Original Article

# Frequency of In-Hospital Diabetic Patients Presented with St Segment Elevation Myocardial Infarction (STEMI) Having Raised Blood Sugar

Diabetic Patients with STEMI Having Raised Blood Sugar

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## ABSTRACT

**Objective:** To determine the frequency of inpatient mortality in non-diabetic patients presented with ST segment Elevation Myocardial Infarction (STEMI) having raised blood sugar.

**Study Design:** Descriptive case series

**Place and Duration of Study:** This study was conducted at the Department of Cardiology, PIMS, KIH Islamabad for a period of 6 months from February 2018 to August 2018.

**Materials and Methods:** The total sample was 150 subjects, aged 20 – 60 years, non-diabetic patients with blood sugar level of ≥ 140 mg /dl at presentation, consecutively recruited for the study, having obtained written informed consent.

**Results:** Amongst the participants, 123 (82%) were discharged while only 27 (18%) had expired. Admission hyperglycemia and male sex were significantly associated with mortality.

**Conclusion:** Hyperglycemia on admission is a strong predictor of mortality in patients with STEMI and could be used in the risk stratification of these patients.

**Key Words:** ST segment elevation myocardial infarction, mortality, hyperglycemia

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## INTRODUCTION

Acute coronary syndrome (ACS) refers to any group of clinical symptoms compatible with acute myocardial ischemia and includes unstable angina (UA), non-ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI)[1]. The important risk factors for Ischemic heart diseases (IHD) are insulin resistance, obesity and type two diabetes mellitus(DM) which are increasing in trend along with genetic factors, a high-fat and energy-rich diet, smoking, and a sedentary lifestyle.

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IHD is likely to become the most common cause of death in near future.[2] STEMI is one of the leading causes of mortality and morbidity worldwide. However, survival after STEMI has considerably improved due to increasing symptom recognition, accurate diagnosis and effective timely reperfusion. Further reasons for reduction in STEMI mortality can be explained by greater use of percutaneous coronary intervention (PCI), antithrombotic therapy and secondary cardiovascular prevention strategies.[3] In one study in England and wales auditing the database of 34722 patients with STEMI, in-hospital mortality was 10.6 % and the strongest predictors of in-hospital survival for STEMI were aspirin therapy given acutely and out-of–hospital thrombolysis.[4]

Hyperglycemia, also called stress hyperglycemia or stress diabetes, associated with critical illness, even in patients without diabetes mellitus (DM), is a consequence of many factors, including increased cortisol, catecholamines, glucagon, growth hormone, gluconeogenesis, and glycogenolysis. Acute hyperglycemia on admission is common among patients with STEMI is common and is one of the important predictors of in-hospital and long-term adverse events. Mortality risk may be modifiable by therapeutic lowering of glucose levels with insulin, though the literature here is inconsistent.[5,6] Poor glycemic control and insulin resistance are associated with significant endothelial cell dysfunction, procoagulability, and diffuse multi-vessel CAD. This finding

underlines the need for aggressive glucose management in this setting and may support a more vigorous screening strategy for early recognition of diabetes.[7] Admission hyperglycemia can be used in risk stratification of these STEMI patients. They also have high incidence of malignant tachyarrhythmias, heart blocks during hospitalization resulting in increased in-hospital mortality. This is supported by a study in Spain, showing 15% mortality in patients of STEMI who presented with stress hyperglycemia (with serum glucose level of ≥ 140mg/dl).[8] A meta-analysis, including 15 trials which examined stress hyperglycemia and in-hospital mortality, showed that stress hyperglycemia in MI is associated with an increased risk of in-hospital mortality in patients with, and without, DM)). the risk of congestive heart failure or cardiogenic shock is also increased in patients without diabetes.[9] As inferred from the studies above that raised blood sugar is a major risk for in-hospital mortality, hence every non-diabetic patient of STEMI with hyperglycemia needs to be monitored vigilantly, to avoid possible complications (e.g arrhythmias) and subsequent mortality. There is variability in the mortality rates of the above mentioned population. Secondly there is limited data available in our country on this issue. Hence this study will show whether raised blood sugar in non-diabetic increases the in-hospital mortality in STEMI patients or not and if it affects then how frequently it affects the STEMI patients.

# MATERIALS AND METHODS

This Descriptive Case series study was conducted in Department of Cardiology, PIMS, KIH/GMC Hospital Islamabad. The study was conducted for a period of 6 months from 21/02/2018 till 21/08/2018. The data was collected through Non probability consecutive sampling.

**Sample Size:** The sample size was calculated according to WHO calculator.

Confidence level =95%

Anticipated population proportion= 0.48[6](ALTERNATIVE REFERENCE CAN BE USED

Absolute precession=0.08

Sample size=150

**Selection of Cases**

**Inclusion criteria:**

- Any patient regardless of gender with STEMI.
- Age: 20 – 60 years.
- Non-diabetic patients with blood sugar level of ≥ 140 mg /dl at presentation.

**Exclusion criteria:**

- Known diabetics on the basis of record.
- Old MI (both STEMI and NSTEMI)
- Left ventricular aneurysm
- Pericarditis
- Prinzmatal angina
- Cocaine

**Data Collection Procedure:** After taking hospital ethical committee permission, informed consent was obtained from all subjects. Patients were included in the study having inclusion and exclusion criteria applied. The blood sample was then sent to laboratory for blood sugar estimation and verified result of blood sugar (of more than 140mg /dl) by assigned pathologist in Shifa international hospital was considered. Demographic data like age and gender with patient's serum blood glucose level and outcome of patient within seven days stay of hospital were collected in proforma. The data was entered into SPSS for analysis by researcher.

**Data Analysis Procedure:** The data was analyzed by SPSS (version 16). For quantitative variables like age and blood glucose level mean ± standard deviation (SD) was calculated. For qualitative variables like gender and mortality frequency and percentages were calculated. The effect modifier such as age and gender were controlled by stratification. Post stratification chi-square test was applied. P value < 0.05 was considered statistically significant.

# RESULTS

The total sample was 150 subjects. The mean age of the participants was 54.5 years with S.d ± 7.744, with an age range of 25-60 years. The mean blood glucose level in participants was 174.04 with S.D ± 21.074. The gender distribution revealed a male preponderance with 117 (78%) males and 33 (22%) females.

**Outcome of the patients:** The outcome of patients revealed that 123 (82%) were discharged while only 27 (18%) had expired. **(Table 3.2)**

**Table No.3.1: Showing Outcome of Patients (N=150)**

| Outcome | Frequency | Percentage |
|---|---|---|
| Discharged | 123 | 82% |
| Expired | 27 | 18% |

**Table No.3.2: Chi-Square Test: To Look for Association of Age with Mortality**

| Age groups | Outcome | | Total |
|---|---|---|---|
| | Discharged | Expired | |
| 20-30 | 6 | 0 | 6 |
| 31-40 | 3 | 0 | 3 |
| 41-50 | 12 | 12 | 24 |
| 51-60 | 102 | 15 | 117 |
| Chi-square | Df | | P-value |
| 20.753 | 3 | | 0.000 |

**Chi-Square Tests:**

- **Chi-square test for association of age with mortality (TABLE 3.3)**
  The chi-square test revealed chi-square = 20.753, df=3 and p-value p=0.000 i.e < 0.05, hence suggesting a statistically significant association.
- **Chi-square test for association of gender with mortality (TABLE 3.4)**

The chi-square test revealed chi-square = 2.275, df=1 and p-value p=0.131 i.e > 0.05, hence suggesting no statistically significant association between gender and mortality.

**Table No.3.3: Chi-Square Test: To Look for Association of Gender with Mortality**

| Gender | Outcome | | Total |
|---|---|---|---|
| | Discharged | Expired | |
| Males | 93 | 24 | 117 |
| Females | 30 | 3 | 33 |
| Chi-square | Df | | P-value |
| 2.275 | 1 | | 0.131 |

# DISCUSSION

Many studies have shown that disturbances of glucose metabolism are widely prevalent in acute myocardial infarction (AMI) and related to short and long term adverse outcome, irrespectively of the presence or absence of previously diagnosed diabetes mellitus (DM).[8,10] The poor prognosis in such patients, despite having baseline characteristics similar to those of patients without diabetes, supports the idea that metabolic abnormalities contribute to their adverse outcomes.[11] This study was conducted on 150 patients with STEMI at the Cardiology Department, PIMS, KIH, Islamabad, for a period of 6 months from 21st February 2018 till 21st August 2018, presenting with raised admission plasma glucose (APG). The mean age of the participants was 54.50 years ± S.D 7.744. This is comparable with other published studies. In a study by Bilal A et al.[12] who evaluated the clinical impact of hyperglycemia on poor outcome in 322 ACS patients, the mean age was 57.6 and 62.8 years. In a study by Akbar DH et al [13]. total of 480 patients were included, the mean age of the patients among hyperglycemic population was 51.5±4.3 year and 45.3±21 years among patients who were normo glycemia.

Ekmekci A et al[5] studied 677 elderly patients in a prospective manner-, mean age of 72.2 ± 5.4 years old who underwent primary PCI for STEMI. In our study, the male patients dominated the female population i.e there was a male preponderance. The male population consisted of 78% of the participants while females only 22%. The female to male ratio was 1:3.5. This observation has also been observed by other authors. Timmer JR et al[14] also found a male dominance pattern. They found that male population constituted 71%. Bilal A,[12] and Timmer JR,[14] reported a frequency of male population in their studies as 64.1%, 80.7%, 68%, respectively. This male preponderance may be attributed to the fact that male gender is the risk factor for STEMI.

Our main finding was that amongst the participants, 123(82%) were discharged while 27 (18%) had expired. This is a significant finding and has important implications for the health care providers. It is comparable with other studies published locally and internationally.

Ekmekci A et[5] al reported 18 % percent in hospital mortality despite of the proper triage and best possible indoor trearment. But the population was relatively 0lder than our study. In the acute phase of MI, higher glucose levels are usually seen and result in insulin resistance, higher free fatty acid concentrations, and impaired myocardial glucose usage which causes increased oxygen consumption and probably worsens ischemia.

Sanjaun R et al[8] reported in a large study in Spain, 15% mortality in patients of STEMI who presented with stress hyperglycemia (with serum glucose level of ≥ 140mg/dl) vs 5 % mortality in normoglycemic.[8] (P < 0.001). Akbar DH et al[13] Observed mortality in 19 % in newly diagnosed hyperglycemia vs 12 % in known diabetic patient. This observation was also similar to that in our study Timmer JR,[14] et observed, mortality by glucose category (<7.8, 7.8-11.0 or > or =11.1 mmol was 9%, 8% and 25%, respectively (p = 0.001); in 332 ACS patients.

# CONCLUSION

Hyperglycemia on admission is a strong predictor of mortality in patients with STEMI and could be used in the risk stratification of these patients.

**Limitations:** First, due to the observational nature of this study, and small sample size the possibility of selection bias and/or residual confounding from unknown or unmeasured covariates cannot be excluded. we should be cautious in hypothesizing about the mechanisms involved and the generalizability of our conclusions to other populations. Our study didn't mention co morbids nor treatment strategy ahead like thrombolyticS therapy or primary PCI but the study was conducted in the best tertiary care hospitals so all possible guideline directed management is possibly given to the patients.

**Author's Contribution:**

| | |
|---|---|
| Concept & Design of Study: | Mahboob ur Rehman |
| Drafting: | Malik Ali Raza |
| Data Analysis: | Farhan Faisal, Anwar Ali, Muhammad Fasih ullah Khan |
| Revisiting Critically: | Mahboob ur Rehman |
| Final Approval of version: | Mahboob ur Rehman |

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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