International Journal of Cardiology 116 (2007) 389–395
International Journal of Cardiology
www.elsevier.com/locate/ijcard

Gender differences in management and outcome of patients with acute myocardial infarction ☆

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Received 23 July 2005; received in revised form 29 May 2006; accepted 2 June 2006
Available online 14 July 2006

Abstract

Background: The study objectives were to assess any gender differences in the application of diagnostic and therapeutic procedures and their impact on outcome in patients with acute myocardial infarction (AMI).
Methods: Prospective cohort study of patients in the PRIAMHO II registry. 58 randomly selected public hospitals in Spain included 6209 patients with AMI admitted to Coronary/Critical Care Unit from May 15 to December 15 2000 with 1-year follow-up. Data were gathered on use of coronary angiography and reperfusion procedures, on a combined outcome variable (including death, reinfarction, postinfarction angina, and stroke during hospital stay), and on 28-day and 1-year mortality rates.
Results: 4641 (74.75%) of the patients were male and 1568 (25.5%) female. No gender differences in coronary angiography or reperfusion therapy use were found. However, female sex alongside age, use of reperfusion therapy, diabetes mellitus, previous revascularization, previous AMI, and higher Killip class were predictors of the combined outcome variable, with an adjusted OR of 1.21 (CI 95% 1.02–1.42).
Conclusions: No association was observed between the gender of patients with AMI and the application of diagnostic or therapeutic procedures. Nevertheless, female sex behaved as an independent adverse short-term prognostic factor.

Keywords: Acute myocardial infarction; Gender; Outcome; Procedures; Prognosis; Women

1. Introduction

Men and women share the same coronary risk factors except for the exclusively female experience of menopause and oral contraceptive use. However, as evidenced by the Framingham study [1], ischemic heart disease appears later in women than in men, although this difference reduces and disappears in older age groups. There have been reports of a higher mortality risk in women that is not always explained by other studied variables. In fact, apart from some isolated studies [2], the female sex has been found to be an independent predictor of worse prognosis in patients with coronary heart disease. This has been a consistent finding in a wide range of studies of first acute myocardial infarction [3] (AMI) and post-AMI periods [4] across numerous countries [5–11] and in reports of atypical presentation forms [12]. However, it remains unclear whether this higher mortality is explained by the higher age of females or presence of other risk factors, notably diabetes [13].

☆ **Financial support:** this study received an educational grant from Boehringer Ingelheim.
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doi:10.1016/j.ijcard.2006.06.007

It is also known that diagnostic and therapeutic procedures are less used in women [14], even taking account of the profile of the attending physician [15]. This situation has also been reported in other populations, including elderly patients [16], ethnic minorities [17], and some financial [18] and socio-economic [19] subpopulations, despite the higher morbidity and mortality rates in these patients. Similar circumstances have been documented in Spain [20], although not in relation to diagnosis or therapeutic management or since publication of new clinical practice guidelines in 2004.

Randomized clinical trials have demonstrated a strong relationship between post-AMI mortality and early myocardial reperfusion, although other treatment strategies (e.g., antiplatelet drugs, betablockers, ACE-inhibitors) have also shown a positive effect on outcome. Our initial working hypothesis was that a lesser use of diagnostic and therapeutic procedures in women may in part explain their worse postinfarction prognosis compared with men. Therefore, the objectives of this study were to assess differences in management between men and women with AMI and to determine the impact of any differences on short and long-term prognoses.

2. Materials and methods

The study used the database from the PRIAMHO II registry [21], designed by the working group on ischemic heart disease of the Spanish Society of Cardiology with the collaboration of the intensive cardiological care group of the Spanish Society of Critical and Coronary Care. Out of the 168 public hospitals in Spain with a coronary or critical care unit (CCU), 58 were randomly selected for the study. Selected centers obtained approval for the study from their corresponding institutional review board. Patients with AMI admitted to these CCUs between May 15 and December 15 2000 were prospectively recruited. Verbal informed consent was obtained from each patient to collect and use their data for research purposes.

Demographic, diagnostic, therapeutic, and clinical data were collected from hospital medical records. Coronary risk factors and previous conditions were assessed by a specific questionnaire administered to patients or their relatives. All variables were precisely defined and their collection was standardized. The CCU application of various diagnostic and therapeutic procedures was also recorded, including coronary angiography and reperfusion procedures (fibrinolysis or primary, rescue, or subacute percutaneous coronary intervention [PCI]). Patients were followed at 1 year by personal interview at an outpatient clinic or by telephone contact when this was not possible.

The end-point of the study was a combined variable including death, reinfarction, postinfarction angina, and stroke during hospital stay. Mortality for any cause at 28 days and 1 year was also considered.

Continuous variables are presented as means (±standard deviation) and categorical variables as percentages. Gender differences were assessed by the chi-square test for categorical variables and by Student's *t*-test or Mann–Whitney *U*-test, as appropriate, for continuous variables. Survival curves were constructed by the Kaplan–Meier method and differences in survival were assessed with the log-rank test. Multivariate analyses were performed by using Cox proportional models. The models included factors that showed univariate gender differences with a $p<0.10$. All p values were two-tailed. A p value <0.05 was considered significant.

3. Results

The study included 6209 patients with AMI: 4641 (74.75%) males and 1568 (25.25%) females. Table 1 lists patient characteristics by gender, including age, history, AMI features, and mortality rates.

The women were significantly older than the men (71 years vs. 64 years). A significantly higher proportion of women than men had a history of diabetes (41.2% vs. 25.5%), hypertension (61.1% vs. 41%), and revascularization (12% vs. 7.2%) but a lower percentage had a history of smoking (15.7% vs. 53.6%) and previous AMI (13% vs. 16.6%). The women more frequently had an AMI with non-ST elevation or LBBB and an AMI of anterior localization, and they had a

Table 1
Patient demographics, cardiovascular risk profile, infarction (AMI) characteristics, and mortality rates

	Men (n=4641)	Women (n=1568)	p
Age	64 (13)	71 (12)	<0.01
Diabetes	1181 (25.5%)	643 (41.2%)	<0.01
Smoking	2486 (53.6%)	245 (15.7%)	<0.01
Dyslipidemia	1845 (39.8%)	651 (41.9%)	0.13
Hypertension	1905 (41.0%)	953 (61.1%)	<0.01
Prior myocardial infarction	772 (16.6%)	202 (13.0%)	<0.01
Prior Revascularization	335 (7.2%)	186 (12.0%)	<0.01
AMI characteristics			
ECG at admission			<0.01
ST elevation	3074 (66.5%)	1005 (65.7%)	
Non-ST elevation	778 (16.%)	286 (18.7%)	
LBBB	130 (2.8%)	61 (4.0%)	
Not determined	641 (13.9%)	177 (11.6%)	
AMI location			<0.01
Anterior	1953 (42.%)	707 (45.9%)	
Inferior	2089 (45.2%)	613 (39.8%)	
Not determined	583 (12.6%)	219 (14.0%)	
Killip class at admission			<0.01
I	3742 (81.2%)	1106 (72.3%)	
II	467 (10.1%)	208 (13.6%)	
III	244 (5.3%)	119 (7.8%)	
IV	155 (3.4%)	96 (6.3%)	
Coronary angiographies in CCU	562 (12.3%)	182 (12.4%)	
Reperfusion procedures	2344 (50.8%)	656 (42.9%)	
CCU mortality	358 (7.7%)	235 (15.0%)	<0.01
28-day mortality	440 (9.5%)	265 (16.9%)	<0.01
1-year mortality	666 (14.4%)	357 (22.8%)	<0.01

AMI: Acute myocardial infarction; LBBB: left bundle branch block; CCU: coronary or critical care unit.

Table 2
Adjusted odds-ratio for coronary angiography during CCU stay

	95% CI			
	OR	Lower	Upper	p
Age	0.98	0.98	0.99	<0.01
Sex: women	1.08	0.89	1.32	0.42
Diabetes	0.97	0.81	1.17	0.78
Smoking	0.88	0.74	1.06	0.18
Prior myocardial infarction	1.06	0.85	1.33	0.59
Prior Revascularization	1.93	1.45	2.56	<0.01
ECG at admission (*)				
Non ST elevation	1.32	1.07	1.64	<0.01
LBBB	1.37	0.82	2.29	0.22
Not determined	1.27	0.97	1.66	<0.07
AMI location (¶)				
Inferior	0.80	0.67	0.95	<0.01
Not determined	0.75	0.55	1.01	<0.06
Killip class at admission (§)				
II	1.27	1.00	1.63	<0.05
III	0.98	0.69	1.39	0.91
IV	1.15	0.78	1.71	0.48

(*) Reference category: ST elevation.
(¶) Reference category: Anterior.
(§) Reference category: Killip I.

Table 3
Adjusted odds-ratios for reperfusion

	95% CI			
	OR	Lower	Upper	p
Age	0.98	0.97	0.98	<0.01
Sex: women	0.87	0.75	1.01	<0.07
Diabetes	0.76	0.67	0.88	<0.01
Smoking	1.16	1.00	1.34	<0.05
Prior myocardial infarction	1.04	0.86	1.26	0.66
Prior Revascularization	1.13	0.87	1.47	0.34
ECG at admission (*)				
Non-ST elevation	0.06	0.05	0.08	<0.01
LBBB	0.28	0.17	0.44	<0.01
Not determined	0.04	0.03	0.06	<0.01
AMI location (¶)				
Inferior	1.02	0.89	1.16	0.78
Not determined	0.45	0.32	0.64	<0.01
Killip class at admission (§)				
II	0.89	0.73	1.09	0.26
III	0.57	0.43	0.76	<0.01
IV	0.65	0.51	0.94	<0.01

(*) Reference category: ST elevation.
(¶) Reference category: Anterior.
(§) Reference category: Killip I.

significantly higher Killip class at admission (Killip ≥ II; 27.7% vs. 18.8%) compared with the men. No significant gender differences were observed in the CCU use of coronary angiography. The factors significantly predicting performance of coronary angiography in the multivariate analysis were lesser age, history of revascularization, non-ST elevation on admission, and anterior location of the AMI (Table 2).

A reperfusion procedure (fibrinolysis or primary, rescue, or subacute PCI) was performed in 42.93% of women (656/1528 with available data) compared with 50.82% of men (2344/4612 with data), a significant difference ($p < 0.0001$). This is an issue of special importance, because patients who underwent some kind of reperfusion had a significantly

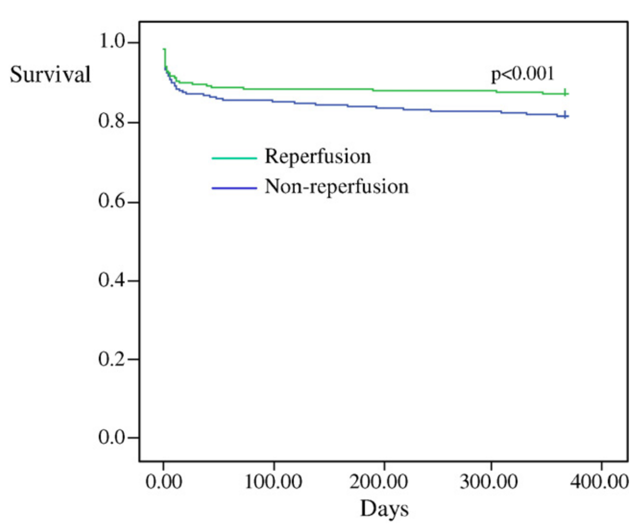

Fig. 1. Survival at 1 year among patients who underwent reperfusion and among those who did not.

higher 1-year survival rate versus those who did not (Fig. 1). In the multivariate analysis, the factors significantly predicting performance of reperfusion procedure were lesser age, absence of diabetes, no smoking history, ST segment elevation on admission ECG, anterior localization of AMI, and Killip class I on admission (Table 3). In this analysis, the female sex variable was only close to statistical significance.

The women received significantly less treatment with IIb/IIIa glycoprotein inhibitors (10.6% vs. 13.1%) despite their higher frequency of AMI with non-ST elevation at admission, lower frequency of lipid-lowering therapy at discharge (36.4% vs. 42.6%), and their similar history of hypercholesterolemia. Furthermore, a significantly lower proportion of women was receiving antiplatelets and betablockers at discharge in comparison with the men, although a higher proportion was taking ACEIs and nitrates (Table 4).

Mortality in the CCU and at 28 days was significantly higher in women (Table 1), with an OR at hospital discharge of 1.95; this difference was established early during CCU

Table 4
Drug therapy during hospital stay

	Men (n=4641)	Women (n=1568)	p
Treatment during hospital stay			
GPIIb-IIIa inhibitors	602 (13.1%)	161 (10.6%)	<0.01
Aspirin	3536 (76.4%)	1078 (70.5%)	<0.01
Ticlopidine	496 (10.7%)	114 (7.5%)	<0.01
Clopidogrel	665 (14.4%)	182 (11.9%)	<0.01
Betablockers	2424 (52.4%)	674 (44.1%)	<0.01
ACEIs	1759 (38.0%)	645 (42.2%)	<0.01
Lipid-lowering drugs	1971 (42.6%)	556 (36.4%)	<0.01
Nitrates	1520 (32.8%)	568 (37.1%)	<0.05
Calcium-channel blockers	658 (14.5%)	183 (13.1%)	<0.1

ACEIs = angiotensin-converting enzyme inhibitors.

stay and persisted until the 1-year follow-up. Table 5 shows the variables significantly related to 28-day mortality in the bivariate analysis, which showed worse 28-day and 1-year survival prognoses for the women. In the multivariate analysis of this end-point (28-day mortality), female sex preserved its strong significance with an OR of 1.36 (95% CI 1.09–1.69), diabetes emerged as an adverse prognostic factor, and some of the treatments applied (betablockers, lipid-lowering drugs) were shown to be protective factors (Table 6). Finally, multivariate analysis of the combined end-point showed higher age, history of diabetes, previous revascularization, anterior AMI localization, advanced Killip class, reperfusion (primary, rescue or subacute), and female

Table 5
Mortality at 28 days

	Alive (n=5515)	Dead (n=705)	p
History			
Age	64 (13)	73 (11)	<0.01
Sex: women	1305 (23.7%)	265 (37.6%)	<0.01
Diabetes	1539 (28.0%)	285 (40.5%)	<0.01
Smoking	2525 (45.9%)	207 (29.4%)	<0.01
Dyslipidemia	2258 (41.1%)	239 (34.0%)	<0.01
Hypertension	2507 (45.6%)	352 (50.1%)	<0.01
Pryor myocardial infarction	841 (15.3%)	133 (18.9%)	<0.01
AMI data			
ECG admission			<0.01
Elevated ST	3580 (65.7%)	500 (71.3%)	
Non-elevated ST	956 (17.5%)	108 (15.4%)	
LBBB	153 (2.8%)	37 (5.3%)	
Without change	762 (14.0%)	56 (8.0%)	
AMI location			<0.01
Anterior	2304 (42.2%)	357 (50.9%)	
Inferior	2453 (44.9%)	248 (35.3%)	
Not determined	705 (12.%)	97 (13.8%)	
Killip class at admission			<0.01
I	4566 (83.9%)	283 (40.5%)	
II	541 (9.9%)	134 (19.2%)	
III	255 (4.7%)	108 (15.5%)	
IV	77 (1.4%)	173 (24.8%)	
Reperfusion			
Reperfusion (of any type)	2695 (49.4%)	307 (43.9%)	<0.01
Primary reperfusion			<0.01
Fibrinolysis	2242 (41.1%)	245 (35.0%)	
PCI	37 (0.7%)	12 (1.7%)	
PCI-stent	249 (4.6%)	25 (3.6%)	
Rescue revascularization			<0.01
Fibrinolysis	35 (0.7%)	8 (1.2%)	
PCI balloon	21 (0.4%)	5 (0.8%)	
PCI stent	97 (1.9%)	11 (1.7%)	
CABG	0 (0.0%)	2 (0.3%)	
CCU treatments			
ASA	5080 (93.3%)	601 (85.9%)	<0.01
Ticlopidine	364 (6.7%)	32 (4.6%)	<0.05
Clopidogrel	421 (7.7%)	27 (3.9%)	<0.01
GPIIb-IIIa Antagonists	700 (12.9%)	63 (9.0%)	<0.05
Non-fractioned heparin	2997 (56.1%)	335 (48.1%)	<0.01
Low-molecular-weight heparin	2769 (51.7%)	254 (37.0%)	<0.01
Betablockers	3007 (55.3%)	127 (18.2%)	<0.01
ACEIs	2357 (43.4%)	198 (28.3%)	<0.01
Lipid-lowering drugs	1168 (21.5%)	52 (7.5%)	<0.01
Calcium antagonists	550 (10.1%)	38 (5.4%)	<0.01

Table 6
Adjusted odds-ratio for mortality at 28 days

		CI 95%		
	OR	Lower	Upper	p
Age	1.04	1.03	1.05	<0.01
Sex: women	1.36	1.09	1.69	<0.01
Diabetes	1.33	1.09	1.62	<0.01
Smoking	1.06	0.84	1.34	0.60
Hypertension	1.05	0.87	1.27	0.62
Prior myocardial infarction	1.12	0.88	1.43	0.36
ECG admission (*)				<0.01
Non-elevated ST	0.50	0.37	0.67	<0.01
LBBB	0.54	0.31	0.93	<0.05
Without change	0.45	0.30	0.69	<0.01
AMI location (¶)				<0.01
Inferior	0.58	0.47	0.72	<0.01
Not determined	1.04	0.71	1.52	0.84
Killip class at admission (§)				<0.01
II	2.90	2.26	3.72	<0.01
III	5.22	3.88	7.03	<0.01
IV	18.75	13.35	26.33	<0.01
ASA	0.82	0.60	1.13	0.23
Heparin	0.54	0.42	0.70	<0.01
Betablockers	0.42	0.34	0.53	<0.01
ACEIs	0.38	0.30	0.46	<0.01
Lipid-lowering drugs	0.56	0.41	0.77	<0.01
Reperfusion	0.94	0.75	1.16	0.54

(*) Reference category: ST elevation.
(¶) Reference category: Anterior.
(§) Reference category: Killip I.

Table 7
Adjusted odds-ratio for combined outcome variable (death, reinfarction, postinfarction angina and stroke) during hospital stay

		CI 95%		
	OR	Lower	Upper	p
Age	1.02	1.02	1.03	<0.01
Sex: female	1.21	1.02	1.42	<0.02
Diabetes	1.18	1.02	1.36	<0.03
Smoking	0.86	0.74	1.01	<0.07
Previous myocardial infarction	1.07	0.88	1.29	0.50
Previous revascularization	1.71	1.29	2.26	<0.00
ECG at admission (*)				
Non-elevated ST	1.04	0.84	1.28	0.75
LBBB	0.80	0.52	1.24	0.32
Not determined	1.07	0.81	1.42	0.62
AMI location (¶)				
Inferior	0.74	0.64	0.86	<0.01
Not determined	1.15	0.85	1.52	0.32
Killip class at admission				
II	1,69	1.38	2.05	<0.01
III	2.64	2.02	3.37	<0.01
IV	13.32	9.45	18.41	<0.01
Reperfusion	1.27	1.08	1.50	<0.01

(*) Reference category: ST elevation.
(¶) Reference category: Anterior.
(§) Reference category: Killip I.

sex to be significant and independent predictive variables of worse prognosis at hospital discharge with an OR of 1.21 (95% CI 1.02–1.42) (Table 7).

4. Discussion

The clinical history (especially age and frequency of diabetes), AMI type, and clinical situation at admission of the women in this study implied *a priori* a worse prognosis than the men, indicating the need for a more interventionalist approach. However, a similar percentage of women as men underwent coronary angiography and significantly fewer women than men underwent primary reperfusion procedures. Moreover, a smaller percentage of women received treatment with IIb/IIIa glycoprotein inhibitors despite their higher rate of AMIs with non-ST elevation at admission. Although use of antiplatelet and lipid-lowering drugs appears to have been below clinical guideline recommendations in both sexes, the women were even less likely to be receiving them at discharge despite their more frequent history of hypercholesterolemia, and they were less likely to be receiving betablockers despite their higher rate of HTA. On the other hand, the women appeared more likely to receive nitrates and calcium antagonists, therapeutic measures of a dubious clinical utility, although the difference did not reach statistical significance.

As anticipated, given the worse AMI prognosis of these women at admission, their short-term and long-term mortality rates were significantly higher than those of the men, and this difference emerged within the first 28 days. It is well documented and is confirmed in this study that initial therapeutic measures, especially pharmacological and/or interventional reperfusion, have a major influence on mortality. Therefore, part of this gender difference in mortality may be due to a difference in therapeutic approach, since women less frequently received primary reperfusion techniques. In fact, the multivariate analysis showed that the simple fact of being a woman was practically an independent predictive factor for not receiving a primary reperfusion.

This issue is rarely addressed in clinical trials, which by their very nature ensure equality between compared groups. Moreover, the relatively low proportion of women in trials of AMI therapies raises suspicions of a gender bias in the selection process [22,23]. In registry-based studies, which more accurately reflect daily clinical practice, similar gender differences to the present findings are commonly reported, despite the fact that hospital-based registries are also liable to a possible selection bias because of women's lesser accessibility to hospitals [24,25]. Indeed, the registry used in the present study may reflect this phenomenon, since only 25.5% of the patients were female, a low percentage for this type of registry.

Most studies that reported a significantly higher mortality in women with AMI [26–28] found, in common with the present study, that higher age, greater presence of comorbidities, and type of AMI presentation played a role in this gender difference. Many authors have also observed that women less frequently receive treatments known to be equally beneficial to both sexes, including betablockers, ACEIs, antiplatelets, and fibrinolysis [29–32]. Indeed, the largest AMI registry to date, the American NRMI, showed that women less frequently received coronary angiography, PCI, or revascularization surgery compared with men [14]. In the present study, the higher mortality of the women is in part explained by the different treatment they received, especially the lesser use of reperfusion techniques (not itself explained by differences in studied variables), as well as by their age, comorbidities, and form of presentation of the disease. Thus, in the bivariate analysis, the women presented a higher risk of worse prognosis at hospital discharge than the men, with an OR of 1.95, and this difference remained significant when other risk factors were considered in the multivariate analysis, although with a lower OR of 1.2.

5. Conclusions

Women have a worse prognosis after an AMI largely as a function of clinical factors. However, there appears to be a gender difference in AMI management that is not explained by these factors and may contribute to this worse prognosis.

Clinical registries closely reflect reality and appear to be an ideal method to demonstrate this variation and to assess the effects of any remedial action taken.

Acknowledgements

We wish to thank all physicians who recruited patients for the registry; their names and institutions are listed below:

PRIAMHO II Investigators (**P**royecto de **R**egistro de **I**nfarto **A**gudo de **M**iocardio **HO**spitalario) José Enero, Hospital General de Albacete, ALBACETE; Pedro Cobo, Hospital Punta Europa, ALGECIRAS; Francisco Sogorb, Hospital General Universitario, ALICANTE; Gonzalo Rey,Hospital San Agustín, AVILÉS; Xabier Mancisidor, Hospital de Cruces, BARAKALDO; Jaume Figueras, Ciutat Sanitaria Vall d'Hebrón, BARCELONA; Xavier Bosch, Hospital Clínic i Provincial de Barcelona, BARCELONA; Antonio Montón, Hospital General Yagüe, BURGOS; Enrique González, Hospital Gran Vía, CASTELLON DE LA PLANA; Patricia Marzal, Hospital Marina Alta y C. E. Denia, DENIA; Pilar Marco, Hospital Nuestra Sra. De Aránzazu, DONOSTIA-SAN SEBASTIAN; Eduardo Escudero, Hospital Can Misses, EIVISSA; Carmen J., Complejo Hospitalario Arquitecto Marcide, EL FERROL; José A. Lapuerta, Hospital Cabueñes, GIJÓN; Joan Sala, Hospital Universitario Josep Trueta; GIRONA; Antonio Reina, Hospital Universitario Virgen de las Nieves; GRANADA; Pablo Velasco, Hospital General de Granollers, GRANOLLERS; Agustín Carrillo, Hospital Princesa de España, JAEN; Martín García; Hospital Universitario de Canaria; LA LAGUNA; Isabel Ostobal, Hospital de la Línea; LA LINEA DE CONCEPCION; Vicente Nieto, Complejo

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References

[1] Lerner DJ, Kannel WB. Patterns of coronary heart disease morbidity and mortality in the sexes: a 26-year follow-up of the Framingham population. Am Heart J 1986;111:383–90.

[2] Wong SC, Sleeper LA, Monrad ES, et al. Absence of gender differences in clinical outcomes in patients with cardiogenic shock complicating acute myocardial infarction. A report from the SHOCK Trial Registry. J Am Coll Cardiol 2001 (Nov 1);38(5):1395–401.

[3] Herman B, Greiser E, Pohlabeln H. A sex difference in short-term survival after initial acute myocardial infarction. The MONICA-Bremen acute myocardial infarction register, 1985–1990. Eur Heart J 1997;18(6):963–70.

[4] MacIntyre K, Stewart S, Capewell S, et al. Gender and survival: a population-based study of 201,114 men and women following a first acute myocardial infarction. J Am Coll Cardiol 2001 (Sep);38(3):729–35.

[5] Launbjerg J, Fruergaard P, Madsen JK, et al. Ten year mortality in patients with suspected acute myocardial infarction. BMJ 1994;308 (6938):1196–9.

[6] Laks T, Tuomilehto J, Joeste E, et al. Acute myocardial infarction in Estonia: first results from the Tallinn AMI Register. J Clin Epidemiol 1996;49(5):573–9.

[7] Abildstrom SZ, Rasmussen S, Rosen M, et al. Trends in incidence and case fatality rates of acute myocardial infarction in Denmark and Sweden. Heart 2003;89(5):507–11.

[8] Capewell S, Livingston BM, MacIntyre K, et al. Trends in case-fatality in 117 718 patients admitted with acute myocardial infarction in Scotland. Eur Heart J 2000;21(22):1833–40.

[9] Chambless L, Keil U, Dobson A, et al. Population versus clinical view of case fatality from acute coronary heart disease: results from the WHO MONICA Project 1985–1990. Multinational monitoring of trends and determinants in cardiovascular disease. Circulation 1997;96 (11):3849–59.

[10] Gottlieb S, Goldbourt U, Boyko V, et al. Mortality trends in men and women with acute myocardial infarction in coronary care units in Israel. A comparison between 1981–1983 and 1992–1994. For the SPRINT and the Israeli Thrombolytic Survey Groups. Eur Heart J 2000;21(4):284–95.

[11] He J, Klag MJ, Whelton PK, et al. Short- and long-term prognosis after acute myocardial infarction in Chinese men and women. Am J Epidemiol 1994;139(7):693–703.

[12] Canto JG, Shlipak MG, Rogers WJ, et al. Prevalence, clinical characteristics, and mortality among patients with myocardial infarction presenting without chest pain. JAMA 2000 (Jun 28);283 (24):3223–9.

[13] Chun BY, Dobson AJ, Heller RF. The impact of diabetes on survival among patients with first myocardial infarction. Diabetes Care 1997 (May);20(5):704–8.

[14] Chandra NC, Ziegelstein RC, Rogers WJ, et al. Observations of the treatment of women in the United States with myocardial infarction: a report from the National Registry of Myocardial Infarction-I. Arch Intern Med 1998;158(9):981–8.

[15] Gottwik M, Zahn R, Schiele R, et al. Differences in treatment and outcome of patients with acute myocardial infarction admitted to hospitals with compared to without departments of cardiology; results from the pooled data of the Maximal Individual Therapy in Acute Myocardial Infarction (MITRA 1+2) Registries and the Myocardial Infarction Registry (MIR). Eur Heart J 2001;22(19):1794–801.

[16] Mickelson JK, Blum CM, Geraci JM. Acute myocardial infarction: clinical characteristics, management and outcome in a metropolitan Veterans Affairs Medical Center teaching hospital. J Am Coll Cardiol 1997;29(5):915–25.

[17] Franks AL, May DS, Wenger NK, et al. Racial differences in the use of invasive coronary procedures after acute myocardial infarction in Medicare beneficiaries. Ethn Dis 1993;3(3):213–20.

[18] Canto JG, Rogers WJ, Chandra NC, et al. The association of sex and payer status on management and subsequent survival in acute myocardial infarction. Arch Intern Med 2002 (Mar 11);162(5):587–93.

[19] Engstrom G, Goransson M, Hansen O, et al. Trends in long-term survival after myocardial infarction: less favourable patterns for patients from deprived areas. J Intern Med 2000;248(5):425–34.

[20] Marrugat J, Anto JM, Sala J, et al. Influence of gender in acute and long-term cardiac mortality after a first myocardial infarction. REGICOR Investigators. J Clin Epidemiol 1994;47(2):111–8.

[21] Aros F, Cuñat J, Loma-Osorio A, et al. Management of myocardial infarction in Spain in the year 2000. The PRIAMHO II study. Rev Esp Cardiol 2003;56(12):1165–73.

[22] Tamis-Holland JE, Palazzo A, Stebbins AL, et al. Benefits of direct angioplasty for women and men with acute myocardial infarction: results of the global use of strategies to open occluded arteries in acute coronary syndromes (GUSTO II-B) angioplasty substudy. Am Heart J 2004;147:133–9.

[23] PCAT Collaborators. Primary coronary angioplasty compared with intravenous thrombolytic therapy for acute myocardial infarction: six-month follow up and analysis of individual patient data from randomized trials. Am Heart J 2003;145:47–57.

[24] Cohen HA, Williams DO, Holmes DR, et al. Impact of age on procedural and 1-year outcome in percutaneous transluminal coronary angioplasty: a report from the NHLBI dynamic registry. Am Heart J 2003;146:513–9.

[25] Agencia de Evaluación de Tecnologías Sanitarias (AETS). Manejo Hospitalario de la Cardiopatía Isquémica en España. Análisis de situación. Ed. Instituto de Salud «Carlos III». Ministerio de Sanidad y Consumo. Madrid, 2001.

[26] Marrugat J, Sala J, Masia R, et al. Mortality differences between men and women following first myocardial infarction. JAMA 1998;280:1405–9.

[27] Weaver WD, White HD, Wilcox RG, et al. Comparisons of characteristics and outcomes among women and men with acute myocardial infarction treated with thrombolytic therapy. JAMA 1996;275:777–82.

[28] Chang W-C, Kaul P, Westerhout CM, et al. Impact of sex on long-term mortality from acute myocardial infarction vs. unstable angina. Arch Intern Med 2003;163:2476–84.

[29] Scirica BM, Moliterno DJ, Every NR, et al. Differences between men and women in the management of unstable angina pectoris (The GUARANTEE Registry). Am J Cardiol 1999;84:1145–50.

[30] Maynard C, Litwin PE, Martin JS, et al. Gender differences in the treatment and outcome of acute myocardial infarction. Results from the myocardial infarction triage and intervention registry. Arch Intern Med 1992;152(5):972–6.

[31] Schwartz LM, Fisher ES, Tosteson NA, et al. Treatment and health outcomes of women and men in a cohort with coronary artery disease. Arch Intern Med 1997;157:1545–51.

[32] Peterson ED, Roe MT, et al. Early use of Glycoprotein IIb/IIIa inhibitors in non ST elevation acute myocardial infarction. J Am Coll Cardiol 2003;42:45–53.