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Original article

Hemoglobin A1c Levels and Thrombus Load in Patients with Type 2 Diabetes Mellitus and Non-ST-Segment Elevation Myocardial Infarction

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Abstract

Background: Patients with Type 2 Diabetes Mellitus (T2DM) facing non-ST-Segment Elevation Myocardial Infarction (NSTEMI) often exhibit a higher incidence of thrombotic events. Hemoglobin A1c (HbA1c) levels, indicative of glycemic control, might influence the thrombus burden in such cases. **This study aimed to** evaluate the relationship between HbA1c, and coronary thrombus burden expressed as thrombolysis in Myocardial Infarction (TIMI) thrombus grade, in NSTEMI patients. **Methods:** This cross-sectional comparative study was carried out on NSTEMI patients with T2DM who underwent early percutaneous coronary angiography. Patients were categorized into two groups based on HbA1c levels: Group I (optimal glycemic control, HbA1c ≤ 6.5%) and group II (suboptimal glycemic control, HbA1c > 6.5%). Detailed clinical, laboratory, and angiographic assessments were performed. The primary outcome measure was the TIMI thrombus grade. **Results**: Group II showed significantly higher weight compared to group I (p=0.026). Group II exhibited higher fasting blood glucose (FBG) and Homeostatic Model Assessment of Insulin Resistance (HOMA-IR) levels (p<0.001). Echocardiographic parameters demonstrated a significantly lower Mitral E in group II (p<0.001). Angiographic parameters revealed a significant difference in the infarct-related artery (p=0.026), with higher TIMI thrombus grade scores and Syntax scores in group II (p<0.001). Revascularization selection varied significantly between groups (p=0.038). **Conclusion:** Elevated HbA1c levels in NSTEMI patients with T2DM were associated with increased thrombus burden, as indicated by higher TIMI thrombus grades.

Keywords: Type 2 Diabetes Mellitus; Non-ST-Segment Elevation Myocardial Infarction; Hemoglobin A1c; Thrombolysis in Myocardial Infarction (TIMI); Thrombus burden.

Introduction:

Diabetes mellitus (DM) is rapidly emerging as one of the most prevalent non-communicable diseases globally. Type 2 diabetes mellitus (T2DM) is a metabolic disorder characterized by hyperglycemia resulting from a combination of pathophysiological factors, primarily resistance to insulin action and inadequate insulin secretion. Individuals with diabetes face an elevated risk of accelerated atherosclerosis, leading to conditions such as coronary artery disease, peripheral arterial disease, and cerebrovascular disease, significantly impacting both morbidity and mortality (1).

DM is linked to a 19% incidence of acute coronary syndrome (ACS) with presentations of nonobstructive coronary artery disease (CAD). Non-ST segment elevation myocardial infarction (NSTEMI) is a clinical manifestation of nonobstructive CAD and is associated with a high ratio of mortality and morbidity (2).

Among individuals with T2DM, both nonobstructive and obstructive stable CADs are correlated with an increased mortality ratio and major adverse cardiovascular events in the long term, with this risk significantly surpassing that in non-diabetic individuals. In the treatment of NSTEMI, the primary objective should be the revascularization of the infarct-related coronary artery (IRA), and a pivotal step is to provide reperfusion through percutaneous coronary intervention (PCI) in the early stages (3).

Several factors are linked to the success of PCI in individuals with ACS. The Syntax score, calculated based on properties such as lesion number, location, and functional importance, provides crucial information in evaluating the extent of CAD. Thrombus load in the IRA is a critical anatomical factor for successful PCI and is typically quantified using the thrombolysis in myocardial infarction (TIMI) thrombus grading system on a 7-point scale. There is a direct relationship between the thrombus load in the infarct-related coronary and outcomes, and this is also incorporated into the Syntax Scoring System (4, 5).

T2DM with unregulated plasma glucose levels may exacerbate the prognosis in CAD through various mechanisms such as endothelial dysfunction, impaired blood fibrinolysis, and increased platelet activity. T2DM is a crucial clinical parameter contributing to the thrombus load in diseased coronaries (1).

Hemoglobin A1c (HbA1c) is considered a reliable indicator of blood glucose levels over the past 8–10 weeks, although it may be influenced by acute stress. An elevated HbA1c level is directly associated with increased mortality in individuals with T2DM (6).

The goal of the study was to evaluate the relationship between HbA1c, and coronary thrombus burden expressed as TIMI thrombus grade, in NSTEMI patients.

Patients and methods:

Patients:

This cross-sectional comparative study, conducted at Benha University Hospital from October 2022 to March 2023, enrolled NSTEMI patients with T2DM who underwent percutaneous coronary angiography.

Permission to perform this study and to use the hospital facilities was acquired from Benha University Research Ethics Committee (**Ms 26-8-2022**), which is part of the Faculty of Medicine, Quality Assurance Unit.

All patients provided their informed written consent after a thorough explanation of the study's benefits and risks.

Inclusion criteria

Patients aged over 18 years, of both sexes, with a diagnosis of NSTEMI determined through clinical symptoms, electrocardiogram (ECG) findings, and cardiac markers.

The diagnostic criteria of T2DM was based on the American Diabetes Association, fasting blood glucose >126, the 2 hours post prandial >140 and the HbA1c > 6.5. (7)

Exclusion criteria

Patients with severe anemia (Hb <7 g/dL), a recent history of acute blood loss or blood transfusion, hemoglobinopathies, severe infection, hypercoagulability, pregnancy, or those in the postpartum period. Additionally, patients with a history of drug abuse, ST-elevated myocardial infarction (MI), metallic valve prosthesis, or those who received glycoprotein IIb/IIIa inhibitor during their treatment were excluded from participation. Patients were divided into two groups according to the HbA1c levels: **Group I:** included the patients with optimal glycemic control with HbA1c ≤6.5% and **group II:** included subjects with suboptimal glycemic control, with HbA1c >6.5%

Methods:

All enrolled cases underwent a comprehensive assessment, involving a detailed history-taking and full clinical examination. The history encompassed personal details such as age, gender, residence, occupation, and special habits, as well as symptoms indicative of heart failure. These symptoms included shortness of breath, fatigue, swelling in the legs, ankles, and feet, rapid or irregular heartbeat, reduced exercise ability, and persistent cough or wheezing. Additionally, participants' past medical history, smoking habits, and medication use were documented. The clinical examination included a general assessment of consciousness and mental state, evaluation for jaundice or pallor, measurement of vital signs, detection of lower limb edema, and an assessment of body mass index (BMI) and waist circumferences. Systemic examination covered the cardiovascular system for abnormal heart sounds or murmurs, the respiratory system for abnormal breath

sounds, adventitious sounds, and respiratory distress, and the gastrointestinal tract, abdomen, central nervous system, and musculoskeletal system for various parameters.

Routine laboratory investigations were conducted, including HbA1c, complete blood count, fasting glucose level, liver function tests (ALT, AST), lipid profile (cholesterol, triglycerides, LDL, HDL), and kidney function tests (serum creatinine, urea).

Baseline electrocardiography (ECG) was performed using a 12-lead ECG to measure rhythm, and T-wave inversion.

Echocardiography, carried out in the left lateral decubitus position, involved measurements taken 24 hours after admission using Philips EPIQ 7C and GE Vivid 7 Pro to assess the following Left Ventricular Ejection Fraction (LVEF), Left Ventricular End-Diastolic Diameter (LVEDd) and End-Systolic Diameter (LVESd), Interventricular Septal Thickness (IVST), Mitral Valve Parameters (E and A waves), Left Atrium Diameter (LA diameter), Left Ventricular End-Diastolic Volume (LVEDV) and End-Systolic Volume (LVESV), Left Ventricular Mass Index (LVMI), E/e' ratio [(8)]. Quantitative coronary angiography was performed based on guidelines and clinical practices at invasive centers, with assessment conducted visually by interventional cardiologists.

The thrombus load in the infarct-related artery was scored using the TIMI thrombus grade. This grading system included six categories, ranging from no cineangiography characteristics of thrombus present (TIMI grade 0) to chronic total occlusion with extensive collateralization (TIMI grade 6) [(9)].

All measurements were independently performed by two physicians blinded to the patients' clinical status.

Statistical analysis of the data:

Statistical analysis was done by SPSS v28 (IBM Inc., Armonk, NY, USA). Quantitative variables were presented as mean and standard deviation (SD) and compared between the two groups utilizing unpaired Student's t- test. Qualitative variables were presented as frequency and percentage (%) and were analyzed utilizing the Chi-square test or Fisher's exact test when appropriate. A two tailed *p* value < 0.05 was considered statistically significant. Univariate regression analysis that determines the relationship between one independent (explanatory variable) variable and one dependent variable was used for prediction of thrombolysis in myocardial infarction thrombus grading score.

Results:

1) Baseline characteristics of the studied groups:

Baseline characteristics (age, sex, height and BMI), residence and smoking were insignificantly different between both groups. Associated comorbidities (HTN, dyslipidaemia, previous stroke and

previous history of CAD) were insignificantly different between both groups (Table, 1).

2) Laboratory investigations of the studied groups:

All lab date were insignificantly different except for FBG and HOMA-IR as they were significantly higher in group II compared to group I (p<0.001) (Table, 2).

3) Echocardiographic and angiographic parameters of the studied groups:

Regarding the echocardiographic parameters, Mitral E was significantly lower in group II compared to group I (0.64 ± 0.13 vs. 0.80 ± 0.06, p<0.001). Other parameters (LVEF, LVEDd, LVESd, IVST, LA diameter, LVEDV, LVESV, LVMI and E/e`) were insignificantly different between both groups (Table, 3).

Regarding the angiographic parameters, infarct-related artery was significantly different between the studied groups (p=0.026). TIMI Thrombus Grading Score (TTGS) and Syntax score were significantly higher in group II compared to group I (p<0.001). The type of lesion was insignificantly different between both groups (Table, 3).

4) Prediction of thrombolysis in myocardial infarction thrombus grading score:

On Univariate regression analysis, HbA1c and MPV were found to be significant independent predictors of TIMI thrombus grade (p<0.001) whereas other variables were insignificant predictors of TIMI thrombus grade (Table, 4).

Table 1: Baseline characteristics of the studied groups

		Group I (n=50)	Group II (n=50)	*p* value
Age (years)	**Mean ± SD**	53.2 ± 10.86	54.54 ± 10.39	0.530
	Range	35 - 72	36 - 72	
Sex	**Male**	38 (76%)	33 (66%)	0.378
	Female	12 (24%)	17 (34%)	
Weight (Kg)	**Mean ± SD**	62.88 ± 5.46	65.6 ± 6.57	**0.026***
	Range	55 - 75	55 - 75	
Height (meter)	**Mean ± SD**	1.62 ± 0.04	1.62 ± 0.05	0.629
	Range	1.55 - 1.7	1.55 - 1.7	
BMI (Kg/m^2)	**Mean ± SD**	24.06 ± 2.56	24.98 ± 3.04	0.106
	Range	19.38 - 29.97	19.26 - 31.22	
Residence	**Rural**	27 (54%)	29 (58%)	0.840
	Urban	23 (46%)	21 (42%)	
Smoking		26 (52%)	21 (42%)	0.423
Comorbidities				
HTN		24 (48%)	21 (42%)	0.688
Dyslipidaemia		23 (46%)	31 (62%)	0.160
Previous stroke		7 (14%)	3 (6%)	0.318
Previous history of CAD		6 (12%)	2 (4%)	0.269

BMI: body mass index; HTN: hypertension; CAD: coronary artery disease; HR: heart rate; SBP: systolic blood pressure; DBP: diastolic blood pressure; *: statistically significant as p value <0.05; Please write the statistical test used in this table.

Table 2: Laboratory investigations of the studied groups

	Group I (n=50)	Group II (n=50)	*p* value
Hb (g/dL)	11.36 ± 1.16 9.5 - 13.5	11.46 ± 1.25 9.5 - 13.5	0.678
WBCs (*10^3cells/µL)	7.87 ± 2.06 4.6 - 11.4	7.56 ± 1.95 4.5 - 11.3	0.439
PLT (*10^3cells/µL)	319.92 ± 55.47 220 - 398	312.88 ± 52.95 226 - 400	0.518
MPV (f/L)	8.1 ± 0.81 7 - 9	8.32 ± 0.65 7 - 9	0.139
FBG (mg/dL)	85.06 ± 8.68 70 - 100	134.26 ± 10.05 120 - 150	**<0.001***
HOMA-IR	0.86 ± 0.11 0.7 - 1	1.32 ± 0.11 1.2 - 1.5	**<0.001***
Serum creatinine (mg/dL)	0.71 ± 0.15 0.5 - 0.9	0.69 ± 0.12 0.5 - 0.9	0.333
Urea (mg/dL)	11.44 ± 4.39 5 - 20	12.3 ± 4.7 5 - 20	0.346
CRP (mg/dL)	16.5 ± 2.83 12 - 21	16.84 ± 2.58 12 - 21	0.532
Troponin I (ng/mL)	73.18 ± 11.35 55 - 95	77.26 ± 12.41 55 - 98	0.089
Total cholesterol (mg/dL)	191.08 ± 28.69 151 - 240	199.22 ± 29.08 150 - 249	0.162
Triglycerides (mg/dL)	140.66 ± 15.7 111 - 169	144.78 ± 19.15 110 - 180	0.242
HDL (mg/dL)	42.54 ± 4.6 34 - 50	42.04 ± 5.81 32 - 50	0.635
LDL (mg/dL)	130.16 ± 22.53 91 - 160	125.52 ± 23.11 90 - 165	0.312
ALT (U/L)	22.08 ± 6.92 10 - 34	22.98 ± 7.89 10 - 35	0.546
AST (U/L)	26.28 ± 8.73 10 - 40	26.44 ± 8.54 10 - 40	0.926

CBC: complete blood count; Hb: hemoglobin; WBCs: white blood cells; PLT: platelet count; MPV: mean platelet volume; FBG: fasting blood glucose; HOMA-IR: homeostatic model assessment for insulin resistance; CRP: C-reactive protein; HDL: high density lipoprotein; LDL: low density lipoprotein; ALT: Alanine transaminase; AST: aspartate transaminase; *: statistically significant *as p* value <0.05; Please write the statistical test used in this table.

.**Table 3:** Echocardiographic parameters and angiographic parameters of the studied groups

Echocardiographic parameters		**Group I (n=50)**	**Group II (n=50)**	***p*value**
LVEF %	**Mean ± SD**	56.56 ± 3.75	55.28 ± 4.17	0.110
	Range	50 - 63	49 - 63	
LVEDd (mm)	**Mean ± SD**	49.4 ± 1.99	49.94 ± 2.08	0.188
	Range	46 - 52	47 - 53	
LVESd (mm)	**Mean ± SD**	32.82 ± 3.32	31.8 ± 3.12	0.117
	Range	27 - 39	27 - 39	
IVST (mm)	**Mean ± SD**	10.9 ± 0.81	10.76 ± 0.77	0.380
	Range	10 - 12	10 - 12	
Mitral E (cm/s)	**Mean ± SD**	0.80 ± 0.06	0.64 ± 0.13	**<0.001***
	Range	0.7 - 0.9	0.44 - 0.85	
LA diameter (mm)	**Mean ± SD**	38.26 ± 1.85	38.9 ± 1.94	0.095
	Range	35 - 41	36 - 42	
LVEDV (mL)	**Mean ± SD**	92.26 ± 9.23	93.51 ± 9.41	0.504
	Range	76.33 - 104.59	77.39 - 109.07	
LVESV (mL)	**Mean ± SD**	46.18 ± 7.35	47.52 ± 8.6	0.407
	Range	30.7 - 58.72	33.3 - 60.29	
LVMI (g/m^2)	**Mean ± SD**	96.3 ± 21.09	104.42 ± 24.2	0.077
	Range	61.9 - 132.9	63.9 - 146.2	
E/e`	**Mean ± SD**	9.03 ± 2.82	10.21 ± 4.01	0.092
	Range	3.72 - 13.27	3.44 - 16.1	
Angiographic parameters				
Type of lesion	**LAD**	15 (30%)	13 (26%)	0.449
	LCX	17 (34%)	22 (44%)	
	RCA	23 (46%)	17 (34%)	
Infarct-related artery	**SVD**	25 (50%)	14 (28%)	**0.026***
	2-VD	18 (36%)	19 (38%)	
	MVD	7 (14%)	17 (34%)	
TTGS	**Mean ± SD**	2.9 ± 0.95	3.92 ± 1.35	**<0.001***
	Range	1 - 4	2 - 6	
Syntax score	**Mean ± SD**	19.66 ± 2.64	26.36 ± 1.78	**<0.001***
	Range	15 - 23	24 - 29	

LVEF: left ventricular ejection fraction; LVEDd: left ventricular end-diastolic diameter; LVESd: left ventricular end-systolic diameter; IVST: interventricular septum thickness; E: early filling velocity; LA: left atrium; A: atrial filling velocity; LVMI: LV mass index; E/e`: early mitral inflow velocity to early diastolic mitral annulus velocity ratio; LAD: left anterior descending coronary artery; LCX: left circumflex coronary artery; RCA: right coronary artery; SVD=Single-vessel disease; 2-VD=Two-vessel disease; MVD: multi-vessel disease; TTGS: TIMI thrombus grading score; *: statistically significant *as p* value <0.05; Please write the statistical test used in this table.

Table 4: Univariate regression analysis for prediction of thrombolysis in myocardial infarction thrombus grading score

	Coefficient	**SE**	**95% CI**	**t**	***p***
HBA1C%	1.020	0.234	0.555 to 1.484	4.35	**<0.001***
Smoking	0.1313	0.255	-0.376 to 0.638	0.513	0.609
Troponin-I	-0.004	0.010	-0.0259 to 0.0165	-0.439	0.661
Total cholesterol (mg/dl)	-0.000	0.004	-0.0087 to 0.008	-0.004	0.999
MPV	0.760	0.132	0.496 to 1.023	5.7178	**<0.001***

MPV, mean platelet volume; SE: standard error; CI: confidence interval; statistically significant *as p* value <0.05; t: Please write the statistical test used in this table.

Discussion:

Coronary artery disease (CAD) is a major global health concern, significantly impacting healthcare systems and patient well-being [10]. NSTEMI presents diagnostic challenges, especially when coexisting with T2DM, a known contributor to cardiovascular complications[11]. Patients with T2DM face an increased risk of atherothrombotic events and less favorable outcomes in CAD. Elevated HbA1c, a marker of long-term glycemic control, plays a crucial role in diabetes-related cardiovascular complications [6, 12, 13].

This study aims to explore the relationship between HbA1c levels and coronary thrombus burden, expressed as TIMI thrombus grade, in NSTEMI patients with T2DM.

This cross-sectional comparative study was carried out on NSTEMI patients with T2DM who underwent early percutaneous coronary angiography. Patients were categorized into two groups based on HbA1c levels: Group I (optimal glycemic control, HbA1c ≤ 6.5%) and group II (suboptimal glycemic control, HbA1c > 6.5%). Detailed clinical, laboratory, and angiographic assessments were performed.

Some researchers similarly found no significant age and gender differences between groups I and II, with comparable smoking and dyslipidemia rates [2]. A recent study in 2023 supported our findings, revealing higher body mass index in high thrombus burden (HTB) compared to low thrombus burden (LTB) patients (27.5 ± 4.6 vs. 26.9 ± 5.5 kg/m2, p=0.04) [14].

In the present study, clinical examination (HR, SBP and DBP) was insignificantly different between both groups. CBC results (Hb, WBCs, PLT and MPV) were insignificantly different between both groups. Serum creatinine, urea, CRP and troponin I levels were insignificantly different between the studied groups. There was an insignificant difference between the studied groups regarding the lipid profile (total cholesterol, triglycerides, HDL and LDL). Liver function tests (ALT and AST) were insignificantly different between both groups. However, FBG and HOMA-IR were significantly higher in group II compared to group I (p<0.001).

Supporting our results, a study found that the admission blood glucose was significantly higher in the HTB group than the LTB group (10.2 ± 5.4 vs. 9.2 ± 4.9 mmol/l, p = 0.001). Also, the CBC results (except hemoglobin) and lipid profile (total cholesterol, triglycerides, HDL and LDL) were insignificantly different between both groups [14].

Parallel to our results, a study reported that there are no statistically significant differences in total cholesterol, HDL, LDL, hypertension prevalence, blood pressure, urea, creatinine, hemoglobin, white blood cell count, platelet count, and mean platelet volume between the two groups [2].

Regarding the echocardiographic parameters, only Mitral E was significantly lower in group II compared to group I (0.64 ± 0.13 vs. 0.80 ± 0.06, p<0.001). Other parameters (LVEF, LVEDd, LVESd, IVST, Mitral A, LA diameter, LVEDV, LVESV, LVMI and E/e`) were insignificantly different between both groups.

Aligned with our findings, is the study which indicated that in patients with STEMI, higher HbA1c levels (≥6.5%) were associated with a lower mean left ventricular ejection fraction. However, angiographic and procedural data were similar among different HbA1c groups [(15)].

Similarly, a study found that there are no statistically significant differences in LVEDd, LVESd, interventricular septum thickness (IVST), mitral E and A velocities, and left atrial (LA) diameter between the two groups [(2)].

Regarding the angiographic parameters, infarct-related artery was significantly different between the studied groups (p=0.026). TTGS and Syntax score were significantly higher in group II compared to group I (p<0.001). The type of lesion was insignificantly different between both groups.

A study found that patients with DM were higher-risk individuals who experienced longer reperfusion delays and were less likely to have closed infarct-related artery at baseline (TIMI 0 + 1 flow: 73.2% vs. 72.0%; p< 0.0001) [(16)].

In agreement with our results, a study observed that the Syntax scores in group II were significantly higher than the group I (26.3 ± 3.0 vs. 20.2 ± 3.4, p < 0.001). Frequency distribution of the IRA and number of diseased vessels did not differ between groups significantly [(2)]. Also, a study reported that TTGS and Syntax score were significantly higher in the HTB group than the LTB group (p < 0.001) [(14)].

On Univariate regression analysis, HbA1c and MPV were found to be significant independent predictors of TIMI thrombus grade (p<0.001) whereas other variables were insignificant predictors of TIMI thrombus grade.

In a study by Algül et al., Univariate and multivariate logistic regression analyses were performed to investigate the predictive factors for thrombus burden. When all the factors that were found to affect the thrombus burden by multivariate regression analysis were examined, age, male sex, having DM, admission blood glucose level, and SHR were determined as independent risk factors for HTB [(14)].

In consistent with our findings, it was reported in the ordered logistic regression analysis that HbA1c was a significant independent predictor of TIMI thrombus grade in a model that included diabetes, smoking, previous PCI, troponin T, total cholesterol, and mean platelet volume [(2)].

HbA1c reflects long-term glycemic control and is less affected by acute stress. Thus, HbA1c levels may provide the relationship between chronic glucose control and

disease progression, more accurately. A 10% reduction in HbA1c levels causes a 45% reduction in the risk of complications [6].

It was reported that increased atherosclerotic and inflammatory events are associated with increased HbA1c in diabetic subjects [17]. Different glycemic targets were proposed in T2DM patients with ACS. A recent ACCORD study demonstrated an increased risk of cardiovascular complications with intensive glycemic control with an HbA1c target of 6% versus a less stringent glycemic control with an HbA1c target of 7%–7.9% among young adults, although that difference was not observed among older individuals [18]. Taking into account that lower HbA1c target did not bring further reduction in development of cardiovascular complications as expected, less stringent diabetes control was recommended.

Hyperglycemia plays an important role in the development of many abnormalities including endothelial dysfunction, increased coagulability, fibrinolytic impairment, and platelets hyperreactivity (19). Glycosylation is a nonenzymatic reaction induced by chronic hyperglycemia and HbA1c is a precursor of advanced glycation end products (AGEs) known as one of glycosylation's products. AGEs induce inflammatory reactions, oxidative stress, and thrombosis, thus associated with vascular damage (20).

Many thrombotic conditions have been stated as being coincided with acute hyperglycemia, myocardial infarction, stroke, and venous thromboembolism (VTE). A study found an odds ratio of 1.27 (95% confidence interval [CI], 1.19–1.35) for the occurrence of pulmonary embolism in diabetic patients. (21) Previously, a study also found diabetes to be a risk factor for VTE with a hazard ratio (HR) of 1.46 (95% CI, 1.03–2.05), even after adjusting for BMI, a known predictor of VTE [22].

It was found that HbA1c levels in diabetic patients were closely related to the severity of CAD. HbA1c levels increased more than 6.5%, leading to an increase in the number of arteries with stenosis >50% in coronary angiography [23].

In their study, researchers discovered that in-hospital mortality exhibited similarities between patients with HbA1c levels greater than or equal to 6.5% but no prior diagnosis of diabetes mellitus (n = 4, 12.9%) and those with established diabetes mellitus (n = 5, 9.8%, $p = 0.66$). Following adjustments for baseline characteristics, HbA1c continued to stand out as a robust and independent predictor of in-hospital mortality, with an odds ratio of 1.412 (95% confidence interval: 1.031–1.935, $p = 0.03$) [15].

Finally, this study had some limitations; it was a single-center study with a relatively small sample size which may limit the power of the study findings. The study included patients who had early percutaneous coronary angiography, which might introduce selection bias, as the population may not be representative of all

NSTEMI patients with type 2 diabetes mellitus. Patients who did not undergo this procedure were excluded.

While our study assessed HbA1c levels and their relationship to thrombus grade, it did not include an extensive analysis of potential confounding variables, such as dietary habits, physical activity, and other comorbidities.

Conclusion:

Our study establishes a significant correlation between suboptimal glycemic controls, denoted by elevated HbA1c levels, and heightened TIMI thrombus grade in NSTEMI patients with Type 2 Diabetes Mellitus. Notably, patients with HbA1c >6.5% exhibited notably higher TIMI thrombus and Syntax scores within the infarct-related artery (IRA). The observed association between HbA1c levels and the thrombus burden within target vessels prompts consideration of potential direct effects of glycated hemoglobin or the thrombogenic impact arising from uncontrolled T2DM on the endothelial layer of afflicted vessel segments.

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