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IMPACT OF ELEVATED BLOOD GLUCOSE ON *CORONARY ARTERY DISEASE SEVERITY* AND OUTCOMES IN *ST-ELEVATION MYOCARDIAL INFARCTION* PATIENTS

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Abstract
Diabetes mellitus (DM) is a known risk factor for the development and progression of coronary artery disease (CAD), particularly in acute conditions such as STEMI (ST-Elevation Myocardial Infarction). Elevated blood glucose levels, both random (RBG) and fasting (FBG), may worsen the severity of CAD and influence clinical outcomes following myocardial infarction (MI). This study aims to investigate the relationship between blood glucose levels, clinical outcomes, CAD severity, and the success of reperfusion therapy in STEMI patients. This prospective observational study was conducted at the Army Cardiac Hospital/CMH Lahore Medical College, Department of Cardiology, from August 2023 to March 2024. A total of 100 STEMI patients were enrolled and divided into two groups based on their RBG levels: non-hyperglycemic (RBG levels <200 mg/dL) and hyperglycemic (RBG levels>200 mg/dL). Fasting blood glucose (FBG) was measured after 8 hours, and patients were further categorized into those with non-elevated FBG (<126 mg/dL) and those with elevated FBG (>126 mg/dL). Patients received either primary percutaneous coronary intervention (PCI) or pharmacoinvasive therapy as per the European Society of Cardiology (ESC) guidelines. The Gensini score was used to assess CAD severity, and major adverse cardiac events (MACE) were monitored during hospitalization. Patients with elevated FBG were older, had a longer history of diabetes, and exhibited more complications, including chronic kidney disease (CKD) and a higher BMI. The Gensini score was significantly higher in the elevated FBG group (95.88 ± 33.79 vs. 55.28 ± 18.59, $p < 0.001$). Elevated FBG was also associated with worse clinical outcomes, including higher rates of MACE, reinfarction, congestive heart failure (CHF), and cardiogenic shock. Elevated blood glucose levels, particularly fasting blood glucose (FBG), were associated with more severe CAD and poorer clinical outcomes in STEMI patients. These findings underscore the importance of early blood glucose control in improving outcomes and reperfusion success.

Keywords: STEMI, Diabetes Mellitus, Blood Glucose, Coronary Artery Disease, Gensini Score, Reperfusion Therapy, MACE, FBG, RBG, Myocardial Infarction, Primary PCI.

Introduction

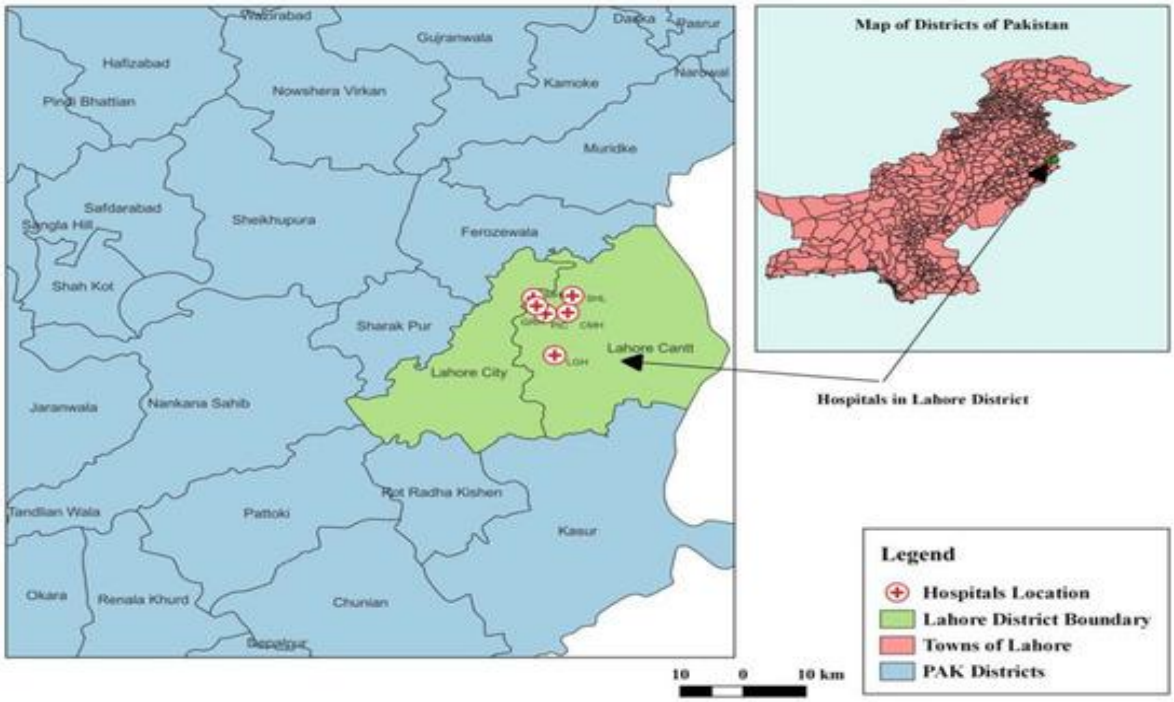
A close link exists between DM and cardiovascular disease (CVD). Type 2 diabetes is regarded as having an equivalent risk of coronary heart disease by the Adult Treatment Panel III of the US National Cholesterol Education Program. As a result, people with type 2 diabetes are just as likely to experience significant coronary events as people with coronary heart disease [1]. Since it is anticipated that the prevalence of DM will rise over the next 30 years and that up to 75% of these cases will die from coronary heart disease, the risk of CVD in cases with DM is at least 2-4 times greater than that faced by non-diabetics of comparable age. Contrary to non-diabetic cases, cases with DM are at increased risk of developing coronary heart disease (CAD) as an acute coronary syndrome (ACS) with a more difficult hospital course, numerous ischemia recurrences, and a higher risk of death [3]. In cases with hyperglycemia and DM, adverse outcomes include congestive heart failure, cardiac shock, ventricles arrhythmias, and death, which are more common after an episode of ACS [4]. Coronary atherosclerosis-related ACS is a serious, perhaps fatal cardiovascular disorder.

Atherosclerotic plaque rupture, vasospasm, platelet aggregation, and subsequent thrombosis are its main underlying pathophysiological mechanisms. These might result in significant coronary artery stenosis or blockage and acute myocardial ischemia or, worse, myocardial infarction. Diabetes cases frequently develop coronary artery lesions that are more widespread, diffuse, severe, and calcified [5]. Regardless of previous diabetes history, cases with acute myocardial infarction (AMI) may exhibit hyperglycemia at the time of admission. Stress hyperglycemia brought on by catecholamines is typically the culprit, and this condition is linked to the progression of myocardial lesions and an increase in mortality [6, 7]. Larger infarct size and a higher prevalence of heart failure and cardiac shock in that population may contribute to the increased mortality [8]; elevated glucose levels in some cases may be a sign of a condition that was present but undiagnosed, such as type 2 diabetes or glucose intolerance. These conditions can increase lipolysis, produce an excess of free fatty acids in the blood, worsen myocardial damage, and worsen coronary disease [9]. Both diabetics and non-diabetics with high admission plasma glucose (APG) have a poor prognosis and, consequently, a poor course of illness progression, and earlier studies have indicated that the serum glucose level at hospital entry may predict mortality in cases with AMI [11, 12]. Elevated admission blood glucose is a significant marker of worse outcomes in cases with myocardial infarction (MI) [10] and high admission plasma glucose (APG). Knowing a patient's entrance blood glucose levels and prior diagnosis of diabetes is critical information for optimal patient management, as early, aggressive treatment of hyperglycemia may improve both short- and long-term outcomes in these cases. This work aimed to address the associations between admission random blood glucose (RBG), fasting blood glucose (FBG), and their correlations, and the severity of coronary artery disease "assessed by Gensini score "and in-hospital outcomes in patients admitted with ST elevated Myocardial Infarction (STEMI).

Methodology

This prospective observational study was conducted at the Army Cardiac Hospital/CMH Lahore Medical College, Department of Cardiology, from August 2023 to March 2024. The primary objective was to evaluate the impact of blood glucose levels on clinical outcomes and the severity of coronary artery disease (CAD) in patients presenting with ST-elevation myocardial infarction (STEMI). A total of 100 patients were enrolled and categorized based on their random blood glucose (RBG) levels upon admission: Group 1 (Non-hyperglycemic) with RBG <200 mg/dl and Group 2 (Hyperglycemic) with RBG >200 mg/dl. After 8 hours, fasting blood glucose (FBG) was measured, and patients were further divided into two subgroups based on their FBG levels: Group I (Non-elevated FBG <126 mg/dL) and Group II (Elevated FBG >126 mg/dL). Ethical approval for the study was obtained from the Army Cardiac Hospital/CMH Lahore Medical College, Department of Cardiology, 2024 Hospital Ethical Committee, and informed written consent was obtained from all participants. The inclusion criteria included STEMI patients who received reperfusion therapy according to ESC guidelines, either primary PCI or pharmaco-invasive therapy. Exclusion criteria encompassed patients under 18 years, those who presented more than 24 hours after symptom onset, and those with non-cardiovascular

causes for acute coronary syndrome (ACS). Comprehensive assessments were performed on all patients, including a detailed medical history, a physical examination, routine laboratory tests, and a 12-lead ECG to confirm ST-elevation myocardial infarction (STEMI). Treatment decisions for reperfusion therapy were based on the European Society of Cardiology (ESC) guidelines. For primary PCI, arterial access was obtained either through the femoral or radial arteries, depending on patient anatomy and operator preference. Coronary angiography was used to assess coronary lesions, with TIMI flow grades used to evaluate the success of reperfusion. In patients receiving pharmaco-invasive therapy, thrombolysis with alteplase (tPA) was performed, followed by coronary angiography if needed. Echocardiographic evaluations using the GE Vivid 7 Ultrasound system were conducted to assess left ventricular (LV) systolic function, wall motion abnormalities, and mitral regurgitation. The Gensini score was utilized to assess the severity of CAD, and major adverse cardiac events (MACE) were tracked during hospitalization. Data analysis was performed using IBM SPSS software (version 20.0), with descriptive statistics summarizing frequencies, percentages, means, standard deviations, and medians. The significance of differences between groups was assessed using appropriate statistical tests, with a p-value of ≤ 0.05 considered statistically significant. The study aimed to determine the correlation between blood glucose levels, CAD severity, and clinical outcomes, providing valuable insights into the role of glucose control in the management of STEMI patients



Study Area/Setting Map

Results

The results of this study provide a detailed insight into the impact of elevated blood glucose levels on patients with STEMI, with clear differences observed between those with non-elevated fasting blood glucose (FBG) levels and those with elevated FBG levels. Patients in the elevated fasting blood glucose (FBG) group were significantly older, with a mean age of 59.70 ± 8.16 years, compared to 52.88 ± 10.53 years in the non-elevated FBG group ($p < 0.001$). Additionally, the duration of diabetes was longer in the elevated FBG group (25.08 ± 8.91 years) compared to the non-elevated FBG group (16.27 ± 7.88 years), with the difference being statistically significant ($p = 0.003$). Furthermore, a greater proportion of patients in the elevated FBG group had complicated diabetes (39.5% vs. 0%) and comorbid conditions such as chronic kidney disease (CKD) (11.6% vs. 0%), hypertension (46.5% vs. 22.8%), and a history of previous MI and PCI, all of which were more prevalent in the elevated FBG group. In terms of clinical presentation, the elevated FBG group had significantly worse outcomes, including a higher Gensini score, which was used to measure the severity of coronary artery disease (CAD). The mean Gensini score was significantly higher in the elevated fasting blood glucose

(FBG) group (95.88 ± 33.79) compared to the non-elevated FBG group (55.28 ± 18.59), with a p-value of <0.001, indicating a strong correlation between elevated blood glucose and more severe coronary artery disease (CAD). Patients with elevated fasting blood glucose (FBG) also experienced longer delays in presenting to the hospital (6.09 ± 7.18 hours vs. 3.74 ± 1.77 hours, p = 0.013), suggesting that delays in seeking medical care were more common in this group, potentially exacerbating the severity of their condition. When it comes to clinical outcomes, the elevated FBG group had a significantly higher incidence of major adverse cardiac events (MACE), with 44.2% of patients in the elevated FBG group experiencing MACE compared to only 3.5% in the non-elevated FBG group (p < 0.001). This group also had higher rates of in-hospital death (11.6% vs. 0%, p = 0.013), reinfarction (14.0% vs. 1.8%, p = 0.040), congestive heart failure (27.9% vs. 1.8%, p < 0.001), cardiogenic shock (16.3% vs. 0%, p = 0.002), and new arrhythmias (20.9% vs. 3.5%, p = 0.001). Notably, patients in the elevated FBG group also had a significantly higher incidence of contrast-induced nephropathy (CIN) (27.9% vs. 0%, p < 0.001) and new requirements for dialysis (14.0% vs. 0%, p = 0.005), indicating that hyperglycemia may contribute to renal complications during hospitalization. The final TIMI flow, which assesses the success of reperfusion therapy, was also significantly worse in the elevated FBG group, with 27.9% of patients in this group having a TIMI flow of 0 compared to only 7.0% in the non-elevated FBG group (p = 0.008). This suggests that poor glucose control negatively affects reperfusion success. Logistic regression analysis revealed significant associations between random blood glucose (RBG) and fasting blood glucose (FBG) levels on the one hand and the Gensini score and major adverse cardiovascular events (MACE) on the other. For the Gensini score, both RBG and FBG showed strong correlations, with p-values <0.001 in univariate analysis and p-values of 0.001 for RBG and <0.001 for FBG in multivariate analysis, indicating that elevated blood glucose levels independently contribute to the severity of CAD. Similarly, for MACE, both RBG and FBG were found to significantly increase the risk of adverse outcomes, with the odds ratio for RBG at 1.011 (95% CI: 1.005 – 1.017) and for FBG at 1.031 (95% CI: 1.016 – 1.045) in univariate analysis, and 0.970 (95% CI: 0.951 – 0.990) for RBG and 1.081 (95% CI: 1.037 – 1.128) for FBG in multivariate analysis. Overall, these findings strongly suggest that elevated blood glucose levels, particularly fasting glucose, are associated with more severe coronary artery disease, poorer reperfusion outcomes, and an increased risk of major adverse cardiac events in STEMI patients. The data underscores the importance of blood glucose management in these patients, as better control of blood glucose levels may improve both short-term and long-term outcomes following STEMI.

Table 1: Distribution of the Studied Cases According to Random Blood Glucose (RBG) Army Cardiac Hospital / CMH Lahore Medical College, Department of Cardiology 2023 August to March 2024.

Random Blood Glucose (mg/dl)	**No (%)**
Non-Hyperglycemia (<200)	72 (72.0%)
Hyperglycemia (>200)	28 (28.0%)
Mean ± SD	182.09 ± 82.65

Table 2: Comparison Between Non-FBG Elevated and FBG Elevated According to Demographic Data, Diabetes History, Risk Factors, and Clinical Presentation Army Cardiac Hospital / CMH Lahore Medical College, Department of Cardiology 2023 August to March 2024.

Variable	Non-FBG Elevated (<126) (n = 57)	FBG Elevated (>126) (n = 43)	P-Value
Sex			
Male	42 (73.7%)	32 (74.4%)	0.934
Female	15 (26.3%)	11 (25.6%)	
Age (Years)	52.88 ± 10.53	59.70 ± 8.16	<0.001*
Diabetes			
No DM	42 (73.7%)	19 (44.2%)	0.003*
Duration of DM (Years)	16.27 ± 7.88	25.08 ± 8.91	0.003*
Complicated DM	0 (0.0%)	17 (39.5%)	<0.001*
Hypertension	13 (22.8%)	20 (46.5%)	0.013*
Smoking	39 (68.4%)	21 (48.8%)	0.048*
History of Dyslipidemia	9 (15.8%)	15 (34.9%)	0.027*
BMI (Kg/m²)	30.23 ± 2.93	31.98 ± 3.41	0.007*
CKD	0 (0.0%)	5 (11.6%)	0.013*
Past Hx of IHD	10 (17.5%)	15 (34.9%)	0.047*
Previous Stroke / TIA	0 (0.0%)	6 (14.0%)	0.005*
Previous MI / ACS	4 (7.0%)	11 (25.6%)	0.010*
Previous PCI	4 (7.0%)	11 (25.6%)	0.010*
Gensini Score	55.28 ± 18.59	95.88 ± 33.79	<0.001*

Table 3: Logistic Regression Analysis for Random Blood Glucose (RBG) and Fasting Blood Glucose (FBG) Effects on Gensini Score and Major Adverse Cardiac Events (MACE) Army Cardiac Hospital / CMH Lahore Medical College, Department of Cardiology 2023 August to March 2024.

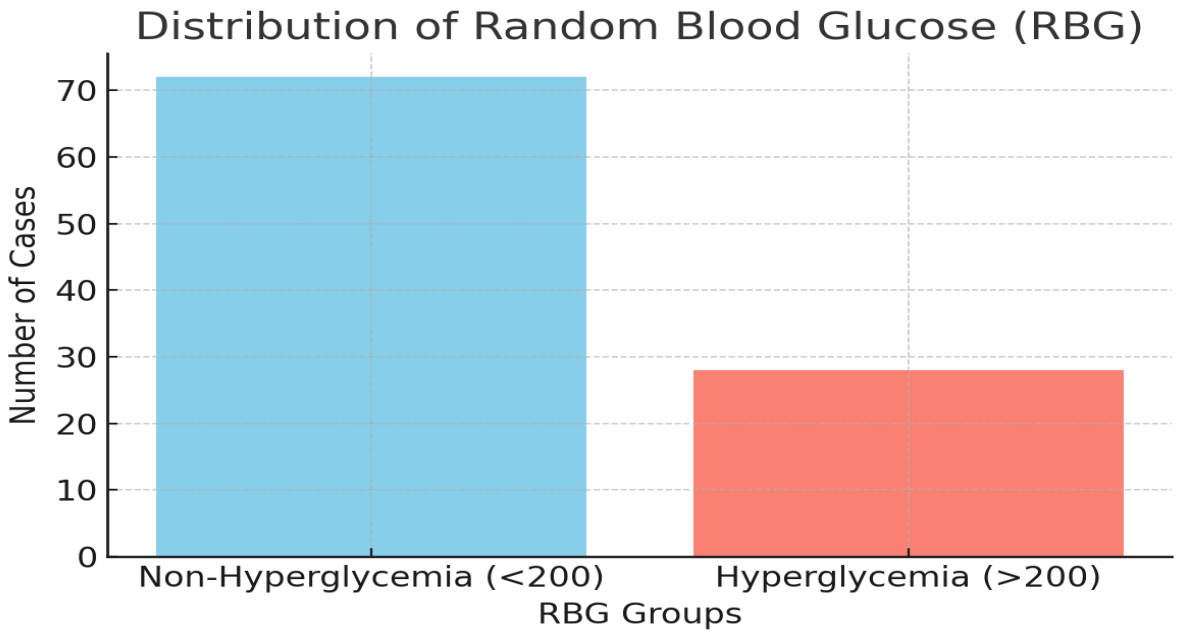
Variable	Univariate Analysis	Multivariate Analysis
Gensini Score		
Random Blood Glucose (RBG)	p < 0.001*; B = 0.297 (95% C.I: 0.244 – 0.351)	p = 0.001; B = 0.138 (95% C.I: 0.059 – 0.217)
Fasting RBG	p < 0.001*; B = 0.341 (95% C.I: 0.286 – 0.396)	p < 0.001*; B = 0.221 (95% C.I: 0.134 – 0.307)
MACE		
Random Blood Glucose (RBG)	p < 0.001*; B = 1.011 (95% C.I: 1.005 – 1.017)	p = 0.003*; B = 0.970 (95% C.I: 0.951 – 0.990)
Fasting RBG	p < 0.001*; B = 1.031 (95% C.I: 1.016 – 1.045)	p < 0.001*; B = 1.081 (95% C.I: 1.037 – 1.128)

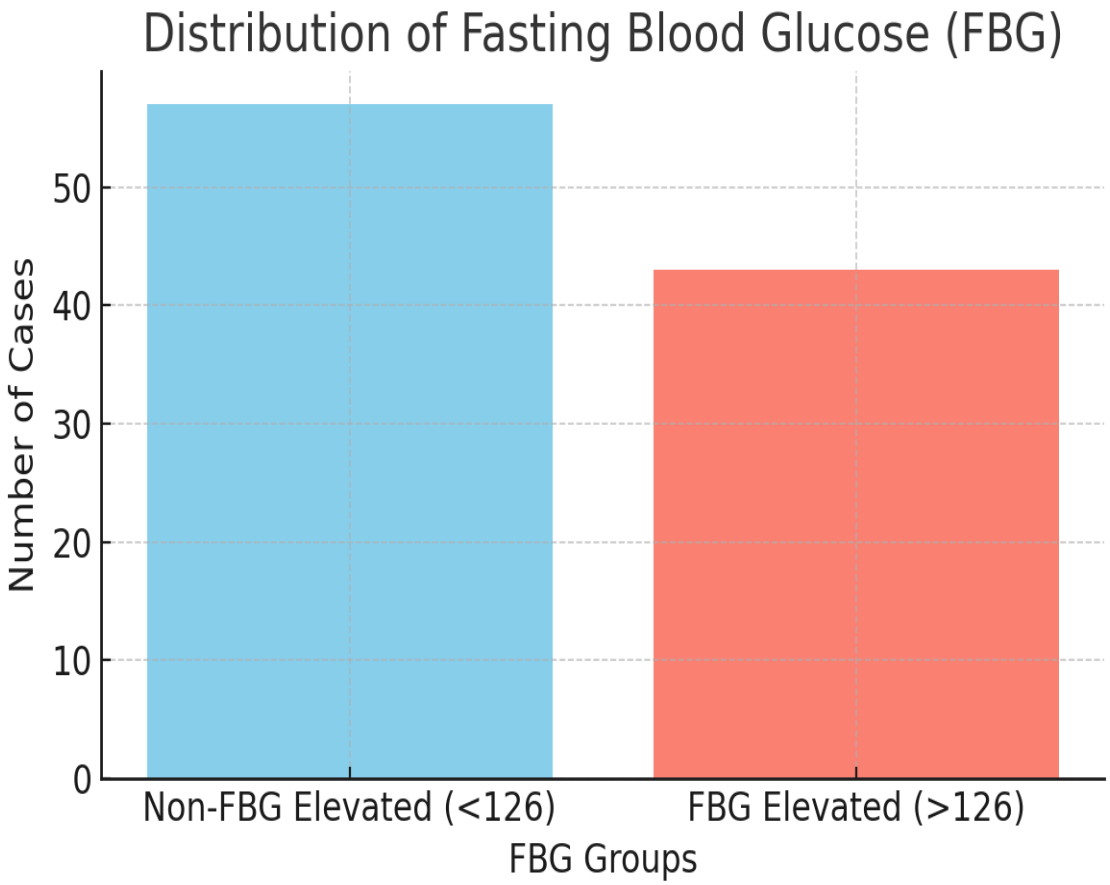
Table 4: Comparison of Reperfusion Strategies, Laboratory Data, and Echocardiographic Parameters Between Non-FBG Elevated and FBG Elevated Groups Army Cardiac Hospital / CMH Lahore Medical College, Department of Cardiology 2023 August to March 2024.

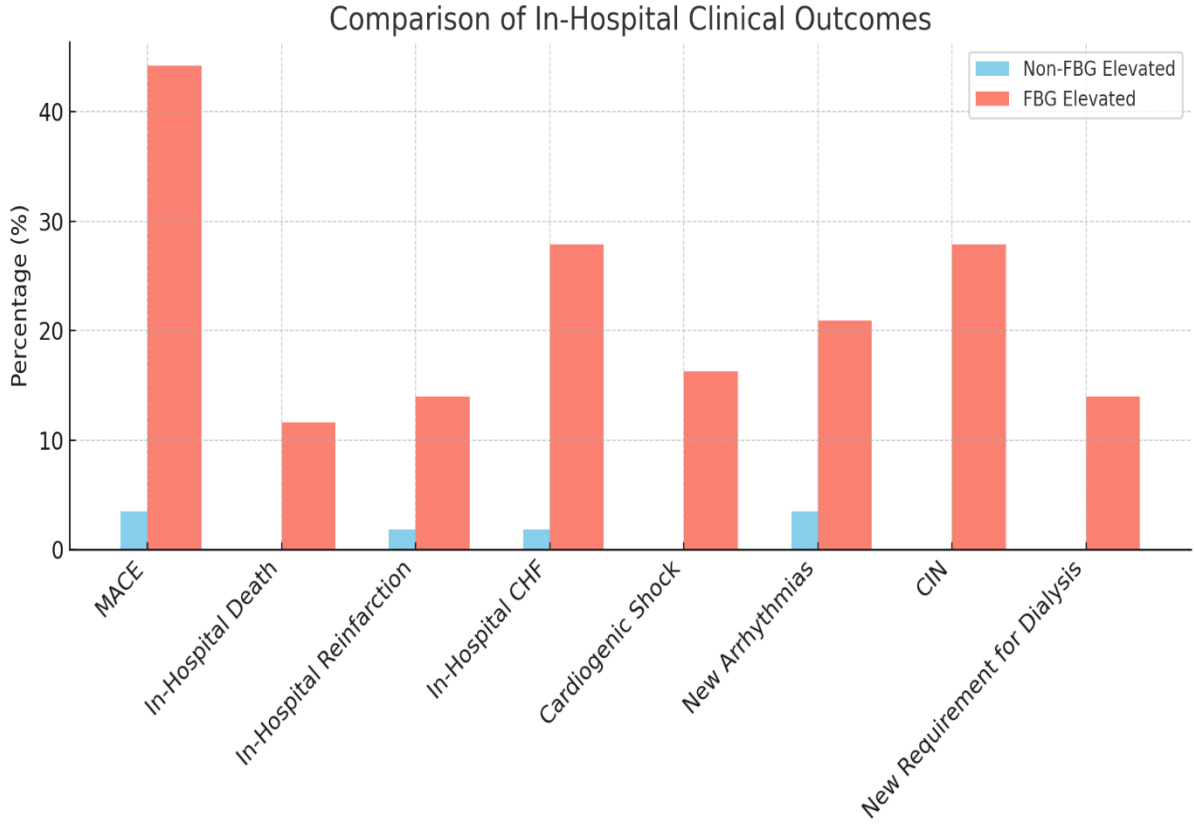
Variable	Non-FBG Elevated (<126) (n = 57)	FBG Elevated (>126) (n = 43)	P-Value
Reperfusion Strategy			
Primary PCI	52 (91.2%)	36 (83.7%)	
Pharmacoinvasive	5 (8.8%)	6 (14.0%)	
Infarction Related Artery			
LAD	19 (33.3%)	17 (39.5%)	0.676
RCA	24 (42.1%)	13 (30.2%)	
Final TIMI Flow			
TIMI 0	4 (7.0%)	12 (27.9%)	0.008*
TIMI 3	43 (75.4%)	20 (46.5%)	
Hemoglobin (gm/dl)	13.01 ± 1.23	12.37 ± 1.43	0.018*
LDL (mg/dl)	134.65 ± 28.03	149.33 ± 25.61	0.008*
Triglycerides (mg/dl)	172.58 ± 33.65	192.74 ± 29.50	0.002*
Ejection Fraction (%)	46.79 ± 5.70	40.56 ± 8.72	<0.001*

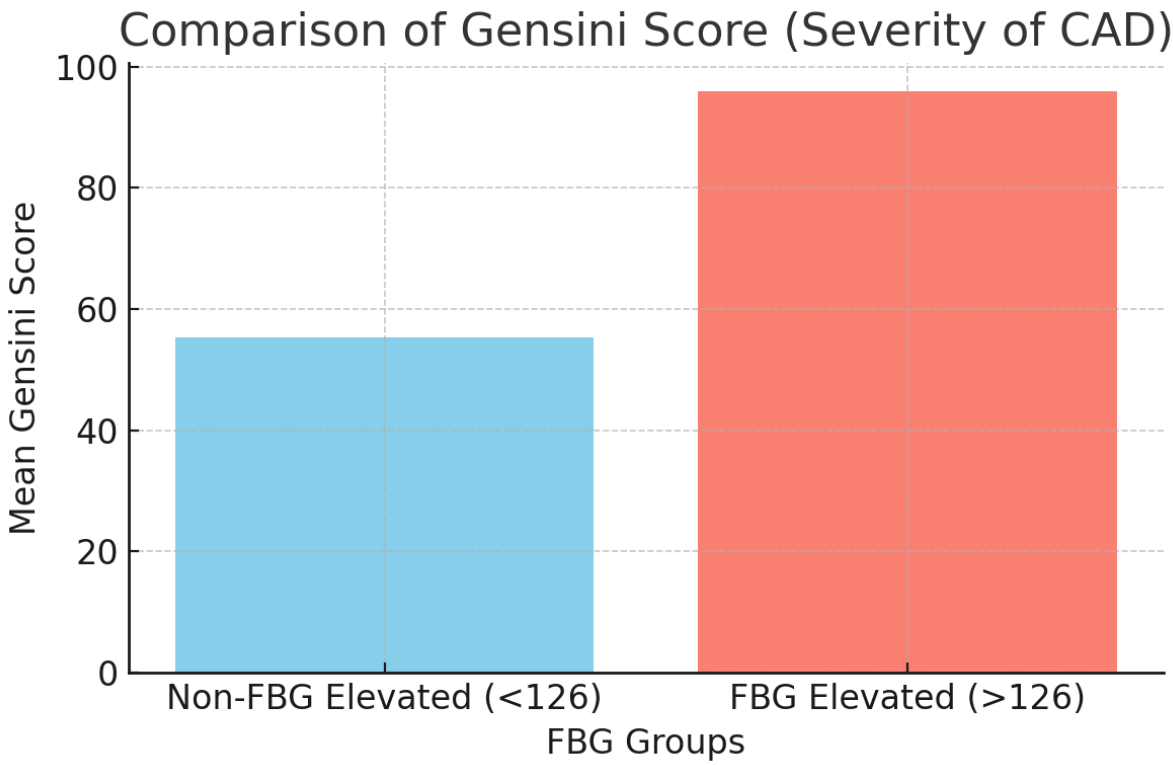
Table 5: Comparison of In-Hospital Clinical Outcomes Between Non-FBG Elevated and FBG Elevated Groups Army Cardiac Hospital / CMH Lahore Medical College, Department of Cardiology 2023 August to March 2024.

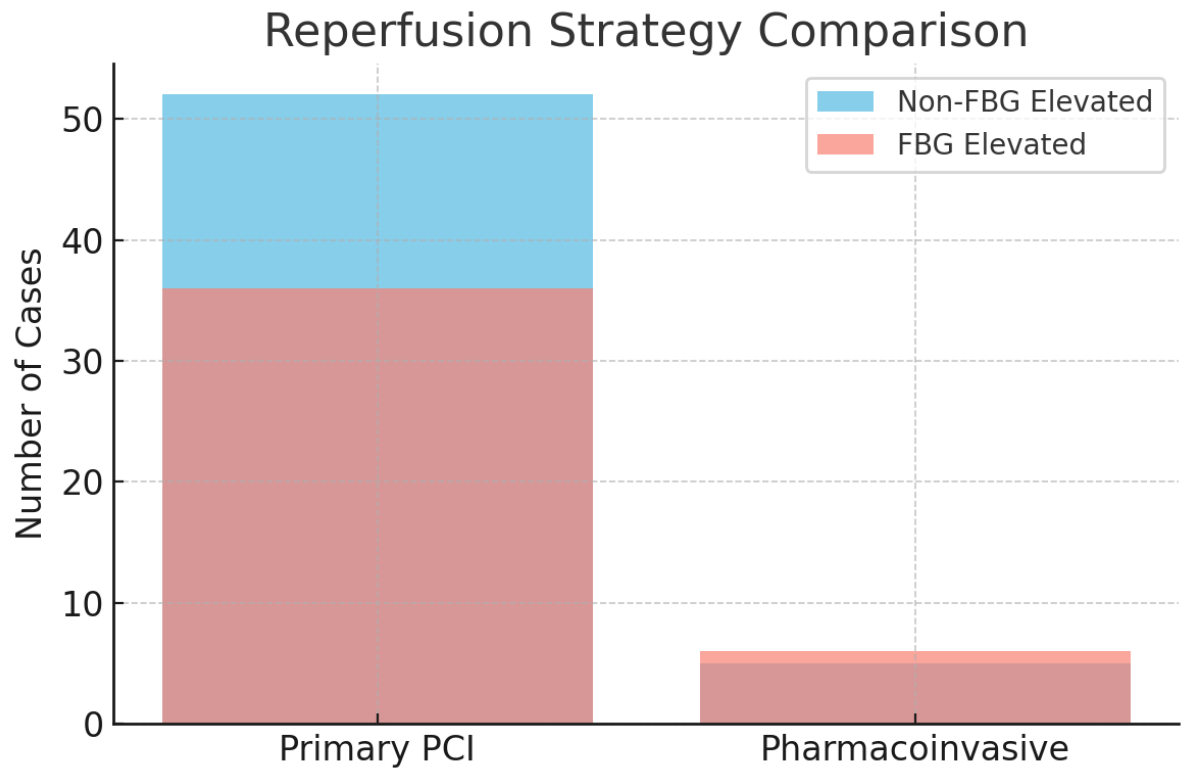
Outcome	Non-FBG Elevated (<126) (n = 57)	FBG Elevated (>126) (n = 43)	P-Value
MACE	2 (3.5%)	19 (44.2%)	<0.001*
In-Hospital Death	0 (0.0%)	5 (11.6%)	0.013*
In-Hospital Reinfarction	1 (1.8%)	6 (14.0%)	0.040*
In-Hospital CHF	1 (1.8%)	12 (27.9%)	<0.001*
Cardiogenic Shock	0 (0.0%)	7 (16.3%)	0.002*
New Arrhythmias	2 (3.5%)	9 (20.9%)	0.001*
CIN (Contrast Induced Nephropathy)	0 (0.0%)	12 (27.9%)	<0.001*
New Requirement for Dialysis	0 (0.0%)	6 (14.0%)	0.005*

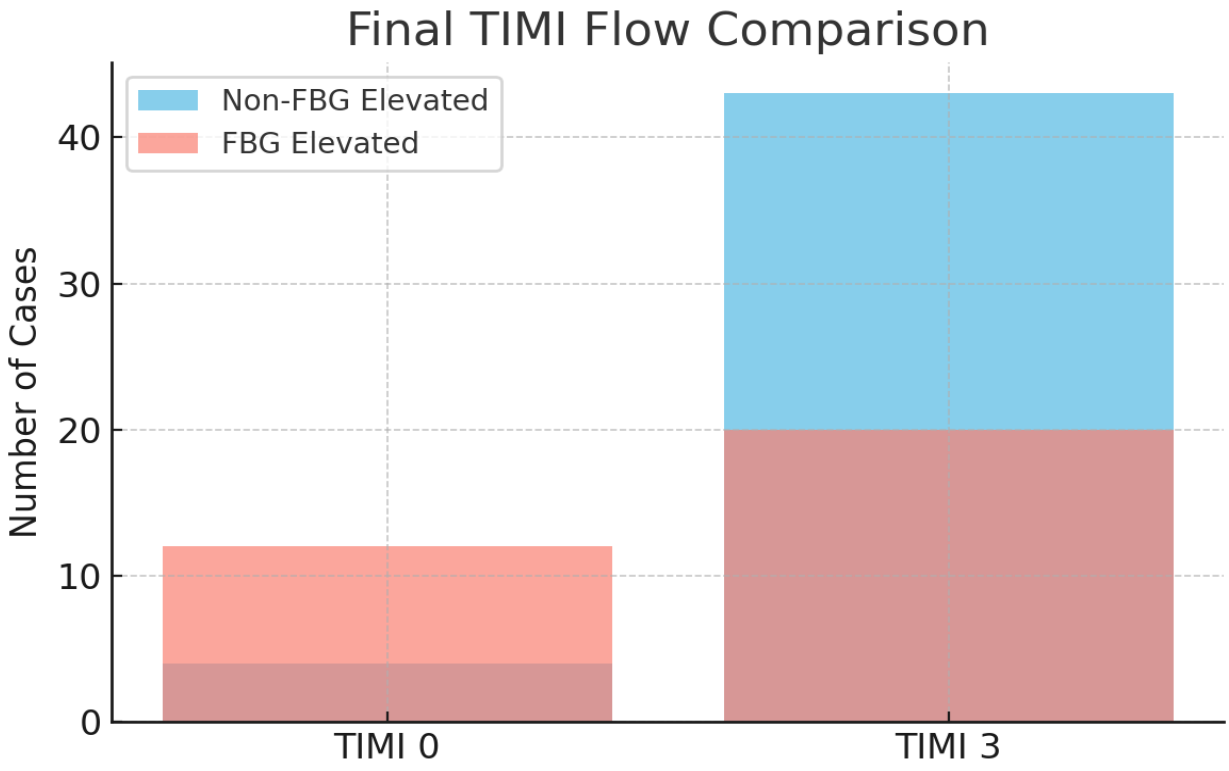

Distribution of Random Blood Glucose (RBG)
Number of Cases
0
10
20
30
40
50
60
70
Non-Hyperglycemia (<200)
Hyperglycemia (>200)
RBG Groups


Distribution of Fasting Blood Glucose (FBG)
Number of Cases
0
10
20
30
40
50
Non-FBG Elevated (<126)
FBG Elevated (>126)
FBG Groups


Comparison of In-Hospital Clinical Outcomes
Non-FBG Elevated
FBG Elevated
Percentage (%)
0
10
20
30
40
MACE
In-Hospital Death
In-Hospital Reinfarction
In-Hospital CHF
Cardiogenic Shock
New Arrhythmias
CIN
New Requirement for Dialysis


Comparison of Gensini Score (Severity of CAD)
Mean Gensini Score
0
20
40
60
80
100
Non-FBG Elevated (<126)
FBG Elevated (>126)
FBG Groups





Discussion

Diabetes mellitus (DM) is a well-established independent risk factor for coronary artery disease (CAD), significantly increasing the risk of mortality from cardiovascular disease (CVD). Diabetic

patients face a 2-3-fold higher risk of CVD and mortality compared to non-diabetic individuals [17]. Moreover, acute hypometabolic disturbances, particularly hyperglycemia, significantly influence outcomes in acute myocardial infarction (AMI). Numerous studies have shown that patients with diabetes or hyperglycemia at admission for acute coronary syndrome (ACS) experience adverse outcomes such as congestive heart failure, cardiogenic shock, ventricular arrhythmias, and death [4]. High admission plasma glucose (APG) levels are indicative of a poor prognosis, which is consistent with the findings of previous studies suggesting that hyperglycemia contributes to worsened disease progression in both diabetic and non-diabetic ACS patients [12, 18]. In our study, we focused on evaluating the impact of random blood glucose (RBG) and fasting blood glucose (FBG) on the severity of coronary artery disease (CAD) using the Gensini score. We analyzed the clinical outcomes in patients with ST-elevation myocardial infarction (STEMI). We found significant differences between the hyperglycemic and non-hyperglycemic groups in terms of baseline characteristics. Patients in both the hyperglycemic and FBG elevated groups had a higher incidence of hypertension, diabetes, previous myocardial infarction (MI), cerebral infarction, chronic kidney disease (CKD), dyslipidemia, and smoking. This finding aligns with the work by J.R. Timmer et al. [19] and Ana T. Timóteo et al. [20], who noted that patients with multiple metabolic risk factors are more likely to experience severe hypometabolic alterations in the setting of acute coronary syndrome (ACS). These findings confirm the well-established relationship between hyperglycemia and adverse clinical outcomes, especially in patients already at risk due to multiple underlying comorbidities. Our study further showed that patients in the hyperglycemic and FBG elevated groups presented later, with a mean delay in time from symptom onset to first medical contact (FMC). This delay is particularly concerning because diabetic patients, who made up the majority of the hyperglycemic and FBG elevated groups, often experience silent myocardial ischemia (SMI), which means they may not exhibit the typical warning symptoms of chest pain [21, 22]. The absence of classical symptoms of AMI, such as chest pain, leads to delayed hospital presentation and worsens outcomes. This phenomenon is well-documented, with studies such as NRMI 2 [23], Arenja et al. [24], and Culić et al. [25] demonstrating that diabetes is a significant predictor of non-pain symptoms during acute myocardial infarction (AMI). In addition to the delay in presentation, our study found that patients in the hyperglycemic and fasting blood glucose (FBG) elevated groups exhibited worse clinical features upon presentation. For instance, 14.3% of hyperglycemic patients were in Killip class IV, compared to only 1.4% of non-hyperglycemic patients ($p < 0.001$). Similarly, 11.6% of patients in the FBG elevated group were in Killip class IV, whereas none in the non-elevated FBG group presented with this severe class ($p < 0.001$). These observations suggest that delayed presentation and the presence of adverse clinical features are significant predictors of poor prognosis in hyperglycemic STEMI patients. These findings align with the work of Ana T. Timóteo et al. [20], who also observed delayed presentation in hyperglycemic patients, resulting in delayed treatment and poorer outcomes. In our analysis, we also noted that both the hyperglycemic group (Mean Gensini Score 102.25 ± 34.71 vs. 61.26 ± 24.12 in the non-hyperglycemic group, $p < 0.001$) and the FBG elevated group (Mean Gensini Score 95.88 ± 33.79 vs. 55.28 ± 18.59 in the non-FBG elevated group, $p < 0.001$) had more severe, extensive, and diffuse coronary artery lesions. This finding is consistent with previous studies, such as those by Ana T. Timóteo et al. [20] and Peng Wei et al. [26], which have demonstrated that elevated blood glucose levels correlate with a higher incidence of multivessel disease and more severe coronary lesions. Moreover, our findings support the concept of a "glycemic continuum," suggesting that elevated glucose levels, even in non-diabetic patients, can contribute to the severity of coronary artery disease (CAD). The "glycemic continuum" hypothesis also aligns with earlier research that suggests early dysglycemia, even in patients with reduced glucose tolerance, initiates the pathological processes leading to atherosclerosis and vascular complications [27]. Our study also found that major adverse cardiac events (MACE) occurred more frequently in patients with hyperglycemia, with 39.3% of the hyperglycemic group experiencing MACE compared to 13.9% in the non-hyperglycemic group ($p = 0.005$). Furthermore, all in-hospital deaths occurred in the hyperglycemic group (17.9%, $p < 0.001$). These findings further reinforce the relationship between higher admission blood glucose

levels and mortality in AMI cases. Previous studies have shown that for every 1 gram per liter increase in glucose level, there is a 1.7-fold increase in the likelihood of death during follow-up in cases of acute infarction, emphasizing the strong connection between admission blood glucose levels and mortality in acute myocardial infarction (AMI) [28]. Additionally, our study supported the predictive value of hyperglycemia at admission, suggesting that it is just as good, if not a better, predictor of death or reinfarction compared to the presence of diabetes itself [29]. Our findings are consistent with the IABP-SHOCK II study [30], which found that hyperglycemia at admission (≥11.5 mmol/L) was an independent predictor of 30-day and 1-year mortality in AMI patients with cardiogenic shock (47.7% vs. 36.5%, $p = 0.004$). Furthermore, studies such as those by Otten et al. [31] and Suleiman et al. [32] reported that elevated fasting glucose was a significant predictor of adverse events and mortality in both diabetic and non-diabetic AMI patients. The exact mechanism by which glycemia contributes to increased mortality in AMI remains unclear, but it is likely linked to the body's stress response. During ACS, stress hormones like glucagon, cortisol, and catecholamines are released, which further exacerbates myocardial damage. This finding is consistent with our results, where both hyperglycemic and FBG-elevated groups had larger infarct sizes and more impaired systolic function. Our results align with studies such as that by Ignacio Cruz-Gonzalez et al. [33], who demonstrated a larger infarct size in the hyperglycemic group. Moreover, our study demonstrated that hyperglycemia hurt reperfusion outcomes. The final TIMI flow was significantly worse in the hyperglycemic group, with only 14.3% achieving TIMI 3 flow compared to 81.9% in the non-hyperglycemic group ($p < 0.001$). Similarly, in the FBG-elevated group, 46.4% achieved TIMI 3 flow, compared to 75.4% in the non-elevated FBG group ($p < 0.001$). These results support previous studies, including work by Surya Dharma et al. [34], which found that hyperglycemia at presentation is associated with worse TIMI flow post-reperfusion. Finally, our study observed a higher incidence of in-hospital reinfarction in the hyperglycemic (17.9% vs. 2.85%, $p = 0.017$) and fasting blood glucose (FBG) elevated groups (14.0% vs. 1.8%, $p = 0.040$). The occurrence of cardiogenic shock and congestive heart failure was also more frequent in these groups, a finding consistent with earlier research on hyperglycemia in ACS [36]. The CardShock study [36] found that severe hyperglycemia is a unique predictor of in-hospital death in both ACS and non-ACS cases, with the highest mortality rates observed in patients with hyperglycemia.

Conclusions

Our study highlights the important role of both random blood glucose (RBG) and fasting blood glucose (FBG) in predicting the severity of coronary artery disease and clinical outcomes in STEMI patients. The findings emphasize the importance of monitoring glucose levels at admission to identify high-risk individuals, enabling more effective clinical management and stratification for timely interventions. Effective glucose control in STEMI patients, particularly those with hyperglycemia, may improve outcomes and reduce adverse events such as reinfarction, death, and cardiogenic shock.

Approval:

The study was approved by the Institutional Review Board (IRB) at Army Cardiac Hospital / CMH Lahore. Written informed consent was obtained from all participants.

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No funding was received for this study.

Conflicts of Interest:

The authors declare that there are no conflicts of interest regarding the publication of this study.

Future Study:
Future studies could focus on a larger sample size and investigate the long-term effects of elevated blood glucose levels on the severity of coronary artery disease and clinical outcomes in patients with ST-segment elevation myocardial infarction (STEMI). A multi-center approach could provide broader insights into these findings.

Research Limitations:
The limitations of this study include its single-center design and relatively small sample size. Additionally, the observational nature of the study does not allow for definitive cause-and-effect conclusions. Further research with a larger cohort and prospective data collection is needed to validate these findings.

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Data Collection Form

IMPACT OF ELEVATED BLOOD GLUCOSE ON *CORONARY ARTERY DISEASE SEVERITY* AND OUTCOMES IN *ST-ELEVATION MYOCARDIAL INFARCTION* PATIENTS

Section 1: Participant Information

- **Participant ID:** _____
- **Age:** _____
- **Height (in cm):** _____

- **Weight (in kg):** _____
- **BMI (Body Mass Index):** _____
- **Residence:**
  - Urban
  - Rural

Section 2: Medical History and Comorbidities

- **Has the participant been diagnosed with any of the following conditions?**
- (Check all that apply)
  - Hypertension
  - Diabetes Mellitus
  - Dyslipidemia
  - Previous Myocardial Infarction (MI)
  - Family History of Coronary Artery Disease (CAD)
  - Atrial Fibrillation
  - Chronic Kidney Disease
  - Other: _____
- **Smoking Status:**
  - Smoker
  - Non-Smoker
  - Ex-Smoker (Duration: _____ years)

Section 3: Laboratory Test Results

1. **Fasting Blood Glucose (mg/dL):** _____
2. **Hemoglobin A1c (%):** _____
3. **Serum Creatinine (mg/dL):** _____
4. **Vitamin D Level (ng/mL):**
   - Deficiency (<10 ng/mL)
   - Insufficiency (10–30 ng/mL)
   - Sufficient (31–100 ng/mL)
5. **Lipid Profile:**
   - **Total Cholesterol (mg/dL):** _____
   - **Triglycerides (mg/dL):** _____
   - **HDL Cholesterol (mg/dL):** _____
   - **LDL Cholesterol (mg/dL):** _____

Section 4: Cardiovascular Health

- **Blood Pressure:**
  - **Systolic Blood Pressure (mmHg):** _____
  - **Diastolic Blood Pressure (mmHg):** _____
- **12-Lead ECG Findings:**
  - Normal
  - Ischemic Changes
  - Abnormal Rhythm
  - Other: _____
- **Transthoracic Echocardiography (Ejection Fraction):**
  - **Left Ventricular Ejection Fraction (%):** _____
- **Coronary Angiography Findings:**
  - **Left Main Disease:**
    - Present
    - Absent

- **Coronary Artery Involvement:**
  - Left Anterior Descending (LAD)
  - Right Coronary Artery (RCA)
  - Left Circumflex Artery (LCX)
- **SYNTAX Score:** _____ (Calculated during angiography)

Section 5: Medications

- **Is the patient currently on any of the following medications?**
- (Check all that apply)
  - Aspirin
  - Statins
  - Beta-blockers
  - Antihypertensives
  - Insulin
  - Oral Hypoglycemic Agents (OHA)
  - Other: _____

Section 6: Clinical Outcome and Follow-Up

- **Clinical Outcome after Treatment (to be completed during follow-up):**
  - Improved
  - No Change
  - Worsened
- **Follow-up Duration:**
  - 1 Month
  - 3 Months
  - 6 Months

Section 7: Informed Consent

- **Informed Consent Obtained:**
  - Yes
  - No

Signature of Participant: _____
Date: _____