

## Original Article

# In Hospital Mortality in Patients with Impaired Fasting Glucose and Acute Myocardial Infarction in a Tertiary Care Centre of Rural Bengal

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**Introduction :** The Cardiovascular mortality in Diabetics is 2-4 times higher than in Non-diabetic population. But there is still controversy regarding Pre-diabetes (IFG and IGT) as a Cardiovascular Risk Factor.

**Aims and Objectives :** In this study we aimed to investigate the early in-hospital mortality among Acute Myocardial Infarction (AMI) patients having Impaired Fasting Glucose (IFG) during the first 7 days of hospitalization.

**Materials and Methods:** A total of 150 AMI patients were evaluated and followed up for their glycemic status and early in hospital mortality (first 7 days) at Burdwan Medical College, Burdwan, West Bengal.

**Result and Analysis:** Mortality in patients having IFG (18%) was higher and as much as in DM (20%) compared to euglycemic (4%) patients but the mortality is not correlated with mean Fasting Plasma Glucose (FPG) level.

**Conclusion :** IFG (ie, pre-diabetes) increases Cardiovascular mortality as much as diabetes. So, IFG may be a marker or risk factor for mortality but lowering FPG in AMI patients is unlikely to yield beneficial effect regarding mortality.

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**Key words :** Impaired Fasting Glucose (IFG), Pre-diabetes, Diabetes Mellitus (DM), Acute Myocardial Infarction (AMI), Fasting Plasma Glucose (FPG)

**D**iabetes Mellitus is an important Cardiovascular Risk Factor. The Cardiovascular mortality in Diabetic Patients is 2-4 times higher than in non-diabetic population<sup>1</sup>. In diabetics, 70-80% of deaths occur because of Cardiovascular Diseases. Pre-diabetes (IGT and IFG) now believed to be as risk factors for Diabetes and Cardiovascular Disease Development<sup>2</sup>. Though less severe than diabetic patients, growing evidence suggests that Pre-diabetic patients have a substantially increased risk of Cardiovascular disease and death compared with normal patients. Observations also indicate that early identification and management of individuals with Pre-Diabetes have the potential to reduce the incidence of Diabetes and its related complications.

### Editor's Comment :

- The Cardiovascular mortality in diabetic patients is 2-4 times higher than in non-diabetic population. But there is still controversy regarding pre-diabetes (IFG and IGT) as a Cardiovascular risk factor. We found out that IFG may be a marker or risk factor for mortality but lowering FPG in AMI patients is unlikely to yield beneficial effect in respect of mortality.

### MATERIALS AND METHODS

#### Study Subjects :

In a Tertiary Care Hospital based cross sectional study of Eastern Part of Rural India, we aimed to investigate the mortality rate among AMI patients during the first 7 days of hospitalization. A total of 150 AMI patients admitted to our Coronary Intensive Care Unit were included and according to their glycemic status they have been grouped into - (1) The patients with diabetes (FPG  $\geq$ 126 mg/dl),

(2) Patients with IFG (FPG between 100-125 mg/dl) and (3) Euglycemic (FPG <100 mg/dl) patients; and followed up.

Patients with other Non-cardiac Acute Illnesses, associated infections and other associated chronic major illnesses like Stroke, COPD, Bronchial Asthma, Chronic Liver Disease; Chronic Kidney Diseases etc. which could affect the mortality outcome had been excluded from this study.

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**Biochemical Tests :**

Venous blood was taken in the morning after an overnight fast for at least 12 hours for biochemical analysis. Plasma Glucose was measured by Standard Laboratory Based Glucose Oxidase method. Diabetes was diagnosed according to “American Diabetes Association” when a previous or current 12 hours fasting Glucose level is 7mmol/l or greater ( $\geq 126\text{mg}\%$ ). Other measurements were done by standard routine laboratory methods.

**Statistical Analysis :**

The SPSS for the Windows 20.0 statistical package program has been used for data analysis. The quantitative data of the groups were compared using ANOVA (ANalysis Of VAriance) and Tukey’s HSD post hoc test for multiple comparison and the qualitative data were compared using Chi-square tests. P value < 0.05 was considered significant. The study has been approved by Local Ethical Committee of our hospital.

**RESULTS**

In our study 84.7% were male and 15.3% were female. The groups were age and sex matched. The mean BMI was higher in diabetics compared to euglycemic and patients with IFG. All females were non-smoker and 38.5% males were smoker with no significant intergroup difference. 44.7% patients were hypertensive in our study. Though 56% of Diabetics were Hypertensive, the intergroup differences were not significant. Both the mean Systolic (SBP) and Diastolic Blood Pressures (DBP) were significantly higher in diabetic patients. The mean Serum Cholesterol and HDL levels were similar in three groups; and the mean Triglyceride and LDL levels were significantly higher in Diabetic patients, but only the higher mean Triglyceride level was significantly associated with early in-hospital mortality (Table 1).

It was found in our study that the mortality was 4% in Non-diabetic group, 20% in diabetic group and 18% in patients with Impaired Fasting Glucose (IFG). Mortality in patients having IFG and DM were significantly higher compared to Euglycemic patients (p value 0.025 and 0.014). However, it was similar between patients with IFG and Diabetic patients (p value 0.799).

Female mortality (26.1%) was higher than male mortality (11.8%), though not

significant statistically. Mortality in this study population was significantly related with IFG, DM, serum Triglyceride and BMI (Table 2).

The mean Fasting Plasma Glucose (FPG) level was not correlated with mortality. The mean serum Triglyceride level was positively correlated with mortality.

**DISCUSSION**

The early in-hospital mortality in AMI patients were approximately the same in patients with IFG and Diabetes and this was significantly higher compared to the individuals with Normal Glucose Levels.

The mortality was also higher in those with increased Serum Triglyceride Level and increased BMI which are common associates of DM.

But in our study population, the mortality was not significantly correlated with FPG level; it was only positively correlated with increased Triglyceride level.

M. Hanefeld *et al*<sup>2</sup> demonstrated in their study that the male sex, higher mean age, high blood pressure, increased serum Triglycerides, increased postprandial Blood Glucose and smoking as independent risk factors for death in Myocardial Infarction.

Haffner SM *et al*<sup>3</sup> and Wheathcoft SB *et al*<sup>4</sup> also demonstrated that the Cardiovascular risk increases in the pre-diabetic period. Detecting patients in this stage and protecting them against the harmful effects

Table 1 — Baseline characteristics and outcome of the patients

Parameters	Non-DM group	IFG group	DM group	Sig
Age(in years)	52.9±6.6	54.7±5.8	54.1±5.6	0.307
Male	84%	86%	84%	0.950
BMI(kg/m <sup>2</sup> )	27.3±2.5	26.8±2.1	29.3±2.6	0.001
Smoker (%)	36%	30%	32%	0.809
Hypertensive (%)	38%	4%	56%	0.140
SBP(mm of Hg)	114.7±14.5	117.4±10.1	134±15.2	0.001
DBP(mm of Hg)	77.8±8.1	77.3±6.4	88.6±11.1	0.001
Cholesterol (mg/dl)	203.3±27.7	199.1±26	200.5±23.6	0.716
Triglyceride (mg/dl)	181.7±27.6	198.9±30.6	225.9±32.0	0.001
LDL(mg/dl)	129.0±20.5	126.9±17.5	144.7±14.8	0.001
HDL(mg/dl)	41.8±3.4	41.7±3.1	42±3.4	0.851
Fasting plasma glucose(mg/dl)	87.6±7.3	114.4±7	193.6±29.1	0.001
Complication developed(%)	28%	44%	44%	0.165
Mortality(%)	4%	18%	20%	0.043

Table 2 — Simple Linear Regression analysis

Unstandardized Coefficients	Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B
B	Std. Error	Beta		Lower Bound Upper Bound
(Constant)	0.744	0.735	1.013	0.313 -0.709 2.197
FPG	-0.001	0.002	-0.088	-0.383 0.702 -0.004 0.003
TG	0.002	0.001	0.206	2.152 0.033 0.000 0.004

a. Dependent Variable: outcome regarding mortality during early in-hospital period

of insulin resistance helps to prevent Coronary Heart Disease.

Mehmet Uçucu, *et al*,<sup>5</sup> also demonstrated that the IFG affects mortality as much as diabetes. Fasting Plasma Glucose is helpful, in determining the cardiovascular risks and in the modification of the therapy to reduce the risk of CHD.

In Diabetics, Coronary Artery Atherosclerosis is aggressive and has an early onset<sup>6</sup>. It is thought that in the pathogenesis of diabetes, long before overt Hyperglycemia occurs and diabetes is diagnosed, there is a long period of insulin resistance, when the blood Glucose is maintained at normal levels by compensatory Hyperinsulinemia.

It was demonstrated that Cardiovascular risk increases also in this Pre-diabetic Period<sup>7,8</sup>.

Recent report from the Rancho Bernardo Study also indicated that pre-diabetic subjects have increased cardiovascular Risk Factors prior to the onset of Clinical Diabetes<sup>9</sup>.

Events associated with Atherosclerosis start to develop long before the stages when this can be detected as IFG and IGT<sup>10</sup>. Detecting patients in this stage and protecting them against the harmful effects of insulin resistance helps to Prevent Coronary Heart Disease.

### CONCLUSION

In conclusion, the IFG (ie, pre-diabetes) increases cardiovascular mortality as much as diabetes. So, the IFG may be a marker or risk factor for mortality but lowering FPG in AMI patients is unlikely to yield

beneficial effect as per this study. Controlling obesity (lowering BMI), lowering Serum Triglyceride Level and treating IFG in the general population may improve the outcome of AMI patients.

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