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EVALUATION OF THE FACTORS ASSOCIATED WITH MORTALITY AFTER PRIMARY PCI IN AN IRANIAN POPULATION

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ABSTRACT

Background: Percutaneous coronary intervention (PCI) is considered the first treatment for early reperfusion in patients presenting with ST-elevation myocardial infarction (STEMI). Yet, mortality rate after depends on various factors, like time-to-treatment, age, female sex, comorbidities, and clinical factors. Unlike significant decrease in CVD-related mortality rate in developed countries, it is still a serious public health threat in Iran.
Objectives: The present study aimed to determine the factors affecting mortality after PCI in an Iranian population.
Patients and Methods: The present cross-sectional study evaluated 89 patients with ST elevation MI (STEMI), candidate of Primary PCI in Emergency Department (ED) of Bu Ali hospital from April 2014 to May 2015. PCI was performed by an interventionalist; the cases with involvement of other vessels underwent staged PCI. Primary outcome in this study was mortality rate.
Results: Type of the involved vessel was LAD in 54 patients (60.7%), RCA in 24 patients (27.0%), and LCX in 10 patients (11.2%). One vessel was involved in 9 patients (10.1%), two-vessel disease in 32 patients (36.0%), and three-vessel disease in 48 patients (53.9%). Mean EF was 43.98±9.85. The mortality rate was 4.5% (4 cases). The type and number of vessel involved, time to PCI, sex, and mean age were not (P>0.05), but mean EF was associated with mortality (P<0.001).
Conclusion: The results of the present study shows that mean EF was found as the only factor associated with mortality, which necessitates that cardiologists pay greater attention to underlying cardiac status of patients with STEMI undergoing primary PCI.

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Introduction

Cardiovascular disease (CVD) is the leading cause of death worldwide, but the recent improvements in prevention and treatment strategies have significantly reduced the mortality rate [1]. One of the important measures is early reperfusion, which is preferably performed through percutaneous coronary intervention (PCI), based on the recommendations of ESC Guidelines for the management of acute myocardial infarction (MI) in patients presenting with ST-elevation myocardial infarction (STEMI) [2].

One of the important factors in the outcome of PCI is proposed to be time and delay in the PCI after the first medical call (FMC) is posited to increase the rate of severe heart failure and mortality [3]. Moreover, every minute delay in primary angioplasty affect one-year mortality [4], and clinical practice guidelines of the American College of Cardiology and the

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American Heart Association (ACC–AHA) have considered a door-to-balloon time of less than 90 minutes and emergency department (ED)-to-balloon time of less than 30 minutes as the first (Class I) recommendation [5].
But the results of studies regarding mortality after primary PCI is controversial, and some studies have found no change in in-hospital mortality rate by reducing the door-to-balloon time [6], which could be due to the fact that various factors, beside time to treatment, have been associated with mortality rate. Factors, such as age, female sex, comorbidities, and clinical factors, like number of vessels involved, and PCI technique, like as staged percutaneous revascularization of multi-vessel coronary disease have been identified as strong predictors of mortality rate after primary PCI [7-10]. Moreover, mortality after one year is mainly due to non-cardiac reasons, such as underlying disease, like diabetes, and renal failure [11]. Therefore, it is essential to identify the underlying factors of PCI-related mortality precisely.
Although studies in developed countries, like the United States have reported significant decrease in mortality rate from CVD in the due to decrease in the risk factors and improvement in treatment strategies [12], all-cause and CVD-related mortality rate had an increasing trend since 1990 and CVD-related mortality remain a serious public health threat in Iran [13]; therefore, it is essential to evaluate the reasons underlying CVD-related mortality in Iran. As primary PCI is the conventional early treatment after STEMI [14].

Objectives

The present study aimed to determine the factors affecting mortality after primary PCI in an Iranian population.

Patients and Methods

Study design

The present descriptive study evaluated 89 patients with ST elevation MI (STEMI), candidate of Primary PCI in Emergency Department (ED) of Bu Ali hospital from April 2014 to May 2015. The protocol of the study was approved by Ethics Committee of Azad University of Medical Sciences (Code: Ir.iau.tmu.rec.1395.291). The design and objectives of the study were explained to all participants and written informed consent was obtained from those who were willing to participate in the study and they were ensured of the confidentiality of their information.
The sample size was calculated at 90 based on the statistician consult. The criteria for inclusion of patients into the study consisted of patients with ST Elevation MI who referred to ED of Bu Ali hospital from April 2014 to May 2015 and were candidate of primary PCI. If the interventionist with >75 balloon procedure in year was not present to do the procedure, the patient was excluded from the study. Also, any patient who was not eligible for primary PCI due to very late admission to hospital and vanished chest pain was also excluded.
Acute MI was diagnosed based on history taking from patients with typical chest pain and electrocardiographic changes as ST Elevation more than 2 mm in anterior leads and/or 1 mm in inferior leads. PCI was performed one interventionist and the cases with involvement of other vessels underwent staged PCI.
Primary outcome in this study was mortality rate.

Statistical analysis

Results were presented as mean ± standard deviation (SD) for quantitative variables and were summarized by frequency (percentage) for categorical variables. Kolmogorov-Smirnov test was used to assess the normal distribution of data. Continuous variables were compared using T test and categorical variables using chi-square test. For the statistical analysis, the statistical software SPSS version 21.0 for windows (SPSS Inc., Chicago, IL) was used. P values of 0.05 or less were considered statistically significant.

Results

Mean age of patients was 59.67±12.67 (range: 25-80) years. Among 89 patients, 76 patients (85.4%) were male, and 13 patients (14.6%) were female. Time to PCI was <90 min in 53 patients and >90 min in 36 cases.
Type of the involved vessel was left anterior descending artery (LAD) in 54 patients (60.7%), right coronary artery (RCA) in 24 patients (27.0%), and left circumflex (LCX) in 10 patients (11.2%). One vessel was involved in 9 patients (10.1%), two-vessel disease in 32 patients (36.0%), and 4three-vessel disease in 48 patients (53.9%). Mean EF was 43.98±9.85 (range: 20-60) **Figure 1.**

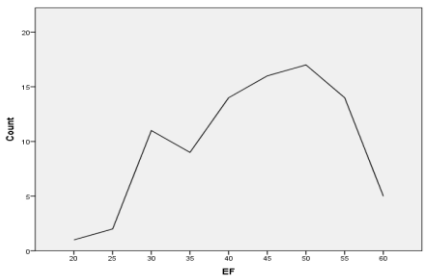

Figure 1: The values of EF among the studied patients

The mortality rate was 4.5% (4 cases). Among the expired cases, the type of vessel was LAD in 2 cases, RCA in1, and LCX in 1, but mortality rate was not associated with type of vessel (P=0.840), nor was it associated with number of vessel (P=0.635). Demographic characteristics of the expired cases are shown in (Table 1).

Table 1: Characteristics of expired cases

	Gender	**Age, years**	**Time to PCI, minutes**	**Type of Vessel involved**	**The number of vessels involved**	**EF**, %
Patient 1	Female	62	>90 min	LAD	2	30
Patient 2	Man	79	<90 min	RCA	3	20
Patient 3	Man	75	<90 min	LCX	3	25
Patient 4	Man	65	<90 min	LAD	3	30
P-value of association with mortality	0.547	0.075	0.491	0.840	0.635	<0.001

Time to PCI in 3 cases who passed away was <90 min and in 1 case >90 min, but mortality rate was not associated with time to PCI (P=0.491). Mean EF was significantly lower in these four cases who expired (26.25±4.78), while it was 44.82±8.88 in the other cases (P<0.001). But mean age (P=0.075) was not associated with mortality. Also, among the expired cases, 3 were male and 1 was female, and sex of participants was not associated with mortality (P=0.547), as shown in (Table 1).
Number of vessels (P=0.735), time to PCI (P=0.331), type of vessel (P=0.921), and mortality (P=0.547) were not associated with sex. Mean EF (P=0.970), and mean age (P=0.288) were not associated with sex.

Discussion

Mortality rate after primary PCI in the present study was 4.5% and mean EF was the only factor associated with mortality (P<0.001), while other factors had no statistically significant association (P>0.05).
Previous studies have reported various mortality rates after primary PCI. In a large study on 96,738 patients undergoing primary PCI for STEMI at 515 hospitals participating in the CathPCI Registry, in-hospital mortality was reported 4.8% in 2005–2006 and 4.7% in 2008–2009, which is consistent with the results of the current study. But other studies have reported higher mortality rates, although a great proportion of patients in the present study (about 40%) underwent PCI >90 min, while the first (Class I) recommendation of ACC–AHA is an ED-to-balloon time of less than 30 minutes [5]. Yet, the mortality rate lied in an acceptable range (4.5%), which shows the appropriateness of the procedure performed in Bu Ali hospital.
Hosseiny et al have evaluated 1313 patients with mean age of 62.3±13.1 years, and reported 3.4% mortality rate in the first 7 days, mostly due to cardiogenic shock, in addition to 3.9% mortality rate until 1 year (58% from cardiovascular causes and 22% from cancer) [11]. Such a difference in mortality rates among studies is also justifiable through the fact that various factors, such as age, female sex, comorbidities, time to treatment, and clinical factors, like number of vessels involved, and PCI technique have been identified as strong predictors of mortality rate after primary PCI [3, 8-10]. In the present study, mean age of patients was about 60 years, which was close to the mean age of the study in Australia, while 14.6% in the present study were female, which was fewer than their study (22.5% female) [11] that can be responsible for such difference. In addition, mortality rate is reported higher in multivessel cases [10, 11], which is in line with the present study, as 3 of the 4 expired cases had three-vessel disease, although the impact was not statistically significant, which might be due to the small number of samples. In addition, in the study by Hosseiny et al, patients with involved vessel in RCA had a significantly lower mortality rate, but in the present study, type of the involved vessel was not associated with mortality rate (P>0.05).
In particular, various researchers, such as Benamer et al [7] and de Boer et al [8] have shown significant association between female gender and mortality rate after PCI, while in the present study, sex of patients was not associated with mortality; this difference can be due to the low number of expired cases in the present study, in addition to the fact that mean age of male and female patients were not significantly different in the current study, while in the study by Benamer et al [7], female patients were older, which increases the mortality rate and decreases the success rate. Also, unadjusted mortality rate is reported higher in females [15], but, other researchers have suggested a lower probability of undergoing revascularization procedures for

women, after adjustment for age, comorbidity and hospital characteristics [9]. Therefore, the adjusted effect of sex of patients on PCI-related mortality rate has to be studied in meta-analysis studies to answer to this discrepancy in the results of studies.
One of the strengths of the present study was investigation of various factors that might affect the mortality rate after primary PCI in an Iranian sample, which has been neglected by previous Iranian studies and the results of the present study can give Iranian physicians a broader view towards primary PCI. On the other hand, there were some limitations to this study. First, the demographic, clinical, procedural and other factors might have been different among participants, which was inevitable due to the observational nature of the study, although we tried to minimize the confounders by evaluating a wide range of variables that are hypothesized to affect the outcome. The small number of sample size was also a great limitation of the present study, and lack of association in various factors might be due to the small number of expired cases. Moreover, the patients' status might alter over the course of the study, which might have not been measured and might influence the results of the study. Therefore, generalizability of the results should be done with precautions. Yet, as long as the authors are concerned, Iranian researchers have not focused on this issue and this study can provide the essential hypotheses for further multi-centric studies, which should be designed on a randomized basis on higher number of patients.
In conclusion, this study shows that the mortality rate after primary PCI in Bu Ali hospital had an acceptable rate (4.5%), which indicates the appropriateness of the performed procedure. In addition, mean EF was found as the only factor associated with mortality ($P<0.001$), which necessitates that cardiologists pay greater attention to underlying cardiac status of patients with STEMI undergoing primary PCI.

Authors' Contribution: Concepts: Mehrnoosh Boroomandpoor; design: Mehrnoosh Boroomandpoor; definition of intellectual content: Simindokht Moshar; literature search: Mohammad Ali Hatami Zade; clinical studies: Shahram Taghdisi and Mehrnoosh Boroomandpoor; data analysis: Seyyed Mohammad Javad Mirlohi; statistical analysis: Seyyed Mohammad Javad Mirlohi; manuscript preparation: Raheleh Soleimani; manuscript editing: Seyyed Mohammad Javad Mirlohi; manuscript review: Mehrnoosh Boroomandpoor; guarantor: Mehrnoosh Boroomandpoor.

Conflicts of Interests:

The authors declare no conflict of interest.

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