

Association of Glycaemic Profile and Left Ventricular Systolic Dysfunction in Acute Coronary Syndrome.

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Abstract

The deranged glycaemic control is well established association with poor outcomes of left ventricular function in acute coronary syndrome. The deranged glycaemic control ranges from stress hyperglycaemia, raised fasting and post prandial and HbA1c levels. The association of these derangement with the left ventricular outcome is studied in this study. The glycaemic and left ventricular function indices were determined in 60 consecutive non-diabetic acute coronary patients admitted in tertiary care teaching hospital. The study suggests that the left ventricular dysfunction correlated with the HbA1c, Fasting, Post-prandial, and admission blood sugar level in decreasing degrees of correlation.

Keywords: HbA1c, Fasting Blood Sugar, Post-Prandial Blood Sugar, Admission Blood Sugar Level, Left Ventricular Function, Acute Coronary Syndrome.

Introduction

More than two-thirds of patients with myocardial infarction, have either diabetes or impaired glucose regulation (impaired glucose tolerance and impaired fasting glucose). Abnormal glucose regulation is almost twice as prevalent in patients with myocardial infarction compared to a matched control population and is a marker for adverse outcomes [1]. Myocardial ischemia due to coronary atherosclerosis commonly occurs without symptoms in patients with diabetes. As a result, multi vessel atherosclerosis often is present before ischemic symptoms occur and before treatment is instituted. A delayed recognition of various forms of coronary heart disease undoubtedly worsens the prognosis for survival for many diabetic patients. Hyperglycaemia during the first 24 to 48 hours after admission for ACS is associated with increased early mortality, whether or not the patient has diabetes. Furthermore, in-hospital mortality has a closer relationship to hyperglycaemia than to diabetic status. Higher baseline glucose and a failure of glucose to decrease are independent predictors of mortality. For

patients undergoing primary angioplasty, mortality increases when the plasma glucose is >10.0 mmol/L [2]. Left ventricular (LV) systolic dysfunction is a common complication of acute coronary syndrome (ACS). In case of ACS, LV systolic dysfunction may occur during the acute period or later. The greatest risk of LV systolic dysfunction arises from myocardial infarction – especially recurrent – and complex arrhythmias, In the presence of LV systolic dysfunction occurring during the acute period of myocardial infarction, most patients (70%) experience heart failure (HF), whereas approximately one-third of patients develop no symptoms of HF.

Therefore, this study was conducted to determine the association between value of admission glucose, HbA1c and left ventricular systolic dysfunction in patient with acute coronary syndrome. Knowledge of association of admission glucose, HbA1c & left ventricular ejection fraction (LVEF) after acute myocardial infarction helps to stratify prognostication of the risk and guides the use of evidence based treatment

Material and Method

The observational cross sectional study, included 60 acute coronary cases without history of diabetes and old myocardial infarction, admitted in the Department of Medicine, Pt. Jawaharlal Nehru Memorial Medical College and Dr. B.R.A.M. Hospital, Raipur. The standard definition criteria were employed for the diagnosis of Acute Myocardial Infarction [3], diagnosis of Non-ST elevation myocardial infarction / unstable angina [4].

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The study excluded Patient with hemoglobinopathy, anaemia, chronic kidney disease, chronic liver failure, recent blood loss and blood transfusion, sepsis. The subjects were sampled for admission, fasting, 2 hours post prandial blood glucose levels, HbA1c and left ventricular volumes and function quantification by modified Simpson's method. The test of significance was determined by applying chi square test [for qualitative data] and Pearson correlation coefficient, using statistical software SPSS IBM Chicago, Version 20.

Observation

The left ventricular ejection fraction after acute myocardial infarction was adversely affected by admission, fasting, post-prandial sugars and HbA1c

($p < 0.00009$, $p < 0.001$, $p < 0.001$, $p < 0.001$). Upon Pearson correlation coefficient determination, the inverse relation of left ventricular ejection fraction after acute myocardial infarction, the coefficient was -0.67, -0.78, -0.74, -0.74 for association with admission, fasting, post-prandial sugars, and HbA1c, respectively.

Results

The left ventricular ejection fraction after acute myocardial infarction is adversely affected by hyperglycaemic states, however, the worst affection is associated with greater derangement of fasting levels. The admission glucose had the least impact on the left ventricular outcome.

Table 1: The left ventricular ejection fraction with the glycaemic indices

GLYCAEMIC INDICES	CRITERION	EF <55 %	EF ≥55%	TOTAL	P VALUE	SIGNIFICANCE
ADMISSION GLUCOSE (AG)	≥ 200 mg /dl	21	2	23	$p < 0.00009$	HS
	<200mg/dl	15	22	37		
FASTING GLUCOSE (FBS)	≥126	23	2	25	$p < 0.001$	HS
	<126	13	22	35		
POST PRANDIAL GLUCOSE (PPBS)	≥140	29	7	36	$p < 0.001$	HS
	<140	7	17	24		
HBA1C	≥ 6.5	27	1	28	$p < 0.001$	HS
	< 6.5	10	22	32		

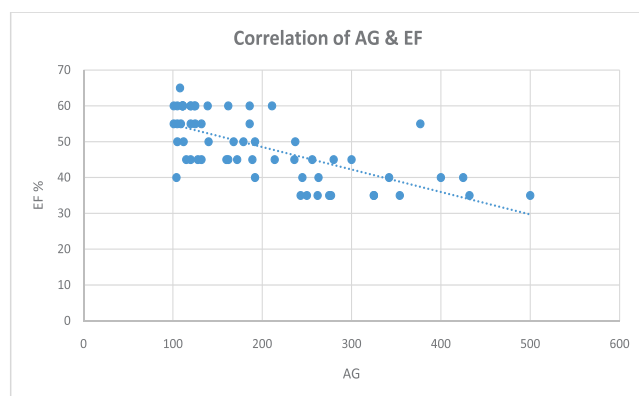


Figure 1: The significant linear inverse correlation between the admission glucose and the left ventricular ejection fraction (Pearson correlation coefficient $[r] = [-0.67]$).

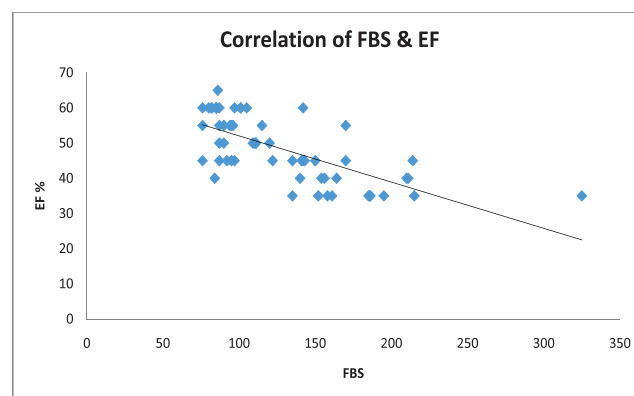


Figure 2: The significant linear inverse correlation between the fasting blood glucose and the left ventricular ejection fraction (Pearson correlation coefficient $[r] = [-0.78]$).

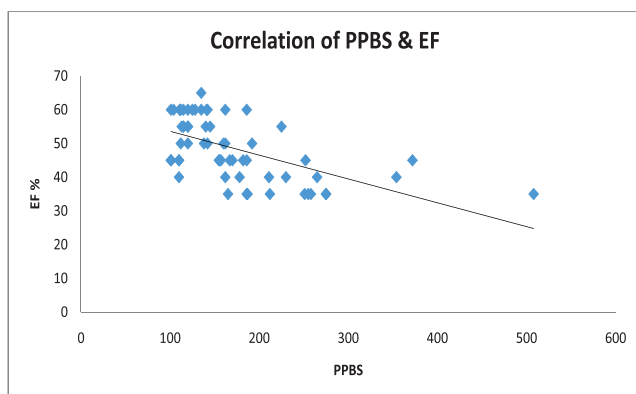


Figure 3: The significant linear inverse correlation between the 2 hour post prandial blood glucose and the left ventricular ejection fraction (Pearson correlation coefficient $[r] = [-0.74]$).

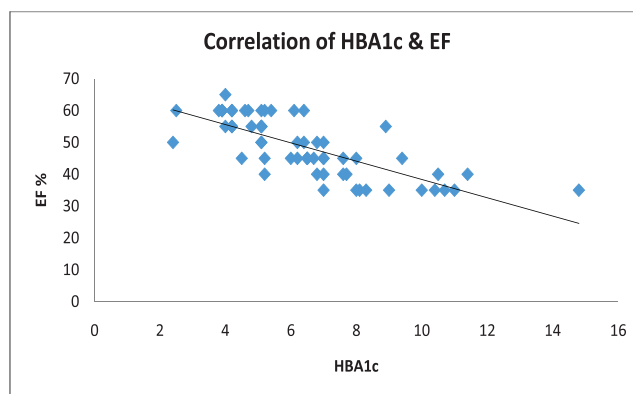


Figure 4: The significant linear inverse correlation between the HbA1c and the left ventricular ejection fraction (Pearson correlation coefficient $[r] = [-0.74]$).

Discussion

The relationship of poor left ventricular ejection fraction after acute myocardial infarction and hyperglycaemia are well documented. (Manal Khudhur Abdul Razzaq, Jawad Ibrahim Rasheed et al (2013), Joanna Gierach, Marcin Gierach et al (2014), Müdspacher D, Radovanovic D et al, Masaharu Ishihara, Ichiro Inoue et al (2003), Zheyne Vlaeva Cherneva, Stefan Veselinov Denchev et al, Christina Chrysohoou, Christos Pitsavos et al).

The worst left ventricular systolic function with high HbA1c and fasting glucose levels, are attributable to latent or pre-diabetic to frank undetected diabetic state that represents chronically advanced hyperglycaemia. Such chronic affection may result in diffuse atherosclerotic coronary artery disease and consequent poorer left ventricular function. The high admission glycaemia represents the stress hyperglycaemia and therefore, though adversely affected the left ventricular outcomes, but had weakest association. The post-prandial hyperglycaemia represents early glycaemic derangement in the diabetes spectrum where the insulin deficiency is only unmasked in post prandial hyperglycaemia, and as a result, its correlation was intermediate with left ventricular functions. The HbA1c levels also correlated with intermediate level of association.

Limitations

The study is limited by a small number of subjects, inability to account for left ventricular dysfunction due to pre-existing disease, extent of myocardial involvement. The recovery of left ventricular dysfunction was not studied.

Conflict of interest:	All authors declare no COI
Ethics:	There is no ethical violation as it is based on voluntary anonymous interviews
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