The Effect of Impaired Fasting Glucose on Out-Come of Patients with Acute Coronary Syndrome

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Abstract
Background And Objectives: diabetes mellitus is one of the major risk factor for the development of atherosclerosis that will result in multiple macro and micro vascular damage resulting in catastrophic complications, one of these major complication is the coronary heart disease in all of its spectrum that include the angina, unstable angina and non ST elevation and ST elevation MI, this spectrum of disease some time can overlap and lead to each another and call ACS (acute coronary syndrome). The objective of this study was to estimate the major effect of acute impairment of fasting glucose on the out come and complication of ACS.

Research Design And Methods: A total of 127 patients with ACS with no previous diagnosis of diabetes were subjected to measurement of fasting blood glucose (FBG) at hospital admission in addition to HbA1c% (as it may indicate the presence of DM. and the patient not know). Based on the FBG, they were divided into those having impaired fasting glucose level (>100mg/dl) (active group: n= 78) and normal glucose level(<100 mg/dl) (control group; n = 49). Patients were followed up for mean of 10 days during the period of hospital admission.

Results: in the active group: 9 patients were died and 16 patients had heart failure, while in the control group, 3 patients were died and heart failure occurred in 18 patients. patients with FBG more than 110 mg/dl carry highest mortality.

Conclusions: Fasting blood glucose levels should be routinely assessed among patients with acute coronary syndromes, and those with impaired fasting glucose should be followed and carefully monitored for complication and those patients also should be aimed for more strong and effective therapeutic strategies like early intervention.

Keywords: diabetes mellitus, atherosclerosis, fasting glucose.

Introduction
Acute coronary syndromes (ACS), including unstable angina, non-ST-elevation myocardial infarction (NSTEMI) and ST-elevation myocardial infarction (STEMI), affect approximately one million Americans each year (Porter et al., 2008). Diabetes is associated with increased cardiovascular risk (Arcavi et al., 2004). Individuals with diabetes have a greater mortality from acute myocardial infarction (AMI) than nondiabetic individuals (Akhil and Rodney, 2007). After an acute coronary event,
hyperglycemia has been shown to be a predictor of immediate and long-term cardiovascular mortality (McGuire et al., 2000). Although the prevalence of diabetes has continued to rise, diabetes remains undiagnosed in many patients (Bartnik et al., 2004; Bruno et al.,).

In recent years several studies have reported an increased prevalence of prior undiagnosed abnormal glucose tolerance, i.e., impaired glucose tolerance (IGT) and diabetes in patients with AMI. Furthermore, such newly diagnosed abnormalities of glucose metabolism have been shown to be associated with an excess long-term cardiovascular mortality. Thus, patients with acute coronary syndrome present an opportunity for targeted screening for diabetes and institution of effective management strategies aimed to improve cardiovascular outcome (Mahmoud, 2005; Hyun-Woong, 2010; Onyebuchi et al., 2008).

The aim of this study was to prospectively evaluate the association between the impaired fasting blood glucose and cardiac-related health state within 10 days after ACS. The results of this study are intended to inform clinicians about the importance of impaired fasting blood glucose as a risk factor for health status outcomes after ACS.

**patients and methods**

This prospective study was conducted in Merjan teaching hospital in Babylon province in the period from August 2009 to October 2010, it included 127 patients who were admitted consecutively to coronary care unit with a diagnosis of acute coronary syndrome (ACS) that is based on symptoms, ECG and cardiac enzymes, all patient were subjected to measure fasting blood glucose and HbA1c% on next morning after admission and accordingly they were divided into those with impaired fasting blood glucose (active group) and those with normal fasting blood glucose (control group), all patient with abnormal Hb A1c% above 6 % were excluded (because of the probability of being diabetic), the active group consisted of 78 patients (49 women and 29 men) while the control group consisted of 49 patients (27 men and 22 women) as shown in figure (1).

![Figure (1): Total numbers and percentages of patients in active and control groups](image-url)
In the active group: 21 patients had unstable angina, 33 patients had NSTEMI and 24 patients had STEMI.

In the control group: also 21 patients had unstable angina, only 12 patients had NSTEMI, and 17 patients had STEMI.

Patients with previous history of diabetes or impaired glucose tolerance test were excluded. Clinical and demographic data were obtained for each patient including blood pressure, lipid profile, and body mass index (BMI), and any patient with abnormal blood pressure or abnormal BMI or lipid profile were excluded also from the study (because all of them are independent risk factors for coronary heart disease). A fasting blood glucose sample was taken on next day of admission. Patients were stratified according to fasting plasma glucose (FPG) on the basis of the American Diabetes Association 2010 criteria as follows: the normal FPG were <5.6 mmol/l (100 mg/dl), 5.6–6.9 mmol/l (100–125 mg/dl) for impaired fasting glucose (IFG), and ≥ 7.0 mmol/l (126 mg/dl) for diabetes. The diagnosis of ACS was based on the joint recommendations by the European Society of Cardiology and American College of Cardiology (Alpert et al., 2000).

ACS was diagnosed if there was a typical rise and gradual fall in the levels of cardiac troponins with at least one of the following features: typical ischemic cardiac chest pain and compatible electrocardiograph changes of myocardial infarction or ischemia. Unstable angina was diagnosed if patients had cardiac chest pain either at rest, of new onset, or of an accelerating nature, accompanied by electrocardiograph changes of ischemia and negative results for cardiac troponins. The patients in both groups were followed up for 10 days after they were admitted in the wards.

**Statistical analysis**

Values were presented as means ± SD. All statistical analysis was performed using SPSS for Windows (version 12). Characteristics of patients in the different glycemic groups were compared using the t-test for categorical data. P values of less than or equal to 0.05 were considered to indicate statistical significance (Daniel, 2009).

**Results**

The ages of patients in both groups ranged from 38-75 years. The mean age ± standard deviation (SD) of patients was 51±1.8 years. Most of patients were female (63.2%) as shown in Table (1).

**Table (1): Clinical and laboratory characteristics of patients classified according to fasting blood sugar**

<table>
<thead>
<tr>
<th>Clinical characteristics</th>
<th>Active group</th>
<th>Control group</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (years)± SD</td>
<td>50±3</td>
<td>47±1</td>
<td>P&gt;0.05</td>
</tr>
<tr>
<td>Sex (%female)</td>
<td>63.2%</td>
<td>58%</td>
<td>P&gt;0.05</td>
</tr>
<tr>
<td>Body-mass index (kg/m2)</td>
<td>26.8</td>
<td>27.6</td>
<td>P&gt;0.05</td>
</tr>
<tr>
<td>Systolic blood pressure (mmHg)</td>
<td>140</td>
<td>145</td>
<td>P&gt;0.05</td>
</tr>
<tr>
<td>Diastolic blood pressure (mmHg)</td>
<td>80</td>
<td>88</td>
<td>P&gt;0.05</td>
</tr>
</tbody>
</table>
*SD=Standard deviation

The outcome in the active group: 9 patients were died and all of them had STEMI & 16 of them had heart failure (EF<50 % by echocardiography). while in the control group, only 3 patients were died and they also had STEMI, but 18 patients developed heart failure as shown in table (2).

Table (2): Short-term outcomes stratified by fasting glycemia

<table>
<thead>
<tr>
<th></th>
<th>Active group</th>
<th>Control group</th>
<th>Total</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-hospital heart failure</td>
<td>16</td>
<td>18</td>
<td>34</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>In-hospital heart death</td>
<td>9</td>
<td>3</td>
<td>12</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>ST elevation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-hospital heart failure</td>
<td>6</td>
<td>6</td>
<td>12</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>In-hospital heart death</td>
<td>9</td>
<td>2</td>
<td>14</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

Table (3): type of MI on both groups

<table>
<thead>
<tr>
<th>Type of MI</th>
<th>Active group</th>
<th>Control group</th>
<th>total</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSTEMI</td>
<td>33</td>
<td>12</td>
<td>45</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>STEMI</td>
<td>24</td>
<td>17</td>
<td>41</td>
<td>&gt;0.05</td>
</tr>
</tbody>
</table>

Patients with elevated levels of fasting glucose were older than patients with normal fasting glucose levels, in addition to that, patients with fasting glucose more than 110 mg/dl were more likely to die.

Discussion

This study focused on the short-term clinical outcomes, for patient with impaired fasting blood glucose levels and acute coronary syndromes.

Diabetes was associated with a higher risk of death or re infarction regardless of ST-segment status on presentation (Caccamo et al., 2010). Although ST elevation was associated with more death and (re)infarction among patients without diabetes, the increased cardiovascular risk associated with diabetes, especially for the recurrence of unstable coronary syndromes, likely reflects several factors (Angeli et al., 2010; Bartnik et al., 2010; Savage, 1996). Predictors of worse outcomes after acute coronary syndromes are more prevalent in the diabetic population, including advanced age, increased heart rate, reduced blood pressure, and congestive heart failure on arrival; and a history of hypertension, angina, infarction, and peripheral vascular disease (Karlson 1993; Zuanetti et al., 1995).

The main finding in this study is that abnormal fasting blood glucose level, newly identified at the hospital admission in patients with acute coronary syndromes, characterized individuals with a high likelihood for major cardiovascular events. Patients with impaired fasting glucose have a cardiovascular mortality rate twice that of their counterparts with normal glucose level. It is only in the recent decade that
fasing blood glucose has been recognized as an independent risk factor for cardiovascular morbidity and mortality (Carlos et al., 2009). Moreover, there are strong indications that the risk increases in a continuous manner starting well below the current threshold for the diagnosis of diabetes mellitus (Peter et al., 2009). The study showed that elevated admission fasting blood glucose in patients admitted for acute coronary syndromes was associated with increased risk for in-hospital complications. Also it is notice that most of patient on active group were suffering from NSTEMI which are associated with less mortality than STEMI

**Conclusion**

The study revealed that there was a strong association between the admission fasting glucose level and adverse events in previously nondiabetic patients and those with impaired fasting glucose should be followed and carefully monitored for complications and those patients also should be aimed for more strong and effective therapeutic strategies like early intervention.

**References**


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