

# Predictors of In-Hospital Mortality in Acute Myocardial Infarction

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## ABSTRACT

**Background:** Acute myocardial infarction is the leading cause of death. This study was conducted to identify the predictors of in-hospital mortality in acute myocardial infarction.

**Study Design:** Prospective cross sectional study

**Place and Duration of Study:** This study was carried out at AK CMH/SKBZ MZD from January 1<sup>st</sup> 2011 to 31<sup>st</sup> December 2012..

**Materials and Methods:** This prospective cross sectional study was carried out at AK CMH/SKBZ MZD from January 1<sup>st</sup> 2011 to 31<sup>st</sup> December 2012 of 151 patients having acute first ever acute myocardial infarction (AMI). Of these 151 patients 133 were discharged from the hospital and 18 died. Both categories were analyzed regarding sex; age; time elapsed from onset of the symptoms of myocardial infarction to assistance at the hospital; family history of AMI ;use of streptokinase; risk factors for atherosclerosis and electrocardiographic location of myocardial infarct.

**Results:** Among 151 patients, 114 (75.5%) were males and 37 (24.5%) were females. Mean age was  $56.59 \pm 14.47$ . Out of these 67 (44.3) received streptokinase. Hospital mortality was 12% (18/151) within 14 days. Age and age category has impact and gender has no impact on mortality .Age category ( $p=0.02$ ), Hypercholesterolemia ( $p=0.043$ ), Time of onset of chest pain to SK given ( $p<0.001$ ), left ventricular failure ( $p=0.001$ ) asystole ( $p=0.001$ ) and ventricular septal defect (VSD) ( $p=0.007$ ) on admission were important prognostic predictors of mortality in AMI. Mortality associated with AMI needs control and prevention of modifiable risk factors. Mean time of onset of chest pain to SK given was  $2.62 \pm 1.46$  hours. In-hospital mortality in SK was 8(11.9%) ( $p=0.002$ ). Complication of AMI such as asystole 6(75%), VSD 3(50%) and LVF 13(27.7%) has statistically significant predictors of higher in-hospital mortality.

General Linear Model (GML), Multivariate statistical analysis revealed that topical presentation of AMI, test between the subject effect association of hypertension with age  $p=0.036$  vs. age category  $p=0.030$  (hypertension  $p=0.059$  vs. mortality  $p=0.018$ ), hypertension level ( SBP level  $p=0.0001$  vs DBP  $p=0.137$  ), cholesterol level with mortality ( $p=0.006$ ) , AF with mortality ( $p=0.047$ ), duration of chest pain with mortality ( $p=0.002$ ) and streptokinase with in-hospital mortality ( $p=0.01$ ) and anteroapical or extensive anterior infarction( $p=0.034$ ) had statistical significant association with in-hospital mortality.

**Conclusion:** Age category, Time of onset of chest pain to SK given, left ventricular failure, asystole and ventricular septal defect (VSD) on admission were statistically significant predictors of mortality in AMI. Mortality associated with AMI needs prompt management and its prevention by control of modifiable risk factors.

**Key Words:** myocardial infarction, in-hospital mortality, Killip functional class

## INTRODUCTION

Acute myocardial infarction (AMI) is the leading cause of mortality and morbidity.<sup>1</sup> AMI is characterized by rupture of the atherosclerotic plaque resulting in occlusive thrombosis in the coronary artery.<sup>2</sup> Mortality is significantly associated to elderly individual, females, to a delay in treatment, to the presence of diabetes mellitus, to right ventricle dysfunction, to left ventricular dysfunction, and to the nonuse of SK in coronary artery reperfusion<sup>3</sup>. The use of thrombolytic such as Streptokinase (SK), fibrinolytic and percutaneous coronary angioplasty decreased AMI mortality. Thrombolytic effectiveness is very significant if given within first 6 hour of AMI.<sup>4-6</sup> Many patients failed to receive fibrinolytic in due time .Various studies have conducted in our<sup>7-8</sup> and other countries regarding predictors of AMI .<sup>9-13</sup> Mortality in AMI significantly decreased in developed countries. This study aimed at identifying statistical significance of clinical and demographic predictors of in-hospital mortality in the coronary care unit.

## MATERIALS AND METHODS

This prospective cross sectional hospital based study was conducted in CMH/SKBZ hospital Muzaffarabad Azad Kashmir from 1<sup>st</sup> August to 31<sup>st</sup> July 2012. One hundred and fifty one patients were diagnosed as having first ever episode AMI on basis of WHO criteria with elevation of the ST segment on the ECG .AMI with topography on ECG with a minimum 0.2-mV elevation of the ST segment in 2 contiguous precordial leads and a minimum 0.1-mV elevation of the ST segment in 2 consecutive leads, and in the V4R lead for right ventricular involvement.<sup>14</sup> Cases included were with and without therapy with streptokinase. Patients with AMI receiving streptokinase after exclusion of any contraindication and those not receiving streptokinase because of either late presentation or the presence of any contraindication were included in study .<sup>15</sup> Patients excluded were those with left bundle-branch block, reinfarction, revascularization surgery, AMI with congenital heart

disease non ischemic, valvular disease. Of these 151 patients, 133 were discharged from of group and 18 died of acute myocardial infarction during hospitalization. The diagnosis of AMI was confirmed by the association of clinical findings of pain or symptoms suggestive of AMI, typical electrocardiographic change and characteristic elevation of the enzymes. Physical examination was carried out in all the patients. Other parameters analyzed were: age, sex, time between symptom onset and hospitalization expressed as "delta T" time of greater or smaller than 12 hours duration, risk factors for coronary atherosclerosis; and the Killip functional class as acute left ventricular failure (AVL).<sup>16</sup> Streptokinase was intravenously administered at the dose of 1,500,000 Unit diluted in saline solution or 5% glucose for 1 hour. The risk factors for coronary atherosclerosis were hypertension, diabetes mellitus, smoking, hypercholesterolemia, and positive familial history. Complete blood count, fasting blood sugar, CK-MB level, serum urea, creatinine, lipid profile, chest x-ray

and. Echocardiography was performed to look for left ventricular ejection fraction and mechanical complications.

Statistical analysis studied as outcome was in-hospital mortality. Data entry and analyses were done on software statistical package SPSS-20. Chi-square test parametric and nonparametric done where appropriate for those in proportion. Quantitative data was expressed as mean and standard deviation. Mortality was cross-tabulated as dependent variable to risk factors of AMI as independent variables to get *p* value. Data was reported in frequency tables. Differences between groups and the effect of patient characteristics on clinical outcome were assessed using the Fisher Exact test for comparison of proportions.

## RESULTS

In 151 patients with AMI, 67 (44.3%) received streptokinase (SK). For baseline characteristics see Table. Mean time SK given was 2.62±1.46 hours.

**Table No.1: Mortality of AMI according to demographics, risk factors and its complications**

| Variables           |                                                                            | No. of Subject<br>No. (%) | Mortality<br>No. (%) | Alive<br>No. (%)      | P-Value |
|---------------------|----------------------------------------------------------------------------|---------------------------|----------------------|-----------------------|---------|
| <b>Total</b>        |                                                                            | <b>151(100)</b>           | <b>18(12.0)</b>      | <b>133(88.0)</b>      |         |
| Gender              | Male                                                                       | 114 (75.5)                | 12 (10.5)            | 102 (89.5)            | .385    |
|                     | Female                                                                     | 37 (24.5)                 | 06 (16.2)            | 31 (83.8)             |         |
| <b>Age (years)</b>  |                                                                            |                           |                      |                       | .036**  |
| Age Category        | <30                                                                        | 4 (2.7)                   | 1(2.5)               | 3 (7.5)               | .022    |
|                     | 30-39                                                                      | 13 (8.6)                  | 1 (7.7)              | 12 (92.3)             |         |
|                     | 40-49                                                                      | 24 (15.9)                 | 1 (4.2)              | 23 (95.8)             |         |
|                     | 50-59                                                                      | 42 (27.8)                 | 1 (2.4)              | 41 (97.6)             |         |
|                     | 60-69                                                                      | 39 (25.8)                 | 6 (15.4)             | 33 (84.6)             |         |
|                     | 70 & above                                                                 | 29 (19.2)                 | 8 (27.6)             | 21 (72.4)             |         |
| Risk Factors        | Hypertension SBP DSB                                                       | 52 (34.4)                 | 9 (17.3)             | 43 (82.7)             | .186    |
|                     | Hypercholesterolemia                                                       | 68 (45.0)                 | 12 (17.7)            | 56 (82.3)             | .037**  |
|                     | Smoking                                                                    | 101 (66.9)                | 13(12.9)             | 88 (87.1)             | .791    |
|                     | Diabetes                                                                   | 29 (19.2)                 | 6 (20.7)             | 23 (79.3)             | .0215   |
|                     | Family History AMI                                                         | 113 (74.8)                | 16 (14.2)            | 97 (85.8)             | .143    |
| Other Factors       | Sub Type of AMI Anterior myocardial Inferior myocardial infarction & other | 84 (55.6)<br>67 (44.3)    | 14 (16.7)<br>4 (6.0) | 70 (83.3)<br>63(94.0) | 0.033*  |
|                     | Time of Onset Chest Pain to SK given <3-6 hours                            | 67 (44.3)                 | 8 (11.9)             | 59 (88.1)             | <0.001  |
|                     | Non SK given >12 hours                                                     | 84 (55.6)                 | 10 (11.9)            | 74 (90.8)             |         |
|                     | Streptokinase                                                              | 67 (44.3)                 | 8 (11.9)             | 59 (88.1)             | 0.017*  |
|                     | Left Ventricular Failure                                                   | 47 (31.1)                 | 13 (27.7)            | 34 (72.3)             | <0.001  |
| Complication of AMI | Asystole                                                                   | 8 (5.2)                   | 6 (75.0)             | 2 (25.0)              | <0.001  |
|                     | Ventricular Fibrillation/Tachycardia                                       | 54 (35.8)                 | 9 (16.7)             | 45 (83.3)             | .421    |
|                     | Complete Heart Block                                                       | 15 (9.9)                  | 4 (26.7)             | 11 (73.3)             | .112    |
|                     | Atrial Fibrillation                                                        | 14 (9.2)                  | 2 (14.3)             | 12 (85.7)             | .922    |
|                     | Mitral Regurgitation                                                       | 24 (15.9)                 | 6 (25.0)             | 18 (75.0)             | .063    |
|                     | VSD                                                                        | 6 (3.9)                   | 3 (50)               | 3 (50)                | .007    |
|                     | Post Myocardial Angina                                                     | 73 (48.3)                 | 9 (12.3)             | 64 (87.7)             | .720    |
|                     | CVA                                                                        | 3 (1.9)                   | 0                    | 3 (100)               | .489    |

\*\*GLM Multivariate analysis

Age category ( $p=0.02$ ), Hypercholesterolemia (Mean $\pm$  SD,  $5.04\pm 1.97$ ) ( $p=.043$ ), Time of onset of chest pain to SK given ( $p<0.001$ ), Complication of AMI such as left ventricular failure (LVF) ( $p=0.001$ ) asystole ( $p=0.001$ ) and ventricular septal defect (VSD) ( $p=0.007$ ) on admission were important predictors of mortality in AMI. In-hospital mortality was 18(12.0%) and with SK group 8(11.9%). The time of onset of chest pain to SK given had 8(11.9%) mortality as compared to patients non SK given 10(11.9%) ( $p=0.001$ ).

Acute LVF was commonest complication 47(31.1%) and was the leading cause of death with 13(27.7%). The death occurred in 8 (11.9%) patients who received SK and was statistically significant. The clinical characteristics of patients are given in table shows mostly the patients were older with greater incidence of AMI of the anterior wall as compared to others AMI. A Few patients received streptokinase and had diabetes's mellitus 29(19.2%) . These diabetic had blood sugars fasting (mean $\pm$  SD,  $7.5\pm 7$ ).

Among smokers, a 13(12.9%) of mortality was observed *and was not statistically significant difference*. Systemic systolic blood hypertension (SBP), (mean $\pm$  SD,  $133.31\pm 24.09$ ), diastolic blood pressures (DBP), mean $\pm$  SD,  $83.03\pm 20.73$ ) has statistical significance and smoking, positive familial history for atherosclerosis had no statistically significant association with mortality in AMI patient in our study .Mortality rate among diabetic patients reached 6 (20.7%) and was not statistical significant ( $P < 0.215$ ). Of the patients with Hypercholesterolemia 12.9% died as compared to 87.1% alive patients and the difference was statistically significant ( $p<0.04\%$ ).

The mortality rates of AMI in inferior wall and others AMI were 6.3%, and anterior wall and the remaining regions of the ventricle 16.7% were observed respectively. When comparing these statistical significant difference was observed in regard to mortality ( $p=0.033$ ). The mortality rate was 8(11.9%) among the patients received the streptokinase, and statistically significant. Patients with acute myocardial infarction in acute LVF had 13(27.7%) mortality rate; ( $P < 0.001$ ) which is statistical significant association

## DISCUSSION

Acute myocardial infarction is the leading cause of death worldwide despite latest development in our factual knowledge and approaches. Of the 151 patients with the first episode of acute myocardial infarction the greater mortality in the males 12% vs.6% in females), was similar to our study.<sup>17</sup> Gender was not statistically significant. The female sex was a factor independently related to in-hospital mortality in AMI and was reported by a study.<sup>18</sup>

Age is an important predictor of survival after AMI and majority patients died in older age.<sup>19</sup> This could be because of delayed delta T time, receives less

thrombolytic agents, and beta-blockers, have advanced coronary artery disease, reduction in myocardium and its blood supply. In our study AMI with older age groups is important predictor of mortality may relate to a decreased coronary arteries and myocardial reserve.

Coronary *reperfusion* therapy is beneficial within the first 12 hours of in AMI. The greatest reduction in mortality is observed whenever patients treated in the first 2 hours after AMI. <sup>20</sup> Of the patients in the first 12 hours, 12% died, and of the patients arriving after 12 had not received streptokinase could not benefit from that therapy. In fact, of the patients receiving streptokinase, 8% died, while of those not receiving that medication, 10% died ( $P < 0.017$ ).

The patients with AMI in-hospital mortality of smokers were higher as compared with that of nonsmoker <sup>21</sup>.

In coronary artery disease, diabetes mellitus interacts with other cardiovascular risk factors accounts for 30% of deaths in diabetic patients.<sup>22</sup> The stress hyperglycemia in non diabetic AMI patients increases in-hospital mortality and the risk of heart failure and of cardiogenic shock although not statistical significant in our study . In our study association between the location of AMI and mortality was observed. The impairment of the left ventricular anterior wall and AMI and the right ventricle impairment observed on ECG is the major cause of the more severe condition. That severity was equivalent to the severity of inferior acute myocardial infarction accompanied by impairment of the right ventricle and the extensive infarction of the anterior wall.<sup>23</sup>

Systemic arterial hypertension<sup>24</sup> hypercholesterolemia<sup>25</sup> are associated with atherosclerosis had influence on in-hospital mortality in ours study on multivariate analysis. Significant difference in mortality exists ( $P = 0.0333$ ) between the topical distributions of AMI. Our study is consistent as reported earlier. Right ventricular impairment and others AMI of the inferior region are associated with high in-hospital mortality and is lower than this in our study.<sup>26</sup> Therapeutic strategies in reducing mortality in acute myocardial infarction should be used early in the emergency department.<sup>27-28</sup>

In our study, prognosticators predictors of mortality were age, presentation of patients after 12 hours of symptom onset; AMI of extensive anterior infarction; no use of streptokinase and complications of AMI. Based on these facts, the population should be encouraged for early medical attention when symptoms suggesting AMI occur, to reduce the time interval between symptom onset and hospital arrival. Angioplasty is better than thrombolysis in high risk patient although our center is not performing primary angioplasty in AMI.<sup>29-32</sup>

## CONCLUSION

In conclusion out of 151 patients with AMI statistical significance predictors of mortality were as follows: Killip functional class as acute LVF; age  $> 70$  years; extensive anterior AMI ; time interval longer than 12 hours from symptom onset to hospital assistance;

nonuse of streptokinase; asystole and VSD. Mortality associated with AMI needs prompt management and its prevention by control of modifiable risk factors.

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