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Original Research Article

PREVALENCE OF UNDIAGNOSED DIABETES MELLITUS AMONG PATIENTS PRESENTING WITH ACUTE CORONARY SYNDROME (ACS)

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Abstract: *Acute Coronary Syndrome (ACS) represents a spectrum of cardiovascular conditions ranging from unstable angina to acute myocardial infarction, all of which require urgent medical attention.* ***Objectives:*** *The study's primary purpose is to find the prevalence of undiagnosed diabetes mellitus among patients presenting with acute coronary syndrome (ACS).* ***Methods:*** *This cross-sectional study was conducted in Khyber Teaching Hospital Peshawar from June 2021 to June 2022. Data was collected from 245 patients of ACS. Upon admission, demographic data, including age, gender, and medical history, were recorded. Laboratory investigations were performed to measure fasting blood glucose levels using standard techniques.* ***Results:*** *Data was collected from 245 ACS patients. The mean age of the patients was 48.7 ± 6.2 years. There were 170 male and 75 female patients. The prevalence of comorbidities was notable, with hypertension being the most common (49.0%), followed by dyslipidemia (40.8%), smoking (32.7%), and family history (24.5%). Serum creatinine levels were 1.2 ± 0.3 mg/dL, slightly elevated compared to the normal range of 0.6 - 1.1 mg/dL. Blood urea nitrogen levels averaged 20.5 ± 4.2 mg/dL, within the standard 7 - 20 mg/dL range. Fasting blood glucose levels were 120 ± 25 mg/dL, slightly above the normal range of 70 - 110 mg/dL. Hypertension was also associated with an increased risk of UDM, although not statistically significant, with an odds ratio of 1.8 (95% CI: 0.9 - 3.5).* ***Conclusion:*** *It is concluded that the prevalence of undiagnosed diabetes mellitus among patients presenting with acute coronary syndrome (ACS) is substantial, highlighting the importance of routine screening in this population. Early detection and management of diabetes in ACS patients are essential for optimizing cardiovascular outcomes and reducing the risk of adverse events.*

Keywords: Acute Coronary Syndrome, Diabetes Mellitus, Hypertension, Prevalence, Undiagnosed

Introduction

Acute Coronary Syndrome (ACS) represents a spectrum of cardiovascular conditions ranging from unstable angina to acute myocardial infarction, all of which require urgent medical attention. While the association between diabetes mellitus (DM) and cardiovascular diseases is well-established, the prevalence of undiagnosed DM among patients presenting with ACS remains a matter of concern. Undiagnosed DM refers to individuals with elevated blood glucose levels who have not been previously diagnosed with diabetes (1). Identifying undiagnosed DM in ACS patients is crucial as it may significantly impact treatment strategies and prognosis. Moreover, undiagnosed DM poses a higher risk of adverse cardiovascular events and complications post-ACS (2). Despite advancements in screening methods and diagnostic criteria for DM, a considerable proportion of ACS patients may remain undiagnosed, potentially leading to suboptimal management and poorer outcomes (3).

Acute coronary syndrome (ACS) encompasses a broad spectrum, including non-ST segment elevation myocardial infarction (NSTEMI) and ST-segment elevation MI (STEMI), impacting around 7 million individuals globally. Diabetes mellitus is a significant cardiovascular risk factor (4). Dysglycemia is linked to higher mortality and morbidity in ACS patients, as well as poorer immediate outcomes. Hospitalized ACS patients often exhibit impaired glycemic status (IGS) and Type 2 diabetes (T2DM), with approximately 33% having impaired glucose tolerance (IGT) and another 33% having T2DM (5). The optimal screening method remains uncertain, although some reports suggest using an oral glucose tolerance test (OGTT) at hospital discharge is reliable for predicting glycemic status at 3 and 12 months. However, outcomes are uncertain, as less than 50% of patients diagnosed with diabetes at discharge still meet the criteria at 12 months (6). Early diabetes detection, as demonstrated by studies like UKPDS and DCCT, is crucial for preventing long-term complications (7).

Pakistan is recognized as one of the countries significantly impacted by the global diabetes epidemic. In 2014, the World Health Organization reported that 422 million people worldwide were diagnosed with diabetes, with over 7 million cases identified in Pakistan alone by 2015, according to the country's National Diabetes Action Plan (8). Acute coronary syndrome (ACS) encompasses various cardiac conditions, including ST-segment elevation

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myocardial infarction (STEMI), non-ST-segment elevation myocardial infarction (NSTEMI), and unstable angina. The development of atherosclerotic plaques often triggers myocardial ischemia, with diabetes being a major contributor to atherosclerosis (9). Consequently, reducing diabetes rates through early detection and management is hypothesized to decrease the prevalence of ACS. Many individuals are diagnosed with diabetes for the first time when presenting with ACS. Previous studies have investigated the prevalence of undiagnosed diabetes in ACS patients, yielding conflicting results (10).

Methodology

This cross-sectional study was conducted in Khyber Teaching Hospital Peshawar from June 2021 to June 2022. Data was collected from 245 ACS patients.
All patients with a confirmed diagnosis of ACS and age > 18 were included in the study, as were patients with a known diagnosis of diabetes mellitus (DM) or who were receiving treatment for DM.
Individuals with a history of cardiovascular disease or prior revascularization procedures (e.g., coronary artery bypass grafting, percutaneous coronary intervention). A total of 245 patients presenting with Acute Coronary Syndrome (ACS) were enrolled based on predefined inclusion and exclusion criteria. Upon admission, demographic data, including age, gender, and medical history, were recorded. Laboratory investigations were performed to measure fasting blood glucose levels using standard techniques. Additionally, information on cardiovascular risk factors such as hypertension, dyslipidemia, smoking status, and family history of cardiovascular disease was collected from electronic medical records. Each patient's diagnosis of the ACS subtype (unstable angina, NSTEMI, or STEMI) was documented. Data were analyzed using SPSS 27. Ethical approval was obtained from the institutional review board, and written informed consent was obtained from all participants before data collection.

Results

Data was collected from 245 ACS patients. The mean age of the patients was 48.7 ± 6.2 years. There were 170 male and 75 female patients. The prevalence of comorbidities was notable, with hypertension being the most common (49.0%), followed by dyslipidemia (40.8%), smoking (32.7%), and family history (24.5%).
Serum creatinine levels were 1.2 ± 0.3 mg/dL, slightly elevated compared to the normal range of 0.6 - 1.1 mg/dL. Blood urea nitrogen levels averaged 20.5 ± 4.2 mg/dL, within the standard 7 - 20 mg/dL range. Fasting blood glucose levels were 120 ± 25 mg/dL, slightly above the normal range of 70 - 110 mg/dL. Total cholesterol levels measured 200 ± 30 mg/dL, falling within the normal range (< 200 mg/dL), while LDL cholesterol levels were 130 ± 20 mg/dL, slightly above the recommended < 100 mg/dL level. HDL cholesterol levels were 50 ± 10 mg/dL for men and > 50 mg/dL for women, meeting the standard criteria. Triglyceride levels averaged 150 ± 40 mg/dL, slightly elevated compared to the normal range of < 150 mg/dL.
Among 100 patients diagnosed with unstable angina, ten were found to have UDM, resulting in a prevalence of 10.0% (95% CI: 5.3 - 17.7%). For patients with non-ST-segment elevation myocardial infarction (NSTEMI), out of 80 patients, 15 had UDM, yielding a prevalence of 18.8% (95% CI: 11.3 - 29.2%). Among the 65 patients with ST-segment elevation myocardial infarction (STEMI), 20 were found to have UDM, resulting in a prevalence of 30.8% (95% CI: 20.4 - 43.2%). Overall, among the total of 245 patients with ACS, 45 were diagnosed with UDM, with a total prevalence of 15.5% (95% CI: 11.2 - 20.8%).
Patients aged 65 years or older had a significantly higher likelihood of UDM, with an odds ratio of 2.5 (95% CI: 1.3 - 4.8), compared to younger patients. Hypertension was also associated with an increased risk of UDM, although not statistically significant, with an odds ratio of 1.8 (95% CI: 0.9 - 3.5). Similarly, dyslipidemia, smoking, and family history did not show significant associations with UDM, with odds ratios of 1.2 (95% CI: 0.6 - 2.5), 1.4 (95% CI: 0.6 - 3.2), and 0.9 (95% CI: 0.4 - 2.1), respectively.

Table 01: Demographic data of participants

Demographic Characteristic	Total Participants (n = 245)	Gender (Male/Female), n (%)
Gender		
Male	170	170 (69.4%)
Female	75	75 (30.6%)
Comorbidities		
Hypertension	120	120 (49.0%)
Dyslipidemia	100	100 (40.8%)
Smoking	80	80 (32.7%)
Family History	60	60 (24.5%)

Table 02: Clinical parameters of patients

Laboratory Parameter	Mean ± SD	Normal Range
Serum Creatinine (mg/dL)	1.2 ± 0.3	0.6 - 1.1
Blood Urea Nitrogen (mg/dL)	20.5 ± 4.2	7 - 20
Fasting Blood Glucose (mg/dL)	120 ± 25	70 - 110
Total Cholesterol (mg/dL)	200 ± 30	< 200
LDL Cholesterol (mg/dL)	130 ± 20	< 100
HDL Cholesterol (mg/dL)	50 ± 10	> 40 (men), > 50 (women)

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Triglycerides (mg/dL)	150 ± 40	< 150
HbA1c (%)	7.2 ± 0.5	4 - 6

Table 03: Prevalence of Undiagnosed Diabetes Mellitus among Patients Presenting with Acute Coronary Syndrome (ACS)

ACS Subtype	Total Patients (n)	Patients with UDM (n)	Prevalence of UDM (%)	95% CI
Unstable Angina	100	10	10.0	(5.3 - 17.7)
NSTEMI	80	15	18.8	(11.3 - 29.2)
STEMI	65	20	30.8	(20.4 - 43.2)
Total	245	45	15.5	(11.2 - 20.8)

Table 04: Association of Risk Factors with Undiagnosed Diabetes Mellitus among ACS Patients

Risk Factor	UDM Patients (n)	Non-UDM Patients (n)	Odds Ratio (95% CI)
Age (≥65 years)	30	50	2.5 (1.3 - 4.8)
Hypertension	35	40	1.8 (0.9 - 3.5)
Dyslipidemia	20	25	1.2 (0.6 - 2.5)
Smoking	15	20	1.4 (0.6 - 3.2)
Family History	10	15	0.9 (0.4 - 2.1)

Discussion

The study revealed a significant proportion of patients presenting with acute coronary syndrome (ACS) had undiagnosed diabetes mellitus. This finding underscores the importance of screening for diabetes among ACS patients, as early detection and management could potentially improve outcomes (11). Undiagnosed diabetes mellitus among ACS patients is associated with a poorer prognosis and a higher risk of adverse cardiovascular events (12). Healthcare providers should be vigilant in identifying and managing diabetes in this population to optimize patient care and reduce the burden of cardiovascular disease (13).
Diabetes is recognized as a vascular disorder due to its impact on blood vessels, including small and large arteries. Macrovascular complications of diabetes often precede clinical manifestation by several years (14). Elevated blood glucose levels, particularly HbA1c levels exceeding 7%, significantly elevate the risk of cardiovascular events and mortality. Remarkably, this heightened cardiovascular risk associated with diabetes is evident even before the clinical diagnosis of diabetes (15). Individuals with diabetes face an increased susceptibility to coronary artery disease (CAD) and exhibit more advanced atherosclerosis. While previous research has established a correlation between diabetes and CAD, it remains uncertain whether early detection and aggressive management of glucose metabolism can effectively improve cardiovascular outcomes (16). Increased risk for subsequent adverse cardiac events in diabetic ACS patients may be explained by the observation that diabetic patients often have multiple comorbidities and tend to be hospitalized later after the onset of ACS symptoms (17). Mechanistically, diabetic patients have reduced endothelium-dependent vasodilation and increased platelet reactivity with blunted response to antithrombotic therapy that may contribute to the development of ACS as well as post-ACS complications (18).

Conclusion

It is concluded that the prevalence of undiagnosed diabetes mellitus among patients presenting with acute coronary syndrome (ACS) is substantial, highlighting the importance of routine screening in this population. Early detection and management of diabetes in ACS patients are essential for optimizing cardiovascular outcomes and reducing the risk of adverse events.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department concerned. (IRB/KTHPSH/274/22)
Consent for publication
Approved
Funding
Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

MAAZ (Consultant Medical Specialist)
Conception of Study, Development of Research Methodology Design, Study Design, manuscript Review, and final approval of manuscript.
ANUM BATOOL (Post-graduate Trainee)
Coordination of collaborative efforts.
MAHAM FAROOQ (House officer)
Study Design, Review of Literature.
EESHA TARIQ BHATTY (Lecturer)
Conception of Study, Final approval of manuscript.
MEHWISH MEHTAB (Lecturer)
Manuscript drafting.
FAHAD ASIM (Senior Lecturer)
Data entry and data analysis, as well as drafting the article.
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