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 ,

الخلاصة

داء السكري احد عوامل الخطر الرئيسية لتنمية تصلب الشرايين الذي سيؤدي الى المختصر المتعدد والضرر الوعائي الدقيق الذي ينتج على تعقيدات هائلة، احدى هذه التعقيدات الخطرة هو مرض القلب التاجي: اجمالاً طيفه الذي يتضمن النوبة القلبية، نوبة قلبية غير مستقرة واحتشاء العضلة القلبية الحاد والجزئي والكامل. هدف هذه الدراسة كانت ان تخمن التأثير الرئيسي للضعف الحاد لصوم الكلوكوز على الناتج الصحي الحاد لمرضى المتلازمة التاجية الحادة. تضمن البحث 127 مريض كان مصاباً بالمتلازمة التاجية الحادة، 78 مريض كان مصاباً بضعف كلوكوز الصوم، 49 مريض كانوا طبيعيين، تمت متابعة المرضى داخل المستشفى لمدة عشرة ايام.

النتائج: 9 من المرضى المصابين بضعف كلوكوز الدم توفوا، بينما المجموعة الثانية كانت الوفاة فيها 3 فقط ، 12 مريض اصيبوا بعجز القلب الحاد مقابل 13 من من المجموعة الثانية وعليه فان قياس كلوكوز الدم في حالة الصيام واجب لكل مريض ، والمرضى الذين لديهم ارتفاع بهذه النسب يجب مراقبتهم بحذر منعاً للمضاعفات.

الكلمات المفتاحية: مرض السكري، تصلب الشرايين، صوم الكلوكوز.

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 admition 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).
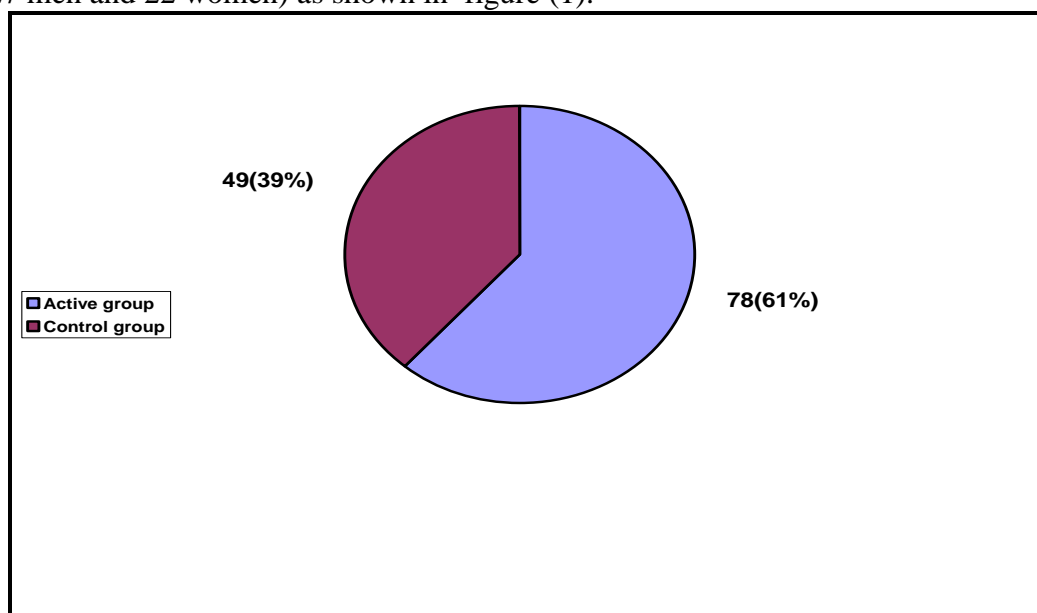

Figure (1): Total numbers and percentages of patients in active and control groups

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 follow: 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

Clinical characteristics	Active group	Control group	P-value
Mean age (years)± *SD	50±3	47±1	**P>0.05**
Sex (%female)	**63.2%**	**58%**	**P>0.05**
Body-mass index (kg/m2)	**26.8**	**27.6**	**P>0.05**
Systolic blood pressure (mmHg)	**140**	**145**	**P>0.05**
Diastolic blood pressure (mmHg)	**80**	**88**	**P>0.05**

*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

	Active group	Control group	Total	P value
All patients **In-hospital heart failure**	16	18	34	>0.05
In-hospital heart death	9	3	12	<0.05
ST elevation **In-hospital heart failure**	6	6	12	>0.05
In-hospital heart death	9	2	14	<0.05

Table (3): type of MI on both groups

Type of MI	Active group	Control group	total	P-value
NSTEMI	33	12	45	<0.05
STEMI	24	17	41	>0.05

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

Akhil Kapur and Rodney De (2007). Palma Mortality after myocardial infarction in patients with diabetes mellitus. Heart. December; 93(12): 1504–1506

Alpert JS, Thygesen K, Antman E, Bassand JP : Myocardial infarction redefined—a consensus document of The Joint European Society of Cardiology/American College of Cardiology Committee for the redefinition of myocardial infarction. J. Am. Coll. Cardiol. 36:959–969.

American Diabetes Association. (2010) Clinical Practice Recommendations 2010. Diabetes Care. 28(suppl 1):S1-S79.

Angeli F, Verdecchia P, Karthikeyan G, Mazzotta G, Del Pinto M, Repaci S, Gatteschi C, Gentile G, Cavallini C, Reboldi G.Curr (2010). Diabetes Rev..New-onset hyperglycemia and acute coronary syndrome: a systematic overview and meta-analysis. Curr Diabetes Rev. Mar;6(2):102-10.

Arcavi L, Behar S, Caspi A, Reshef N, Boyko V, Knobler H. (2004). High fasting glucose levels as a predictor of worse clinical outcome in patients with coronary artery disease: results from the Bezafibrate Infarction Prevention (BIP) study. Am Heart J. Feb;147(2):239-45.

Bartnik , M.; Malmberg , K.; Norhammar, A.; Tenerz , Å.; Öhrvik J. and Rydén. L.(2010). Newly detected abnormal glucose tolerance: an important predictor of long-term outcome after myocardial infarction.European Heart Journal. Volume25, Issue22 .Pp. 1990-1997.

Bartnik M, Malmberg K, Norhammar A, Tenerz A, Ohrvik J, Rydén L. (2004). Newly detected abnormal glucose tolerance: an important predictor of long-term outcome after myocardial infarction. Eur Heart J. Nov;25(22):1990-7.

Bruno Vergès, Marianne Zeller, Gilles Dentan, Jean-Claude Beer, Yves Laurent, Luc Janin-Manificat, Hamid Makki, Jean Eric Wolf, Yves Cottin on behalf of the Observatoire des Infarctus de Côte d'Or Survey Working Group Impact of Fasting Glycemia on Short-Term Prognosis after Acute Myocardial Infarction*.* Journal of Clinical Endocrinology & Metabolism , Vol. 92, No. 6 2136-2140.

Caccamo G, Bonura F, Bonura F, Vitale G, Novo G, Evola S, Evola G, Grisanti MR, (2010). Novo S. Insulin resistance and acute coronary syndrome. Atherosclerosis. Aug;211(2):672-5. Epub 2010 Apr 4.

Carlos M C Monteiro; Luciene Oliveira; Maria C O Izar; (2009). Tatiana Helfenstein; Andreza O Santos; Simone M Fischer; Sahana W Barros; Luiz F M Pinheiro;

Antonio Carvalho; C C ; Francisco Fonseca A H. Early glucometabolic profile in patients with acute coronary syndromes and metabolic syndrome. Arq. Bras. Cardiol. vol.92 no.2 São Paulo Feb.

Daniel, W.W. Probability and t distribution. Biostatistics: (2008). A foundation for analysis in the health sciences.9th ed.pp:83-123.John Wiley and Sons, Inc. U.S.A.

Hyun-Woong Park, Taek Geun Kown, Ki-Young Kim, and Jang-Ho Bae, (2010). Insulin Resistance and Atherosclerosis Surrogates in Patients With Coronary Atherosclerosis. Korean Circ J. February; 40(2): 62–67.

Karlson BW, Herlitz J, Hjalmarson A. (1993). Prognosis of acute myocardial infarction in diabetic and non-diabetic patients.Diabetes Med 10: 449–54.

Mahmoud Suleiman, Haim Hammerman, MD; Monther Boulos, Michael R. Kapeliovich, Abeer Suleiman, Yoram Agmon, Walter Markiewicz, Doron Aronson. (2005). Fasting Glucose Is an Important Independent Risk Factor for 30-Day Mortality in Patients With Acute Myocardial Infarction .A Prospective Study. (Circulation;111:754-760.).

McGuire DK, Emanuelsson H, Granger CB, Magnus Ohman E, Moliterno DJ, White HD, Ardissino D, Box JW, Califf RM, Topol EJ. (2000). Influence of diabetes mellitus on clinical outcomes across the spectrum of acute coronary syndromes. Findings from the GUSTO-IIb study. GUSTO IIb Investigators. Eur Heart J. Nov; 21(21):1750-8.

Onyebuchi E. Okosieme, MD, Rajesh Peter, Muhammad Usman, Hemanth Bolusani, Prem Suruliram, Lindsay George, MD, and L. Marc Evans. (2008). Can Admission and Fasting Glucose Reliably Identify Undiagnosed Diabetes in Patients With Acute Coronary Syndrome? Diabetes Care. October; 31(10): 1955–1959.

Peter R. Sinnaeve, P. Gabriel Steg, Keith A. A. Fox, Frans Van de Werf, Gilles Montalescot, Christopher B. Granger, Elias Knobel, Frederick A. Anderson, Omar H. Dabbous, (2009). Álvaro Avezum, for the GRACE Investigators. Increased Short-term and 6-Month Mortality in ST-Segment Elevation and Non–ST-Segment Elevation Acute Coronary Syndromes The Global Registry of Acute Coronary Events Arch Intern Med. 169(4):402-409.

Porter A, Assali AR, Zahalka A,Etal Iakobishvili Z, Brosh D, Lev EI, Mager A, Battler A, Kornowski R, Hasdai D (2008). Impaired fasting glucose and outcomes of ST-elevation acute coronary syndrome treated with primary percutaneous intervention among patients without previously known diabetes mellitus. Am Heart J. Feb;155(2):284-9. Epub 2007 Nov 26.

Savage PJ. (1996). Cardiovascular complications of diabetes mellitus: what we know and what we need to know about their prevention. Ann Intern Med; 124: 123–6.

Zuanetti G, Latini R, Maggioni AP, Santoro L, Franzosi MG, (1995). On behalf of the GISSI-2 Investigators. Influence of diabetes on mortality i