSADE and ACTION-GWTG Registry Participants. Temporal changes in the use of drug-eluting stents for patients with non-ST-Segment-elevation myocardial infarction undergoing percutaneous coronary intervention from 2006 to 2008: results from the can rapid risk stratification of unstable angina patients supress ADverse outcomes with early implementation of the ACC/AHA guidelines (CRUSADE) and acute coronary treatment and intervention outcomes network-get with the guidelines (ACTION-GWTG) registries. Circ Cardiovasc Qual Outcomes 2009;2:414-20.
35. Fornasini M, Yarzebski J, Chiriboga D, et al. Contemporary trends in evidence-based treatment for acute myocardial infarction. Am J Med 2010;123:166-72.
36. Nguyen HL, Goldberg RJ, Gore JM, et al. Age and sex differences, and changing trends, in the use of evidence-based therapies in acute coronary syndromes: perspectives from a multinational registry. Coron Artery Dis 2010;21:336-44.
37. Nguyen JT, Berger Ak, Duval S, et al. Gender disparity in cardiac procedures and medication use for acute myocardial infarction. Am Heart J 2008;155:862-8.
38. McCormick D, Gurwitz JH, Lessard D, et al. Use of aspirin, beta-blockers, and lipid-lowering medications before recurrent acute myocardial infarction: missed opportunities for prevention? Arch Intern Med 1999;159:561-7.
39. Davis AM, Vinci LM, Okwuosa TM, et al. Cardiovascular health disparities: A systematic review of health care interventions. Med Care Res Rev 2007;64(5 Suppl):29S-100S.
40. Berger AK, Duval S, Jacobs DR Jr, et al. Relation of length of hospital stay in acute myocardial infarction to postdischarge mortality. Am J Cardiol 2008;101:428-34.
41. Goldberg RJ, O'Donnell C, Yarzebski J, et al. Sex differences in symptom presentation associated with acute myocardial infarction: a population-based perspective. Am Heart J 1998;136:189-95.
42. Nguyen HL, Gore JM, Saczynski JS, et al. Age and sex differences and 20-year trends (1986 to 2005) in prehospital delay in patients hospitalized with acute myocardial infarction. Circ Cardiovasc Qual Outcomes 2010;3:590-8.