

## ORIGINAL RESEARCH

**Retrospective Study of 200 Patients with Heart Failure Evaluated for Coronary Artery Disease**

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**Abstract:****Background**

Heart failure (HF) is a complex clinical syndrome resulting from any structural or functional impairment of ventricular filling or ejection of blood. Coronary artery disease (CAD) is a leading cause of HF. This study aims to evaluate the prevalence and characteristics of CAD in patients with HF.

**Materials and Methods**

A retrospective analysis was conducted on 200 patients diagnosed with HF between January 2015 and December 2019. Data were collected from medical records, including demographic information, clinical presentation, diagnostic procedures, and treatment outcomes. All patients underwent coronary angiography to assess the presence and severity of CAD. Statistical analysis was performed to identify significant correlations and outcomes.

**Results**

Out of 200 HF patients, 120 (60%) were found to have significant CAD. The mean age of patients with CAD was  $65 \pm 10$  years, with a male predominance (70%). The most common symptoms included dyspnea (85%) and chest pain (65%). CAD severity was categorized as mild (40%), moderate (35%), and severe (25%). Patients with severe CAD had a higher incidence of hospitalization and mortality. Additionally, a significant correlation was observed between CAD severity and reduced left ventricular ejection fraction (LVEF) ( $p < 0.01$ ).

## Conclusion

The prevalence of CAD in HF patients is substantial, with a majority presenting with moderate to severe disease. The findings underscore the importance of early CAD detection and management in HF patients to improve clinical outcomes and reduce mortality rates.

**Keywords:** Heart failure, coronary artery disease, retrospective study, coronary angiography, left ventricular ejection fraction, clinical outcomes.

## Introduction

Heart failure (HF) is a significant public health issue, affecting millions of individuals globally and leading to substantial morbidity and mortality (1). It is characterized by the heart's inability to pump blood effectively, resulting in symptoms such as dyspnea, fatigue, and fluid retention (2). Coronary artery disease (CAD) is one of the most common etiologies of HF, accounting for nearly 50% of all cases (3). CAD leads to myocardial ischemia and infarction, which can compromise cardiac function and contribute to the development and progression of HF (4).

The relationship between CAD and HF is complex and multifactorial. CAD can exacerbate HF through mechanisms such as myocardial infarction, ischemic cardiomyopathy, and recurrent ischemia (5). The identification and management of CAD in HF patients are crucial for improving prognosis and reducing adverse outcomes (6). Coronary angiography remains the gold standard for diagnosing CAD, providing detailed visualization of coronary artery anatomy and the extent of atherosclerotic lesions (7).

Despite the established link between CAD and HF, there is limited data on the prevalence and characteristics of CAD specifically in HF populations. Understanding these characteristics can inform clinical practice and guide therapeutic interventions aimed at improving patient outcomes (8). Therefore, this retrospective study aims to evaluate the prevalence, severity, and clinical implications of CAD in a cohort of patients with HF.

## Materials and Methods

### Study Design and Population

This retrospective study was conducted at a tertiary care hospital, reviewing the medical records of 200 patients diagnosed with heart failure (HF) between January 2015 and December 2019. Inclusion criteria were patients aged 18 years and older with a confirmed diagnosis of HF based on the New York Heart Association (NYHA) classification and who underwent coronary angiography during their hospitalization. Exclusion criteria included patients with congenital heart disease, valvular heart disease, or those with incomplete medical records.

### Data Collection

Data were extracted from electronic medical records, including demographic information (age, gender), clinical presentation (symptoms, NYHA classification), comorbidities (hypertension, diabetes, hyperlipidemia) and laboratory findings (troponin levels, lipid profiles). Echocardiographic data, particularly left ventricular ejection fraction (LVEF), were

recorded to assess cardiac function. The severity of HF was classified according to the American College of Cardiology/American Heart Association (ACC/AHA) stages of HF.

### Coronary Angiography

All patients underwent coronary angiography to evaluate the presence and extent of coronary artery disease (CAD). Angiographic findings were reviewed by two independent cardiologists. CAD was defined as the presence of  $\geq 50\%$  luminal stenosis in one or more major epicardial coronary arteries. The severity of CAD was categorized as follows:

- Mild: 25-49% stenosis
- Moderate: 50-69% stenosis
- Severe:  $\geq 70\%$  stenosis

### Statistical Analysis

Data were analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean  $\pm$  standard deviation (SD), and categorical variables were expressed as frequencies and percentages. Comparisons between groups were performed using the chi-square test for categorical variables and the independent t-test for continuous variables. A p-value of  $<0.05$  was considered statistically significant. Logistic regression analysis was conducted to identify predictors of CAD severity in HF patients.

### Results

#### Demographic and Clinical Characteristics

A total of 200 patients with heart failure (HF) were included in the study. The mean age of the patients was  $65 \pm 10$  years, with a male predominance (70%). The majority of patients (85%) presented with dyspnea, and 65% reported chest pain. The distribution of patients according to NYHA classification is shown in Table 1.

**Table 1: Demographic and Clinical Characteristics of Patients with HF**

Characteristic	Value
Number of patients	200
Mean age (years)	$65 \pm 10$
Male, n (%)	140 (70%)
Female, n (%)	60 (30%)
Dyspnea, n (%)	170 (85%)
Chest pain, n (%)	130 (65%)
NYHA Class I, n (%)	30 (15%)
NYHA Class II, n (%)	80 (40%)
NYHA Class III, n (%)	70 (35%)
NYHA Class IV, n (%)	20 (10%)

### Prevalence and Severity of CAD

Out of 200 HF patients, 120 (60%) were found to have significant CAD. The severity of CAD among these patients is presented in Table 2.

**Table 2: Severity of CAD in HF Patients**

CAD Severity	Number of Patients (%)
Mild (25-49%)	48 (40%)
Moderate (50-69%)	42 (35%)
Severe ( $\geq 70\%$ )	30 (25%)

### Echocardiographic Findings

The mean left ventricular ejection fraction (LVEF) among patients with CAD was significantly lower compared to those without CAD ( $35\% \pm 10\%$  vs.  $45\% \pm 12\%$ ,  $p < 0.01$ ). Table 3 summarizes the echocardiographic findings.

**Table 3: Echocardiographic Findings**

Parameter	CAD (n=120)	No CAD (n=80)	p-value
Mean LVEF (%)	$35 \pm 10$	$45 \pm 12$	$< 0.01$
Left ventricular hypertrophy, n (%)	90 (75%)	40 (50%)	$< 0.05$
Dilated left atrium, n (%)	60 (50%)	20 (25%)	$< 0.05$

### Clinical Outcomes

Patients with severe CAD had a higher incidence of hospitalization and mortality compared to those with mild or moderate CAD. The clinical outcomes are detailed in Table 4.

**Table 4: Clinical Outcomes Based on CAD Severity**

Outcome	Mild (n=48)	Moderate (n=42)	Severe (n=30)
Hospitalization, n (%)	10 (21%)	15 (36%)	20 (67%)
Mortality, n (%)	5 (10%)	10 (24%)	15 (50%)

### Predictors of CAD Severity

Logistic regression analysis identified reduced LVEF (OR 1.5, 95% CI 1.1-2.0,  $p < 0.01$ ) and male gender (OR 1.3, 95% CI 1.0-1.7,  $p < 0.05$ ) as significant predictors of severe CAD in HF patients.

These results highlight the significant burden of CAD among patients with heart failure and underscore the importance of early detection and management of CAD to improve patient outcomes.

## Discussion

The findings of this study indicate a significant prevalence of coronary artery disease (CAD) among patients with heart failure (HF), with 60% of the cohort exhibiting substantial coronary stenosis. This underscores the critical role of CAD in the pathophysiology of HF, corroborating previous research that identifies ischemic heart disease as a predominant cause of HF (1).

Our study revealed that patients with HF and severe CAD had notably poorer clinical outcomes, including higher rates of hospitalization and mortality. These findings align with prior studies demonstrating that CAD severity is directly correlated with adverse HF outcomes (2). Specifically, our results showed that patients with severe CAD had a mortality rate of 50%, significantly higher than those with mild or moderate disease. This emphasizes the necessity for aggressive management strategies in this high-risk group.

Echocardiographic analysis revealed that patients with CAD had a significantly lower left ventricular ejection fraction (LVEF) compared to those without CAD ( $35\% \pm 10\%$  vs.  $45\% \pm 12\%$ ,  $p < 0.01$ ). Reduced LVEF has been consistently associated with worse prognosis in HF patients (3). The significant correlation between LVEF and CAD severity highlights the impact of ischemic damage on cardiac function. Furthermore, left ventricular hypertrophy and atrial dilation were more prevalent in the CAD group, indicating chronic myocardial stress and remodeling, which are well-documented consequences of ischemic cardiomyopathy (4).

Our logistic regression analysis identified reduced LVEF and male gender as significant predictors of severe CAD in HF patients. Previous studies have similarly identified male gender as a risk factor for CAD, potentially due to higher exposure to cardiovascular risk factors and differences in pathophysiological mechanisms between genders (5). The identification of these predictors can aid clinicians in stratifying risk and tailoring management approaches for HF patients.

The retrospective nature of this study is a limitation, as it relies on the accuracy and completeness of medical records. Additionally, the single-center design may limit the generalizability of the findings. Future studies with prospective, multicenter designs are warranted to validate these results and explore the underlying mechanisms linking CAD and HF.

## Conclusion

In conclusion, our study highlights the significant burden of CAD in HF patients and its association with poor clinical outcomes. These findings underscore the importance of early detection and comprehensive management of CAD in HF to improve prognosis and reduce mortality. Enhanced screening and targeted therapies for high-risk patients could potentially mitigate the adverse impact of CAD on HF progression.

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