Original Research Paper

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Correlation of Coronary Angiography Findings with Hba1c Levels in Patients with Acute Coronary Syndrome

Medical Science

KEYWORDS : - Hba1c, Acute coronary syndrome, angiography

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ABSTRACT

Diabetes mellitus(DM) is one of the commonest disease worldwide ranking next to cardiovascular disorder. It is estimated that around a 100 million population is affected by diabetes worldwide. Diabetes is a disease of complications, both acute and chronic. Cardiac affliction is by far the commonest cause of mortality in patients with diabetes. Coronary artery disease alone accounts for the major chunk of mortality in diabetes. Glycated hemoglobin (HbA1c) is an established marker for evaluating glucose level at an intermediate term, as it reflects the average plasma glucose control over a period of 2–3 months. Several observational studies demonstrated that a higher HbA1c level was associated with increased risks of cardiovascular diseases and deaths. Although coronary artery disease and diabetes mellitus have been recognized as distinct entities for many decades, but their correlation was established only in 1870 after the work of Seegen J, Der. who emphasized higher incidence and mortality of Coronary artery disease among diabetics Although the patient's history, physical examination and non-invasive techniques like resting ECG, Holter monitoring, stress test, stress echocardiography, stress thallium imaging are valuable in establishing the diagnosis of acute coronary syndrome in diabetes; coronary angiography or arteriography remains the gold-standard technique for diagnosing and evaluating coronary artery disease. Hence, this study was undertaken and an attempt was made to correlate Hba1c levels in patients presenting with acute coronary syndrome with special interest on their angiographic profile.

INTRODUCTION:

HbA1c level is an indicator of the average blood glucose concentrations over the preceding 2–3 months and is used as a convenient and well-known biomarker in clinical practice.(1,2) The relationship between increasing plasma HbA1c levels and a higher risk for incident macrovascular and microvascular disease is most prominent above a HbA1c of 7.0 % (53 mmol/mol) for macrovascular and 6.5 % (48 mmol/mol) for microvascular disease (3). In cohort studies with patients with type 2 diabetes, poor glycemic control, as measured by HbA1c, is associated with an increased risk for cardiovascular disease (4–6). Long-term glycometabolic disorder implies a high risk for cardiovascular disease As different from admission glucose, HbA1c is an indicator of general glycometabolic state and is minimally affected by acute stress and also acute glucose management Patients with acute coronary syndrome (ACS) are diverse in terms of clinical presentation and risk of death or disability. Accurate management decisions with comprehensive evaluation may improve the outcomes of patients at high risk. In the present study, we investigated the correlation of Hba1c levels with the coronary angiography findings in patients presenting with acute coronary syndrome.

MATERIALS AND METHOD:

Study population: Consecutive patients with a diagnosis of acute coronary syndrome admitted to MGM Hospital, Aurangabad between the period of 1st of July 2012 to 30th of September 2014 were included in the study.

Inclusion criteria:

Patients diagnosed:

1. ST-Elevation myocardial infarction as per the criteria for the universal definition of myocardial infarction 2012.(7)

2.Unstable angina and Non-ST elevation MI as per the criteria for the definition of UA and NSTEMI.(8)

Exclusion criteria:

Patients with:

1.Haemoglobinopathies

2.Severe iron deficiency/vitamin B12 anemia or on iron/vitamin B12 supplements or erythropoietin administration

3.Chronic liver failure

Study groups:

Patients were primarily divided into two groups;

Group A = non-diabetics

Group B = known diabetics.

Further these groups were divided as per HBA1C values. (9-11)

Non-diabetics into 3 groups:

Group A1 = HBA1C <5.7%

Group A2 = HBA1C 5.7 to 6.4%

Group A3 = HBA1C > 6.5%

Known diabetics into 2 groups:

Group B1 = HBA1C <7%

Group B2 = HBA1C >7%

Non-diabetics were the ones who had no history of prior diabetes (documented and informed) and were never prescribed oral hypoglycemic agents, insulin, or diet therapy. Patients with HbA1c of more than 6.5% on admission were also included in the non-diabetic group.Known diabetes was defined in the presence medical records documenting past history of DM or past laboratory results compatible with the diagnosis of DM, according to the American Diabetes Association (ADA) 2010 Revised Clinical Practice Guidelines for diabetes diagnosis or if the patient had been informed of the diagnosis by a physician before the admission or was on oral antihyperglycemic agents, insulin, or diet

therapy. The definition of known DM was regardless of the duration of disease or the need for antidiabetic agents. A detailed history with duration of symptom onset, clinical features, and the demographic profile was obtained from every patient admitted to study group. Past history of coronary heart disease(CHD) was considered if the patient had documented records or had sustained a myocardial infarction(MI) in past, underwent PCI/CABG or had electrocardiographic evidence of IHD, or was on antiplatelet medications in the absence of a history of CVA/peripheral vascular diseases. The family history of CHD was solely based on information given by patient himself/herself or by patient's 1st or 2nd relatives. Investigations like ECG, Trop T, CKMB, HbA1c, BSL-R & CBC were done on admission. Serial ECG recordings, routine 2D-Echo, BSL F & PP were carried out subsequently. Coronary angiography findings were noted in all those who underwent the same. HBA1C test was performed by high-performance liquid chromatography method (HPLC). Patients were followed up until discharge or in-hospital death. The composite primary endpoint of this study was a correlation of HBA1C levels with coronary angiography findings. Continuous variables were presented as mean +/- SD and categorical variables were presented as a number of patients and percentage. Characteristics of the groups were compared using Chi-square test or the Fisher exact test or the student t-test, as appropriate. The statistical significance level was set at $p < 0.05$.

OBSERVATION AND RESULTS: Of the 278 patient population in our study, 86 patients (30.9%) were known diabetics while the remaining 192 (69.1%) patients were non-diabetic. Of the 192 non-diabetic patients in our study 124 (64.6%) had HBA1C below 5.7%, 43 (22.4%) had HBA1C between 5.7 to 6.4% and 25 (13%) had HBA1C more than 6.5%.Of the 86 known diabetics in our study, majority i.e 49 (57%) had HBA1c above 7 and 37 (43%) had HBA1C below 7.

Table 1. Distribution of patients according to diabetes status (n=278)

Diabetic Status	No. of Patients	%
Non-Diabetics (Group A)	192	69.1
Known Diabetes (Group B)	86	30.9
Total	278	100

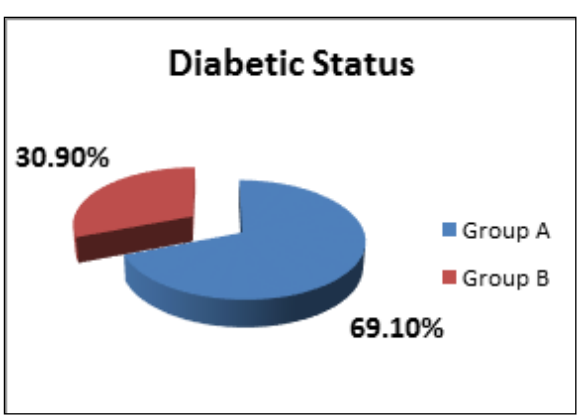


Table 2. Distribution of non-diabetics according to HBA1C values

Non-diabetics	No. of Patients	%
HBA1C <5.7% (Group A1)	124	64.6
HBA1C 5.7 to 6.4% (Group A2)	43	22.4
HBA1C >6.5% (Group A3)	25	13
Total	192	100

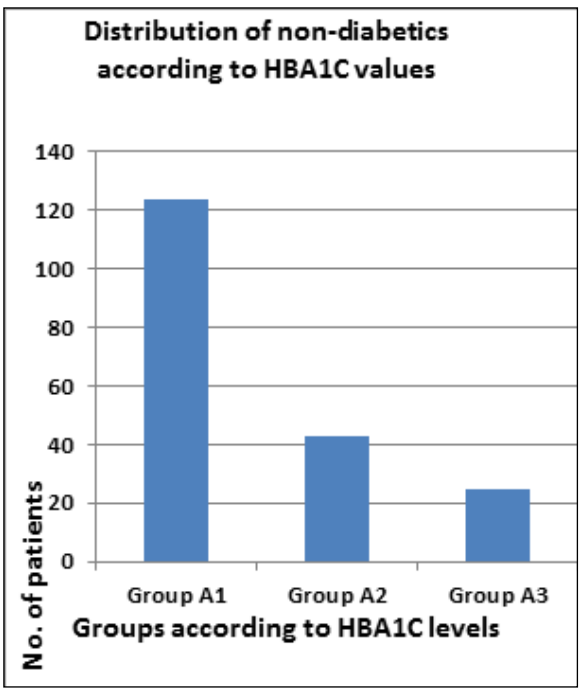
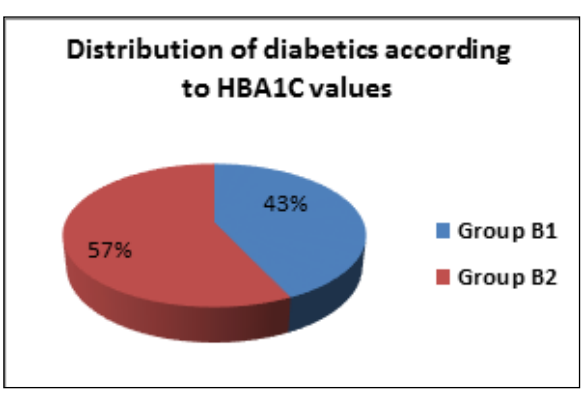


Table 3. Distribution of known diabetics according to HBA1C values

Diabetics	No. of Patients	%
HBA1C <7% (Group B1)	37	43
HBA1C >7% (Group B2)	49	57
Total	86	100



Of the 86 known diabetics in our study, majority i.e 49 (57%) had HBA1c above 7 and 37 (43%) had HBA1C below 7.

Table 4. Distribution of patients according to Coronary Angiography (CAG) findings (no. of vessel involvement)

CAG finding	No. of Patients	%
Normal coronaries	71	30.08
Single vessel disease (SVD)	117	49.57
Double vessel disease (DVD)	34	14.40
Triple vessel disease (TVD)	14	5.93
Total	236	100

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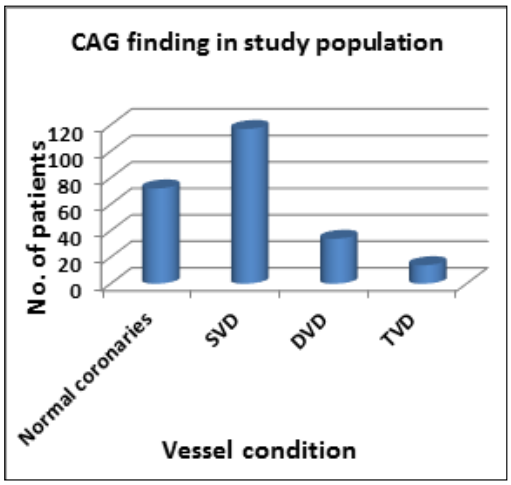
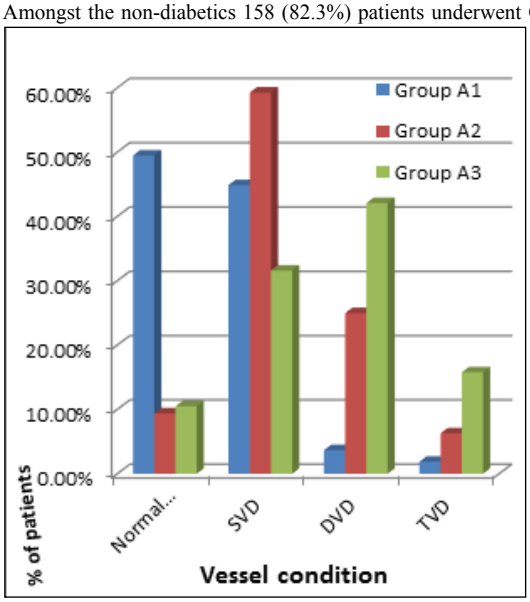


In our study, a total of 236 (84.89%) patients underwent CAG. Of these 71 (30.08%) had normal coronaries, 117 (49.57%) patients had single-vessel involvement, 34 (14.40%) had double vessel involvement and 14 (5.93%) of patients had triple vessel involvement.

Table 5. Distribution of CAG findings in non-diabetics according to HBA1C values

CAG finding	Non- Diabetic (158)						Chi Sq	P value
	Group A1		Group A2		Group A3			
	No	%	No	%	No	%		
Normal coronaries	53	49.5	03	9.4	02	10.5	12.4	0.002 S
Single vessel disease (SVD)	48	44.9	19	59.3	06	31.6	11.8	0.003 S
Double vessel disease (DVD)	04	3.7	08	25	08	42.1	27	0.000 HS
Triple vessel disease (TVD)	02	1.9	02	6.3	03	15.8	7.70	0.012 S
Total	107	100	32	100	19	100	---	--

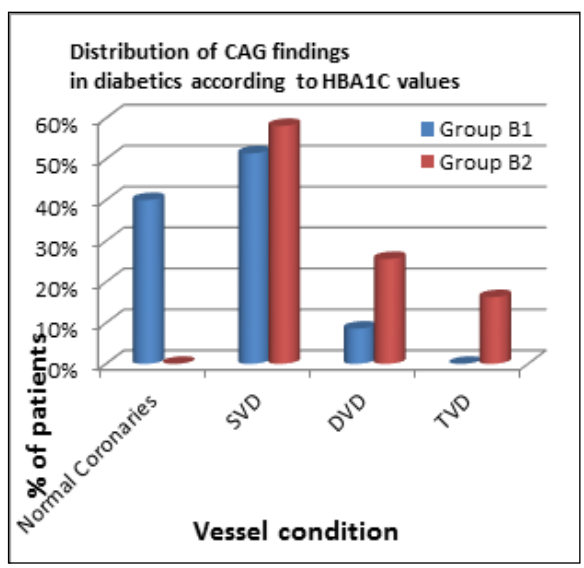
Amongst the non-diabetics 158 (82.3%) patients underwent CAG.



Normal coronaries were found in 49.5% of patients in group A1 compared to 9.4% in group A2 and 10.5% in group A3. P value for normal coronaries across the three groups was 0.002, which is statically significant. Single vessel disease was seen in 44.9% of patients in group A1 compared to 59.3% in group A2 and 31.6% in group A3. P value for single vessel disease across the three groups was 0.003, which is statically significant. Double vessel disease was seen in 3.7% of patients in group A1 compared to 25% in group A2 and 42.1% in group A3. P value for double vessel disease across the three groups was 0.000, which is statically highly significant. Triple vessel disease was seen in 1.9% of patients in group A1 compared to 6.3% in group A2 and 15.8% in group A3. P value for triple vessel disease across the three groups was 0.012, which is statically significant.

Table 6. Distribution of CAG findings in known diabetics according to HBA1C values

CAG finding	Known diabetic (n=78)				Chi Sq	P value
	Group B1		Group B2			
	No.	%	No.	%		
Normal coronaries	14	40	00	00	15.6	0.000 HS
Single vessel disease (SVD)	18	51.4	25	58.1	0.351	0.553 NS
Double vessel disease (DVD)	03	8.6	11	25.6	3.79	0.520 NS
Triple vessel disease (TVD)	00	00	07	16.3	6.26	0.012 S
Total	35	100	43	100	---	---



In the known diabetic group 78 (90.7%) patients out of 86 underwent CAG. Normal coronaries were found in 40% of patients in group B1 v/s 0% of patients in group B2. The p-value for normal coronaries across the two groups was 0.000, which is statistically highly significant. Single vessel disease was seen in 51.4% of patients in group B1 v/s 58.1% of patients in group B2. The p-value for single vessel disease across the two groups was 0.553, which is statistically not significant. Double vessel disease was seen in 8.6% of patients in group B1 v/s 25.6% of patients in group B2. The p-value for double vessel disease across the two groups was 0.520, which is statistically not significant. Triple vessel disease was seen in 0% of patients in group B1 v/s 16.3% of patients in group B2. The p-value for triple vessel disease across the two groups was 0.12, which is statistically significant.

DISCUSSION: HBA1C and number of diseased vessels in non-diabetic and known diabetic group.

1.Non-diabetic group: Amongst the non-diabetics 158 (82.3%) patients underwent CAG. Normal coronaries were found in 49.5% of patients in group A1 compared to 9.4% in group A2 and 10.5% in group A3. P value for normal coronaries across the three groups was 0.002, which is statically significant. Single vessel disease was seen in 44.9% of patients in group A1 compared to 59.3% in group A2 and 31.6% in group A3. P value for single vessel disease across the three groups was 0.003, which is statically significant. Double vessel disease was seen in 3.7% of patients in group A1 compared to 25% in group A2 and 42.1% in group A3. P value for double vessel disease across the three groups was 0.000, which is statically highly significant. Triple vessel disease was seen in 1.9% of patients in group A1 compared to 6.3% in group A2 and 15.8% in group A3. P value for triple vessel disease across the three groups was 0.012, which is statically significant. These findings suggest that increasing levels of HBA1C are associated with multivessel disease in non-diabetics presenting with ACS.

Known diabetic group: In the known diabetic group 78 (90.7%) patients out of 86 underwent CAG. Normal coronaries were found in 40% of patients in group B1 v/s 0% of patients in group B2. The p-value for normal coronaries across the two groups was 0.000, which is statistically highly significant. Single vessel disease was seen in 51.4% of patients in group B1 v/s 58.1% of patients in group B2. The p-value for single vessel disease across the two groups was 0.553, which is statistically not significant. Double vessel disease was seen in 8.6% of patients in group B1 v/s 25.6% of patients in group B2. The p-value for double vessel disease across the two groups was 0.520, which is statistically not significant. Triple vessel disease was seen in 0% of patients in group B1 v/s 16.3% of patients in group B2. The p-value for triple vessel disease across the two groups was 0.12, which is statistically significant. These findings suggest that poorly controlled diabetics as depicted by HBA1C of >7%, is associated with multivessel disease in known diabetic patients presenting with ACS. A study by Nobutaka Ikeda et al(11) indicated that HBA1C values are associated with coronary lesion complexity in both known diabetics as well as non-diabetics presenting with CAD. Mahmut cakmak et al(12) also demonstrated a significant association between elevated HBA1C levels and a number of diseased vessels in AMI patients, irrespective of the diabetic status.

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