

# Evaluation of the Correlation between Admission Day Glycemic Status and In Hospital Outcome of Acute Coronary Syndrome in Diabetic and Non Diabetic Patients

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## Abstract

**Background/Aims:** In developed country coronary artery disease (CAD) is considered as the major reason for occurrence of death. Acute coronary syndrome (ACS) comprise of STEMI, NSTEMI as well as unstable angina. The risk factors leading to ACS includes diabetes Mellitus, obesity, smoking cigarette, high blood pressure, dyslipidemia and insulin resistance. Diabetic patients are prone to have coronary artery disease that later result in the form of widespread atherosclerosis. Acute Myocardial infarction and Diabetes Mellitus are considered as bad prognostic factors leading to increased heart failure incidence resulting in higher mortality in hospitals. This study is conducted with the aim to determine the prognosis of patients with ACS comparing admission blood sugar and HbA<sub>1c</sub> values.

**Methods:** The present study was a prospective observational study. It was conducted on 100 ACS patients with or without type 2 diabetes mellitus admitted to Department of General Medicine, PDU Medical College, Churu, Rajasthan, from Oct-2020 to Mar-2021. Data were collected and analyzed with the help of suitable statistical tools.

**Results:** The Random Blood Sugar level for 48 patients in the non-diabetic group was <140 mg and 44 patients of the diabetic group had Random Blood Sugar level ≥140 mg. The glycemic level of 50 non-diabetic patients was <6.5 and the glycemic level for 44 diabetic patient was ≥6.5. 45 of the patients who had Random Blood Sugar level <140 mg had no adverse cardiac effects and 14 patients with Random Blood Sugar level ≥140 mg had adverse cardiac effects. 47 of the patients with glycemic level <6.5 had no adverse cardiac effects and 14 of the patients with glycemic level ≥6.5 had adverse cardiac effects.

**Keywords:** Acute coronary syndrome, Diabetes mellitus, HbA<sub>1c</sub>, Random blood sugar

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## I. Introduction

In developed country coronary artery disease (CAD) is considered as the major reason for occurrence of death. Coronary artery disease occurs when plaque starts building up in coronary arteries. It is generally developed due to cholesterol deposits later resulting in narrowing of the arteries leading to atherosclerosis. Acute coronary syndrome (ACS) comprise of STEMI, NSTEMI as well as unstable angina. The risk factors leading to ACS includes diabetes Mellitus, obesity, smoking cigarette, high blood pressure, dyslipidemia and insulin resistance. Among these risk factors obesity and high blood sugar level are termed as the grave prognostic factors in diabetic as well as in non diabetic patients.

Coronary artery disease is considered as an important complication with regards to diabetes mellitus representing two or four folds greater risk taken into consideration with the mortality rates when contrasted with the non diabetic population. Diabetic patients are prone to have coronary artery disease that later result in the form of widespread atherosclerosis. The American Heart Association found that Diabetes Mellitus is a significant factor taking the form of cardiovascular disease seen in similar group of people who smoke, inclusive of high blood pressure levels as well as dyslipidemia.

It was evident from the **Framingham Heart Study** that the chances of coronary heart disease, congestive heart failures, myocardial infarction and sudden deaths occur because of being diabetic and

uncontrolled or fluctuating blood sugar levels. The prevalence of coronary artery disease is observed to be twice in men with diabetes mellitus when contrasted with those men who do not have diabetes.

Due to ageing of the people, high obesity rate and sedentary living pattern the incidence of diabetes is witnessed to be rising in Indian patients. Type 2 diabetes patients who do not have a previous incidence of ACS are also prone to risk of having coronary artery disease similar to the ones suffering from diabetes with previous episode sufferers of ACS<sup>5</sup>. Thus, diabetes can be regarded as one of the significant cause of CVD. Therefore, it can be said that diabetes is also a form of cardiovascular disease.

It was confirmed with the help of **Framingham Study** that females were noticed to have higher occurrence with regards to diabetes when compared to males.

Acute Myocardial infarction and Diabetes Mellitus are considered as bad prognostic factors leading to increased heart failure incidence resulting in higher mortality in hospitals. It occurs due to atrial fibrillation as well as post- infarction including angina in diabetic patients'.

Controlling the glucose level may reduce the microvascular complications taking place such as nephropathy and retinopathy. It does not go well in the case of cardiovascular diseases as it effects adversely. Thus, it is advised that bringing down the blood sugar level to normal can help in minimising the progression of microvascular disorders that is caused by diabetes.

Controlling hypertension can help in controlling the blood sugar level as well. This might help in eliminating the microvascular complications and reduce the risk leading to cardiovascular diseases especially coronary artery disease'. HBA<sub>1c</sub> and ACS together increase the risk of mortality in the first month only.

Diabetes is termed as a vital factor that plays a crucial role in development of ACS and has its adverse effect on patients after developing ACS. Some studies showed that uncontrolled level of blood sugar is termed as poor management of diabetes that develops ACS when neglected for long span of time. It might result in the form of Coronary artery disease developed at an irreversible stage if not paid attention timely. This study is conducted with the aim to determine the prognosis of patients with ACS comparing admission blood sugar and HBA<sub>1c</sub> values.

## **II. Materials And Methods**

**Place of study:** The study was conducted on 100 patients admitted to Department of General Medicine, PDU Medical College, D.B. Hospital, Churu, Rajasthan, from Oct-2020 to Mar-2021. Rajasthan.

**Study population:** Patients admitted as ACS cases with or without type 2 diabetes mellitus.

**Design of the Study:** The present study was a prospective observational study.

### **Inclusion criteria:**

- Acute coronary Syndrome diagnosed in patients presenting with chest pain and or dyspnoea for >30 minutes and not more than 24 hours with ECG changes.

### **Exclusion criteria:**

Other factors that determine the prognosis of the ACS were excluded

- Age >75years,
- Pre-existing renal disease
- Concurrent systemic infections
- Past history of ACS and cardiac events
- Past history of Cerebrovascular accidents

### **Study method:**

- Based on the admission blood sugar level patients were categorized in to 2 groups with those who had RBS < 140mg/dl & those with RBS >140mg/dl. A value of 140 mg/dl was taken as cut-off value in accordance with American Heart Association (AHA).

- Based on the admission HbA<sub>1c</sub> level patients were grouped in to 2 category with those having HbA<sub>1c</sub> less than 6.5% & those with value more than or equal to 6.5%. Routine blood investigations including complete hemogram, renal function test, clotting time and bleeding time were done.

- Clinically diagnosis of DM was done if the patient is informed of the diagnosis by a physician prior to the admission or if he was on any therapy for diabetes. ECG has been taken as soon as the patient is admitted & also repeated when indicated. ECHO was done on subsequent day or at the time of discharge.

- Cardiovascular assessment was carried out daily or frequently if required as in complicated cases. The diagnosis, ECG, ECHO reports were discussed with the cardiologist or the treating physicians.

- The findings were recorded in the study Performa.

- Cases were kept under the close follow up till discharge.

**Data Collection and analysis:**

The data was collected from all eligible patients after taking written consent. A detailed clinical history, complete physical examination, blood was sent for cardiac markers, blood sugar, and HbA1c levels. Admission day glycemic status was assessed by sending the blood sample for random blood sugar value and HbA1C level at the time of hospital admission. A detailed standard statistical analysis was carried out at the end of study to conclude the results.

**Ethics statement**

The study protocol was approved by the institutional ethical committee. Informed consents were obtained in written-form from patients and all clinical investigations were conducted according to the standard protocol. The patients gave consent for the publication of the clinical details.

**III. Results**

**Table 1: Demographic Data**

		Cases		Total	P-value
		Non-Diabetic	Diabetic		
Sex	Male	45	30	75	<0.05
	Female	7	18	25	
Total		52	48	100	

Among the non-diabetic group, 45 patients were male and the remaining 7 of the patients were female. Among the diabetic group, 30 of the patients were male and the remaining 18 of the patients were female.

**Table 2: Random Blood Sugar**

		Cases		Total	P-value
		Non-Diabetic	Diabetic		
Random Blood Sugar	<140	48	4	52	<0.05
	>=140	4	44	48	
Total		52	48	100	

Among the non-diabetic group, majority of the patients had Random blood sugar <140. Among the diabetic group majority of the patients had random blood sugar >=140.

**Table 3: Glycemic level**

		Cases		Total	P-value
		Non-Diabetic	Diabetic		
Glycemic Level	<6.5	50	4	54	<0.05
	>=6.5	2	44	46	
Total		52	48	100	

Among the non-diabetic group, majority of the patients had glycemic level <6.5. Among the diabetic group, majority of the patients had >=6.5.

**Table 4 : Crosstab Random blood sugar and adverse cardiac events**

		Adverse Cardiac Event		Total	P-value
		No Cardiac Event	Adverse Cardiac Events		
Random Blood Sugar	<140	45	7	52	>0.05
	>=140	34	14	48	
Total		79	21	100	

Among the patients with random blood sugar <140 adverse cardiac event was absent in majority of the patients. Among the patients with random blood sugar >=140 adverse cardiac event was absent in majority of the patients.

**Table 5 : Crosstab of Glycemic level and adverse cardiac event**

		Adverse Cardiac Event		Total	P-value
		No Cardiac Event	Adverse Cardiac Events		
Glycemic Level	<6.5	47	7	54	<0.05
	>=6.5	32	14	46	
Total		79	21	100	

Among the non-diabetic patients with glycemic level <6.5, adverse cardiac event was absent in majority of the patients. Among the diabetic patients with glycemic level >=6.5, adverse cardiac events were absent in majority of the patients.

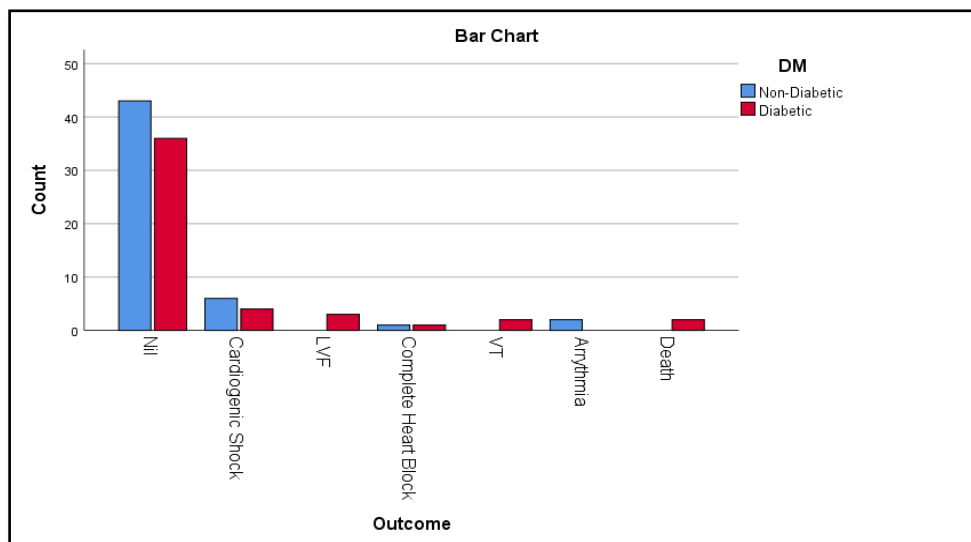


Figure 1: Outcome

#### IV. Discussion

The study population included patients admitted with ACS patients with or without type 2 diabetes mellitus. Comorbidities such as renal disease, Cerebrovascular accident, previous history of MI concurrent infections were excluded, so as to study the prognosis related to the diabetes and blood sugar alone.

##### Diabetic history

The diabetic patients comprised of 48% of the sample population. The high value of HbA1c also indicates that though majority of the diabetics have received some treatment with either oral hypoglycemic agents or insulin, the treatment was not adequate. This may be either due to lack of compliance or improper follow up.

##### Clinical findings

42% of the diabetic patients had higher risk of MI. 33% of the patients in the diabetic group had hypertension, 32% of the patients had dyslipidemia, 13% consumed alcohol, 31% of the patients were obese, 15% consumed tobacco and 18% of the patients smoked.

##### Random Blood Sugar and Glycemic levels

The Random Blood Sugar level for 48 patients in the non-diabetic group was <140 mg and 44 patients of the diabetic group had Random Blood Sugar level  $\geq$ 140 mg.

The glycemic level of 50 non-diabetic patients was <6.5 and the glycemic level for 44 diabetic patient was  $\geq$ 6.5.

45 of the patients who had Random Blood Sugar level <140 mg had no adverse cardiac effects and 14 patients with Random Blood Sugar level  $\geq$ 140 mg had adverse cardiac effects.

47 of the patients with glycemic level <6.5 had no adverse cardiac effects and 14 of the patients with glycemic level  $\geq$ 6.5 had adverse cardiac effects.

##### HbA1C

The mean HbA1C for diabetic patients was  $8.517 \pm 1.3238$  and that of non-diabetic patients was  $7.471 \pm 1.9270$ . This showed that there was statistically significant difference between the mean HbA1C levels of diabetic and non diabetic patients on admission.

##### Gender and age

In the non-diabetic group majority of the patients belonged to 41-60 years of age group. On the other hand in the diabetic group the majority of the patients belonged to 51-60 years of age group.

In the non-diabetic group the number of males was 45 and that of females was 7. Similarly, in the diabetic group the number of males was 30 and that of females was 17. Both the groups showed male predominance. It implies that more number of males were affected than the females.

In this study the mean admission HbA1C was significantly high in patients with adverse cardiac events while mean RBS was not. Moreover patients presenting with above normal admission HbA1C ( $\geq$ 6.5), had more adverse cardiac events.

This study also showed that patients with history of diabetes when presented with an elevated admission Glycemic level have significant adverse cardiac events when compared to a non-diabetic patient with elevated admission Glycemic level.

According to the study of *Mansour et al., (2011)* the mean age was found to be  $63.8 \pm 14.6$  years in the non-diabetic group and the mean age in the diabetic group was  $61.0 \pm 12.0$  years<sup>11</sup>.

As per the study of *Goyal et al., (2009)* it was found that Higher glucose levels predicted death in patients with and without diabetes history, but this relationship was more steep in nondiabetic subjects such that their rate of 30-day death (13.2%) matched that of diabetic patients (13.7%) when average glucose was  $>$  or  $=144$  mg/dL (8 mmol/L) ( $P = .55$  after multivariable adjustment)<sup>12</sup>.

*Vivas et al., (2007)* showed that in patients admitted for ACS (with or without ST segment elevation), the FPG concentration better predicts the likelihood of suffering an in-hospital adverse event. This suggests that the FPG (fasting plasma glucose) concentration is a better indicator of metabolic status than APG (admission plasma glucose) during the first days after the onset of an ACS. The results suggest further research should be performed into the optimum management of hyperglycemia in such patients<sup>13</sup>.

## V. Conclusion

The study concluded that the Random Blood Sugar  $\geq 140$  was found in the diabetic patients at the time of admission in the hospital. This implied that the diabetic patients are at a greater risk of developing adverse cardiac effects as compared to non-diabetic patients. MI was found to be the most common type of ACS in both the groups.

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