

Increasing HbA1C Level; a Prognostic Indicator of Increased Thirty Days Mortality in Patients of ST-Segment Elevation in Myocardial Infarction

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ABSTRACT

Objective: To determine the association of glycosylated hemoglobin with short term mortality after myocardial infarction

Study design: Prospective case-control type of study

Place and duration: Deptt. of Cardiology, B. V Hospital Bahawalpur from 01-04-2010 to 31-08-2012.

Patients and methods: Initially, 955 patients presenting with myocardial infarction (MI) were enrolled in the study. About 201 patients dropped out from study because of early deaths (n=17), falling in the impaired glucose tolerance range on subsequent oral glucose tolerance test (OGTT) (n=67), having dyslipidemia on investigations (n=20) or because of the other co-morbidities like chronic renal failure (n=34), stroke (n=42) or previous history of MI (n=21). The remaining 754 patients were divided into two groups, diabetics and non-diabetics, depending upon the results of oral glucose tolerance test. Glycosylated hemoglobin HbA1C level was determined in all the patients. These patients were followed up after 30 days and the number of deaths was estimated. Data was analyzed using SPSS version 10.

Results: In non-diabetic patients, increasing HbA1C level (>5.5%) resulted in significantly increased number of deaths while in diabetic group, HbA1C level was not significantly associated with increased mortality in one month period after the acute myocardial infarction.

Conclusion: Higher levels of HbA1C in diabetic as well as non-diabetic patients increase the risk of short term mortality after acute myocardial infarction.

Key words: Glycosylated hemoglobin, oral glucose tolerance test

INTRODUCTION

Diabetes is a chronic condition of diverse etiology and pathogenesis; affecting approximately 220 million people world wide. It carries significant morbidity and mortality stemming from long term complications. Glycosylated haemoglobin has been the key measure of glycaemic control in diabetic patients for last two decades. Glycosylated haemoglobin is formed by non-enzymatic glycation of N-terminus of beta chain of haemoglobin. The glycosylated Hb concentration levels are also more closely related to the risk of chronic complications than random single or episodic glucose levels¹.

Glycosylated hemoglobin A1c (HbA1C) reflects the average blood glucose levels over 2 months and is minimally affected by acute hyperglycemia often observed in myocardial infarction (MI)². In 2009, The International Expert Committee recommended the use of HbA1C to diagnose diabetes mellitus with a threshold > 6.5%³. The American Diabetes Association (ADA) adopted this recommendation in

its position statement entitled, "Standard of medical care in diabetes-2010"⁴. Prospective studies indicate that a high normal HbA1C level of 5.5% to 6.5% poses very high risk for subsequent development of diabetes, and the risk increases substantially as the values increase^{5,6}. Glycosylated hemoglobin (HbA1C) level on admission is also a prognostic factor for mortality in patients with and without diabetes after myocardial infarction⁷⁻¹².

METHODOLOGY

This was a prospective case-control type of study which was carried out in the department of Cardiology, Bahawal Victoria Hospital Bahawalpur, from 1st April 2010 to 31st August 2012. Initially, 955 patients presenting with myocardial infarction (MI) were enrolled in the study. The diagnosis of MI was based on the definition of the American College of Cardiology and the European Society of Cardiology which considers MI as a typical rise in cardiac troponin T or I, or CK-MB, above the 99th centile for normal, with at least one of the following; ischemic symptoms, development of pathological Q-waves on the ECG, ischemic ECG changes (ST-segment

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depression or elevation) or coronary artery intervention e.g., PCI¹³.

All those patients who were having one or more of the known major risk factors of coronary artery disease (hypertension, smoking, dyslipidemia, BMI > 30 kg/m²) except diabetes mellitus were excluded from the study. Patients were grouped to be diabetic or non-diabetic based on the WHO criteria for the diagnosis of diabetes mellitus^{14,15}. About 201 patients dropped out from study because of early deaths (n=17), falling in the impaired glucose tolerance range on subsequent oral glucose tolerance test (OGTT) (n=67), having dyslipidemia on investigations (n=20) or because of the other co-morbidities like chronic renal failure (n=34), stroke (n=42) or previous history of MI (n=21). The remaining 754 patients were divided into two groups, diabetics and non-diabetics, depending upon the results of oral glucose tolerance test. Glycated hemoglobin HbA1C level was determined in all the patients. These patients were followed up after 30 days and the number of deaths was estimated. Data was analyzed using Statistical Package for Social Sciences (SPSS) version 10. We compared the mortality rate and its association with HbA1C level in the two groups.

RESULTS

Among the 754 patients finally included in the study, 46.7% (n=352) were diabetics. Baseline characteristics of the patients are shown in Table 1. During the follow up (thirty days after acute MI), 20% deaths occurred in diabetic group as compared to 11.2% in non-diabetic population (p Value <0.001, odds ratio=2.04) (Fig. 1). In non-diabetic patients, increasing HbA1C level (>5.5%) resulted in significantly increased number of deaths (33 versus 12, p Value=0.001, odds ratio=2.99) while in diabetic group, although higher HbA1C level was associated with increased number of deaths (odds ratio=1.66) in one month period after the acute myocardial

infarction but statistically, this difference was not found to be significant (Table 2).

Fig. 1: Comparison of number of deaths in diabetic and non diabetic groups

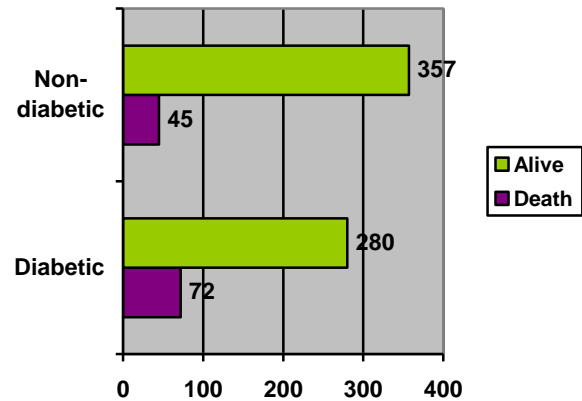


Table 1: Baseline characteristics of the patients Mean age

Variable	=n
Male	51±09
Female	54±07
Male	512
Female	242
Diabetics	
HbA1C 6.5-8	172
HbA1C > 8	180
Non diabetics	
HbA1C < 5.5	198
HbA1C 5.5-6.5	204
Blood pressure (mmHg)	
Systolic	117±13
Diastolic	80±12
Mean BMI	26.4±3.2
MI	
Anterior	264
Lateral	136
Inferior	317
Combination	37

Table 2: Mortality statistics at 30 days follow up

	Non-diabetics			Diabetics		
	HbA1C < 5.5	HbA1C 5.5-6.5	p Value	HbA1C 6.5-8	HbA1C > 8	p Value
Dead	12	33	0.001	28	44	> 0.05
Alive	186	171	-	144	136	-
Total	198	204	-	172	180	-

DISCUSSION

Numerous prior studies have shown that elevated admission or fasting glucose increases the risk of death and in-hospital complications in patients with acute coronary syndrome (ACS) and patients undergoing coronary revascularization^{16,20}. However the studies determining the association between

HbA1C level and complications of coronary artery disease including subsequent mortality have shown conflicting results²¹. Diabetic patients face an 11% increased risk of mortality from ischaemic heart disease (UKPDS 23)^{1,22}. While those with HbA1C >8% face a 150% increased risk of death from heart disease.¹ As previously noted, HbA1C levels below the threshold for a diagnosis of diabetes (<6.5%) are

associated with a very high risk of CHD: such patients should receive demonstrably effective preventive treatment⁴. In a study by E. Selvin et al, after 15 years follow up of more than 11000 participants, suggested that HbA1C values in normal range without diabetes can identify people at higher risk of CAD, stroke and death¹⁰. Our study revealed that in non-diabetic people, HbA1C levels in the range of 5.5-6.5% were associated with a significant increase in the number of deaths following acute myocardial infarction. In the patients, who already had established diabetes mellitus, higher HbA1C levels, although, pose a greater risk of death (odds ratio=1.66) but it was found to be statistically insignificant (p value >0.05). Our results are similar to those reported by Chowdhury et al⁸ and Liu et al²¹.

CONCLUSION

Higher levels of HbA1C in diabetic as well as non-diabetic patients increase the risk of short term mortality after acute myocardial infarction.

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