IN-HOSPITAL COMPLICATIONS AND OUTCOME OF PATIENTS WITH ACUTE MYOCARDIAL INFARCTION IN SULAIMANI CORONARY CARE UNIT

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ABSTRACT

Background

Complications following acute myocardial infarction started to decrease in the past three decades after development of primary percutaneous coronary intervention and thrombolytic therapy, beside many other antiplatelet medications; however complications following acute myocardial infarction still is a major concern in the developing countries.

Objectives

To detect complications and mortality that follow acute myocardial infarction during hospitalization.

Methods and study design

An observational study, consecutive patients (n=120) with the diagnosis of acute myocardial infarction admitted to the Sulaimani coronary care unit from June 2017 to February 2018 were included in this study, the in-hospital mortality and complications were recorded and analyzed.

Results

The mean age of populations in this study was 61.39±10.36 years, there were (70%) males and (30%) females, 35% of patients were smokers, 47.5% of patients had hypertension, 35% of patients had diabetes mellitus, anterior wall infarctions was present in (41.7%) of patients, while inferior wall infarction was present in (34.2%) of patients, (27.5%) of patients received thrombolytic therapy, while (54.2%) of patients received primary percutaneous coronary intervention for revascularization, 3.3% of them died during hospital stay while 53.3% of them discharged from hospital in stable condition after staying one to two days in hospital. Left ventricular dysfunction was found in (20.7%) of patients while (13.3%) develop arrhythmia and (13.3%) develop cardiogenic shock.

Conclusion

In-hospital mortality rate of acute ST segment elevation myocardial infarction in this study was 3.3% which is comparable with studies from the western countries and India, this low rate of mortality belongs to high rate of revascularizations (percutaneous coronary intervention and thrombolytic.

Keywords: *Acute myocardial infarction, In-hospital complications and mortality, Sulaimani Coronary Care Unit.*

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INTRODUCTION

Myocardial infarction (MI) (i.e. heart attack) is the irreversible death (necrosis) of heart muscle secondary to prolonged lack of oxygen supply (ischemia). Complications of acute MI include ischemic, mechanical, arrhythmic, embolic, and inflammatory disturbances. Nevertheless, circulatory failure from severe left ventricular (LV) dysfunction or one of the mechanical complications of MI account for most fatalities. Ischemic complications can include infarct extension, recurrent infarction, and post infarction angina. Infarct extension is a progressive increase in the amount of myocardial necrosis within the infarct zone of the original MI. Following fibrinolytic therapy, reocclusion of the infarct-related artery (IRA) occurs in approximately 5% to 10% of patients by the time of discharge, and in 25% to 30% of patients at 1 year [(1)]. These patients also tend to have a poorer outcome [(2,3)]. Reinfarction is more common in patients with diabetes mellitus or prior MI. With the advent of primary percutaneous coronary intervention (PCI) and stent placement, risk of reinfarction has dropped substantially, to approximately 3% during the first 90 days after MI [(4)].

Cardiogenic shock in patients with STEMI may be caused by extensive LV infarction or by mechanical complications, including papillary muscle rupture, ventricular septal rupture, free-wall rupture with tamponade, and RV infarction. Prior MI, older age, female gender, diabetes, and anterior infarction are risk factors for development of cardiogenic shock [(5, 6)]. Patients with small, more distal infarctions may have discrete regional wall motion abnormalities with preserved overall LV function because of compensatory hyperkinesis of the unaffected segments [(7)]. Mitral regurgitation can complicate acute MI, Acute rupture affects the posteromedial papillary muscle more often than anterolateral papillary muscle because of its singular blood supply [(8, 9)]. Delay to operation appears to increase the risk of further myocardial injury, organ failure, and death [(10)]. Emergency surgical repair is necessary, even in hemodynamically stable patients, [(11)] because the rupture site can expand abruptly, resulting in sudden hemodynamic collapse in previously stable patients [(11)].

Ventricular arrhythmias are common early after onset of STEMI, and not all require intervention. At the other end of the spectrum, the incidence of ventricular fibrillation (VF) is approximately 2% to 4%. By far the most common supraventricular arrhythmia is AF, which occurs in 8% to 22% of patients with STEMI, with higher rates in elderly patients and those with HF and hypertension. In a contemporary study, the incidence of new-onset AF during hospitalization was 6.3% [(12)]. Abnormal conductions has decreased substantially in the reperfusion era. High grade (i.e , second- or third-degree) AV block and persistent bundle-branch block are independently associated with worse short- and long-term prognosis in both inferior/posterior and anterior/lateral MI but are more ominous in anterior/lateral MI because of a relatively greater extent of myocardial injury [(13)]. Acute pericarditis after STEMI has decreased with the aggressive use of reperfusion therapy [(14)]. It is important to exclude free-wall rupture when a pericardial effusion is present, [(15)] especially if the width of the effusion is >1 cm [(16)].

PATIENTS AND METHOD

A prospective and observational study was carried out at Sulaimani Coronary Care Unit for a period of eight months, from 1st of June 2017, to 1st of February 2018. We collect a total of 120 patients with AMI that free of exclusion criteria. Diagnostic and therapeutic measures undertaken and various complications were recorded. All patients that presented with first onset AMI admitted in Sulaimani Coronary Care Unit were included. Exclusion criteria are; Previous episode of MI, Patients that previously diagnosed as heart failure, or have known arrhythmia such as AF, left bundle branch block, heart block, Patients with comorbidity such as chronic lung disease, Corpulmonale, Pre-excitation syndrome. Patients included in the study were from unlimited age, both male and female, with history of ischemic chest pain along with ST-segment elevation/changes. Patients were divided into four groups on the basis of ST-segment elevation/changes in different leads. Anterior AMI, inferior AMI, inferior +right ventricular AMI, lateral AMI. Blood samples of 5ml were collected from the patients included in the study, analyzed for serum CK and CK-MB and troponin test by using commercially available kits (Human). Beside history, physical examination of each patient were carried out, addressing specifically risk factors for AMI including Hypertension, DM, smoking, atherosclerosis. Patients were examined daily, while cardiac monitoring was done for first 72 hours. Patients were followed during their hospital stay for occurrence of arrhythmias, cardiogenic shock, mechanical complications, pulmonary edema and death. However, if there was any rhythm disturbance,

cardiac monitoring continued as long as the patients stayed in the hospital. Presence of heart failure was assessed clinically according to Killip classification. Echocardiography done for all patients. Systolic LV function was assessed by ejection fraction on M mode. Diastolic LV dysfunction was assessed by recording "E" and "A" velocity by pulse wave Doppler interrogation.

Statistical analysis: Data analysis was done bycomputerized statistical software; Statistical Package for Social Sciences (SPSS) version 24. Descriptive statistics presented as (mean ± SD) and frequencies as percentages. Multiple contingency tables conducted and appropriate statistical tests performed,Chi-square used for categorical variables and independent t-test was used to compare between means. In all statistical analysis level of significance (p value) set at ≤ 0.05 and the result presented as tables and/or graphs.

RESULTS

Among one hundred twenty patients, 84 were males and 36 were females, patients aged between 37 and 82 years. Mean age was 61.39±10.36 years. Regarding BMI; (56.7%) of patients were (18.5-24.9 normal), (34.2%) of patients were (25-29.9 overweight), (9.1%) of patients were (>30 obese). About smoking status (40.8%) were not smokers, (35%) were active smokers and (24.2%) were ex-smokers as shown in Table 1.

Distribution of patients in our study according to past medical illness showed that 35% of patients didnot had any illness, 47.5% of them had HT, 35% of the patients had DM, 17.6% of patients had cerebrovascular disease.

Distribution of patients in the study according to type of MI: Among all 120 patients, (41.7%) had Anterior MI, (34.2%) had Inferior MI, 1.7% had only lateral wall MI, while 12.5% had anterolateral wall MI and 4.2% of patients had inferior and lateral wall MI, (0.8%) of patients had Posterior wall MI, (2.5%) of patients had anterior and inferior wall MI. The occurrence of combination of more than one type of MI co-existing together is (0,8%), Including Inferior and Anterolateral, Inferior and Posterior, Inferior; Lateral and Posterior,as shown in table 2

The duration from onset of chest pain before the patients reaching hospital is critical in patients with AMI, so we took duration of chest pain as an important aspect in the study; 30.8% of patients arrived in < 2 hrs. 48.4% of patients reached in 2-12 hrs and 20.8% of them >12 hrs.

In our study we concentrate on the troponin test and type of revascularization that the patients received, because the earliest therapy the patients receive associate with better outcome. Regarding troponin test that done for patients, it was positive in (81.7%) and negative in (18.3%) of patients. Regarding type of therapy, (27.5%) of patients received thrombolytic therapy, while (54.2%) of patients received primary PCI for revascularization, (3.3%) of patients received both thrombolytic followed by PCI, (15%) of patients didn't receive any type of revascularization therapy.

The echo finding were different regarding wall motion abnormality and some mechanical complications as shown in Figure 1.

Table 1. Socio-demographic characteristics of the patients.

Variable	No (%)
Age (mean±SD)	61.39±10.36
Gender	
Male	84 (70)
Female	36 (30)
Smoking	
Yes	42 (35)
No	49 (40.8)
Ex-smoker	29 (24.2)
BMI	
<18.5	0(0)
18.5-24.9	68 (56.7)
25-29.9	41 (34.2)
≥ 30	11 (9.1)

Table 2. Number of the patients according to type of MI.

Type of MI	No (%)
Anterior	50 (41.7)
Inferior	41 (34.2)
Lateral	2 (1.7)
Anterolateral	15 (12.5)
Posterior	1 (0.8)
Anterior, Inferior	3 (2.5)
Inferior, Lateral	5 (4.2)
Inferior, Anterolateral	1 (0.8)
Inferior, Posterior	1 (0.8)
Inferior, Lateral, Posterior	1 (0.8)
Total	120(100%)

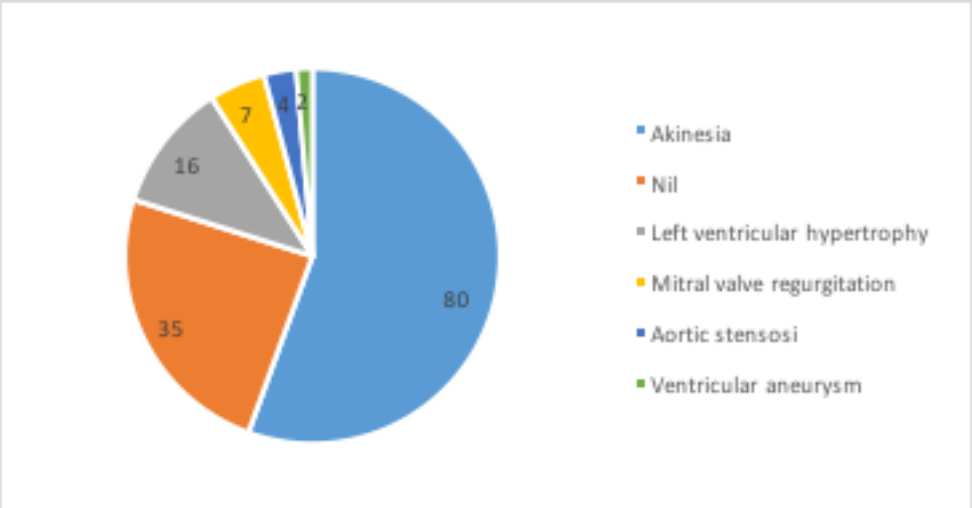

Figure 1. Distribution of patients according to echocardiography finding.

We noticed the number of the days the patient stayed in hospital following appropriate therapy, in order to know the early complications that occur in hospital, (23.4%) of patients stayed in hospital just one day, while (65.8%) of patients stayed for two days, (10%) of patients stayed for three days and only (0.8%) of patients stayed in hospital for >4 days.

The rate of complication in our study was higher among patients with mean age of 65.25±4.76 when compared to younger age populations with p value 0.596, complications were higher among males than females with p value 0.517, about smoking, the rate of complications were higher among nonsmokers when compared to smokers with p value 0.417, and the rate of complication higher among patients with higher BMI range with p value 0.982.

The prevalence of complications that follows AMI during hospitalization shown in Table 3.

In this study we found that the complication was higher among diabetic patients when compared to nondiabetics with p value (0.508), complications was lower in HT patients when compared to non-hypertensive patients with p value (0.084) but higher among diabetics if compared to HT patients with p value (0.395), the rate of complication was higher if the patients had both DM and HT than patients who hadn't any of them, as shown in Table 4.

The prevalence of complications also varies according to the wall of myocardium that involved in infarction, we found that complications were higher in cases of Anterior MI when compared with inferior walls and lateral walls with (p value 0.222), and complications were higher when patient complaining of double wall MI

e.g.; patients with inferior and lateral wall MI has higher complications when compared to anterior and inferior wall alone. Patients who reached hospital earlier Than 2 Hrs were associated with less complications when compared to patients reached hospital >2 hrs and > 12 hrs. with (p value 0.001), and also patients that stayed more >1 days associated with more complications when compared to patients stayed < 1 day with (p value 0.00). as shown in Table 5.

Patients that had positive troponin test at the time of admission associated with higher complications and those patients who underwent primary PCI had lower complication rate with (p value 0.094) when compared to patients that received thrombolytic therapy with (p value 0.652), and patients that not underwent any of them had higher complications, with (p value 0.132), as shown in Table 6.

Table 3.Prevalence of complications in patients with acute MI.

Complications	No (%)
No complications	64 (53.3)
left ventricle dysfunction	25 (20.7)
Cardiogenic shock	16 (13.3)
Arrhythmia	16 (13.3)
Death	4 (3.3)
Mechanical complication	1 (1.65)
Pericarditis	1 (0.8)

Table 4. Complications according to past medical illness.

Past medical illness	Complication	without complication	P value
Nil	20	22	
Hypertension	24	33	0.084
Diabetes mellitus	23	19	NS
Cerebrovascular disease	7	14	NS

NS : Non-Significant

Table 5. Prevalence of complications according to duration of chest pain before hospitalization and stay in hospital.

Variable	Complication (N)	Without complication (N)	P value
Duration of chest pain before hospitalization			
<2hr.	11	26	0.001
2-12hr.	27	31	
>12hr.	18	7	
Stay in hospital			
1 day	8	20	
2 day	37	42	0.000
3 day	10	3	
>4 day	1	0	

Table 6. Prevalence of complications according to troponin test and type of therapy.

Variable	Complication N	Without complication N	P value
Troponin			
Positive	50	48	NS
Negative	6	16	
Type of therapy			
Thrombolytic	16	17	NS
PCI	24	41	NS
Both (Thrombolytic, PCI)	2	2	NS
None	14	4	

DISCUSSION

In our study there was an undue delay in presenting to hospital; 48.4% of patients reached hospital between 2-12 hrs and 20.8% of patients >12 hrs, In the Western studies, the mean duration of delay ranges from 3 to 4 h in the GRACE [17] registry, GUSTO III [18] and GUSTO IIb [19] trial, the mean time delay was only 2-4 h. The duration of hospital stay in our study; 23.4% of patients stayed 1 day and 65.8% of patients stayed 2 days, which is comparable with the data from other developed countries.

In ENACT study, [20] the total hospital stay was 7.9 days in UK/Ireland and 12.6 days in Eastern Europe. The reason behind this study was mainly the presence of only one coronary care unit with inadequate number of beds that made the cardiologist to discharge the patient soon after stabilization and revascularization. Primary angioplasty in acute myocardial infarction is the gold standard treatment for management of AMI due to its profound ability to achieve high percentage of reperfusion [21]. In our study PCI performed to 57.5% of patients that presented with STEMI which is higher when compared to other country, in the developed countries where good transfer facilities exist, 28% of STEMI patients receive the benefit of primary PCI. This difference mainly due to availability of PCI throughout the day. The overall mortality rate was 3.3 % in our study which is similar to a randomized controls trial on fibrinolysis for STEMI [22,18], the reported mortality ranged between 4% to 7%, but much lower when compared to a study performed in north India that the mortality rate was 18.4%. In a study published in Scotland, [23] the case fatality following AMI was 22.2% in a group of 11,778 patients. In the MITRA and MIR registries data [24] from Germany the overall mortality was 15%. Only one recent study indicates a lower mortality (8.3%) [25]. This is reasonably due to smaller size of our study and the larger number of patients received primary PCI than thrombolytic.

Cardiogenic shock is the most life-threatening complication of MI and remains the leading cause of death. Historically, the incidence of cardiogenic shock ranged between 5 to 15% but many registries have reported that the implementation of reperfusion strategies reduced the incidence of this complication [26, 27]. In Argentina, cardiogenic shock incidence is 6% according to the 2011 registry of the Sociedad Argentina de Cardiología; when data from the same centers were compared in different time intervals from 2001 to 2005 the incidence decreased from 12% to 5% [28]. In our study the rate of cardiogenic shock is 8.3% which is similar to the studies described above, In our registry and in line with other reports, most cardiogenic shock admitted were due to STEMI [29].

Cardiac failure is one of the most important complications that is observed during the first month of MI. in our study, heart failure (LV dysfunction) was observed in 15.8% of patients during hospital stay, while in the GRACE registry [17], this was observed in 18% of patients. In the GUSTO III trial,18 the prevalence of cardiac failure was 17.2%. Spencer et al [30] reported heart failure in 20.4% of the 606, 500 patients with AMI during hospitalization and 8.6% patients developed heart failure thereafter.

The cause of death in our study was mainly due to cardiogenic shock because very few patients with cardiogenic shock receive guideline based therapy like revascularization and intra-aortic balloon pumping

because of financial reason. In our study mortality rate in cases if acute mitral valve regurgitation and VSD was 100%, because MR and VSD treated medically as there are no surgical facilities in proper time. As per previous published data, mortality was observed in approximately 45 percent among surgically treated patients and 90 percent among those treated medically. In our study we found that 1% of patients had VSD, In the GUSTO III tria1, [18] the prevalence of VSD was 2% but according to Jose et al [31] from India it was observed in 1% of patients. This is most likely due to availability of primary PCI in our center in the revascularization.

Atrial Fibrillation (AF) is a frequent complication of acute myocardial infarction (AMI), in our study we found that new onset AF is present in 3.5% of patients, the present study showed that the overall incidence of AF (10.8%) appeared to be close to, but slightly higher than, that observed in older clinical trials of patients with AMI (rates 5–10%) [32, 33] this discrepancy most likely due to smaller size of our study and shorter duration of hospital stay with lack of continuous monitoring during hospitalization. In our study 46.2% of cases had HT, of these morbidity and mortality was present in most of the patient, most of them due to arrhythmia, the Global Utilization of Streptokinase and t-PA for Occluded coronary arteries (GUSTO-I) [34] have shown post-infarction unstable angina, and re-infarction could contribute to this excess mortality. Smoking increases the risk of coronary heart disease and cardiovascular-related mortality in the general population, [35] but studies of patients with acute myocardial infarction (AMI) have consistently reported lower crude mortality in smokers compared with nonsmokers [36, 37]. This "smoker's paradox" has been investigated in numerous short-term studies but relatively few long-term studies. In our study we also noticed this paradox effect of smoking as complications and mortality was lower among smokers when compared to nonsmokers.

We have to do all effort for public education regarding signs/symptoms of AMI and also all effort should be done to prove emergency transfer facilities by government so that revascularization can be done in proper time (within 3 hours of symptom onset) and many of the devastating consequences of acute MI averted.

Limitations of the study

The number of patients with STEMI in our study is small compared to published trials from the West. The mean hospital stay was shorter in our study population due to early discharge of uncomplicated patients

Conclusion

In comparison to other studies that were done in western country and India, the rate of mortality and complications is acceptable in our study, a significant finding of our study was that early arrival to the hospital and early revascularization was associated with reducing morbidity and mortality and improving survival. It was also found that delay in reaching hospital and unawareness of the patient about symptoms of AMI associated with increasing mortality because the patient that delayed > 24 hr did not receive revascularization therapy.

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