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A Study of Association Between Glycosylated Haemoglobin Level and Outcome in Acute Coronary Syndrome Patients with type 2 Diabetes Mellitus"

A. Mahesh[1], Aravind Mirajkar[2], M. Rajesh[3], P.M.Karthik[4]

[1]Postgraduate, Department of General Medicine, AVMC, Puducherry.

[2]Professor, Department of General Medicine, AVMC, Puducherry.

[3]Assistant Professor, Department of Cardiology, AVMC, Puducherry.

[4]Assistant Professor, Department of General Medicine, AVMC, Puducherry.

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KEYWORDS

Acute Coronary Syndrome, Type 2 Diabetes Mellitus, Glycosylated Hemoglobin, Cardiovascular Outcomes, Diastolic Dysfunction, Mortality

ABSTRACT:

Background: Diabetes Mellitus (DM) is a well-established risk factor for cardiovascular diseases, significantly increasing the incidence and severity of Acute Coronary Syndrome (ACS). Chronic hyperglycemia accelerates atherosclerosis, contributing to poor cardiovascular outcomes. Glycosylated hemoglobin (HbA1c) is a reliable marker of long-term glycemic control, and its association with ACS prognosis remains a topic of clinical interest.

Aim: This study aims to evaluate the relationship between HbA1c levels and clinical outcomes in ACS patients with Type 2 Diabetes Mellitus (T2DM), focusing on mortality, cardiac dysfunction, and other complications.

Materials & Methods: A cross-sectional study was conducted at Aarupadai Veedu Medical College and Hospital, Pondicherry, including 205 ACS patients with T2DM. Patients were evaluated based on clinical presentation, laboratory investigations, and echocardiographic findings. HbA1c levels were analyzed in relation to mortality, diastolic dysfunction, arrhythmias, and mitral regurgitation. Statistical analysis was performed using SPSS v23.0, with a p-value of <0.05 considered significant.

Results: The mean age of the study population was 54.33 years, with 46.3% males and 53.7% females. Hypertension, smoking, and alcohol consumption were present in 46.3%, 20.5%, and 29.3% of patients, respectively. The mean HbA1c was 8.5%. Mortality was observed in 9.3% of cases, but no significant association was found between HbA1c levels and mortality. However, patients with diastolic dysfunction had significantly higher HbA1c levels ($p<0.05$). No significant correlation was observed between HbA1c and arrhythmias or mitral regurgitation.

Conclusion: While HbA1c was not a direct predictor of mortality in ACS patients with T2DM, its association with diastolic dysfunction suggests that poor glycemic control may contribute to adverse cardiac outcomes. Effective glycemic management may help improve long-term cardiovascular prognosis in these patients.

INTRODUCTION

Diabetes mellitus is a disease of antiquity known to affect mankind since the past 3500 years. It is a big concern because of devastating consequences of its complications. Diabetes is 9Macrovascular complications start taking place long before the patient has been diagnosed with symptomatic diabetes.[1] Hyperglycemia accelerates process of atherosclerosis by the formation of glycated proteins and advanced glycation end products. High admission blood glucose levels after acute myocardial infarction are common and are associated with increased. Glycometabolic state at hospital admission is an important risk marker for

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long term mortality in patients with acute MI. Glycosylated haemoglobin measure average blood glucose levels during the periods of 8-12 weeks. So it can prove very useful for diagnosis of diabetes mellitus in ACS when stress induced hyperglycemia is a confounding factor because HbA1c is unlikely to rise with acute hyperglycemia.[2,3]

It is clear that microvascular as well as macrovascular complications of type 2 DM are due to chronic hyperglycemia. CHD events and mortality rate are two to four times higher in patients with type 2 DM and correlate with glycosylated haemoglobin level. Other factors like Dyslipidemia and Hypertension also play important role in macrovascular complications.[4,5]

Coronary artery disease has been considered as the important cause of death in industrialized nations. Acute Coronary Syndrome includes Unstable Angina (UA), ST Elevation MI (STEMI) and Non-ST Elevation MI (NSTEMI). The important risk factors for ACS include Diabetes, Obesity, Cigarette smoking, Sedantary lifestyle, Systemic Hypertension, Dyslipidaemias etc.[6,7] Unlike other cardiovascular risk factors, obesity and type 2 diabetes mellitus are showing rising trend. Uncontrolled diabetes has high incidence of ACS and associated with poor prognosis. Higher blood sugar value at admission in patients presented with ACS carries grave prognosis not only in diabetics but in non-diabetics too. Coronary artery disease which is being considered as the most significant complication of DM presents 2-4 folds increase in mortality compared to non-diabetics population. Patients with diabetes have coronary artery disease much earlier & they show comparatively more wide spread atherosclerosis.[8]

The Framingham Heart study also revealed a marked increased in coronary artery disease, myocardial infarction, congestive heart failure and sudden death in diabetics. The age matched risk of the above cardiovascular diseases is twice with DM when compared to those without diabetes. However DM influence on macrovascular complications is not well known. Inadequate glycaemic management has been shown by elevated HbA1c value, and its elevated value during admission for ACS, increases the mortality in first month. Also hyperglycaemia at the time of ACS without the history of DM has increased short term mortality.[9] Patients with type 2 DM who do not have previous incidence of ACS carry the same risk for coronary artery disease as individuals without DM who has suffered previous episodes of ACS. In acute MI, DM has been a bad prognostic factor with an increased occurrence of heart failure, higher morbidity and mortality in hospital, conduction abnormalities including atrial fibrillation and post infarction angina among diabetics.[10] Present research aimed to study the association of HBA1c level and outcome of acute coronary syndrome in patients with type2 diabetes.

The relationship between glycosalated haemoglobin level and ACS in type 2 diabetes mellitus was studied in Narayana et al[13]. However we aimed to see the relationship between glycosalated haemoglobin levels and outcome variables (Mitral regurgitation, diastolic and systolic dysfunction, mortality, arrthymias) in the study

MATERIAL & METHOD

This cross-sectional study was conducted in the Department of General Medicine at Aarupadai Veedu Medical College and Hospital, Pondicherry, over 18 months. The study included 205 patients admitted to medical wards with acute coronary syndrome (ACS) confirmed by ECG, Troponin I, and Echocardiography, aged between 18 to 65 years, and experiencing their first episode of ACS. Patients with hemoglobinopathies, hypothyroidism, blood dyscrasias, leukemias, systemic infections, or pre-existing renal disease were excluded. Sampling was done using a simple random selection of patients admitted to the cardiac ICCU without prior cardiac history. Independent variables included demographic details, comorbid conditions, medication use, and laboratory values, while outcome variables comprised biochemical markers, arrhythmias, and ejection fraction percentage. The study was interdepartmental, collaborating with the cardiology department, with institutional funding covering investigation costs. Risks were minimal, limited to blood collection for biochemical tests, while benefits included assessing ACS outcomes based on HbA1c levels and improving preventive strategies for type 2 diabetes patients. Data analysis was performed using SPSS v23.0, with results summarized through descriptive statistics, tables, and graphical

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representations. Statistical significance was determined using unpaired t-tests for continuous data and chi-square tests for categorical data, with a p-value of <0.05 considered significant.

RESULT

In current study, 205 patients were included in present with mean age of 54.33±9.8yrs with 46.3% were male patients and 53.7% were female patients.

Table 1: Showing distribution of gender and details about patients

		Count	N %
Gender	Female	110	53.7%
	Male	95	46.3%
Hypertension	Absent	110	53.7%
	Present	95	46.3%
Smoking	Absent	163	79.5%
	Present	42	20.5%
Alcohol	Absent	145	70.7%
	Present	60	29.3%
Antidiabetics	No	37	18.1%
	Yes	168	82.0%
Anti Hypertensive	No	113	55.1%
	Yes	92	44.9%
Mortality	No	186	90.7%
	Yes	19	9.3%
Diastolic dysfunction	Absent	126	61.5%
	Present	79	38.5%

Among patients 46.3% were hypertensive, 20.5% were smokers and 29.3% were alcoholic. 82% of cases were on Antidiabetic and 44.9% on antihypertensive medications. The diastolic dysfunction was present in 38.5% of the cases.

Table 2: Showing presence of arrythmias and mitral regurgitation

		Count	N %
Arrythmias	No	166	81.0%
	Yes	39	19.0%

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Mitral regurgitation	No	184	89.8%
	Yes	21	10.2%
Pericardial effusion	NO	205	100.0%
Cerebrovascular accidents	NO	205	100.0%
Leftventricular aneurysms	NO	205	100.0%

Among the patients arrythmias was present in 19%, mitral regurgitation in 10.2% cases.

Table 3: Association of mortality and diastolic dysfunction with HbA1c

		HbA1C		p-value
		Mean	SD	
Mortality	No	8.5	1.5	0.52
	Yes	8.3	2.5	
Diastolic dysfunction	Absent	7.9	1.5	0.01*
	Present	9.4	1.4	
Arrythmias	No	8.5	1.5	0.61
	Yes	8.3	2.0	
Mitral regurgitation	No	8.5	1.6	0.95
	Yes	8.5	1.5	

There is no significant difference in mortality with HbA1c levels among patients. There is significant higher mean HbA1c among the patients with diastolic dysfunction.($p<0.05$) There is no significant association of HbA1c with presence of arrythmias and mitral regurgitation.

DISCUSSION

In current study, 205 patients were included in present with mean age of 54.33yrs, 46.3% were male patients and 53.7% were female patients. Among patients 46.3% were hypertensive, 20.5% were smokers and 29.3% were alcoholic. 82% of cases were on Antidiabetic and 44.9% on antihypertensive medications. In study by Dubey TN et al., found that average age was 58.17±9.87. Among the 110 patients, 64 (57.2%) were non-diabetic, 27 (24.5%) were diabetic, and 20 (18.2%) had impaired glucose tolerance. 46 individuals (41.8%) had hypertension.[11] Another study by Khan FR et al., out of the 151 patients in total, 89 (58.9%) were men and the remaining patients were women. It was 55.4 ± 11.2 years old on average. [9]

In present study, there is significant higher mean HbA1c among the patients with diastolic dysfunction.($p<0.05$) However, there is no significant difference in mortality, presence of arrythmias and mitral regurgitation with HbA1c levels among patients. Mortality was present in 9.3% of the cases and diastolic dysfunction was present in 38.5% of the cases.In study by Dubey TN et al., the most common consequences were left ventricular dysfunction (LVD) and heart failure (HF), which were significantly more prevalent in diabetics than nondiabetics ($p = 0.009$). Patients with problems had higher mean HbA1c levels (6.61 ± 2.13) compared to those without issues (5.90 ± 1.27). Because ACS might be a symptom of DM, each patient with ACS should be tested for diabetes and glucose intolerance. Patients with DM have higher morbidity and severity following an ACS than nondiabetics.[11] Patients with HbA1c levels < 5.7% and > 7.2% were

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linked to a greater prevalence of MI as compared to those with values between 6.0% and 7.0%.[12]

In a study by Narayana R et al., the Hba1c level is strongly associated with risk of ACS. Occurrence of ACS was significantly more in patient with HbA1c more than 7% when compared to controls.[13] Albashir A et al., found that HBA1c levels can be used as predictor for severity of CAD. The total number of enrolled patients was 85. Dyslipidaemia was found among 63 (74.1%) patients, and 52 (69.4%) of the patients were noted to have hypertension. A total of 19 (22.4%) patients were smokers. About 59 (69.4%) of patients had a family history of IHD, and 22 patients (25.9%) had a history of IHD. STEMI was the main ECG finding 54 (63.5%). Modified Gensini score depicted that 32 (35.29%) had mild acute coronary syndrome, 23(27.06%) had moderate, and 30 (37.65%) had severe acute coronary syndrome. HbA1c was significantly positively correlated with the severity of ACS among diabetic patients (P value = 0.001).[14]

CONCLUSION

The mean HbA1c level was found to be 8.5%, reflecting suboptimal glycemic control among the study population. While the overall mortality rate was 9.3%, no significant association was observed between HbA1c levels and mortality. However, a significant correlation was found between higher HbA1c levels and the presence of diastolic dysfunction ($p<0.05$), suggesting that poor long-term glycemic control may contribute to impaired cardiac function. These findings highlight the importance of glycemic control in ACS patients with T2DM, particularly in relation to cardiac dysfunction. While HbA1c may not directly predict mortality, its association with diastolic dysfunction emphasizes the need for targeted management strategies to improve long-term cardiovascular outcomes. Future studies with larger sample sizes and long-term follow-up may provide further insights into the prognostic value of HbA1c in ACS patients with diabetes.

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