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Correlation of Hba1c Levels With Clinical Outcomes in Patients with Acute Coronary Syndrome

Medical Science

KEYWORDS : HbA1c, acute coronary syndrome

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ABSTRACT

Diabetes mellitus is a well-recognized risk factor for cardiovascular disease and diabetic individuals with acute coronary syndrome (ACS) have a two- to fourfold increased risk of adverse cardiovascular events compared to non-diabetic individuals.6 The presence of elevated blood glucose levels, diabetes mellitus, or both contributes to more than 3 million cardiovascular deaths worldwide each year.8 Although admission glucose has good prognostic value on outcome in ACS, it may be affected by meals, the circadian cycle, and also the stress response On the other hand Glycated hemoglobin A1c (HbA1c) is a better marker of sugar control, as it provides a good reflection of plasma glucose concentrations over 8 to 12 weeks with no effect from meals or the circadian cycle. It also unmasks minor glycometabolic disease, such as impaired glucose tolerance, impaired fasting glucose or metabolic syndrome.16 The primary objective of this study is - To Study the relationship between HbA1c levels and the short-term outcome in patients with Acute Coronary Syndrome (both diabetic and non-diabetic patients).

Introduction:

Diabetes mellitus is a major and well-established risk factor for macrovascular diseases such as atherosclerotic cardiovascular diseases and microvascular diseases such as neural, renal and retinal diseases (1,2). (5,6). Recent studies have showed that glycemic excursion might play an important role in the pathogenesis of atherosclerosis and may be an independent risk factor for cardiovascular complications in diabetics. Chronic glucose dysregulation is associated with poor outcomes in AMI patients both with and without diabetes.(7) Chronic glucose dysregulation, as assessed by hemoglobin A1c (HbA1c) levels, is a prognostic factor for mortality in patients with AMI. Recent studies have showed that glycemic excursion might play an important role in the pathogenesis of atherosclerosis and may be an independent risk factor for cardiovascular complications in diabetics(7) It has been reported that elevated HbA1c levels probably mean long-term insulin resistance and severe consequences such as hyperglycemia, dyslipidemia, hypercoagulability, and system inflammatory response.(8) Growing evidence supports the finding that HbA1c level is an independent risk factor for cardiovascular events, regardless of the diagnosis of diabetes (9-12).

II. Aims & objectives:

Clinical outcome of NonDiabetics and Known Diabetics with high HbA1c with Acute Coronary Syndrome.

III. Material & Methods:

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

ST-Elevation myocardial infarction as per the criteria for universal definition of myocardial infarction 2012.[36]

Unstable angina and Non-ST elevation MI as per the criteria for the definition of UA and NSTEMI.[37]

Exclusion criteria:

Patients with

Haemoglobinopathies

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

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.

Non-diabetics into 3 groups
Known diabetics into 2 groups

Group A1 = HBA1C <5.7%
Group B1 = HBA1C <7%

Group A2 = HBA1C 5.7 to 6.4%
Group B2 = HBA1C >7%

Group A3 = HBA1C > 6.5%

Non-diabetics were the ones who had no history of prior diabetes (documented and informed) and were never prescribed oral antihyperglycemic 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.

IV. Study design & Technique

The composite primary endpoint of this study was a correlation of HBA1C levels with in-hospital complications mainly the major adverse cardiac events and in-hospital mortality. The major adverse cardiac events included left

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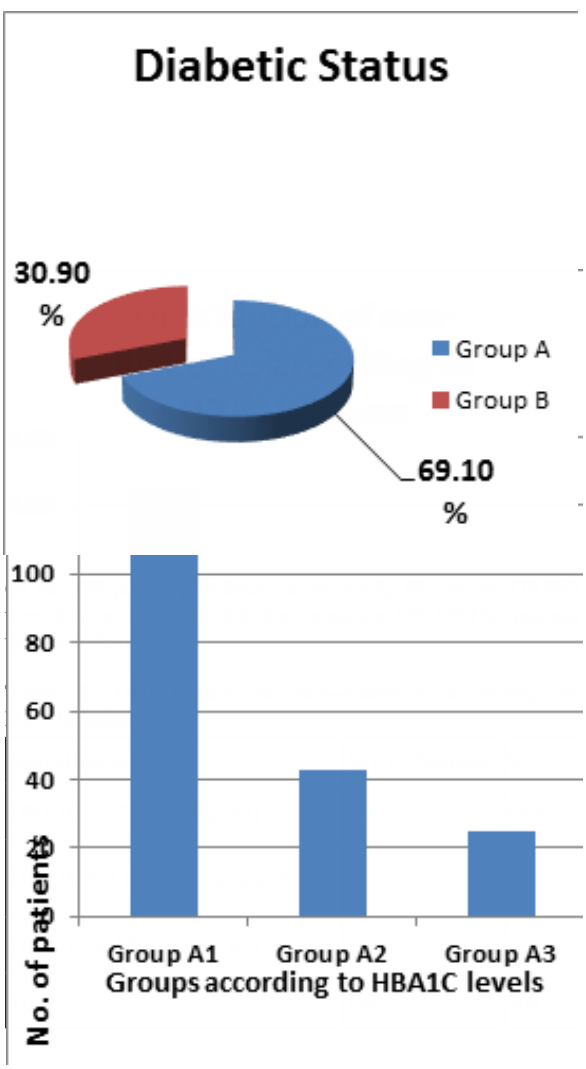
ventricular failure and cardiogenic shock. Left ventricular failure was defined as echocardiographically determined left ventricular ejection fraction (LVEF) of less than 40%. Cardiogenic shock was defined as systolic arterial pressure <90 mmHg (mean, <60 mmHg) with the need for inotropic support, with diminished end-organ perfusion, manifesting as cool, clammy extremities, diminished mental alertness and oliguria with urine output <20 ml/h. The other in-hospital complications included various arrhythmias.

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.

V. Results and Analysis:

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

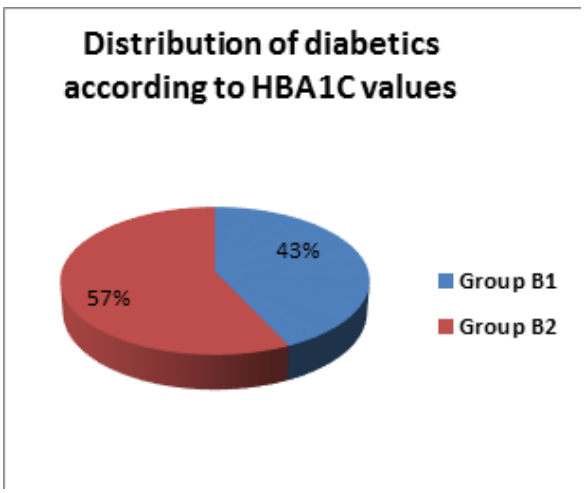
Diabetic Status	No. of Patients	%
Non-Diabetics (Group A)	192	69.1
Known Diabetes (Group B)	86	30.9
Total	278	100



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%.

Table 3. Distribution of known diabetics according to HBA1C values

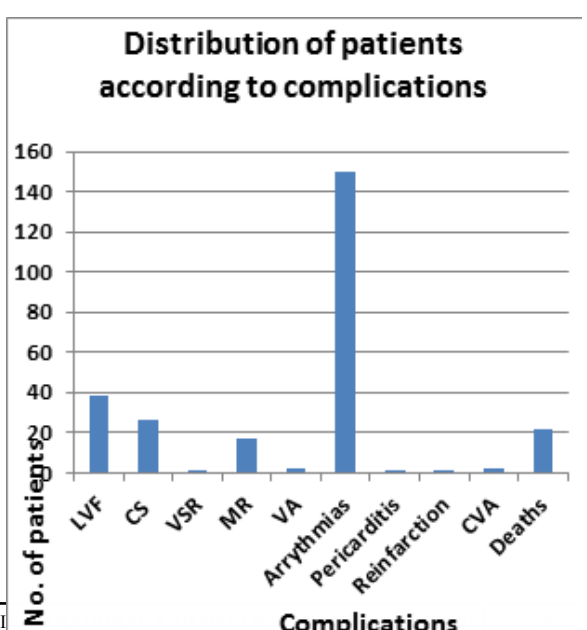
Diabetics	No. of Patients	%
HBA1C <7% (Group B1)	37	43
HBA1C >7% (Group B2)	49	57
Total	86	100



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

Complications	N= 278	%
Left Ventricular Failure (LVF)	38	13.7
Cardiogenic Shock (CS)	26	9.3
Ventricular Septal Rupture (VSR)	01	0.3
Mitral Regurgitation (MR)	17	6.1
Ventricular Aneurysm (VA)	02	0.7
Arrythmias	150	53.9
Pericarditis	01	0.3
Reinfarction	01	0.3
Cerebrovascular Accident (CVA)	02	0.7
Deaths	22	7.9

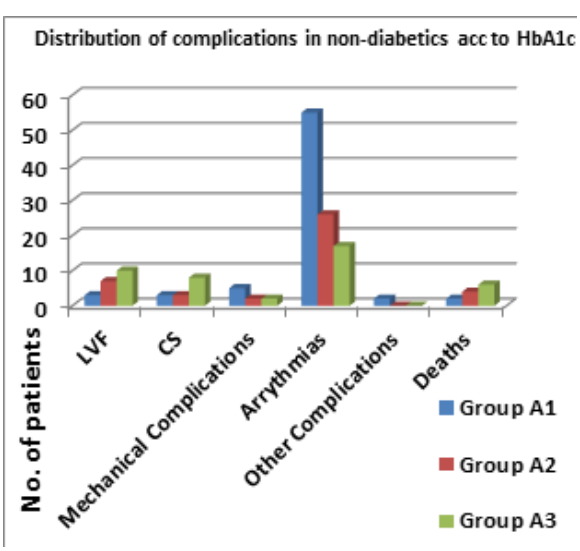
Table 4. Distribution of patients according to



Total of 158 (56.8%) patients had complications in our study. Arrhythmias were the most common complications in our study, occurring in 150 patients (53.9%) while left ventricular failure was seen in 38 patients (13.7%), the cardiogenic shock was seen in 26 (9.3%). Mechanical complications included ventricular septal rupture, seen in 01 (0.3%), mitral regurgitation seen in 17 (6.1%) and ventricular aneurysm, seen in 02 (0.7%). Other complications like pericarditis and reinfarction were seen in 01 (0.3%) each and CVA was seen in 02 (0.7%). A total of 22 patients died during the study (7.9%).

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

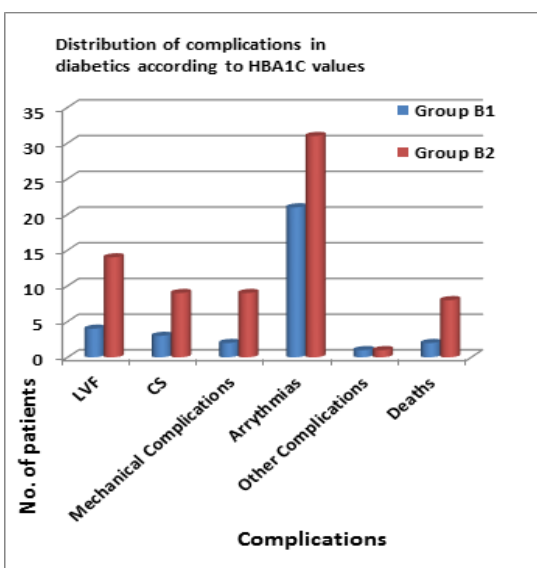
Complications	Group A1 (n=124)		Group A2 (n=43)		Group A3 (n=25)		Chi Sq	P Value
	N0.	%	N0.	%	N0.	%		
Left Ventricular Failure (LVF)	03	2.4	07	16.3	10	40	23.7	0.000 HS
Cardiogenic Shock (CS)	03	2.4	03	7.0	08	32	19.8	0.000 HS
Mechanical complications	05	4.0	02	4.6	02	8	0.65	0.722 NS
Arrythmias	55	44.3	26	60.5	17	68	2.06	0.358 NS
Other complications	2	1.6	0	00	0	00	1.09	0.580 NS
Deaths	02	1.6	04	9.3	06	24	14.9	0.001 S



Left Ventricular Failure (LVF) was seen in 2.4% of patients in group A1, 16.3% in group A2 and 40% in group A3. The p-value was 0.000, which is statistically highly significant.Cardiogenic shock was seen in 2.4% of patients in group A1, 7% in group A2 and 32% in group A3. The p-value was 0.000, which is statistically highly significant.Mechanical complications were seen in 4% of patients in group A1, 4.6% in group A2 and 8% in group A3. The p-value was 0.722, which is statistically not significant. Arrhythmias were seen in 44.3% of patients in group A1, 60.5% in group A2 and 68% in group A3. The p-value was 0.358, which is statistically not significant. Other complications (pericarditis, reinfarction, CVA) were found in 1.6% of patients in group A1 and 0% in groups A2 and A3. The p-value was 0.580, which is statistically not significant. Death occurred in 1.6% of patients in group A1 and 9.3% in group A2 and 24% in group A3. The p-value was 0.001, which is statistically significant.

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

Complications	Group B1 (37)		Group B2 (49)		Chi Sq	P Value
	N0.	%	N0.	%		
Left Ventricular Failure (LVF)	04	10.8	14	28.6	2.70	0.101 NS
Cardiogenic Shock (CS)	03	8.1	09	18.4	1.42	0.234 NS
Mechanical complications	02	5.4	09	18.4	2.50	0.114 NS
Arrythmias	21	56.7	31	63.3	0.926	0.761 NS
Other complications	01	2.7	01	2	0.388	0.844 NS
Deaths	02	5.4	08	16.3	1.97	0.161 NS



Left Ventricular Failure (LVF) was seen in 10.8% of patients in group B1 and 28.6% in group B2. The p-value was 0.101, which is statistically not significant.Cardiogenic shock was seen in 8.1% of patients in group B1 and 18.4% in group B2. The p-value was 0.234, which is statistically not significant.Mechanical complications were seen in 5.4% of patients in group B1 and 18.4% in group B2. The p-value was 0.114, which is statistically not significant. Arrhythmias were seen in 56.7% of patients in group B1 and 63.3% in group B2. The p-value was 0.761, which is statistically not significant. Other complications (pericarditis, reinfarction, CVA) were found in 2.7% of patients in group B1 and 2% in group B2. The p-value was 0.844, which is statistically not significant. Death occurred in 5.4% of patients in group B1 and 16.3% in group B2. The p-value was 0.161, which is statistically not significant.

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Discussion:

Our study population consisted of 192 (69.1%) non-diabetics and 86 (30.9%) known diabetics.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. In the non-diabetic group, left Ventricular Failure (LVF) was seen in 2.4% of patients in group A1, 16.3% in group A2 and 40% in group A3. Cardiogenic shock was seen in 2.4% of patients in group A1, 7% in group A2 and 32% in group A3. The p-value (0.000) in both the cases is statistically highly significant and thus suggests that in the non-diabetic group, increasing levels of HBA1C are associated with major adverse cardiovascular events. Death occurred in 1.6% of patients in group A1 and 9.3% in group A2 and 24% in group A3. The p-value was 0.001, which is statistically significant. In the known diabetic group, left ventricular failure (LVF) was seen in 10.8% of patients in group B1 and 28.6% in group B2. Cardiogenic shock was seen in 8.1% of patients in group B1 and 18.4% in group B2. The p values (0.101 and 0.234) are both statistically not significant. This observation suggests that though the incidence left ventricular failure (LVF) and cardiogenic shock was more in group B2, there was no statistical significance to this finding. Death occurred in 5.4% of patients in group B1 and 16.3% in group B2. The p-value was 0.161, which is statistically not significant.

This finding suggests that in non-diabetic people, higher HBA1C levels were associated with major adverse cardiovascular events (left ventricular failure and cardiogenic shock) and a significant increase in the number of deaths following ACS. In the patients, who already had established diabetes mellitus, higher HBA1C levels, although, are associated with major adverse cardiovascular events and pose a greater risk of death (5.4% deaths in B1 v/s 16.3% in group B2) but it was found to be statistically insignificant. (p-value 0.161)

Conclusion

Higher HBA1C levels, in non-diabetics, are associated with major adverse cardiovascular events (left ventricular failure and cardiogenic shock) and a significant increase in the number of deaths following ACS.

In the patients, who already have established diabetes mellitus, higher HBA1C levels, are also associated with major adverse cardiovascular events and pose a greater risk of death but the association is not statistically significant.

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