Reprint
Admission Blood Glucose Level is a Risk Predictor in Acute Myocardial Infarction in Non-Diabetic Patients

DAAD H. AKBAR
King Abdulaziz University Hospital, Jeddah 21415, P.O. Box 18298
Saudi Arabia

The aim of the study is to determine whether admission blood glucose level can be used as a risk predictor in acute myocardial infarction in non-diabetic patients. Analysis of all non-diabetic patient’s files admitted to King Abdul Aziz University Hospital, Jeddah, with a definitive diagnosis of acute myocardial infarction between January 1995 to December 1999 was carried out. A total of 87 patient's charts were studied. The mean age was 53 years (range 35-87 years), and M:F ratio was 7.7:1. Admission blood glucose level was significantly higher in patients who developed heart failure, reinfarction and those who died, 8.6 mmol/l versus 7.4 mmol/l, 8.1 mmol/l versus 7.3 mmol/l and 9.3 mmol/l versus 7.8 mmol/l (P= 0.01, 0.03, 0.003 respectively). Old age was also significantly associated with poor outcome while no significant relation was found between the peak cardiac enzyme (creatinine phosphokinase) level and worse outcome. Our data indicated that admission blood glucose level could be used as a risk predictor in non-diabetic patients with acute myocardial infarction.

Key Words: admission blood glucose, myocardial infarction, non-diabetic patients, risk predictor.

INTRODUCTION

Myocardial infarction (MI) is one of the most common diagnoses in hospitalized patients in industrialized countries. Although the mortality rate after admission for MI has declined by about 30% over the last two decades, approximately 1 of 25 patients who survive the initial hospitalization die in the first year after MI as reported by Antman & Braunwald (1998). Multiple risk factors have been found to be a predictor of poor outcome in patients with acute MI, such as age >70 years, prior MI, Killip class I, anterior site of infarction, and the combination of hypotension and tachycardia, (Becker et al. 1998). Many investigators (Fuller et al. 1980; Scheidt-Nave et al. 1991; Bjornholt et al.

e-mail: daadakb@yahoo.com
1999; Coutinho et al. 1999; Gersrein et al. 1999) have shown that a moderately elevated blood glucose level is a continuous risk factor for ischemic heart disease and cardiovascular mortality. The aim of this study is to determine whether admission blood glucose level can be used as a risk predictor in acute MI in non-diabetic patients.

METHOD

Medical charts of all patients admitted to King Abdulaziz University Hospital (KAUH), Jeddah, Kingdom of Saudi Arabia with a diagnosis of acute M.I in the period between January 1995 till December 1999 were reviewed. Definitive diagnosis of MI was confirmed by Winter & Eisenberg (1995) criteria: the presence of at least two of the following criteria: 1) a history of prolonged chest discomfort. 2) electrocardiographic changes consistent with ischemia or necrosis. 3) elevated cardiac enzymes. Non-diabetic patients were eligible for inclusion in this study while diabetic patients whether known or discovered on admission (those who had fasting blood glucose level after admission >7.8 mmol/l and 2-hours post prandial >11.1 mmol/l) were excluded. Relevant data were collected from medical charts including patient’s age, sex, body mass index (BMI) (body weight in kilograms divided by the square height in meters), admission blood glucose level, peak cardiac enzyme level (creatinine phosphokinase), mode of treatment whether thrombolytic or surgical intervention, development of complications as heart failure and reinfarction (defined as infarct with an onset >72 hours after the index infarct) were retrieved as well as duration of hospital stay and mortality. Blood glucose and cardiac enzyme (creatinine phosphokinase) analysis were performed on Hitachi autoanalyzer (Hoffmann-La Roche-BM, Switzerland). Analysis was according to the manufacturer instructions. Statistical analysis was done using computer software (SPSS 7.5).

RESULTS

A total of 87 patients fulfilled the inclusion criteria and they were included in the study. The mean age was 52.63 years (range 30-87 years) with M: F ratio 77:10 (7.7: 1) and mean BMI 26.21 (range 20-36). The mean admission blood glucose level was 7.91 ± 2.38 mmol/l and the mean peak cardiac enzyme level was 1289 iu/l (range 227-5319 iu/l) (normal range 0-195 iu/l). Fifty eight patients (66.7%) received thrombolytic therapy while 14 (16%) had surgical intervention. Heart failure developed in 38 patients (43.7%) while reinfarction in 13 (15%) and 2 (2.3%) died. The duration of hospital stay was ranging between 7-14 days. As shown in Tables (1 & 2), admission blood glucose level and old age were significantly associated with poor outcome i.e. development of heart failure, reinfarction and mortality after acute MI while infarct size measured by enzyme release (peak creatinine phosphokinase) was not related to worse outcome (Table 3).
Table 1. Relation of admission plasma glucose level to outcome following acute myocardial infarction

<table>
<thead>
<tr>
<th>Variable</th>
<th>Plasma glucose (mmol/l)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>n</td>
</tr>
<tr>
<td>Heart failure</td>
<td>8.59 ± 2.9</td>
<td>38</td>
</tr>
<tr>
<td>Recurrent myocardial Infarction</td>
<td>8.1 ± 2.4</td>
<td>13</td>
</tr>
<tr>
<td>Mortality</td>
<td>9.3 ± 0.2</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 2. Relation of age to outcome following acute myocardial infarction

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean age (years)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>n</td>
</tr>
<tr>
<td>Heart failure</td>
<td>57.9</td>
<td>38</td>
</tr>
<tr>
<td>Recurrent myocardial Infarction</td>
<td>59.1</td>
<td>13</td>
</tr>
<tr>
<td>Mortality</td>
<td>52.8</td>
<td>2</td>
</tr>
</tbody>
</table>
Table 3. Relation between peak cardiac enzyme (creatine phosphokinase) and outcome following acute myocardial infarction

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean peak cardiac Enzyme (iu/l)*</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>N</td>
</tr>
<tr>
<td>Heart failure</td>
<td>1490 ± 602</td>
<td>38</td>
</tr>
<tr>
<td>Recurrent myocardial Infarction</td>
<td>1216 ± 64</td>
<td>13</td>
</tr>
<tr>
<td>Mortality</td>
<td>2707 ± 700</td>
<td>2</td>
</tr>
</tbody>
</table>

* Normal range for creatine phosphokinase = 0.195 iu/l

DISCUSSION

It has been reported that the magnitude of the rise in the blood glucose during the early phase of an acute MI is attributed to the degree of left ventricular failure (Bellodi et al. 1989), which is mainly determined by a raised concentration of catecholamines and cortisol as a response to infarct extension and myocardial dysfunction as described by Oswald et al. (1986). We found a significant relation between admission blood glucose level and the development of heart failure. Mak et al. (1993) has found that a relationship exists between admission blood glucose level and hospital mortality in patients with acute MI, which is in agreement with that found in our study. This higher mortality could be explained by the altered protection afforded by ischemic preconditioning due to raised blood glucose level as suggested by Kersten et al. (1998). A significant association between admission blood glucose level and the development of recurrent MI has been described by Norhammar et al. (1999), which is similar to our findings. The relationship between admission blood glucose level and poor outcome after acute MI in non-diabetic patients is a metabolically caused mechanism and it may identify subjects with compromised glucose metabolism that is not solely a manifestation of acute stress. A 22-year follow up study conducted by Bjornholt et al. (1999), showed that non-diabetic men with fasting glucose level >4.7 mmol/l had 1.4 fold higher risk of cardiovascular mortality.
than men with lower glucose values. Another epidemiological study done by Scheidt-Nave et al. (1991), with data from a follow up period of 14 years demonstrated that men with fasting blood glucose levels of 6.1-6.6 mmol/l and 6.7-7.2 mmol/l had ~1.3 and ~1.5 fold higher adjusted risk of ischemic heart disease mortality than men with glucose levels <5.5 mmol/l. Results from the U.K. Prospective Diabetes Study (1998), reported that intensive blood glucose control decrease the risk of MI in diabetics. The retrospective design of our study eliminated the possibility to know if admission blood glucose was fasting or random. Therefore, if there is a dysglycemic level above which individuals are at a higher risk for ischemic heart disease mortality, it may be as low as 5.5 mmol/l for fasting and 6.5 mmol/l for 2 hours values. So, it may be possible to use the same levels in non-diabetic patients with acute MI as a predictor of poor outcome. Age was found to be a predictor of poor outcome in acute MI, a finding also reported by Becker et al (1998). In our study as well as in the DIGAMI study conducted by Malmberg et al. (1997) and other study conducted by Norhammar et al. (1999), infarct size measured by enzyme release was not related to poor outcome.

In conclusion, admission blood glucose level can be added to the other risk predictors in non-diabetic patients with acute MI. Further prospective studies are needed to determine the blood glucose level that can be used as risk predictor. Although no cardiovascular studies of interventions that lower blood glucose in non-diabetics people have been reported, this may be important especially for patients with history of previous MI. Also randomized trials designed to test the impact of specific management strategies on outcome according to initial risk classification are warranted. Follow up studies on patients with high admission blood glucose are required to find out if these patients are at a higher risk to develop diabetes mellitus if so, screening at more frequent intervals and application of secondary preventive measures, such as exercise, weight loss and smoking cessation, are needed.

REFERENCES


---

شعبة جامعة القاهرة للعلوم والطب بهيئة النشر 31 العدد 1 - نيسان 1431هـ
management of patients with acute myocardial infarction at increased risk for adverse outcome: a nationwide perspective of current clinical practice. The national registry of myocardial infarction (NRMI-2) participants. American Heart Journal 135(5Pt 1): 786-796.


(Received 10/1/1420; 16th February 2000, accepted 26/8/1421; 22nd November 2000)
مجلة جامعة أم القرى
للفنون والعلوم والهندسة

مقدمة