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ORIGINAL ARTICLE

# Tight Glycemic control in acute coronary syndromes: Prognostic implications

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## KEYWORDS

Tight glycemic control;  
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**Abstract** *Background:* Elevated admission plasma glucose is associated with increased mortality in patients who are admitted with acute coronary syndromes.

*Aim:* To validate the hypothesis that tight glycemic control could reduce major adverse cardiac events in hyperglycemic patients with acute coronary syndromes.

*Methods:* Fifty adult patients admitted with acute coronary syndromes within 6 h of presentation with “RBS > 140 mg/dl” were enrolled in this study to evaluate the effect of tight glycemic control using insulin actrapid infusion (aiming at RBS of 80–130 mg/dl during the 1st 24 h post admission) on decreasing infarct size, and major adverse cardiac events during ICU admission and 30 days follow up.

*Results:* Of 50 patients enrolled in the study, 25 patients received insulin by infusion (group A), while the rest received insulin via S.C. route (group B). The glycemic control was significantly lower in group A.

Heart failure at 7 and 30 days was 4% and 12%, respectively, in group A vs. 20% and 24%, respectively, in group B. Hemodynamic instability was seen in 8% in group A vs. 28% in group B during the ICU stay. Mortality at 7 and 30 days was 0% and 0%, respectively, for group A vs. 4% and 12%, respectively, for group B.

*Conclusion:* Tight glycemic control in patients with acute coronary syndromes presenting with hyperglycemia on admission is beneficial.

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## Introduction

The Euro Heart Survey Diabetes 2007 examined the correlation between acute coronary syndromes and diabetes. It has provided evidence that diabetes is particularly common in patients with chest pain in the intensive coronary care unit (ICCU). Patients with a normal blood glucose level account

for only one third of the patients admitted to the ICCU. Another third is made up patients with known diabetes, whereas the remaining patients have newly diagnosed diabetes, i.e. diagnosed on admission, or an impaired glucose tolerance [1].

The world prevalence of diabetes among adults (aged 20–79 years) is approximately 6.4%, affecting 285 million adults in 2010 and is predicted to rise to 7.7%, affecting 439 million adults by 2030. Between 2010 and 2030, there will be a 69% increase in number of adults with diabetes in developing countries and a 20% increase in developed countries. Globally, diabetes is likely to be the fifth leading cause of death [2].

With CHD ranking as the number one cause of death worldwide, with diabetes increasing by two to three times the risk of CHD, and with diabetes and the often preceding metabolic syndrome dramatically increasing their prevalence, diabetologists and cardiologists have started to join their forces to improve the management of the millions of patients suffering from both diseases [3].

### Aim of the work

This study was designed to validate the hypothesis that intensive blood glucose control with intravenous insulin infusion could reduce short term in hospital mortality and 30 day mortality, re-infarction, stroke and re-hospitalization for congestive heart failure in critically ill hyperglycemic patients admitted to an intensive care unit (ICU) with acute coronary syndrome.

### Patients and methods

Fifty critically ill adult patients admitted to the ICU with acute coronary syndromes within 6 h of presentation with admission hyperglycemia “RBS > 140 mg/dl” with or without previously known diabetes mellitus were enrolled in this study.

Patients were divided into two groups; 25 patients in each group, where group A received intensive insulin therapy in the form of insulin infusion for 24 h in order to maintain blood glucose in the range of 80–130 mg/dl.

Patients in group B received reperfusion therapy with the standard anti ischemic therapy and standard glycemic control with sliding scale insulin if glucose exceeded 180 mg/dl, targeting in hospital glycemic control with blood glucose < 140 mg/dl.

Full history taking, clinical examination, ECG analysis quantitatively and qualitatively, cardiac enzymes serial analysis, transthoracic two-dimensional, M-mode and color flow Doppler imaging echocardiography was done before discharge stressing on the following: segmental wall motion abnormalities (SWMA) with calculation of segmental wall motion score and on left ventricular ejection fraction (calculated by two-dimensional echocardiography using modified Simpson’s method).

Random blood sugar was measured hourly and corrected accordingly with modulation of the dose of insulin infusion for group A in order to achieve the targeted level of glycemic control between 80 and 130 mg/dl. Serum K was repeated every 2 h and as needed according to the assessment of the attending physician in order to avoid incidence of hypokalemia and hypoglycemia and in order to treat accordingly. Then in hospital glycemic control was maintained by sliding scale sub-

cutaneous insulin four times daily in order to maintain this level of tight glycemic control along with reperfusion therapy with the standard anti ischemic therapy as well.

All patients were closely monitored for the incidence of in hospital complications in the form of in-hospital death, re-infarction, arrhythmias, heart failure or hemodynamic instability or stroke.

Incidence of out of hospital mortality, re-infarction, heart failure and any coincident complication was followed up for 1 month.

### Results

Comparison between studied groups regarding that demographic data revealed that there was no significant difference in the proportions between male and females in both groups (Table 1).

Mean age was  $55.12 \pm 8.03$  for group A and  $59.68 \pm 11$  for group B with non-significant difference as shown in Table 1.

Each group was composed of 25 patients of whom eight (32%) patients were diagnosed as having: non ST-segment elevation acute coronary syndromes “Unstable angina + Non STEMI”, 10 (40) patients were diagnosed as having inf. STEMI”, seven (28%) patients were diagnosed as having anterior STEMI. Both groups were identical regarding diagnosis as shown in Table 2.

The aim of tight glycemic control in the intensive insulin therapy arm group A was successfully achieved. The range of glycemic control during the 1st 24 h as well as during the rest of ICU stay was significantly lower in group A (Table 3 and Fig. 1).

*Cardiac enzymes:* There was no significant difference regarding CK-MB on admission, but after 12 h it was insignificantly higher in group B. There was no significant difference between both groups regarding troponin on admission, although the number of cases converting to positive being higher in group B as shown in Table 4, Figs. 2 and 3.

The ECG was qualitatively and quantitatively analyzed for each patient in both groups and comparison between both groups at admission and at 24 h from admission and upon discharge showed no significant difference between studied groups regarding most of the ECG variables but the sum of ST-segment depression in inferior leads was significantly higher in group B at ECGs done 24 h after admission and the sum of ST-segment elevation in I and aVL at discharge was higher in group B (Table 5 and Fig. 4).

*Echocardiographic parameters:* E.F was higher in group A yet the difference did not reach statistical significance, whereas regional wall motion abnormality score index was significantly lower in group A as shown in Table 6.

In our study; there was no significant difference between the studied groups regarding the incidence of re-infarction where only one case in group B suffered from re-infarction while no cases in group A. The incidence of heart failure was higher in group B; five cases (20%) compared to only one case (4%) in group A (*P* value 0.08) (Table 7).

During 30 days follow up of patients in both groups, there was a non-significant increase in the incidence of heart failure in group B compared to group A (3 vs. 6, *P* value 0.27). There was an insignificant increase in the incidence of

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