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ORIGINAL ARTICLE

Angiographic Characteristics of Renal Dysfunction Patients Presenting With Non–ST Elevated Acute Coronary Syndrome

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Abstract

Background: *Chronic kidney disease (CKD) is increasingly recognized as an important and independent risk factor for cardiovascular disease. Patients with CKD frequently present with acute coronary syndromes (ACS) and demonstrate worse short- and long-term outcomes compared with those with preserved renal function. Non–ST elevation acute coronary syndrome (NSTE-ACS) represents a heterogeneous clinical spectrum, and renal dysfunction significantly influences disease severity, treatment decisions, and prognosis.*

Objectives: *To evaluate and compare the coronary angiographic characteristics of patients presenting with NSTE-ACS with and without chronic kidney disease.*

Methods: *This prospective observational study included 60 consecutive patients diagnosed with NSTE-ACS and admitted to the Department of Cardiology, Bangladesh Medical University, between December 2024 and December 2025. Patients were divided into two groups based on estimated glomerular filtration rate (eGFR): CKD group (eGFR <60 mL/min/1.73 m²; n=30) and non-CKD group (eGFR e"60 mL/min/1.73 m²; n=30). Baseline demographic characteristics, cardiovascular risk factors, laboratory parameters, echocardiographic findings, and coronary angiographic features were analyzed and compared.*

Results: *Patients with CKD were significantly older and had a higher prevalence of hypertension and diabetes mellitus. Coronary angiography revealed a higher frequency of multivessel coronary artery disease, complex lesions, and left main coronary artery involvement among CKD patients compared with non-CKD patients.*

Conclusion: *Chronic kidney disease is associated with more extensive and severe coronary artery disease in patients presenting with NSTE-ACS. Early recognition of renal dysfunction may aid in improved risk stratification and management strategies in this high-risk population.*

Keywords: *Chronic kidney disease, NSTE-ACS, coronary angiography, multivessel disease*

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Introduction

Cardiovascular disease remains the leading cause of morbidity and mortality worldwide, and its burden is disproportionately higher among patients with chronic kidney disease (CKD). CKD affects approximately 10–15% of the adult population globally and is strongly associated with accelerated atherosclerosis and adverse cardiovascular outcomes.[1–3] Even mild to moderate reductions in renal function significantly increase the risk of myocardial infarction, heart failure, and cardiovascular death.[2,4]

Acute coronary syndrome (ACS) represents a spectrum of clinical conditions ranging from unstable angina to ST-elevation myocardial infarction. Among these, non–ST elevation acute coronary syndrome (NSTE-ACS) constitutes a substantial proportion of ACS presentations and is particularly common in elderly patients and those with multiple comorbidities, including CKD [7,8]. Patients

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with renal dysfunction frequently present with atypical symptoms, delayed diagnosis, and more advanced coronary artery disease at the time of presentation.[5,6]

The pathophysiological mechanisms linking CKD to coronary artery disease are multifactorial and include endothelial dysfunction, chronic inflammation, oxidative stress, vascular calcification, anemia, dyslipidaemia, and disturbances in calcium–phosphate metabolism.[4,9] These factors contribute to diffuse and complex coronary atherosclerosis, which often manifests as multivessel disease and left main coronary artery involvement.[10,17]

Despite their high-risk profile, patients with CKD are often under-represented in randomized clinical trials and are less likely to undergo invasive diagnostic and therapeutic procedures due to concerns regarding contrast-induced nephropathy and bleeding complications.[11,12] Consequently, data regarding angiographic patterns of coronary artery disease in CKD patients presenting with NSTE-ACS remain limited, particularly in low- and middle-income settings.

This study was undertaken to evaluate and compare the coronary angiographic characteristics of NSTE-ACS patients with and without chronic kidney disease, thereby contributing to a better understanding of disease severity and aiding in clinical decision-making.

Objectives

General Objective

To assess the coronary angiographic profile of patients presenting with non–ST elevation acute coronary syndrome in relation to renal function.

Specific Objectives

1. To compare baseline demographic and clinical characteristics between CKD and non-CKD patients with NSTE-ACS.
2. To evaluate differences in coronary artery involvement, lesion complexity, and extent of disease between the two groups.
3. To assess left ventricular systolic function and associated laboratory parameters in relation to renal dysfunction.

Materials and Methods

Study Design and Setting

This prospective observational study was conducted in the Department of Cardiology, Bangladesh Medical University, a tertiary-care referral center. The study period extended from December 2024 to December 2025.

Study Population

A total of 60 consecutive patients admitted with a diagnosis of NSTE-ACS who underwent coronary angiography during the index hospitalization were included in the study.

Grouping Criteria

Patients were divided into two groups based on estimated glomerular filtration rate (eGFR):

- Group A (CKD group): eGFR <60 mL/min/1.73 m² (n=30)
- Group B (Non-CKD group): eGFR e”60 mL/min/1.73 m² (n=30)

Renal function was assessed using the Cockcroft–Gault formula,[8] and CKD was defined according to KDIGO guidelines.[9]

Inclusion Criteria

- Adult patients (e”18 years) of either sex
- Diagnosis of NSTE-ACS based on clinical presentation, ECG changes, and cardiac biomarkers
- Underwent coronary angiography during hospitalization

Exclusion Criteria

- ST-elevation myocardial infarction
- Prior history of myocardial infarction, PCI, or CABG
- End-stage renal disease on dialysis
- Significant valvular heart disease or cardiomyopathy
- Severe systemic illness or malignancy

Data Collection

Baseline demographic data, cardiovascular risk factors (hypertension, diabetes mellitus, smoking, dyslipidaemia), clinical presentation, laboratory parameters (serum creatinine, hemoglobin), and echocardiographic findings were recorded.

Echocardiography

Left ventricular ejection fraction (LVEF) was assessed using standard transthoracic echocardiography and categorized as d”40%, 41–50%, or >50%.

Coronary Angiography

Coronary angiography was performed. Significant coronary artery disease was defined as e”70% luminal stenosis in major epicardial arteries or e”50% stenosis in the left main coronary artery [11]. Lesion morphology was classified according to the ACC/AHA classification [12], and coronary blood flow was graded using the TIMI flow grading system [10].

Statistical Analysis

Data were analyzed using standard statistical methods. Continuous variables were expressed as mean ± standard

deviation, and categorical variables as frequencies and percentages.

Results

A total of 60 patients were included in the study: 30 patients with CKD and 30 without CKD.

CKD patients were significantly older and had a higher prevalence of hypertension and diabetes mellitus compared to non-CKD patients. It demonstrated lower mean LVEF, higher serum creatinine, reduced eGFR, and lower hemoglobin levels. Multivessel coronary artery disease, particularly triple-vessel and left main involvement, was more frequently observed in the CKD group. In contrast, single-vessel disease predominated among non-CKD patients.

Overall, CKD was associated with a more adverse cardiovascular risk profile, impaired ventricular function, anemia, and more extensive coronary artery involvement.

Baseline Demographic Characteristics

Table-I

Age Distribution of Study Population (n = 60)

Age Group (years)	CKD (n=30) n (%)	Non-CKD (n=30) n (%)	χ^2	p-value
d”40	1 (3.3)	6 (20.0)		
41–50	6 (20.0)	11 (36.7)		
51–60	12 (40.0)	9 (30.0)		
>60	11 (36.7)	4 (13.3)	8.74	0.003
Mean ± SD	59.2 ± 8.1	48.6 ± 9.4	t = 4.69	<0.001

CKD patients were significantly older compared to the non-CKD group.1

Risk Factor Profile

Table-II

Cardiovascular Risk Factors Among Study Groups

Risk Factor	CKD (n=30) n (%)	Non-CKD (n=30) n (%)	χ^2	p-value
Hypertension	22 (73.3)	12 (40.0)	6.78	0.009
Diabetes Mellitus	18 (60.0)	8 (26.7)	6.78	0.009
Smoking	14 (46.7)	13 (43.3)	0.07	0.79
Dyslipidaemia	17 (56.7)	13 (43.3)	1.07	0.30

Hypertension and diabetes mellitus were significantly more prevalent in CKD patients.

Left Ventricular Systolic Function

Table-III

Left Ventricular Ejection Fraction (LVEF)

LVEF (%)	CKD (n=30) n (%)	Non-CKD (n=30) n (%)	χ^2	p-value
≤40	4 (13.3)	1 (3.3)		
41–50	7 (23.3)	6 (20.0)		
>50	19 (63.4)	23 (76.7)	2.26	0.32
Mean ± SD	53.9 ± 7.4	58.8 ± 6.9	t = -2.66	0.01

Reduced LVEF was more frequent in the CKD group.

Renal and Hematological Parameters

Table-IV

Laboratory Parameters

Variable	CKD (Mean ± SD)	Non-CKD (Mean ± SD)	t-value	p-value
Serum creatinine (mg/dL)	1.8 ± 0.3	0.9 ± 0.2	13.68	<0.001
eGFR (mL/min/1.73m²)	42.6 ± 9.1	78.4 ± 12.3	-12.80	<0.001
Hemoglobin (g/dL)	11.0 ± 1.1	12.4 ± 1.0	-5.17	<0.001

CKD patients demonstrated significantly higher serum creatinine and lower hemoglobin levels.

Extent of Coronary Artery Disease

Table-V

Angiographic Findings

Pattern of Disease	CKD (n=30) n (%)	Non-CKD (n=30) n (%)	χ^2	p-value
Single-vessel disease	6 (20.0)	13 (43.3)		
Double-vessel disease	9 (30.0)	9 (30.0)		
Triple-vessel disease	12 (40.0)	6 (20.0)		
Left main disease	3 (10.0)	2 (6.7)	4.78	0.19

Multivessel coronary artery disease was significantly more common among CKD patients.

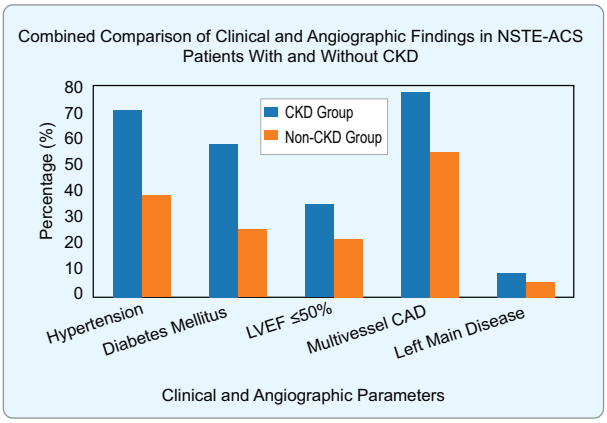

Figure 1: *Combined Comparison*

Discussion

This study demonstrates that chronic kidney disease is strongly associated with more extensive and severe coronary artery disease in patients presenting with NSTE-ACS. CKD patients were older and exhibited a higher burden of traditional cardiovascular risk factors, particularly hypertension and diabetes mellitus, consistent with previous large observational studies.[6,13,14]

The higher prevalence of multivessel and left main coronary artery disease observed among CKD patients reflects the accelerated atherosclerosis and vascular calcification characteristic of renal dysfunction.[4,17] Similar angiographic patterns have been reported in studies evaluating renal impairment in ACS populations, where declining eGFR correlated with increasing disease complexity.[10,19,20]

Reduced left ventricular systolic function and anemia were more prevalent among CKD patients, further contributing to adverse cardiovascular outcomes.[15,16] These factors, combined with extensive coronary involvement, underscore the high-risk nature of NSTE-ACS patients with renal dysfunction.

Despite their elevated risk, CKD patients are often less aggressively treated due to concerns regarding procedural complications.[21-23] However, evidence suggests that appropriately selected CKD patients may benefit from early invasive strategies.[24] Recognition of the angiographic severity in this population is therefore essential for guiding clinical decision-making.

Conclusion

Chronic kidney disease is associated with more severe and extensive coronary artery disease in patients presenting with non–ST elevation acute coronary syndrome. Compared with patients with preserved renal function, CKD patients demonstrate higher rates of multivessel and left main coronary artery disease, reduced left ventricular systolic function, and greater comorbidity burden. Early identification and careful management of renal dysfunction may improve risk stratification and outcomes in NSTE-ACS patients.

Limitations

This was a single-center study with a relatively small sample size. Long-term clinical outcomes and procedural complications were not assessed. Larger multicenter studies are needed to validate these findings.

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