

# Study of occurrence of heart failure due to coronary artery disease amongst diabetics and non-diabetics with deranged baseline parameters

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## Abstract

**Background:** Diabetes is Associated with incident heart failure in general Population and with worst outcomes among the patients with already existing heart failure. Patients with type 2 diabetes have a significantly higher risk of developing cardiovascular disease namely myocardial infarction, heart failure, and stroke. **Aim and Objectives:** To study the incidence of heart failure in diabetics with stable coronary artery disease comparing with non-diabetic cohort also, to study the difference of incidence of CHF between diabetic men and women with stable coronary artery disease. **Material and Methods:** Its a descriptive type of study and conducted at tertiary care hospital from Mumbai. Its carried out for a period of 08 months and included a total of 100 participants. Inclusion and exclusion criterias were defined well before the study begins. **Results:** There were 51 males and 49 females among the study subjects with maximum between 51-60 years age group. The prevalence of heart failure is more among diabetics with stable CAD (20%), as compared to non-diabetics with CAD (08%). Out of the total, 08% diabetic females and 12% diabetic males developed heart failure. HbA1c levels among diabetics have significant association with heart failure. **Summary and Conclusions:** Diabetes is an independent risk factor for heart failure. Increased incidence of heart failure among diabetic patients with stable CAD appears to involve male and female equally. Prevalence of heart failure is more among diabetics with stable CAD as compared to non-diabetics

**Key Word:** Congestive Heart Failure, Acute coronary Syndromes.

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## INTRODUCTION

Heart failure is an enormous burden of disease, leading to substantial Healthcare costs, despite advances in treatment. It is a complex clinical syndrome that arises

secondary to abnormalities of cardiac structure and/or function (inherited or acquired) that impair the ability of the left ventricle to fill or eject blood. The cardinal manifestations of heart failure are dyspnea and fatigue<sup>1</sup>. The number of heart failure Admissions have increased steadily. Among the patients that had been classified in the highest risk groups are patients with diabetes<sup>2</sup>. Patients with type 2 diabetes (T2DM) have a significantly higher risk of developing cardiovascular disease (CVD) namely myocardial infarction, heart failure, and stroke. Available evidence indicates that the risk of macrovascular complications increases with the severity of hyper glycemia, thus suggesting that the relation between metabolic disturbances and vascular damage is approximately linear. Despite clear advances in the prevention and treatment of CVD, the impact of

T2DM on CVD outcome remains high and continues to escalate<sup>3</sup>. Diabetes is Associated with incident heart failure in general Population and with worst outcomes among the patients with already existing heart failure<sup>4,5,6</sup>. Diabetes also predicts heart failure in patients with acute coronary syndromes<sup>7</sup>. Although MI and hypertension are the most common risk factors associated with CHF, diabetes mellitus is also a strong and independent risk factor. The precise mechanism by which diabetes portends heart failure is unclear. In fact it remains to be elucidated whether in this context the diagnosis of diabetes per se is more important than just presence inadequate glycaemic control. People with diabetes have an increased prevalence of atherosclerosis and coronary heart disease (CHD) and experience higher morbidity and mortality after acute coronary syndrome and myocardial infarction (MI) than people without diabetes. Even in the absence of CAD, patient with diabetes shows changes in myocardial performance that put them at the risk of heart failure (diabetic cardiomyopathy). To determine to what extent the association between diabetes and heart failure is influenced by other risk factors for heart failure (including interim myocardial infarction and presence of baseline myocardial ischemia), we evaluated the risk of heart failure associated with diabetes in cohort of inpatient and outpatient with stable CAD.

**MATERIAL AND METHODS**

The present study is a descriptive type of study and was conducted at tertiary care hospital from Mumbai. The participants were interviewed using a pretested questionnaire taking treatment at various places under department of medicine like intensive care unit, medicine wards and cardiology department. The study was carried out over a period of 08 months i.e. from 2<sup>nd</sup> February 2011 to 31<sup>st</sup> September 2011 and a total of 100 cases were included in the study. The inclusion criteria for the study was the patients with heart failure having

history of diabetes and acute coronary syndromes and patient without diabetes having history of acute coronary syndromes with heart failure. Few other types of patients were also included in the study like those with

- Prior myocardial infarction
- Angiographic evidence of >50% stenosis in one of the coronary arteries
- Prior coronary revascularization
- Exercise induced ischemia (treadmill or nuclear scintigraphy)

While, the exclusion criteria included those with non-ischemic causes of heart failure, inability to walk one block, acute coronary syndrome in last 6 months and patients with GFR<30 ml/hr. All patients completed a baseline study visit that included a medical history interview, physical examination, questionnaire, laboratory analysis, exercise Test, and echocardiogram. Diabetes was defined as self-reported diabetes or the use of anti diabetes medications. An estimate of chronic glycaemia was provided by serum HbA1C measurement. Serum glucose level, HbA1C, and LDL cholesterol were assessed by standard routine biochemistry analysis after an overnight fast. Framingham criteria were used for the clinical diagnosis of heart failure<sup>8</sup>.

**Few Definitions**

Diabetes was defined as per 2006 WHO Diabetes Criteria as a fasting plasma glucose of >126mg% or a random plasma glucose of >200 mg%<sup>9</sup>. HbA1c: a cut-off of >6.5% and <6.5% was used because this cut-off was recently used to redefine the diagnosis of diabetes<sup>10</sup>. Hypertension was defined as a blood pressure >140/90 mm of Hg<sup>11</sup>. Hypercholesterolemia and hypertriglyceridemia were defined as per ATP III Guidelines<sup>12</sup> as serum cholesterol>200mg% and triglycerides>150mg% respectively.

**RESULTS AND OBSERVATIONS**

**Table 1:** Gender wise Age Distribution of study population

Sr No.	Age Groups (Years)	Male (n=51)	Female (n=49)
1	<50	14	13
2	51-60	21	22
3	61-70	12	14
4	71-80	04	00
	Total	51	49
	Mean Age in years	55.33	55.96

From the above Table No. 01, it is clear that out of the 100 cases studied 51 were males and 49 were females and the maximum number of patients in the study group were between 51-60 years comprising of 21 males and 22 females.

**Table 2: Genderwise distribution of diabetic status of study population**

		Diabetes Mellitus		Total	
		Yes	No		
Gender	Male	Count	26	25	51
		% of Total	26.00%	25.00%	51.00%
	Female	Count	24	25	49
		% of Total	24.00%	25.00%	49.00%
Total		Count	50	50	100
		% of Total	50.00%	50.00%	100.00%
Chi <sup>2</sup> =0.040		Df = 1	P value = 0.841		

Table No 02 shows that, 50 patients of self reported or biochemically diagnosed diabetes were included in the study, in that 26 were male and 24 were female patients. Out of 50 non diabetic patients, there were 25 males and 25 were females.

**Table 3: Various Baseline parameters among study population**

Parameters	Diabetics (n=50)	Non-Diabetics(n=50)
H/o Hypertension	46 (92%)	47 (94%)
LDL Cholesterol	99.33 (SD- 4.95)	101.27 (SD-5.73)
H/o MI or Revascularisation or CST positive	50 (100%)	50 (100%)
BMI	28.9 (SD-1.908)	28.88 (SD-1.85)
Sr. Creatinine	1.028 (SD-0.335)	1.082 (SD-0.318)
Smoking	09 (18%)	10 (20%)
LVEF	44.66 (SD-18.81)	47.91 (SD-13.36)
Anti-diabetic therapy	Insulin 27(54%) OHA 16(32%) Combination 7(14%)	-----

**Table 4: Prevalence of CHF in diabetics and non-diabetics with CAD**

	Diabetics (N=50)	Non-Diabetics (N=50)	P value-
CHF	10 (20%)	04 (08%)	0.0837
No CHF	40 (80%)	46 (92%)	

Above Table No 04 shows that, prevalence of heart failure is more among diabetics with stable CAD (20%), as compared to non-diabetics with CAD (08%).

**Table 5: Incidence of occurrence of CHF among males and females with stable CAD**

	Diabetics (N=50)	Non-Diabetics (N=50)	P Value-
Male	6 (12%)	3(6%)	0.596
Female	4(8%)	1(2%)	
Total	10(20%)	4(8%)	

Table 5 shows that 08% diabetic females and 12% diabetic males developed heart failure. While, among non-diabetics 06% males and 02% females developed heart failure.

**Table 6: Gender wise mean age for HF among diabetics**

Diabetics with CHF (N=10)		P Value-
Males	55 (SD-9.65)	0.143
Females	62.75 (SD-5.37)	

Table 6 showing that diabetic females who developed heart failure were having meanage of 62.75 years while in males mean age was 55 years.

**Table 7: HbA1c levels among Diabetics with CHF**

	CHF	No CHF	P Value-
HbA1c levels	8.62(SD-1.30062)	6.719(SD-0.3445)	0.002051

**Table 8: Duration of Diabetes at the time of Acute coronary syndrome**

	CHF (N=10)	No CHF (N=40)	P value-
Duration in Years	7.29 (SD-1.79)	6.59(SD-0.698)	0.256

From the table, Diabetic patient who developed CHF had mean duration of diabetes 7.29 years and patient who did not develop CHF mean duration was 6.59 years at the time infarction.

## DISCUSSION

There were 100 cases with history of stable coronary artery disease since 30-36 months duration which were included in the study. 50 patients were diabetics and 50 were non diabetics for comparative study. Of the total study population 51 were males and 49 were females. Clinical profile was studied in detail and compared. Regarding the effect of duration of diabetes mellitus, there was no any significant difference found in development or progression towards heart failure (P value 0.253). Patients who developed heart failure had borderline significantly more often a high level of HbA1C, compared with patients who remained free of heart failure. Amongst diabetic patients with CAD who developed heart failure HbA1c (8.62%) was higher as compared to patient who did not developed heart failure (6.71%) with P value < 0.05. This present study with 10(20%) diabetic patients and 04 (08%) non diabetic patients developed heart failure after index acute coronary syndrome after 30-36 months duration. These figures are close to study by van melle *et al*<sup>13</sup>. Diabetes remained a strong predictor of heart failure while adjustments were made for other pre-defined predictors of heart failure. Thus, adjustment for age, sex, smoking, BMI, LDL cholesterol, systolic blood pressure, LVEF Adequate adjustment is important because diabetes is a disorder that frequently clustered with other risk factors for CAD and heart failure.

## SUMMARY AND CONCLUSIONS

Based on this study, the increased incidence of heart failure among diabetic patient with stable CAD appears to involve male and female equally. There were no significant differences related to the duration of diabetes in developing heart failure. The increased incidence of heart failure among diabetic patient with stable CAD correlates with higher HbA1c. Diabetes is an independent risk factor for heart failure and it also showed that diabetes, compared with other established risk factors (e.g., age, smoking status, physical inactivity, LVEF, exercise-induced wall motion abnormalities, diastolic dysfunction), is among the key players in heart failure development.

## LIMITATIONS

There are few limitations of the study which includes no catheterization was performed at baseline to ascertain the extent of CAD. Also, because our study population consisted only of patients with stable CAD, conclusions cannot be extrapolated to populations with unstable coronary syndromes. This particular study endorses once again the detrimental influence of diabetes on heart failure prognosis. Because prevention of heart failure is an important public health goal and no clear

improvement in event rates was noted during the past few years, future studies should focus on the mechanism by which diabetes leads to heart failure and how these effects can be prevented.

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