original article

In-hospital mortality following acute myocardial infarction in Kosovo: a single center study

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BACKGROUND AND OBJECTIVES: Randomized trials have demonstrated that primary angioplasty is more effective than intravenous thrombolysis in reducing mortality and morbidity in patients with acute myocardial infarction (AMI). The aim of this study was to assess the in-hospital mortality of patients with AMI admitted to the only tertiary care center in Kosovo, where coronary percutaneous intervention procedures are unavailable. We also assessed the impact of age and gender on in-hospital mortality.

PATIENTS AND METHODS: Consecutive patients with the diagnosis of AMI, admitted in our institution between 1999 and 2007, were included in this retrospective study.

RESULTS: Of 2848 patients (mean age 61±11.3 years, 73.4% males) admitted with AMI, 292 (10.25%) patients died during in-hospital stay. The overall in-hospital mortality was 12.3% for women and 9.5% for men ($P<.05$). Women were significantly older than men (64.2±11 years vs 59.7±11.8 years, $P<.05$). Mean length of stay was 12.0±94 for women and 10.7±7.6 for men. From 1999 to 2007 there was an increase in the age of patients with AMI but the mortality rate remained stable.

CONCLUSIONS: Compared to developed countries, patients with AMI in Kosovo present at an earlier age but have a higher mortality rate. Women with AMI had a significantly higher in-hospital mortality rate than men. The lack of percutaneous coronary intervention procedures in AMI patients may have contributed to the high in-hospital mortality in our population.

In general, clinical presentation and outcome of acute myocardial infarction (AMI) and coronary artery disease vary across regions and differ from country to country.[1] Significant differences in the prevalence of AMI exist with respect to gender, age and ethnicity.[1] Despite major progress in prevention, diagnosis, and treatment, coronary artery disease is the leading cause of mortality in the general population.[2] Several studies have shown that in patients with AMI, age 70 years or older is clinically important and an independent predictor of increased risk of in-hospital death.[3-6] Most previous studies demonstrated that women have a higher in-hospital mortality than men.[7-11] Several prior randomized clinical studies that compared primary percutaneous transluminal coronary angioplasty with thrombolysis have demonstrated that primary angioplasty is more effective than intravenous thrombolysis in reducing mortality and morbidity in patients with AMI.[12-15] The reduced mortality of patients with AMI in recent years, compared with previous decades, may be explained at least in part by more widespread use of percutaneous coronary intervention such as a revascularization approach.[16,17] The aim of this study was to assess the in-hospital mortality of patients with AMI from the Kosovo population admitted in the only tertiary health center in Kosovo, which is also the secondary health center for more than 1 million inhabitants of Prishtina. The other objective of our study was to assess the impact of age and gender on in-hospital mortality in these patients.

PATIENTS AND METHODS

This study included 2848 consecutive patients with a clinical diagnosis of AMI at discharge or death due to

AMI managed in the coronary care unit and two divisions of cardiology in the Service of Cardiology, at the Internal Medicine Clinic, University Clinical Center of Kosovo, in Prishtina, between June 1999 and May 2007. The inclusion criterion for this study was the diagnosis of AMI established according the definition of the World Health Organization, which requires at least two of the following criteria: (1) typical chest pain that lasted for ≥20 minutes; (2) typical changes on surface ECG (ST-segment elevation of ≥0.1 mV in ≥2 limb leads or ≥0.2 mV in ≥2 contiguous precordial leads, pathological Q waves, or complete left bundle branch block of new onset); and (3) increased activity of creatine kinase (CK) and/or its myocardial band (CK-MB) ≥two times the upper limit of normal range.[8] Trained research medical students studied the information from the hospital medical records in the hospital archive. Demographic data were obtained from all patients including age, gender, laboratory data, ECG, and the prevalence of risk factors such as a previous history of coronary heart disease, diabetes, hypertension, smoking status, family history of cardiovascular disease and clinical course during hospitalization.

Based on the review of all in-hospital ECGs, AMI was classified as either Q-wave infarction or non-Q-wave infarction. Regarding infarct location, AMI was classified as anterior (septal, anterolateral, high lateral, extensive anterior) if electrocardiographic changes diagnostic of AMI involved the following leads: D1, aVL, V1-V3; V4-V6), inferior (inferior, inferolateral, inferodorsal, laterodorsal, inferolaterodorsal) if electrocardiographic changes diagnostic of AMI involved the following leads: D2, D3, AVF; D1, AVL; V5 and V6; V7 and V8) and anteroinferior when the ECG changes involved leads from both above locations. Information on diabetes, hypertension, smoking status and a family history of cardiovascular disease was extracted from medical records. Hypercholesterolemia was diagnosed if total cholesterol was >5 mmol/L or if patient received lipid-lowering therapy. Patients were divided into three categories: ≤45 years (young), >45 to 65 years (middle age), and >65 years (old age).

Data are presented as mean±standard deviation or proportions (% of patients). Continuous data were compared with the two-tailed unpaired t test and with one-way ANOVA. Discrete data were compared with the chi-square test. A *P* value <.05 was considered to indicate statistical significance.

RESULTS

The mean age of the study population was 61.0±11.3 years (Table 1). Of 2848 patients with AMI, 1254 (44%) had arterial hypertension, 541 (19%) had diabetes mellitus, 627 (22%) had hypercholesterolemia, 1538 (54%) had smoked (current or ex-smokers) prior to admission and 1542 had a positive familial history for coronary artery disease. There were 2091 (73.4%) males and 757 (26.6%) females. The female patients were significantly older than male patients (64.2±11 years vs. 59.7±11.8 years, *P*<.001), and the risk factor profile differed significantly between female and male patients (Table 2). A positive family history for coronary artery disease was the most important risk factor for females (67.2%) compared with males (49.4%) (*P*<.001). Hypercholesterolemia was more frequent in females (30.4%) than in males (19%, *P*<.001). On the other hand, smoking (66.5%) and hypertension (47.8%) were significantly more frequent in males. The proportion of patients with diabetes did not differ significantly between males and females.

Table 1. Clinical characteristics of the patients (n=2848).

Age (years) (mean±SD)	61±11.3
Hypertension	1254 (44%)
Diabetes	541 (19%)
Hypercholesterolemia	627 (22%)
Smoking	1538 (54%)
Positive family history for CAD	1542 (54.1%)
In-hospital stay (days) (mean±SD)	11±8
In-hospital mortality	292 (10.25%)

Values are numbers (percentages) unless otherwise indicated.

Table 2. Clinical characteristics of the study patients divided according to gender.

	Female	Male	*P* value (male vs. female)
Patients in cohort	757 (26.6%)	2091 (73.4%)	
Age (years) (mean±SD)	64.2±11	59.7±11.8	<.001
Hypertension	286 (37.8%)	968 (47.8%)	.011
Diabetes	153 (20.2%)	388 (18.5%)	.411
Hypercholesterolemia	230 (30.4%)	397 (19.0%)	<.001
Smoking	148 (19.6%)	1390 (66.5%)	<.001
Positive family history for CAD	509 (67.2%)	1033 (49.4%)	<.001
In-hospital stay (days) (mean±SD)	12±9.4	10.7±7.6	<.001
In-hospital mortality rate (%)	93 (12.3%)	199 (9.5%)	.054

Values are numbers (percentages) unless otherwise indicated.

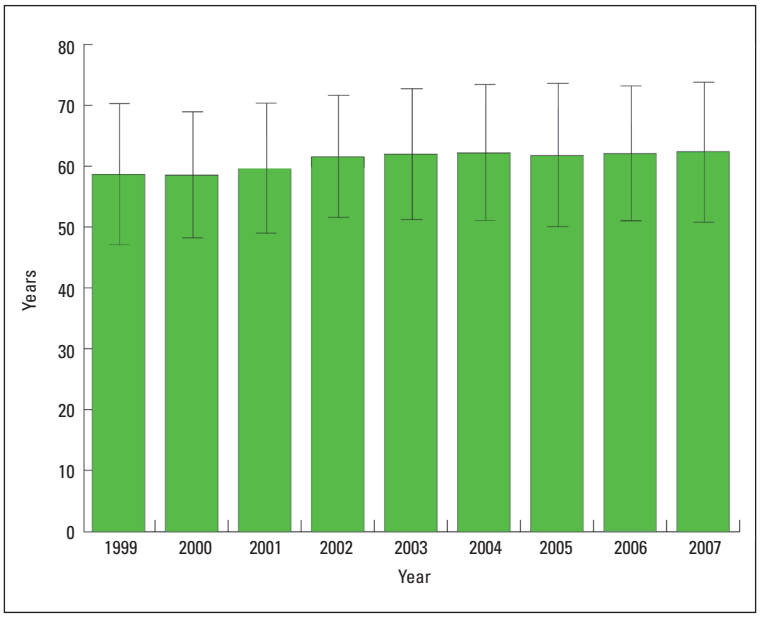

Figure 1. Age (mean±SD) of patients with diagnosis of acute myocardial infarction from 1999 to 2007 (*P*=.018).

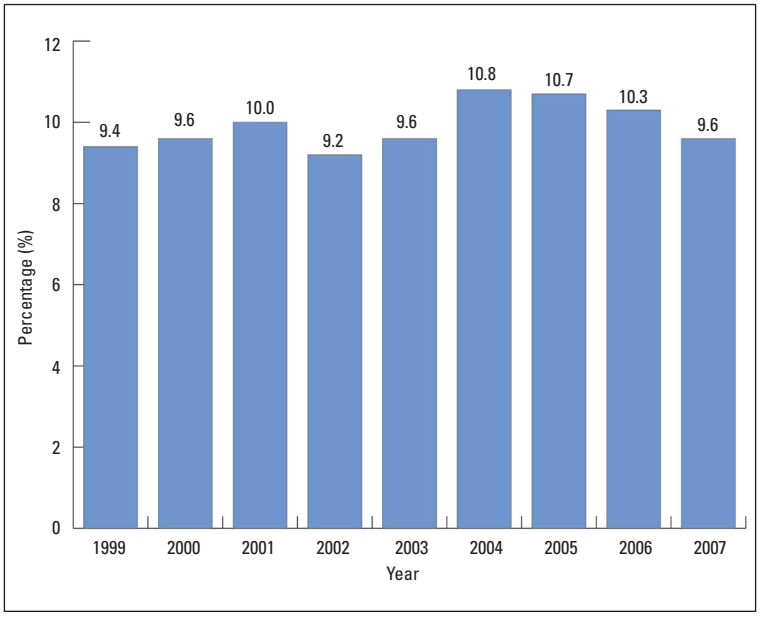

Figure 2. Annual mortality rate from 1999 to 2007 in patients with acute myocardial infarction.

Anterior wall infarction occurred in 1595 patients (56%), inferior wall infarction in 1196 (42%), and anteroinferior infarction in 57 (2%). During the in-hospital stay, 292 (10.3%) patients died and 2556 patients were discharged from the hospital after a mean stay of 11±8 days. The overall in-hospital mortality was 12.3% for women and 9.5% for men (*P*<.05) (Table 1).

Of the 2848 patients in the study cohort, 298 (10.5%) were ≤45 years of age, 1535 (53.9%) were in the group >45 to ≤65 years, and 1015 (35.6%) were older than 65 years. Patients in all three age groups were predominantly male, but this was more evident in the younger (89.3%) and middle age groups (76.7%) compared with the 65 years group (63.7%).The mortality rate was significantly higher for female patients compared with male patients in the younger (7.7% vs. 4.5%, *P*<.001), but not in the middle age (8.4 vs 7.6%, *P*=.491) or older groups (16.8 vs. 16.7%, *P*=.963). During 1999 to 2007, the average age of patients with AMI increased (Figure 1) from 58.8 years to 62.4 years (*P*=.018). The mortality rate seems not to have decreased during the same years (Figure 2).

DISCUSSION

One of the main findings of our study was that the age of patients admitted for AMI in Kosovo was lower than the age of patients in most European countries.[8-11,17-20] This finding may be explained by the higher prevalence of important risk factors, such as smoking and a positive family history for coronary artery disease in our patients. In fact, the prevalence of smoking in our study population is among the highest in Europe. We found that women were of older age than men at the time of AMI. This finding is in accordance with previous studies.[8-11,19-21] Furthermore, the in-hospital stay was longer and mortality among our patients was higher compared with developed countries.[9,16,19,21,23,24] This may be explained by the lack of early revascularization interventional therapy.

The mortality in patients treated with thrombolysis in the MITRA/MIR (Maximal Individual Therapy in the Acute Myocardial Infarction Registry)[16] was similar to our findings, but the patients treated with angioplasty showed lower mortality. Therefore, the unavailability of the angioplasty procedure in our center could have had an important negative impact on observed high-rates of in-hospital mortality. In addition, though not analyzed in this study, possible delays in arrival of patients in our center, due to the lack of a system of early health care delivery to those patients, have taken their toll on mortality as well. The mortality rate, however, was lower than in some studies conducted over the last decade,[8,10,22] which may imply that the treatment of our patients is in accordance with recommended protocols that include thrombolysis.

Our study demonstrated that women with AMI have a significantly higher in-hospital mortality rate than men. This finding is in accordance with previous studies.[8-11,20,21,23,24] However,Hirakawa et al[19] in the set-

ting of the Tokai Acute Myocardial Infarction Study II (TAMIS II) study found that women with AMI undergoing percutaneous interventions in AMI did not have a significantly higher in-hospital mortality rate compared to men in Japan. In particular, we found that the mortality rate was significantly higher for female patients compared with male patients of a younger age, but not in the other two older age groups. This finding is in accordance with the findings of a study by Vaccarino et al,[22] but it contradicts findings of a study by Fabijanic et al,[10] who found a significantly higher mortality rate in female patients >65 years, whereas in patients <65 years there were no significant differences. Previous studies of myocardial infarction in elderly patients found either no significant differences in the mortality rate between men and women[25,26] or a lower rate among women.[27,28]

Our study has several limitations. First, only in-hospital patient outcomes were analyzed; we have no information on pre-hospital deaths. In addition, we did not have the post-discharge mortality data of these patients. Second, information about treatment with aspirin, beta-blockers, ACE inhibitors, statins and thromolytic therapy was not collected, although these medications were routinely used in our patients. These treatments have been proven to reduce mortality in AMI patients.[29] Third, we could not assess the cause except by clinical and ECG data as autopsies were not performed.

In conclusion, the age of AMI patients in Kosovo is lower than in developed countries. The in-hospital stay was longer and in-hospital mortality was higher compared to developed countries. Our study demonstrates that women with AMI have significantly higher in-hospital mortality than men. It seems that that the lack of percutaneous coronary interventions in our patients with AMI may have contributed to the high in-hospital mortality.

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