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Gender Differences in In-hospital Mortality and Angiographic Findings of Patients with Acute ST-segment Elevation Myocardial Infarction (STEMI) Undergoing Percutaneous Coronary Intervention (PCI)

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A B S T R A C T

There are conflicting reports in the literature regarding the role of sex on the in-hospital mortality of patients with acute myocardial infarction. The objective of this study is to determine whether there are gender differences in in-hospital mortality and angiographic findings of patients with acute ST-segment elevation myocardial infarction (STEMI) undergoing percutaneous coronary intervention (PCI). We conducted a prospective study of all patients admitted to University Hospital Center Split, Croatia with STEMI from 2004 to 2008 who underwent PCI. From March 2004 throughout September 2008, 488 patients with STEMI underwent PCI (364 men, 74.6%; 124 women, 25.4%). Compared with men, women were significantly older (mean age, 67.3 vs. *60.3 years; p<0.001). Men had a significantly higher proportion of circumflex artery occlusion (19.5%* vs. *10.5%, p=0.022). A higher proportion of men had a multivessel disease than women (56.8%* vs. *41.9%; p=0.004). In-hospital mortality was significantly higher among women (11.3%* vs. *4.6%; p=0.002) but after adjustment for the baseline difference in age, the female sex was not an independent predictor of in-hospital mortality (adjusted OR 1.15; 95% CI 0.82–1.84). In men, occlusions of left anterior descending artery showed higher mortality rate than occlusions of other coronary arteries (LM 0%, LAD 7.3%, Cx 2.8%, RCA 0.7%, p=0.03). According to our results female gender is not an independent predictor of in-hospital mortality after percutaneous coronary intervention. In men, occlusions of left anterior descending arteries are associated with higher mortality rate comparing to occlusions of other coronary arteries.*

Key words: *gender, myocardial infarction, in-hospital mortality, percutaneous coronary intervention*

Introduction

Coronary artery disease (CAD) remains the leading cause of morbidity and mortality in both men and women in Croatia.

There are conflicting reports in the literature regarding the role of sex on the in-hospital mortality of patients with acute myocardial infarction (AMI). There are several studies which have demonstrated that women with AMI have higher in-hospital mortality rates than men[1–4]. This difference has been attributed to their older age, more severe angina, and higher rates of systemic hypertension, diabetes mellitus, hypercholesterolemia and congestive heart failure. There are some reports from large studies indicating that women diagnosed with AMI are less likely to undergo revascularization treatments[5–6].

However, more recent studies demonstrated that gender was not an independent predictor of mortality after percutaneous coronary intervention[7–8].

The aim of this study was to determine whether there are gender differences in in-hospital mortality and angiographic findings of patients with acute ST-segment elevation myocardial infarction (STEMI) undergoing percutaneous coronary intervention (PCI).

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Materials and Methods

From March 2004 throughout September 2008, 488 patients with STEMI underwent a percutaneous coronary intervention at the University Hospital Split, Croatia.

Informed consent was obtained from each patient before the intervention. All patients presenting within 12h from symptom onset with signs of ischemia (persistent elevation or re-elevation of ST segment in ≥2 contiguous electrocardiographic leads or left bundle branch block) were included. Clinical data were collected prospectively during patient's hospitalization. Data elements included information on comorbidities, procedural details, angiographic outcomes, complications and in-hospital outcomes. Multivessel disease was defined by a stenosis of >50% in two or more major epicardial coronary arteries.

The study was approved by the Medical Ethics committee of University Hospital Center Split.

Statistical analysis

Continuos variables were expressed as mean value± SD and were compared using a t-test. Categorical variables were expressed as absolute value and percentage and were compared using χ^2-test. Multivariable analyses were performed to test for gender differences in in-hospital mortality after adjustment for baseline differences.

A p value less than 0.05 was considered statistically significant.

The data were analyzed using the statistical package SPSS 11.0 for Windows (SPSS Inc., Chicago, IL, USA).

Results

A total of 488 patients were enrolled in the study (364 men, 74.6%; 124 women, 25.4%). Baseline characteristics and angiographic findings are reported in Tables 1 and 2, respectively. Overall, women were older than men (mean age, 67.3 *vs.* 60.3 years; p<0.001) and were more likely to have hypertension, but they were less likely to have a history of smoking.

Men had a significantly higher proportion of circumflex artery occlusion (19.5% *vs.* 10.5%, p=0.022). A higher proportion of men had a multivessel disease (56.8% *vs.* 41.9%; p=0.004).

In-hospital mortality was significantly higher among women (11.3% *vs.* 4.6%; p=0.002) but after adjustment for the baseline difference in age, the female sex was not an independent predictor of in-hospital mortality (adjusted OR 1.15; 95% CI 0.82–1.84). In men, occlusions of left anterior descending artery showed higher mortality rate compared to occlusions of other coronary arteries (LM 0%, LAD 7.3%, Cx 2.8%, RCA 0.7%, p=0.03). Com-

TABLE 1
BASELINE CHARACTERISTICS

	Women (n=124)	%	Men (n=364)	%	p
Age	67.3		60.3		p<0.001
Hypertension	93	75.0	203	55.7	p<0.001
Hypercholesterolemia	60	48.4	173	47.5	p=0.87
Diabetes	45	36.3	125	34.3	p=0.69
Previous angina	13	10.5	37	10.1	p=0.91
Previous heart failure	6	4.8	14	3.8	p=0.63
Previous MI	8	6.4	41	11.3	p=0.12
Prev. bypass surgery	3	2.4	19	5.2	p=0.19
Smoking	34	27.4	187	51.4	p<0.001
Cerebrovascular dis.	10	8.0	26	7.1	p=0.74

TABLE 2
ANGIOGRAPHIC FINDINGS*

	Women (n=124)	%	Men (n=364)	%	p
Infarct-related coronary artery					
Left main artery	1	0.8	4	1.1	p=0.78
Left anterior descending artery	55	44.4	150	41.2	p=0.77
Left circumflex artery	13	10.5	71	19.5	p=0.022
Right coronary artery	55	44.4	139	38.2	p=0.22
Multivessel disease	52	41.9	207	56.8	p=0.004

* Because of rounding, not all percentages total 100

TABLE 3
COMPARISON OF IN-HOSPITAL MORTALITY BETWEEN WOMEN AND MEN ACCORDING TO INFARCT-RELATED CORONARY ARTERY*

	Women (n=124)	Men (n=364)	p
	No. of in-hospital deaths		
Total	11.3 (14/124)	4.6 (14/364)	p=0.002
Infarct-related coronary artery			
Left main artery	0 (0/1)	0 (0/4)	
Left anterior descending artery	12.7 (7/55)	7.3 (11/150)	p=0.22
Left circumflex artery	15.3 (2/13)	2.8 (2/71)	p=0.05
Right coronary artery	9.1 (5/55)	0.7 (1/139)	p=0.002

*Data are presented as % (No. of deaths/ No. of patients)

parison of in-hospital mortality between women and men, according to infarct-related coronary artery, is shown in Table 3. Both men and women, showed significant differences in mortality rate in a group of patients with multivessel disease (5.8% *vs.* 1.3%, p=0.026, 19.2% *vs.* 5.5%, p=0.018, respectively).

Discussion

The results of our study show that in-hospital mortality after acute ST-segment elevation myocardial infarction in patients undergoing percutaneous coronary intervention was at least two-fold higher among women than men. However, after adjustment for baseline characteristic such as older age alone, this difference in in-hospital mortality disappeared, so female gender was no longer an independent predictor of mortality after percutaneous coronary intervention. This study is inconsistent with previous studies that had previously showed that women had a higher adjusted in-hospital mortality than men[9–13], although their analyses revealed that at least a portion of these higher in-hospital mortality rates in woman may be due to higher incidence of older age and a greater prevalence of diabetes, hypertension, hypercholesterolemia and congestive heart failure. On the other hand, concerning the baseline characteristics, our data showed only a higher incidence of older age and a greater prevalence of hypertension in women, except for having a lower prevalence of smoking.

It is a well-known fact that women generally develop coronary artery disease between 6 and 10 years later than men as a result of the protective role of endogenous estrogen[14]. This fact explains the older age of female patients suffering from myocardial infarction and a higher prevalence of other risk factors. On the other hand, our data showed that women had less severe coronary artery disease, considering the prevalence of multivessel disease, previous myocardial infarction and previous bypass surgery which is consistent with findings of other studies. This distinction between prevalence of risk factors and severity of coronary artery disease is far from clear[11]. According to previous mentioned studies, in-hospital mortality was significantly higher among women even after adjustment for baseline differences and some risk factors[9–13]. It has been suggested that it may be related to higher complication rates in women, including stent thrombosis and bleeding complications, smaller vessel size and increased tortuosity and underuse of invasive procedures in women with acute myocardial infarction. The difference in body size, a surrogate for coronary vessel diameter, between men and women has also been postulated to influence in-hospital mortality[15]. Kastrati et al.[16] reported that a genetic variant of platelet glycoprotein IIIa increases the risk of restenosis after PCI more in women than in men. Johansson et al.[17] suggested that reduced collateral blood flow in women with STEMI accounts for the higher rate of complications.

However, the results of our study are not unique in the literature. Several other studies confirmed that when the mortality rate was adjusted for differences in baseline variables, female gender was not a significant predictor of death[7–8,19–22].

Angiographic findings have demonstrated that men had significant higher incidence of infarct related artery of the left circumflex artery. This is consistent with the findings of Cheng et al.[18]. In men, occlusions of left anterior descending artery showed significantly higher mortality rate than occlusions of other coronary arteries. Both men and women, showed a significant differences in mortality rate in a group of patients with multivessel disease.

In conclusion, the results of this study demonstrate that women had significantly higher in-hospital mortality than men. However, after adjustment for older age alone, this difference in in-hospital mortality disappeared, so according to our results female gender is not an independent predictor of mortality after percutaneous coronary intervention at least in southern part of Croatia. In men, occlusions of left anterior descending artery are associated with higher mortality rate than occlusions of other coronary arteries.

Further larger-scale studies are needed before firm conclusions can be drawn.

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RAZLIKE U SMRTNOSTI I ZASTUPLJENOSTI OKLUZIJA KORONARNIH ARTERIJA U OVISNOSTI O SPOLU KOD BOLESNIKA SA INFARKTOM MIOKARDA SA ST ELEVACIJOM (STEMI) LIJEČENIH PERKUTANOM KORONARNOM INTERVENCIJOM (PCI)

SAŽETAK

U literaturi su zastupljeni različiti podatci o ulozi spola u smrtnosti kod bolesnika sa infarktom miokarda. Cilj rada je ispitati razliku u zastupljenosti okluzija koronarnih arterija i smrtnosti u ovisnosti o spolu kod osoba sa infarktom miokarda sa ST elevacijom (STEMI) liječenih perkutanom koronarnom intervencijom (PCI). Provedeno je prospektivno istraživanje koje je uključivalo sve osobe sa STEMI kod kojih je provedena hitna perkutana koronarna intervencija u KBC Split u razdoblju od 2004. do 2008. godine. U razdoblju od ožujka 2004. do rujna 2008. provedeno je 488 hitnih perkutanih koronarnih intervencija u akutnom infarktu miokarda sa ST elevacijom (364 muškaraca; 74,6%, 124 žena; 25,4%). Prosječna životna dob žena sa STEMI statistički je značajno viša u odnosu na prosječnu životnu dob muškaraca sa STEMI (67,3 g. *vs.* 60,3 g.; p<0,001). Udio okluzija cirkumfleksne grane lijeve koronarne arterije statistički je značajno veća u muškaraca (19,5% *vs*. 10,5%; p=0,022). Muškarci imaju veći udio višežilnih lezija (56,8% *vs*. 41,9%; p=0,004). Žene imaju statistički značajnu veću smrtnost u odnosu na muški spol (11,3% *vs*. 4,6%; p=0,002), ali nakon provedene multivarijantne analiza uzimajući u obzir dob, ženski spol više ne predstavlja neovisni čimbenik smrtnosti nakon perkutane koronarne intervencije (OR 1,15;95% CI 0,82–1,84) Okluzija LAD kod muškaraca povezana je sa većom stopom smrtnosti u odnosu na okluziju ostalih koronarnih arterija (LM 0%, LAD 7,3%, Cx 2,8% RCA 0,7%; p=0,03). Prema podacima naše studije ženski spol ne predstavlja neovisni čimbenik smrtnosti nakon PCI. Infarkt miokarda uzrokovan okluzijom lijeve prednje silazne grane u muškaraca je povezan sa daleko najvećim mortalitetom.