



“UNDIAGNOSED DIABETES MELLITUS IN ACUTE CORONARY SYNDROME (ACS) PATIENTS”

Dr Obaidullah¹, Dr Mahwash Mengal^{2*}, Dr Abdul Jabbar³, Dr Asma Shaheer⁴, Dr Muhammad Farid⁵, Momin Khan⁶

¹Senior Registrar, Department of Medicine, Timergara Teaching Hospital Dir Lower

^{2*}Assistant Professor, Department of Physiology, Bolan Medical College Quetta, Balochistan

³Professor, Medicine Department, Saidu Group of Teaching Hospital Swat, KPK

⁴FCPS Postgraduate Resident, General Medicine, Jinnah Postgraduate Medical Center Karachi

⁵Assistant Professor, Family Medicine, CMH Lahore

⁶Associate Professor, Medicine Department, Saidu Group of Teaching Hospital Swat, KPK

***Corresponding author:** Dr Mahwash Mengal,

Assistant Professor, Department of Physiology, Bolan Medical College Quetta, Balochistan

Email: drmahwashmengal@gmail.com

ABSTRACT

Background: Acute coronary syndrome (ACS) continues to be the principal cause of sickness and death all over the world. It has been firmly established that diabetes mellitus increases the risk of coronary artery disease, a large number of patients are always unidentified at the time they have an acute cardiac event. Unrecognized diabetes can negatively affect the seriousness, therapeutic approach, and outcome of ACS, especially in regions where healthcare facilities and metabolic screening are scarce.

Objective: Determining how often undiagnosed diabetes mellitus occurs among patients presenting with acute coronary syndrome and assessing the association of this condition with clinical and metabolic characteristics at admission.

Methods: This cross-sectional study at the hospital was carried out over a six-month period from April, 2025 to September, 2025 at the Saidu Group of Teaching Hospital Swat. Participating in the research were 180 patients who were diagnosed with ACS and had no previous history of diabetes. Each patient's demographic and clinical details were noted. On the day of admission and within the first 24 hours, fasting plasma glucose and glycated hemoglobin (HbA1c) levels were determined. The presence of undiagnosed diabetes was indicated by the fulfillment of the standard diagnostic criteria. Researchers used both descriptive and inferential statistics to analyze the data.

Results: Among the 180 patients with acute coronary syndrome, 62 (34.4%) were first-time diagnosed with diabetes mellitus, and 46 (25.6%) had prediabetes. The majority of acute coronary syndrome cases presented with ST-elevation myocardial infarction, especially in those patients who were not aware of their diabetes condition. Patients with newly identified diabetes showed a much higher occurrence of both hypertension and dyslipidemia as compared to the normoglycemic group.

Conclusion: The majority of ACS patients were found to have undiagnosed diabetes mellitus. It is important to perform a routine glycemic screening once ACS patients are presented for an early diagnosis, and the implementation of effective secondary prevention strategies to improve cardiovascular outcomes.

Keywords: Acute Coronary Syndrome; Undiagnosed Diabetes Mellitus; Prediabetes; Cardiovascular Risk Factors; Glycemic Screening

INTRODUCTION

Acute coronary syndrome (ACS) is a range of extremely dangerous clinical states that develop due to acute myocardial ischemia and are always significant causes of sickness and death all over the world. The problem of ACS in low- and middle-income countries is made worse by the widespread presence of unknown cardiometabolic risk factors, especially diabetes mellitus. More and more cases of undiscovered diabetes are being reported at the time of hospital admission for ACS, which means that a large number of patients have an acute cardiac event with prolonged hyperglycemia but without a prior diagnosis. Studies from South Asian populations show that undiagnosed diabetes among ACS patients is quite frequent and it is associated with adverse in-hospital outcomes as well as delayed risk stratification (1). Reversible ischemic cardiomyopathy with severe reduction of left ventricular ejection fraction (LVEF) is a frequent challenging presentation of CAD in daily clinical practice. A new 3-month protocol with the removable subcutaneous implantable cardioverter-defibrillator in ischemic cardiomyopathy (PROTECT-ICD) is a prospective, multicenter study aiming to investigate the clinical outcomes and LVEF improvement after optimal medical therapy and revascularization in patients with ischemic cardiomyopathy and severely reduced ejection fraction, who have been implanted with a wearable cardioverter defibrillator (WCD) (2).

Matching results in chronic coronary syndromes show that silent dysglycemia continues to be a major public health issue with respect to cardiovascular prognosis and long-term disease control (2). Moreover, lifestyle-related metabolic perturbations, including dietary factors affecting glycemic control in coronary heart disease patients, explain the complicated interaction between nutrition, diabetes, and coronary pathology (3). The link between diabetes and coronary artery disease (CAD) is very well known, and the problem becomes huge if the presence of diabetes is not known until the patient suffers a first-time acute coronary event. Therefore, if diabetes is left undiagnosed, treatment with glucose-lowering drugs is delayed, and the patient is deprived of the early, comprehensive secondary preventive measures (including lifestyle changes and pharmacotherapy) that can reduce the risk of a new/ recurrent cardiovascular episode. Data from studies conducted in South Asia and its vicinity indicate that quite a few middle-aged and older people have undiagnosed cardiometabolic disorders, including diabetes and ischemic heart disease, and more often than not, such conditions are only detected when severe clinical events occur (4).

On the one hand, physiologically, insulin resistance is at the core of the mechanism through which it favors the growth of atherosclerotic plaques, making them more prone to rupture and worsening the prognosis of ACS patients (5). However, the dysfunction of platelets and the accompanying inflammation associated with diabetes further aggravate the process of coronary thrombosis, the patient shows more serious clinical features, and experiences complications during ACS (6). Recent studies implicate metabolic and lipid-related markers as critical factors in risk stratification for diabetes among CAD patients. Lipid abnormalities, high fasting triglyceride to HDL cholesterol, were found to be perfect markers of prediabetes and type 2 diabetes in patients having coronary artery disease (7). Similarly, inflammatory lipid parameters referring to the platelet to HDL cholesterol ratio were shown to have a prognostic value for the long-term survival of CAD patients independent of the diabetes status at baseline (8).

All these results point to the fact that the subclinical metabolic deregulation remains a feature of a typical ACS patient that shows up in the hospital, which increases the probability of finding a previously undiagnosed diabetes. Moreover, coronary patients' diet intervention and nutrition over extended periods were reported to have effects on the metabolic phenotypes, kidney function, and cardiovascular risk, which strengthens the case for metabolic screening in patients presenting with ACS (9). Biomarkers are now increasingly being tested to enhance cardiovascular risk stratification in patients with CAD and diabetes. Soluble suppression of tumorigenesis-2 (sST2) was demonstrated as a predictor of adverse cardiovascular events among CAD patients, with differing prognostic values for those with and without diabetes (10). Similarly, lipoprotein(a) was shown to be linked with

peripheral arterial disease in patients being operated for coronary artery bypass grafting, indicating the presence of systemic atherosclerotic load that may be enhanced by unnoticed diabetes (11). Moreover, the disparities related to ethnicity, socio-economic status, and the accessibility of healthcare facilities pose a challenge to the timely diagnosis of diabetes and cardiovascular disease, especially in the developing regions, contributing to the late detection of diabetes until the occurrence of ACS (12).

Advanced research has revealed that the impairment of cholesterol efflux capacity, kidney issues, and microvascular damage are more common in dysglycemic coronary patients even before diabetes is clinically diagnosed. Peripheral artery disease has been found to be related to reduced cholesterol efflux capacity in coronary heart disease patients with and without diabetes, which points to early metabolic and vascular derangements (13). An elevated urine albumin-to-creatinine ratio has also been found to be a risk factor for cardiovascular death in CAD patients irrespective of their diabetes status, pointing to the existence of overlapping mechanisms of renal and cardiovascular damage in undiagnosed diabetes (14). Either directly or indirectly, metabolites like trimethylamine N-oxide are now regarded as predictors of cardiovascular events in diabetic CAD patients, which further supports metabolic dysregulation as a major player in the adverse outcomes (15).

In a prevention context, diet quality and protein intake have been demonstrated to markedly affect the occurrence of type 2 diabetes in patients with coronary heart disease, which points out that these risk factors are always modifiable and remain unnoticed in undiagnosed subjects (16). Secondary prevention in coronary heart disease has been strongly justified as the most effective way to stop heart-related deaths and incidents at least twice, by early detection and management of diabetes (17). Studies on large-scale data of electronic medical records have discovered in detail that several factors are simultaneously associated with significant adverse cardiovascular events in coronary patients who have type 2 diabetes, showing the prognostic importance of early diabetes detection (18). Collectively, these pieces of evidence mostly support the idea of focusing on the assessment of undiagnosed diabetes in acute coronary syndrome (ACS) patients so as to enhance risk stratification, amplify the benefits of acute management, and secure long-term cardiovascular outcomes.

Objective: To determine how often undiagnosed diabetes mellitus occurs in patients who present with acute coronary syndrome, and to evaluate whether it is related to their clinical and metabolic profiles on admission.

MATERIALS AND METHODS

Study Design: The present investigation was a hospital-based cross-sectional observational study conducted to ascertain the prevalence of undiagnosed diabetes mellitus in patients with acute coronary syndrome.

Study Settings: Saidu Group of Teaching Hospital Swat, KPK.

Duration of Study: April, 2025 to September, 2025.

Sample Size: The study encapsulated 180 patients diagnosed with acute coronary syndrome.

Inclusion Criteria: Patients of either sex aged 30 years and above who were admitted to the hospital with a confirmed diagnosis of acute coronary syndrome, such as ST-segment elevation myocardial infarction, non-ST-segment elevation myocardial infarction, or unstable angina, were recruited. Those patients without a known history of diabetes mellitus who provided consent were included in the study.

Exclusion Criteria: Exclusion criteria were patients with a previous history of diabetes mellitus, those on corticosteroids or drugs affecting glucose metabolism, critically ill patients who could not be biochemically assessed, and patients with chronic kidney or liver diseases.

Methods: After admission, information was gathered by means of a questionnaire to record demographic data, clinical history, and main cardiovascular risk factors. Blood samples were taken within a day of hospitalization, following standard conditions. Fasting plasma glucose and glycated hemoglobin (HbA1c) concentrations were determined by the hospital lab's methods. Diabetes mellitus, previously unknown, was classified according to the American Diabetes Association criteria,

for example, HbA1c $\geq 6.5\%$ and/or fasting plasma glucose ≥ 126 mg/dL in patients not previously diagnosed with diabetes. ACS diagnosis was made by clinical symptoms, changes in the electrocardiogram, and cardiac biomarkers. SPSS software was used for data entry and analysis. Descriptive statistics were performed to calculate frequencies and percentages, while the relationship between glycemic status and clinical variables was tested statistically. Statistical significance was defined at $p < 0.05$.

Results

A total of 180 patients who had been diagnosed with acute coronary syndrome were finally analyzed. The study population consisted of male and female patients, with an average age of 54.8 ± 9.6 years. Most of the patients were males, and there were 118 (65.6%) cases, while 62 (34.4%) were females. Most of the patients were over 45 years of age, which is a typical age pattern of ACS cases in tertiary care hospitals.

Table 1: Baseline Demographic Characteristics of ACS Patients (n = 180)

Variable	Frequency	Percentage (%)
Male	118	65.6
Female	62	34.4
Age ≤ 45 years	48	26.7
Age > 45 years	132	73.3

The analysis of the glycemic status indicated that a large part of the patients had abnormalities in their glucose metabolism that had not been detected before. The criteria used were fasting plasma glucose and HbA1c levels. Based on these criteria, 72 (40.0%) of the patients were normoglycemic, 46 (25.6%) were classified as prediabetic, and 62 (34.4%) of them were found to have undiagnosed diabetes mellitus. It is evident that over one-third of the patients with ACS were, at the time of admission, living with diabetes without a prior diagnosis.

Table 2: Glycemic Status of Study Participants

Glycemic Status	Number of Patients	Percentage (%)
Normoglycemic	72	40.0
Prediabetes	46	25.6
Undiagnosed Diabetes Mellitus	62	34.4

The distribution of glycemic status in patients with acute coronary syndrome is also shown in the diagram next to it, which very clearly shows that there is a large proportion of undiagnosed diabetes in this group.

The clinical presentation of ACS was different among the various glycemic categories. The most frequent presentation was ST-elevation myocardial infarction (STEMI), which was seen in 96 (53.3%) patients, non-ST-elevation myocardial infarction (NSTEMI) in 52 (28.9%) patients, and unstable angina in 32 (17.8%) patients. It was noted that new diabetics were more commonly found in the group of patients having the ischemic event as STEMI than in other subtypes of ACS.

Table 3: Type of Acute Coronary Syndrome by Glycemic Status

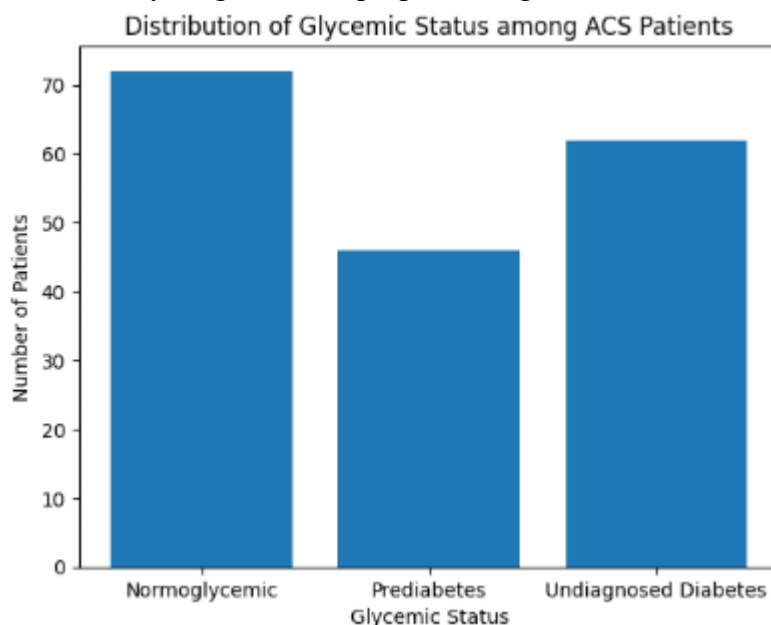
ACS Type	Normoglycemic	Prediabetes	Undiagnosed DM
STEMI	34	22	40
NSTEMI	24	14	14
Unstable Angina	14	10	8

Assessment of cardiovascular risk factors revealed hypertension and dyslipidemia as two of the most common conditions in patients having undiagnosed diabetes. Although smoking history was a common feature in all groups, it showed a higher occurrence in normoglycemic and prediabetic patients.

Table 4: Cardiovascular Risk Factors According to Glycemic Status

Risk Factor	Normoglycemic (%)	Prediabetes (%)	Undiagnosed DM (%)
Hypertension	47.2	56.5	69.4
Dyslipidemia	41.7	52.2	67.7
Smoking	55.6	50.0	46.8

Overall, the findings indicate that there is a significant proportion of undiagnosed diabetes and prediabetes in ACS patients, emphasizing the importance of regular glycemic screening during acute coronary presentation for timely diagnosis and proper management.



Discussion

The data presented in the current paper are indicative of an extensive proportion of undiagnosed diabetes mellitus in the cohort of patients with acute coronary syndrome, strengthening the notion of silent dysglycemia as one of the major culprits in the development of cardiovascular events. Over a third of ACS patients were newly diagnosed with diabetes at the time of hospital admission, a figure that is similar to the findings of hospital-based studies from Pakistan, which have repeatedly demonstrated undiagnosed diabetes as one of the most frequent comorbidities in ACS (1). Such an observation is in line with the international data that show a significant proportion of patients with dysglycemia that goes undetected until they suffer from ischemic events, indicating deficits of early screening and preventive healthcare structuring (2). Considering the well-documented interdependence of diabetes and coronary artery disease, a delayed diagnosis of diabetes is likely to be one of the factors contributing to deteriorated cardiovascular outcomes. Furthermore, the

considerable percentage of prediabetes among this study group is indicative of the long-standing, gradual metabolic risk evolution in ACS patients. Prediabetes is a ticking time bomb that leads to diabetes and intensifies the formation of atherosclerotic plaques.

Earlier studies have shown that the composition of the diet, in particular the consumption of plant-based protein, can influence glycemic control as well as diabetes remission in coronary heart disease patients, emphasizing the fact that people with undiagnosed metabolic abnormalities are missing the chance for early intervention (3). Besides that, population-based surveys from South Asia have revealed that the lack of accessibility to health check-ups on a regular basis, people with cardiometabolic diseases are mostly not aware of their condition, and the diagnosis is made at a very late stage, when they already suffer from severe cardiovascular manifestations (4). From the perspective of pathology, insulin resistance and long-term high blood glucose are the major causes of endothelial dysfunction, increased inflammatory responses, and plaque vulnerability. In this research, the predominance of STEMI in patients with undiagnosed diabetes is in line with the results of the PROSPECT study, which showed that insulin resistance is strongly related to high-risk coronary plaque and poor clinical outcomes in patients with ACS (5). In addition, platelets of diabetes patients show hyperreactivity and inflammation, which favor the formation of thrombus, further increasing the degree of coronary occlusion in acute episodes (6). These two factors could also serve as plausible explanations for the fact that more serious ACS cases were observed in patients with previously unrecognized diabetes.

The metabolic and lipid profiles related to undiagnosed diabetes should also be considered. Researchers have found that non-traditional lipid parameters, for example, an increased triglyceride-to-HDL cholesterol ratio, are more strongly associated with prediabetes and type 2 diabetes in patients with coronary heart disease (7). Inflammatory lipid parameters, such as platelet-to-HDL cholesterol ratios, have been linked with the risk of long-term mortality in CAD patients regardless of whether they have diabetes or not, indicating that metabolic dysregulation might happen before a person is formally diagnosed with diabetes (8). These results indicate that in ACS patients, metabolic assessments should be more specific and not just limited to glucose testing. Coronary populations' lifestyle and dietary choices are the main factors for both the onset and the progression of diabetes. Studies have demonstrated that the renal and cardiovascular health of coronary heart disease patients can be affected by their long-term commitment to Mediterranean or low-fat diets, and nutrition plays a significant role in the alteration of cardiometabolic risk (9). Biomarkers like soluble suppression of tumorigenesis-2 have also been found to have prognostic significance in CAD patients, whether they have diabetes or not, implying that undiagnosed diabetes may cover up the existence of high-risk biological profiles (10).

Furthermore, high levels of lipoprotein(a) have been linked to systemic atherosclerosis in coronary bypass patients, which might add to the cardiovascular risk of those with silent diabetes (11). Social, demographic, and medical care disparities are equally important factors behind the late diagnosis of diabetes. Studies have shown that racial, ethnic, and socioeconomic disparities influence the ability of individuals to receive preventive cardiovascular care and timely metabolic screening, mainly in the context of developing countries (12). Markers of vascular dysfunction, such as reduced cholesterol efflux capacity, have been associated with peripheral artery disease in patients with coronary artery disease regardless of the known diabetes status, indicating that metabolic impairment is taking place even before diabetes is clinically diagnosed (13). Kidney markers, such as higher levels of urine albumin-to-creatinine ratio, also suggest a higher risk of cardiovascular death for CAD patients with silent blood glucose irregularities (14). New metabolic biomarkers are also helpful in shedding light on the cardiovascular risks of undiagnosed diabetes.

Trimethylamine N-oxide has been identified as a predictor of adverse cardiovascular events in diabetic CAD patients, reflecting gut-derived metabolic pathways that may already be altered in undiagnosed individuals (15). Nutritional quality and protein intake have also been shown to influence the incidence of type 2 diabetes in coronary heart disease populations, emphasizing the importance of early dietary counseling for at-risk patients (16). These factors collectively suggest that undiagnosed diabetes represents a missed window for preventive intervention. From a clinical perspective, early

identification of diabetes in ACS patients is crucial for optimizing secondary prevention strategies. Secondary prevention measures, including strict glycemic control, lipid management, and lifestyle modification, have been shown to significantly reduce recurrent coronary events and mortality (17). Large-scale analyses using electronic health records have further identified diabetes-related factors associated with significant adverse cardiovascular events, underscoring the prognostic importance of early diagnosis and targeted management (18). Generally, the findings of this study support routine screening for diabetes in all ACS patients, especially in high-risk populations, to improve short- and long-term cardiovascular outcomes.

Conclusion

This research brings to light the significant problem of undiagnosed diabetes mellitus in patients who come to the hospital with acute coronary syndrome. In fact, more than a third of these patients were found to be diabetic only when they got admitted to the hospital. The presence of silent dysglycemia jointly with ACS reflects how neglecting to recognize the prolonged state of metabolic disturbances contributes to the development of atherosclerosis and later worsens the clinical picture. Moreover, the large number of prediabetic cases hints at the fact that there is a huge reservoir of people who are on the verge of transitioning to full-blown diabetes and having recurrent cardiovascular incidents. Surely, this calls for both fasting plasma glucose and HbA1c to be used as standard tests for glycemic screening of all patients with ACS, whether they have a history of diabetes or not. The time to diagnosis of diabetes coinciding with an acute coronary episode facilitates rapid targeting of glucose control, implementation of risk factors modification, and initiation of secondary prevention. Making the addition of systematic diabetes screening to ACS treatment pathways can be a game-changer in terms of reducing cardiovascular events, decreasing the burden of long-term morbidity and mortality among vulnerable segments.

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