The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 7, 2025

FREQUENCY OF RETINOPATHIC CHANGES IN PREVIOUSLY UNDIAGNOSED DIABETIC PATIENTS PRESENTING WITH ACUTE CORONARY SYNDROME

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DOI: https://doi.org/10.5281/zenodo.17275307

Keywords
Diabetic retinopathy; Acute coronary syndrome; Diabetes mellitus; Glycated hemoglobin A

Article History
Received: 05 July 2025
Accepted: 10 July 2025
Published: 20 July 2025

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Abstract

Background: *Diabetes mellitus (DM) significantly increases heart risk, and diabetic retinopathy (DR) serves as a microvascular marker of systemic vascular dysfunction. However, the frequency of DR remains unlike the previously undiagnosed diabetics introduced with acute coronary syndrome (ACS).*

Objective: *To determine the frequency of retinopathic changes in previously undiagnosed diabetic patients admitted with ACS. Methods: This cross-sectional study included 150 adults (35–75 years) with ACS in a tertiary care hospital for a period of six months from January 2025 till June 2025. Absence of diabetic history but glycated hemoglobin (HBA1C)> 6.4% were enrolled. Fundoscopic examination was demonstrated under mydriasis to detect retinopathy. The associations with demographic and diagnostic variables were analyzed using Chi-Square and T-tests.*

Results: *Retinopathic changes were found in 40% (n = 60) of patients. People with retinopathy were old (60.78 ± 7.55 vs. 55.49 ± 7.79 years, p<0.001) and high HBA1C level (9.45 ± 0.72% vs 8.59 ± 0.73%, p<0.001). Important associations were noted with male sex (p = 0.003), smoking (p <0.001), hypertension (p = 0.003), anemia (P <0.001), and dyslipidemia (P = 0.005). The ACS types consisted of STEMI (46%), NSTEMI (35.3%), and unstable angina (18.7%).*

Conclusions: *The adequate proportion of undiagnosed diabetic patients with ACS displays DR, which highlights its role as an early marker of systemic vascular injury. Regular retinal screening in ACS patients can increase heart risk stratification and enable time intervention.*

INTRODUCTION

Diabetes mellitus (DM) represents a global health challenge, which is with rapidly growing prevalence, and its microvascular and macrovascular complications contribute significantly to the cardiovascular disease across the world(1). In microvascular complications, diabetic retinopathy (DR) is a major cause of avoidance blindness in working adults and serves as a clinical marker for generalized microangiopathy associated with diabetes. Importantly, DR is not rapidly recognized as a

separate ocular disease, but as an expression that equates systemic vascular damage including heart disease (CVD) complications such as acute coronary syndrome (ACS)(2).

The ACS represents a spectrum of immediate heart conditions arising from myocardial ischemia, especially from the presence of diabetes(3). It is well documented that diabetes increases both the risk and severity of ACS. About 25–30% of patients with ACS have diabetes, and one of these is made new diagnosis during adequate entry, which reflects a large undivided diabetes population with latent systemic complications(4).

The prevalence of diabetes retinopathy in previously undiagnosed diabetic patients is unproven in terms of ACS presentation, yet its assessment may unveil early vascular damage. Recent studies investigating large cohorts have reported a variable rate of diabetic retinopathy in diabetic patients in patients with more than 10% to 15%, with a clear positive correlation between DR prevalence and levels of glycosylated hemoglobin (HbA1c)(5). For example, in a nationwide Korean study, about 10.7% of patients were found DR with uncontrolled diabetes, and this prevalence increased considerably with high HbA1c reading, mirroring trends seen in the known diabetes population(6).

Pathophysiology connecting DR with ACS includes endothelial dysfunction, microvascular damage and shared mechanisms of quick atherosclerosis. DR, especially to patients with severe retinopathy, is shown to display more comprehensive coronary artery disease, plaque vulnerability, and high rates of heart incidences, emphasizing DR as a valuable predictor of heart risk(7).

A study conducted on patients with new diagnosis type 2 diabetes indicates that the frequency of retinopathic changes can be up to 15–18%, underlining the importance of broader screening in diabetes diagnosis to detect early microvascular participation(8). In addition, in the coexistence of high blood pressure and poor glycemic control, retinopathy increases severity and cardiovascular risk, there are frequently encountered in patients with ACS.

Given the intersection of diabetic retinopathy and acute coronary syndrome in the setting of undiagnosed diabetes, a systematic exploration of retinopathic changes in this subgroup may provide significant insight to the initial identification of patients at increased heart risk(9). The evaluation of retinopathy in undiagnosed diabetics with ACS can guide not only ocular management, but also heart risk stratification and medical decision making.

The purpose of this cross-sectional study is to determine the frequency of retinopathic changes in previously undiagnosed diabetic patients introduced with acute coronary syndrome. Understanding DR's burden and patterns in this weaker population is necessary to underline the importance of integrated heart and eye screening protocols, which can eventually improve the patient's results through timely identification and intervention.

Materials and Methods:

The cross-sectional study was performed at the Department of Cardiology, Gulab Devi Teaching Hospital, Lahore for a period of six months from January 2025 till June 2025 with ethical approval. A total of 150 patients were nominated using a non-probability consecutive sampling technique. The sample size was calculated using the WHO sample size calculator, which included patients presenting with acute coronary syndrome (ACS) with 95% confidence levels and 5% margin, assuming 10.7% of retinopathic changes among patients previously undiagnosed diabetes (ACS).

Eligible participants were adults between 35 to 75 years of age of either sex, which were clinically defined by chest pain lasting more than 30 minutes with sweat, vomiting, dyspnea and electrocardiographic abnormalities. According to standard criteria, the diagnosis was classified as Electrocardiographic Changes and Troponin I level, was classified as ST-Elevated Myocardial Infarction (STEMI), Non-ST Elevated Myocardial Infarction(N-STEMI), or unstable angina. If they had no prior history of the use of diabetes or antidiabetic drugs, and has more than 6.4% of the glycated hemoglobin (HBA1C) levels performed during hospitalization, patients were considered to be undiagnosed diabetics. Patients with a known history of diabetes, chronic retinopathy, glaucoma, cataract or chronic kidney disease were excluded.

After informed consent, demographic data (age, sex), heart -risk factors (smoking, alcohol, drug use), and

hypertension (BP ≥140/90 mmHg), dyslipidemia (total cholesterol> 200 mg/dL), and Anemia (HB <10G/DL) were recorded. Blood samples were collected for HbA1c estimate. While patients were stabilized for ACS management, the eye evaluation was done by fundoscopy using direct ophthalmoscope under pharmacological induced mydriasis. The presence of retinopathic changes defined as abnormal neo -vascularization in the retina was documented by an experienced ophthalmologist blindly for ACS subtype.

Data analysis was done using SPSS version 27. The normality of variables such as age and symptom duration was evaluated using Shapiro-Wilk test which generated p value>0.05 so data was normal. Generally continuous variables were expressed as the Mean, standard deviation, while the categorical variables were presented as frequencies and percentage. Stratification was applied to age, gender, symptom duration, risk factor and ACS type. Post-Stratification, retinopathic changes and relationships between the categorical variables were analyzed using the Chi-Square Test. A p-value of ≤0.05 was considered statistically significant.

Results:

The mean age of patients with retinopathic changes was 60.78 ± 7.55 years, with an overall mean of 57.61 ± 8.10 years, whereas the mean age of patients without retinopathic changes was 55.49 ± 7.79 years. The mean duration of symptoms was 9.57 ± 5.76 hours, with an average of 9.02 ± 4.74 hours when retinopathy was absent and 10.39 ± 6.99 hours when it was present. With an overall mean of 8.93 ± 0.84%, the mean HbA1c level was 8.59 ± 0.73% in patients without retinopathy and 9.45 ± 0.72% in those with retinopathy.

Table I: Continuous variable in patients with and without Diabetic Retinopathy

Variable	Absent (Mean ± SD)	Present (Mean ± SD)	Total (Mean ± SD)
Age (years)	55.49 ± 7.79	60.78 ± 7.55	57.61 ± 8.10
Duration of symptoms (hours)	9.02 ± 4.74	10.39 ± 6.99	9.57 ± 5.76
HbA1c (%)	8.59 ± 0.73	9.45 ± 0.72	8.93 ± 0.84

Of the 150 patients in the study, 28.7% were women and 71.3% were men. 53.3% claimed having smoked in the past, compared to 46.7% who did not. Twenty-seven percent of the patients had alcohol intake, whereas 79.3% did not. Among the group, substance addiction was comparatively rare, occurring in just 10.7% of cases. Of the patients, anemia was found in 24.0% and dyslipidemia in 46.0%. Of the cases, 52.0% had hypertension and 48.0% had normotension. Acute coronary syndrome (ACS) was classified as follows: ST-elevation myocardial infarction (STEMI) was responsible for 46.0% of cases, non-ST-elevation myocardial infarction (NSTEMI) for 35.3%, and unstable angina for 18.7%. 60.0% of patients had no retinopathic involvement, while 40.0% had retinopathic alterations.

Table II: Demographic and clinical variables

Variable	Category	Frequency	Percent
Sex	Female	43	28.7
	Male	107	71.3
	Total	150	100.0
Smoking	No	70	46.7
	Yes	80	53.3
	Total	150	100.0
Alcoholic	No	119	79.3

	Yes	31	20.7
	Total	150	100.0
Substance Abuse	No	134	89.3
	Yes	16	10.7
	Total	150	100.0
Dyslipidemia	No	81	54.0
	Yes	69	46.0
	Total	150	100.0
Anemia	No	114	76.0
	Yes	36	24.0
	Total	150	100.0
Hypertension	No	72	48.0
	Yes	78	52.0
	Total	150	100.0
Type of ACS	NSTEMI	53	35.3
	STEMI	69	46.0
	Unstable angina	28	18.7
	Total	150	100.0
Retinopathic changes	Absent	90	60.0
	Present	60	40.0
	Total	150	100.0

The existence of retinopathic alterations was shown to be significantly correlated with a number of categorical factors. With a greater percentage of males afflicted, retinopathy was strongly correlated with sex ($\chi^2 = 9.13$, $p = 0.003$). Anemia ($\chi^2 = 17.11$, $p < 0.001$), hypertension ($\chi^2 = 8.62$, $p = 0.003$), dyslipidemia ($\chi^2 = 7.89$, $p = 0.005$), and smoking status also had a high connection ($\chi^2 = 13.50$, $p < 0.001$). There was a significant correlation between alcohol use and ACS type ($\chi^2 = 8.37$, $p = 0.015$). Patients with retinopathy exhibited higher HbA1c values (9.45 ± 0.72% vs. 8.59 ± 0.73%; $t = -7.19$, $p < 0.001$) and were substantially older (60.78 ± 7.55 years vs. 55.49 ± 7.79 years; $t = -4.16$, $p < 0.001$) than patients without retinopathy for continuous variables.

Table III: Chi square of association and independent sample t test

Variable Pair	Test	p-value
Sex × Retinopathic changes	Pearson Chi-square	0.003
Smoking × Retinopathic changes	Pearson Chi-square	<0.001
Alcoholic × Type of ACS	Pearson Chi-square	0.015
Anemia × Retinopathic changes	Pearson Chi-square	<0.001
Hypertension × Retinopathic changes	Pearson Chi-square	0.003
Dyslipidemia × Retinopathic changes	Pearson Chi-square	0.005
Type of ACS × Alcoholic	Pearson Chi-square	0.015
Age (years) × Retinopathic changes	Independent t-test	<0.001
HbA1c (%) × Retinopathic changes	Independent t-test	<0.001

Discussion:

The frequency of retinopathic changes in Previously Undiagnosed diabetic patients introduced with acute coronary syndrome is a subject that exposes interrelationship between microvascular and macrovascular complications in diabetes, especially focuses on retinopathy and cardiovascular consequences. In this cross-sectional study of 150 patients, retinopathic changes were present in 40% of cases and were associated with the presence of vascular risk factors such as older, prolonged symptom period, worse glycemic control (high HBA1C), and anemia, hypertension, dyslipidemia and smoking. It provides an important clinical picture of retinopathy burden in undiagnosed diabetic patients with acute coronary syndrome (ACS).

The results of this study align with recent observation and conclusions from analytical research and emphasize a strong relationship between diabetic retinopathy (DR) and the severity of heart disease. Atia et al. (2020) observed that diabetic retinopathy was significantly associated with the range of coronary artery disease (CAD) in diabetic patients, with a higher number of diseased vessels and greater Gensini scores reported in DR patients, reflecting more severe coronary involvement(10). Their findings underline the DR's predictive value to the severity of coronary disease, which complements our findings of a significant correspondence between retinopathy presence and ACS in an undiagnosed diabetes cohort(11).

Similarly, a study displayed that the increasing severity of DR is correlated with high rates of ACS and more comprehensive coronary artery stenosis, as identified by CT angiography, suggests that retina also reflects microvascular damage similarities and possibly the burden of systemic macrovascular disease(12,13). This supports observation in our data that retinopathy patients had considerable age and higher HBA1C levels, both of the risk factor for vascular complications, adding evidence that poor glycemic control contributes to microvascular damage with atherosclerotic progression.

Meta-analysis and systematic reviews have also strengthened the association, and other umbrella reviews have documented that DR increases the risk for more than two times heart disease incidence and is an independent predictor of cardiovascular mortality(7,14). Our study has increased the high HbA1c discovery and increased smoking growth in high blood pressure, anemia, dyslipidemia, and retinopathy patients, aligns well with these risk factors that are often cited in literature as CVD risk in diabetic patients.

In addition, along with the use of ACS types and alcohol, the relationship between other risk factors in this study, the findings in literature observe the heterogeneous presentations of ACS in diabetic patients with different vascular risk profiles(15). The effect of retinopathy as microvascular complication is an important point of systemic endothelial dysfunction that is not only limited to the retina, but also extends to the coronary vasculature.

Laser speckle flowgraph shows the objective has added hemodynamic insight, which combines ocular vascular resistance indices to the initial cardiovascular dysfunction in systemic atherosclerosis and ACS patients supports the use of retinal assessment as non-invasive markers of systemic vascular health(16). This complements the clinical relevance of detection of retinopathy in predicting cardiac results.

Regarding the frequency of retinopathy, 40% of this study in already undiagnosed diabetic patients with ACS is more than some reports such as documentation of about 5% in acute STEMI patients, possibly reflecting differences in population, methods of detection and diabetes diagnosis time(17). Importantly, studies that emphasize undiagnosed diabetes in the ACS population shows the dangerous high burden of diabetes and its complications, urging for more aggressive screening protocols in heart settings(18–20).

This cross-sectional design confirms the concrete spread of retinopathy and heart disease without the installation of temporarily or causality. However, it provides compelling evidence that retinopathy is not only normal, but is also significantly associated with worse glycemic control, old age and other vascular risk markers in this group.

The study addresses the intersection of microvascular and macrovascular complications in previously undiagnosed diabetic patients, a clinically important yet underexplored population. The study provides strong, real-world data on the study DR

prevalence(40%), by employing standardized HbA1c-based diagnosis and direct fundoscopy during ACS hospitalization. Its analysis of many vascular risk factors, including hypertension, anemia and dyslipidemia, adds depth to the understanding of systemic endothelial dysfunction. In addition, findings outline the ability of DR as a non-invasive biomarker for the severity of heart disease, supporting integrated screening strategies. These insights contribute to preventive cardiology and ophthalmic to promote the initial identity of high -risk individuals for extensive care.

The cross-sectional design of the study establishes temporal or causal relationships between the severity of DR and ACS. Being a single-center study with a relatively small sample size limits the generality for a broader population. Fundoscopic examinations, although clinically practical, may reduce early retinopathy compared to advanced imaging techniques such as optical coherence tomography (OCT). Selection bias because only hospitalized ACS patients were included, except for milder cases. In addition, the lack of stratification by DR severity and the absence of follow -up data prohibited insight into prognostic implications. Using advanced retinal imaging is warrant to validate and expand these findings to the multi -level, longitudinal study of the future.

Conclusion:

Retinopathy is often associated with more severe coronary involvement and systemic risk factors in undiagnosed diabetic patients introduced with ACS. Retinopathy emerges as an important marker of systemic vascular disease and poor glycemic control, which strengthens the need for integrated heart and ophthalmologic screening in diabetes care.

Conflict of Interest:

The authors declared no conflict of interest.

Funding:

This project was not funded in any form by any institution or hospital.

Ethical Considerations:

The study was conducted after approval from institutional board. The informed consent was taken from all participants and measures were taken to ensure confidentiality of patients.

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