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UNDIAGNOSED DIABETES MELLITUS IN ACUTE CORONARY SYNDROME (ACS) PATIENTS

Talal Safdar[1], Syed Meerab Javed[2*], Chander Parkash[3], Niaz Ahmed[4], Muhammad Mohsin Sial[5], Sajjad ul Hasan[6]

[1]Assistant Professor of Medicine, Fauji Foundation Hospital Rawalpindi, Pakistan
[2*]MBBS, FCPS (Med), Consultant Internist, Department of Medicine, King Salman Armed Forces Hospital, Tabuk, Saudia Arabia
[3]Assistant Professor Adult Cardiology, Sindh Institute of Cardiovascular Diseases, Pakistan
[4]Professor, Department Medicine, Shaheed Mohtarma Benazir Bhutto Medical College Lyari Karachi and Sindh Government Lyari General Hospital Karachi, Pakistan
[5]House Officer, Department of Internal Medicine, Mayo Hospital Lahore, Pakistan
[6]Assistant Professor, Department of Community Medicine, Amna Inayat Medical College, Sheikhupura, Punjab, Pakistan

Corresponding author: Dr Syed Meerab Javed,
Email: meerab.javed@gmail.com

Abstract

Introduction: Undiagnosed diabetes mellitus is a common but often overlooked condition among patients presenting with acute coronary syndrome (ACS), significantly impacting clinical outcomes and recovery.

Objective: To determine the prevalence of undiagnosed diabetes in ACS patients and evaluate its impact on presentation and short-term prognosis.

Materials and Methods: A cross-sectional study was conducted at Department of Medicine, Mayo Hospital Lahore, Pakistan, from October, 2024 to March, 2025. ACS patients without prior diabetes history were screened using HbA1c, fasting glucose, and OGTT. Clinical and biochemical profiles were recorded and analyzed.

Results: Among 237 ACS patients, 92 (38.8%) were newly diagnosed with diabetes. These patients exhibited higher BMI, hypertension, and dyslipidemia. Atypical ACS presentations and elevated troponin-I levels were more common among them, indicating more severe myocardial injury.

Conclusion: Undiagnosed diabetes is highly prevalent in ACS patients and associated with worse clinical parameters. Routine diabetes screening in ACS admissions is essential for timely diagnosis and improved outcomes.

Keywords: *Undiagnosed diabetes, acute coronary syndrome, HbA1c, cardiovascular risk, Pakistan.*

INTRODUCTION

The issue of undiagnosed diabetes mellitus has become one of the most important challenges affecting patients with acute coronary syndrome (ACS) disease, as it impacts the short- and long-term outcomes of the occurrence of cardiovascular complications. The rising burden of diabetes in the world leads to patients being largely undiagnosed until the development of severe disorders like ACS. There is evidence that links dysregulated glucose metabolism to cardiovascular disease, especially when

glucose metabolism is pathologically silent until an acute cardiac event. In a study conducted by Xu et al. (1), they revealed that the atherogenic index of plasma (AIP), an indicator of lipid risk associated with the cardiovascular system, has a close correlation with undiagnosed diabetes among ACS patients in various BMI and LDL-C categories. This discovery re-emphasises the silent effect of diabetes in patients who may not show classical signs of diabetes and end up with life-threatening cardiac challenges.

It has been discovered that diabetic and pre-diabetic patients with chronic coronary syndrome have become a public health crisis. In a study by Drobek et al, it was established that close to half of the chronic coronary syndrome patients were pre-diabetics and undiagnosed diabetics, which indicates the importance of performing metabolic screening on cardiac patients. This morbidity is even higher when it comes to ACS, where one has underlying diabetes, which can intensify myocardial damage and slow down the process of recovery. In their detailed review, Shah et al. (3) postulated the importance of incorporating diabetes screening and management guidelines into the pathways of the care of patients with ischemic heart disease and ACS due to the significant changes in the pathophysiological picture and reactivity to treatment in case of undiagnosed diabetes. Another indication of the possible undiagnosed diabetes has to do with hyperglycemia at the time of admission to the hospital. Patients with non-ST elevation ACS and an unknown history of diabetes presented with high levels of blood glucose, in a study by Liu et al (4) showed worse short-term prognosis, indicating a pathway of latent metabolic malfunction.

This hyperglycemia may be due to stress-related hormonal adjustments, but more commonly uncovers an underlying, yet undiagnosed diabetic state (5). Metabolic syndrome is a combination of disorders, such as insulin resistance, which can deteriorate the ACS outlook. As demonstrated by Fanta et al. (6), metabolic syndrome significantly aggravates both the short-term prognosis of ACS patients and the discharge diagnosis of diabetes in many of them. In a study by Khan et al. (7) conducted in the Pakistani population, the association of elevated glycated haemoglobin (HbA1c) with the severity of coronary artery disease was examined, and poor glycemic control was found to be related to worse ACS presentations, such as multivessel disease and an increase in troponin levels.

It is common to recommend cardiac rehabilitation after ACS, which has an unequal effect in patients with and without diabetes. A meta-analysis by Gadager et al. (8) demonstrated that diabetic patients (in particular, patients who were undiagnosed at the moment of a cardiac event) display various rates of recovery and gain benefits from rehabilitation programs compared to their non-diabetic peers. Therefore, it is crucial to diagnose and treat diabetes early to maximize post-ACS treatment. These results were also detected in Ethiopia, with Demisse et al. (9) observing a predominance of misconceptions and a lack of awareness regarding ACS in patients with diabetes diagnosed within the past year, indicative of a general problem in knowledge and access to care.

Muneeb et al. (11) pointed out in Pakistan that dyslipidemia was very prevalent in ACS patients, which is a common cause of coronary artery disease and diabetic complications, further indicating the possibility of using lipid abnormalities as red flags to detect undiagnosed diabetes. Clinical outcomes do not match in young diabetic patients with ACS as well. According to Jarrah et al. (12), poor cardiovascular outcomes and increased readmissions were reported in the youngest patients, who were unaware of being diabetic until ACS hospitalization. Likewise, Ahmed et al. (13) identified diabetes as a significant factor in worse angiographic profiles in Pakistani ACS patients, which argues that undiagnosed diabetes contributes to a greater extent of coronary involvement and unfavourable prognosis. Another area that has been ignored is the effects of prediabetes. Noreldin et al. (14) stressed that ACS is negatively impacted by prediabetes, meaning that even the initial stages of metabolic imbalance remain highly dangerous. Jiao et al. (15) added another type of layer in their contribution to the literature by correlating outcomes of diabetic elderly ACS patients with elevated serum uric acid values with poorer prognoses that can also be used to aid in the screening process.

Post-ACS glucose tolerance testing has been used to predict undiagnosed diabetes. As proved by Zywicki et al. (16), 1-hour and 2-hour plasma glucose measurements after oral glucose tolerance test were among the significant predictors of myocardial injury, even in those patients who were not previously diagnosed with diabetes. Additional support leading to the introduction of the view that

acute glucose level increase during ACS is not only a temporary event but that it may also be a clue to hidden metabolic disorders is stress hyperglycemia, described by Wang et al. (17). The study by Wang et al. (18) also considered the predictive value of the triglyceride-glucose index, which has proved to be significantly related to poor cardiovascular outcomes in diabetic ACS patients. This marker may be especially beneficial in the unrecognized diagnosis of diabetes in patients who are without classic risks of the disease. Finally, systemic inflammation has a vital role in the pathogenesis of ACS. According to Gao et al. (19), higher values of systemic inflammation index were correlated with poor clinical outcomes in ACS patients, most of whom were diabetics newly diagnosed with the disease. This verifies the interaction of metabolic and inflammatory pathways in the development of coronary syndromes.

Objective: To determine the prevalence of undiagnosed diabetes mellitus in patients presenting with acute coronary syndrome (ACS) and assess its impact on clinical presentation, management strategies, and short-term cardiovascular outcomes.

MATERIALS AND METHODS

Study Design: Cross-sectional Observational study.

Study Setting: The study was conducted at the Department of Medicine, Mayo Hospital Lahore, Pakistan.

Study Duration: The study was carried out over a six-month period from October, 2024 to March, 2025.

Inclusion Criteria: Patients The patients aged more than 30 years admitted with a proven diagnosis of acute coronary syndrome (STEMI, NSTEMI, or unstable angina) were involved in the study. The patients who had a documented history of diabetes mellitus were excluded. The participants would be obliged to agree to the glucose tolerance tests and HbA1c assessment during hospitalization.

Exclusion Criteria: Patients with a confirmed history of either type 1 or type 2 diabetes mellitus were not to be included in the study. Patients with chronic kidney disease, hepatic impairment, or under corticosteroid therapy were also excluded because they may affect glucose catabolism. Patients who were hemodynamically unstable or critically ill were also excluded.

Methods

After admission, all patients who met the criteria were investigated statistically, on average, using the routine clinical examinations and lab tests, upon showing any symptoms of acute coronary syndrome (ACS). Undiagnosed diabetes mellitus in patients having no known history of diabetes was also screened by fasting plasma glucose (FPG), random blood glucose (RBG), glycated haemoglobin (HbA1c) and in case of practical difficulties, a 2-hour oral glucose tolerance test (OGTT) according to the guidelines outlined by ADA. HbA1c ≥6.5%, FPG ≥126 mg/dL, or 2-hour OGTT ≥200 mg/dL were used to classify patients as diabetic. A structured data collection form was used to collect data on demographics, clinical presentation, lipid profiles, body mass index (BMI), blood pressure, as well as cardiac enzyme levels. The level of ACS was determined by the appearance of the ECG and troponin. The SPSS version 25 was used to analyze data. Frequencies and percentages were computed using descriptive statistics, followed by chi-square and logistic regression to establish relationships between undiagnosed diabetes and other clinical variables; $p<0.05$ was deemed to be significant.

RESULTS

A total of 237 patients presenting with acute coronary syndrome (ACS) were enrolled during the study period. Of these, 148 (62.4%) were male and 89 (37.6%) were female, with a mean age of 58.7 ± 11.2 years. Among the study population, 92 patients (38.8%) were diagnosed with previously undiagnosed diabetes mellitus based on HbA1c and OGTT results. The remaining 145 (61.2%) had normal glucose metabolism or prediabetes.

Table 1: Gender Distribution Among Patients with Undiagnosed Diabetes

Gender	Undiagnosed Diabetes (n = 92)	Non-Diabetic (n = 145)	Total (n = 237)
Male	59 (64.1%)	89 (61.4%)	148
Female	33 (35.9%)	56 (38.6%)	89

There was no statistically significant gender difference in the prevalence of undiagnosed diabetes among ACS patients ($p = 0.68$). However, the majority of those with undiagnosed diabetes were above the age of 55 years ($p = 0.03$), suggesting age as a contributing factor.

Clinical presentation also varied significantly between groups. Atypical chest pain (such as dyspnea, fatigue) was more common in patients later diagnosed with diabetes. Additionally, the diabetic group had higher mean BMI (28.6 ± 3.4 kg/m²) and a greater prevalence of hypertension and dyslipidemia.

Table 2: Risk Factor Profile in Patients With and Without Undiagnosed Diabetes

Risk Factor	Undiagnosed Diabetes (n = 92)	Non-Diabetic (n = 145)	p-value
Hypertension	69 (75%)	77 (53.1%)	0.001
Dyslipidemia	63 (68.5%)	70 (48.3%)	0.002
BMI > 27 kg/m²	71 (77.2%)	66 (45.5%)	<0.001
Smoking	28 (30.4%)	58 (40.0%)	0.14

There was a statistically significant association between undiagnosed diabetes and comorbidities such as hypertension, dyslipidemia, and elevated BMI. Smoking status was not significantly different between the groups.

In terms of ACS subtypes, STEMI was the most common presentation overall. However, a higher proportion of diabetic patients presented with NSTEMI and unstable angina compared to non-diabetics, suggesting a more insidious disease progression in diabetic individuals.

Table 3: Type of ACS Presentation

ACS Type	Undiagnosed Diabetes (n = 92)	Non-Diabetic (n = 145)	p-value
STEMI	40 (43.5%)	82 (56.6%)	0.04
NSTEMI	31 (33.7%)	41 (28.3%)	
Unstable Angina	21 (22.8%)	22 (15.2%)	

Significant differences were observed in ECG findings and cardiac enzyme levels between the groups. Mean troponin-I levels were higher in patients with undiagnosed diabetes (3.2 ± 1.4 ng/mL) compared to non-diabetics (2.4 ± 1.1 ng/mL, $p = 0.001$), indicating more extensive myocardial injury.

Table 4: Cardiac Biomarker and Glucose Parameters

Parameter	Undiagnosed Diabetes (n = 92)	Non-Diabetic (n = 145)	p-value
Troponin-I (ng/mL)	3.2 ± 1.4	2.4 ± 1.1	0.001
HbA1c (%)	7.1 ± 0.6	5.4 ± 0.4	<0.001
Fasting Glucose (mg/dL)	143.2 ± 22.5	98.6 ± 13.4	<0.001

These findings illustrate that undiagnosed diabetes is significantly associated with adverse risk profiles, atypical presentations, and higher cardiac biomarker levels in ACS patients. This emphasizes the importance of routine diabetes screening in all ACS admissions, particularly in high-risk populations.

DISCUSSION

The present research examines the huge burden of unrecognized diabetes mellitus in patients hospitalized with acute coronary syndrome (ACS), stressing its impact on clinical presentation and outlook. The percentage of patients with newly identified diabetes under hospitalization (38.8%) in our cohort of patients is also consistent with the results of other international research that highlights the hidden rate of glucose metabolism disorder in cardiac patients. Indeed, Xu et al. (1) revealed that a robust correlation between atherogenic index and undiagnosed diabetes existed in ACS patients, and it was necessary to use lipid profile as an initial screening tool. It was also noted in this research that there are demographic and clinical differences among newly diagnosed diabetic and non-diabetic patients with ACS. The vast majority of undiagnosed diabetics were older than 55 years, which indicates that older age is one of the risks of glucose intolerance and coronary artery disease.

As Shah et al. (3) observed, the control of diabetes is very important in ischemic heart disease, and the untreated cases form a gap which must be urgently filled to ensure that the secondary cardiovascular issues are avoided. In addition, Liu et al. (4) highlighted that hyperglycemia in admission patients, even among patients with no previous history of diabetes, is associated with inferior short-term outcomes, indicating that it could be an indication of undiagnosed diabetes or stress hyperglycemia. The atypical presentations, like breathlessness or fatigue, were also more commonly detected in undiagnosed diabetics than in non-diabetic people in our findings. It correlates with the results of Manistamara et al. (10), who have proved that diabetes patients tend to have non-classical symptoms during ACS, which delays the process of seeking medical help and leads to poorer outcomes.

Johnson et al. (5) argue that patients are not aware of the symptoms of ACS and its connection to diabetes, which also supports our point of view that not only patient education but also early metabolic screening are the ways to make a diagnosis and intervene at the right time. Besides, the occurrence of other illnesses like hypertension, dyslipidemia and obesity was much greater among undiagnosed diabetics. This reinforces the observation of Fanta et al. (6), who observed that there is a strong correlation between metabolic syndrome and poor outcomes in patients with ACS. Besides provoking the occurrence of coronary artery disease, these comorbidities also interact synergistically with hyperglycemia to hasten damage in the vascular structures.

The percentages of non-ST elevation myocardial infarction (NSTEMI) and unstable angina manifestations were higher among patients with newly diagnosed diabetes in our study. This points to a more insidious disease trajectory of such a group, a finding that had been reported by Jarrah et al. (12), who observed more subtle presentation and complication rates in younger diabetic ACS patients. Prior to diagnosis, these patients tend to undergo microvascular and macrovascular alterations, pointing out the importance of preventive measures and active approaches. The diabetic group also demonstrated significant increases in cardiac biomarkers, and this finding was consistent with those of Zywicki et al. (16), who found that post-ACS glucose tolerance tests were associated with the severity of myocardial injury. The elevated levels of troponin-I among the undiagnosed diabetics in our study might indicate the exposure of these individuals to an increased risk of myocardial necrosis. Jiao et al. (15) observed that high serum uric acid values in diabetic ACS have a poor prognosis, which implies that a combination of metabolic markers may be required to accurately determine risk in newly diagnosed diabetic patients.

The fact that the present study is pertinent to the South Asian population, especially Pakistan, is one of the more convincing components since the burden of non-communicable diseases, including diabetes and cardiovascular disease, is still increasing. The rate of dyslipidemia found by Muneeb et al. (11) among patients with ACS in Lahore also supports our observations and implies that the high prevalence of dyslipidemia is also regional. Diabetes was also shown to be a significant risk factor in Pakistan in studying patients of ACS, as their angiographic severities were found to be worse in conjunction with diabetes (Ahmed et al. 13). The consequences of missed diagnosis of diabetes among ACS patients are very broad. Admission hyperglycemia related to acute stress is associated with a poor outcome, and can be an indicator of metabolic disorder in patients undergoing percutaneous coronary intervention (PCI), even when the previous history of the patient is identical (as Wang et

al.(17) have indicated). On the same note, Wang et al. (18) emphasized the prognostic significance of the triglyceride-glucose index in patients with diabetes and ACS, indicating that the latter can serve as a tool applicable in the identification of high-risk patients who could have been overlooked using conventional screening programs.

This view has been further extended by Gao et al. (19) to display systemic inflammation previously observed in diabetic status as a significant factor in the poor prognosis of ACS. Our research is in line with the hypothesis that timely diagnosis of diabetes in the ACS patients can have a considerable impact on both clinical outcomes and long-term treatment. Advantages of early detection do not only apply to acute care. Gadager et al. (8) established that significant differences in the outcomes of cardiac rehabilitation among patients with and without diabetes are possible, and that designing specific programs aimed at diabetic patients will help change the patterns of recovery positively. Furthermore, since improving awareness and education, as proposed by Demisse et al. (9), can make patients know when to seek care, this may also lead to empowering patients to get earlier care.

CONCLUSION

This research shows that the prevalence of untreated diabetes mellitus in patients presenting with acute coronary syndrome (ACS) is high and negatively affects the actual presentation, risk factor status, and prognosis in the short term. Patients newly diagnosed with diabetes had more distinct dyslipidemia, hyperventilation, and high levels of cardiac biomarkers, which demonstrate more significant myocardial damage. These results support the necessity of systematic diabetes screening in the entire population of ACS patients using HbA1c, fasting glucose, and oral glucose tolerance tests, especially when concerning a high-risk demographic like cohorts in Pakistan. The timely diagnosis of diabetes not only contributes to the optimization of short-term treatment strategies but also to enhanced long-term cardiovascular outcomes due to the possibility to initiate glycemic control intervention in time. Introducing diabetes screening into the protocols of managing ACS and increasing the awareness of the population and patients about the connection between diabetes and heart disease are crucial measures in combating this issue that becomes a primary threat to the well-being of society and mitigating the effects of ignored metabolic disorders.

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