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Clinical profile and Prevalence of diabetes in patients with myocardial infarction

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Abstract
Background: Diabetics experience a greater mortality during the acute phase of myocardial infarction (MI) and a higher morbidity in the postinfarction period. This study was conducted to assess the prevalence of diabetes as a risk factor for acute myocardial infarction.
Methods: Detailed demographic details such as age, gender, weight, BMI, blood pressure, smoking and alcohol details, previous clinical and medical history were noted for all the patients. Blood was collected from the patients for random blood glucose levels and HbA1c levels
Results: 63.5% patients were males and only 36.5% of them were females with the average age being around 66 years. Most of the patients who were admitted to the hospital with MI were obese or overweight with elevated cholesterol and triglyceride levels. Out of the 104 patients, 59 (56.7%) had no diabetics, 29 (27.9%) were known diabetics. 11 (10.6%) of them were identified as diabetic during the hospitalization.
Conclusions: The chronic and acute hyperglycaemia associated to acute coronary syndromes, mainly in acute myocardial infarction is an independent and determinant factor in the outcome for patients with and without diabetes mellitus.

Keywords: acute myocardial infarction, diabetes mellitus, prevalence, risk factors

Introduction
Diabetes affects more than 6% of the people in US alone and is present in more than 30% of the patients hospitalized with acute coronary syndromes. It has been recognized for some time that diabetics experience a greater mortality during the acute phase of myocardial infarction (MI) and a higher morbidity in the postinfarction period [1, 2]. This increased risk is almost two to four fold for coronary heart disease (CHD) in patients with diabetes [1, 3]. They also have a two-fold risk for short-term mortality rate after myocardial infarction (AMI), even after the adjustment of CHD4. AMI is the leading cause of death in both men and women. Age, sex and diabetes are the known risk factors for survival. It has been reported that women have a higher 30-day mortality after AMI than men [5, 6]. Few other studies have reported that higher early post-MI mortality rates may be limited to younger women, who represent a dinstinct group characterized by unique risk factors and pathophysiology. However, in the recent years, there has been a transition of the burden of cardiovascular disease in Asia, where it is expected to reach alarming proportions due to the increasing rates of smoking, alcoholism, obesity and diabetes [8, 9].
Nearly 20% of the patients with AMI and without previously known diabetes develop elevated glucose levels during their hospitalization [10, 11]. This further increases the mortality rates among the patients with AMI [13]. The reason for this association is estimated to be the underlying unrecognized diabetic status [14, 15]. The appearance of the higher sugar levels may be due to the stress of the AMI.
The prevalence in the number of previously known diabetes and newly detected diabetes in patients with acute myocardial infarction is limited. Therefore the study was conducted to identify the prevalence of diabetes, both previously known and newly detected in the patients with AMI in the area.

Methods
This study was conducted by the department of medicine at Gulbarga Institute of Medical Sciences during the period of two years and four months. 104 patients with myocardial infarction, who were admitted into our hospital, were included into the study. Informed consent was taken from all the patients before the inclusion into the study. All patients had fulfilled the diagnostic criteria for acute myocardial infarction. Detailed demographic details such as age, gender, weight, BMI, blood pressure, smoking and alcohol details, previous clinical and medical history were noted for all the patients. Patients with epilepsy, subdural hematoma and sub-arachnoid hemorrhage or any other neurological disability that would affect the HbA1c levels were excluded from the study.
Blood was collected from the patients for random blood glucose levels and HbA1c levels. Cholesterol levels and triglyceride levels were also estimated. On the 2nd and the 5th days of admission, fasting blood glucose levels were measured.
Patients were considered diabetic if they were known diabetic or their glucose levels were, RBS >200 mg/dL, fasting glucose >126 mg/dL and post prandial glucose >200 mg/dL. If even on the 5th day if the glucose levels were <126 mg/dl, they were considered to be non-diabetic.
Newly diagnosed diabetics were defined as such if they have elevated glucose level during their entire hospital stay. They were further confirmed after 2-3 months of re-measuring the

glucose levels, when the patient came for follow-up.
Patients who were not previously known diabetics and whose fasting blood glucose were <126 mg/dl were considered to be non-diabetic. All the patients with normal blood glucose levels during the stay, but could not be further investigated due to early death or due to any other difficulties were also classified as non-diabetic.
Therefore, the final assessment of the patients based on blood glucose levels was done as:

Euglycemic: patients with normal RBS, FBS and PPBS and HbA1c

Known diabetic: Those who have a previous history of diabetes.

Newly detected diabetes: Those with RBS ≥200 mg/dL, fasting glucose ≥126 mg/dL, post prandial glucose ≥200 mg/dL and HbA1c >6.5% but without a history of diabetes.

Stress hyperglycemia: RBS ≥200 mg/dL with HbA1c <6.5%.

Results

The total mortality of the patients was 9 (8.7%). Most of the patients were males and only 36.5% of them were females. The average age of the patients was around 66 years. Many of the patients who were diabetic and had MI were smokers, whether regular or occasional, though the alcoholics were not many (Table 1).

Table 1: Demographic details.

Details	Men	Women	Total
No of patients	66 (63.5%)	38 (36.5%)	104
Age	64.6±3.6	69.3±5.1	66.2±3.1
BMI			
<25	41 (62.1%)	24 (63.2%)	65 (62.5%)
≥25	25 (37.9%)	14 (36.8%)	39 (37.5%)
Smoking status			
Never	29 (43.9%)	37 (97.4%)	66 (63.5%)
Occassional	18 (27.3%)	1 (2.6%)	19 (18.3%)
Always	19 (28.8%)	0	19 (18.3%)
Alcoholic status			
Never	41 (62.1%)	31 (81.6%)	72 (69.2%)
Occasional	16 (24.3%)	3 (7.9%)	19 (18.3%)
Regular	9 (13.6%)	4 (10.5%)	13 (12.5%)
Blood pressure			
Systolic	136±5	139±5	-
Diastolic	92±2	94±4	

Most of the patients who were admitted to the hospital with MI were obese or overweight with elevated cholesterol and triglyceride levels. The TGL levels were nearly 200 mg/dl while the total cholesterol was 212.4 mg/dl (Table 2). There was a significant elevated glycated hemoglobin levels among the diabetic patients. Out of the 104 patients, 59 (56.7%) had no diabetics, 29.
(27.9%) were known diabetics. 11 (10.6%) of them were identified as diabetic during the hospitalization while 6 had elevated blood sugar levels due to stress (Figure 1).

Table 2: Biochemical details

Details	Patients with diabetes	Patients without diabetes
Total cholesterol (mg/dL)	212.4±5.2	141.9±7.6
HDL- cholesterol (mg/dL)	44.5±2.2	41.5±4.6
LDL-cholesterol (mg/dL)	136.1±4.1	123.4±3.9
Triglycerides (mg/dL)	198.5±5.3	119±6.7
Fasting plasma glucose (mg/dL)	126.1±6.1	95.7±2.1
Hb (g%)	13.6±0.9	11.9±0.4
Glycated hemoglobin	8.03±1.4	4.9±0.1

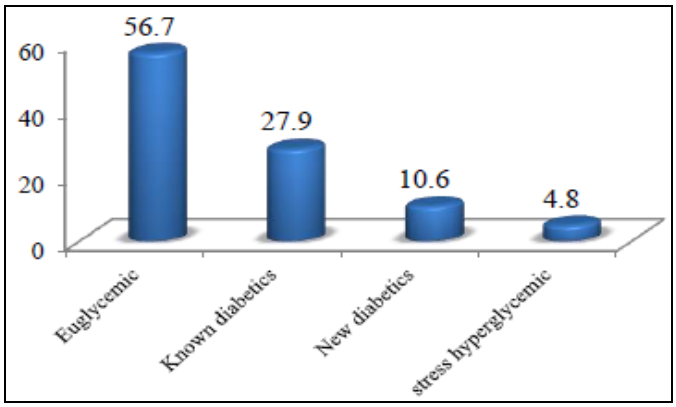

Fig 1: Categorization according to glycaemic status.

Diabetic patients who have had an MI previously are more at risk to a recurrent MI rather than those without. It has been observed in our study that the risks for diabetic patients without a prior MI are equally prone to an MI as that as the non-diabetics who have had a previous attack (Figure 2).

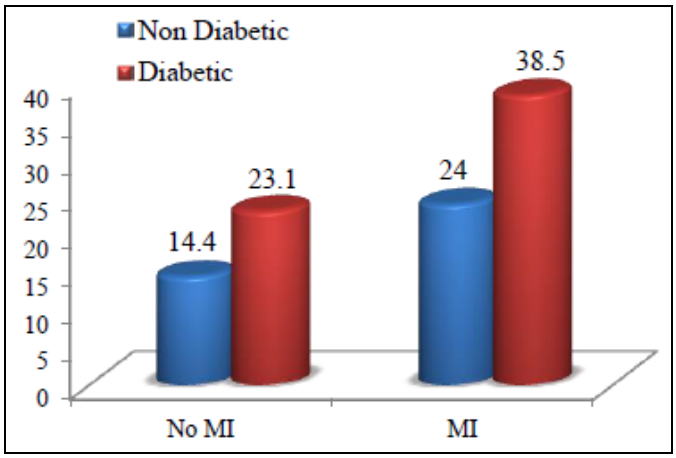

Fig 2: Association between diabetes and previous MI among the patients.

Discussion

Framingham study reports increased incidence of heart disease in patients with diabetes and its poor prognosis than their non-diabetic counterparts. Mortality rate was also more in men

than in women among the diabetic patients than the non-diabetic patients [3].

The diabetic patients who sustain myocardial infarction are more likely to get complications than those patients who have no diabetes such as recurrent infarction, cardiogenic shock, atrioventricular and intraventricular conduction abnormalities, chronic congestive heart failure and myocardial rupture [15-17].

In our study, the prevalence of diabetes among the patients with myocardial infarction was 40 (38.5%). This was comparatively high in relation to a few other studies but a few studies corroborated our study [15, 18]. In a study by Tenerz *et al*, reported that every fourth patient hospitalized with acute myocardial infarction had diabetes mellitus [19].

The main cause of death in industrialized countries such as USA is coronary artery disease, especially if it is associated with diabetes. There is a considerable decrease in life expectance in such people [20]. 9 (8.7%) patients in our study, died due to MI and all of them were diabetic.

Elevation of blood glucose levels on admission during the early phase of MI in patients who have no history of diabetes is said to be a predictor of in hospital and long term outcome in patients with AMI. This elevation is said to be mainly stress related [21]. In our study we have had 6 (4.8%) such cases.

The association between diabetes and non-fatal AMI may be a direct effect of diabetes. The metabolic effect of diabetes on cardiovascular morbidity and mortality is complex [22-25]. Diabetes is associated with activation of the renin-angiotensin-aldosterone system [22-23]. Collagen cross-linking is a major mechanism by which vascular and cardiac compliance is diminished in diabetes and may also contribute to diabetic cardiomyopathy [24, 25]. Other potential underlying mechanisms may include accelerated atherosclerosis associated with diabetes. Hyperglycemia, insulin resistance, and advanced glycation end-products have been implicated in vascular inflammation and endothelial dysfunction in patients with diabetes [26]. Further important contributing factors may include increased platelet activation, presence of a chronic hypercoagulable state, and impaired fibrinolysis [27-29]. Serum levels of insulin-like growth factor-binding protein-1 are elevated in patients with diabetes, which in turn has been shown to be associated with increased risk for cardiovascular mortality and morbidity in these patients [30]. The prevalence of known diabetics in our study were 27.9% while in studies by Singh *et al*. it was 24%, Gracy *et al*. it was 8.5% and Kiers *et al* the incidence was 17% [31-33].

The newly diagnosed diabetic is our study was 10.6% while in a study by Woo *et al*. it was 18% and Singh *et al* it was 8.75%.A Finnish population based study has shown that patients with diabetes without a previous history of MI have as a great risk for infarction as individuals without diabetes with a previous myocardial infarction. The 7-year incidence rates of MI (fatal and nonfatal) in subjects without diabetes were 18.8% in those with a previous MI and 3.5% in those without a history of infarction, the corresponding rates in individuals with diabetes were 45.0% and 20.2%, respectively [35, 36].

In our study, 25 patients who were non-diabetic had a history of previous MI while 24 patients with diabetes had a MI for the first time, indicating that the risks for these two conditions were the same. 40 patients accounting for 38.5% in our study had a previous history of MI and were diabetic, showing that with these conditions the risk factor was high.

Conclusion

The chronic and acute hyperglycemia associated with acute coronary syndromes, mainly in acute myocardial infarction is an independent and determinant factor in the outcome for patients with and without diabetes mellitus. The control of blood sugar levels in patients especially in patients who have had a history of MI will lead to better outcomes and better quality of life.

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