Original Research Article

Etiological Spectrum of Heart Failure with Reduced Ejection Fraction in a Moroccan Military Hospital: A Comparative Registry Analysis

ABSTRACT

Background: The etiological distribution of HFrEF varies significantly across regions, reflecting differences in cardiovascular risk factor prevalence, genetic predisposition, and healthcare access. Data from North African military populations are scarce.

Methods: Etiologies were systematically classified in 173 HFrEF patients based on clinical, electrocardiographic, echocardiographic, and coronary angiographic findings. Coronary angiography was performed when ischemic etiology was suspected.

Results: Ischemic cardiomyopathy was the predominant etiology (56.6%), followed by idiopathic dilated cardiomyopathy (23.1%), hypertensive cardiomyopathy (11.5%), valvular cardiomyopathy (7.5%), and toxic cardiomyopathy (1.7%). Compared to international registries, the ischemic etiology burden in our cohort (56.6%) exceeded that of Asian and Spanish registries (39.8–42.3%) but aligned with North African and British cohorts.

Conclusion: Ischemic cardiomyopathy dominates the etiological spectrum of HFrEF in this Moroccan military cohort, reinforcing the priority of coronary risk factor management and timely coronary revascularization in prevention strategies.

Keywords: HFrEF; Etiology; Ischemic cardiomyopathy; Dilated cardiomyopathy; Coronary angiography; Morocco

1. Introduction

The etiology of HFrEF critically influences prognosis, therapeutic strategy, and the likelihood of LV recovery. In Western countries, ischemic cardiomyopathy secondary to coronary artery disease (CAD) accounts for the majority of HFrEF cases (50–70%), followed by dilated cardiomyopathy (DCM), hypertensive cardiomyopathy, and valvular heart disease [1]. In contrast, non-ischemic etiologies, including idiopathic DCM, inflammatory cardiomyopathies, and toxic causes, predominate in younger populations and certain geographic regions [2].

Coronary artery disease remains the global leading cause of HFrEF due to myocardial ischemia, infarction, hibernation, and adverse ventricular remodeling. Accurate etiological characterization is essential, as ischemic etiology carries distinct prognostic implications and guides specific interventions including coronary revascularization, implantable cardioverter-defibrillators (ICD), and cardiac resynchronization therapy (CRT) eligibility criteria [3].

This study aimed to systematically characterize the etiological spectrum of HFrEF in a Moroccan military hospital and to compare these findings with major international registries to identify region-specific etiological patterns.

2. Methods

Etiology was classified based on: (1) clinical history and risk factor profile; (2) ECG findings; (3) echocardiographic pattern (global vs. segmental dysfunction); (4) coronary angiography results. Ischemic cardiomyopathy was defined as HFrEF in the presence of obstructive CAD (≥50% stenosis in ≥1 major epicardial artery) or prior myocardial infarction. Idiopathic DCM was diagnosed after exclusion of all identifiable

causes. Hypertensive cardiomyopathy required a history of sustained hypertension with echocardiographic evidence of LV hypertrophy preceding dilatation. Toxic cardiomyopathy was attributed to documented alcohol excess or chemotherapy exposure.

3. Results

3.1 Etiological Distribution

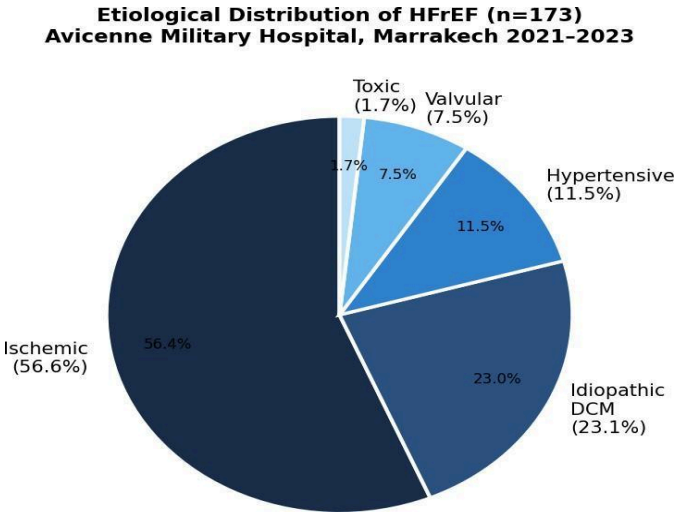

Figure 1. Etiological distribution of HFrEF in the study cohort (n=173). DCM = Dilated Cardiomyopathy.

Ischemic cardiomyopathy was the leading etiology in 56.6% of patients, consistent with the dominant cardiovascular risk factor burden (smoking 53%, diabetes 45%). Idiopathic DCM accounted for 23.1%, hypertensive cardiomyopathy for 11.5%, valvular cardiomyopathy for 7.5%, and toxic cardiomyopathy for 1.7%.

3.2 Coronary Angiography Findings

Coronary angiography was performed in patients where ischemic etiology was clinically suspected based on history, ECG changes, or segmental wall motion abnormalities. Among those undergoing angiography, multivessel disease was the most common finding, with a significant proportion requiring percutaneous coronary intervention (PCI) or referral for coronary artery bypass grafting (CABG).

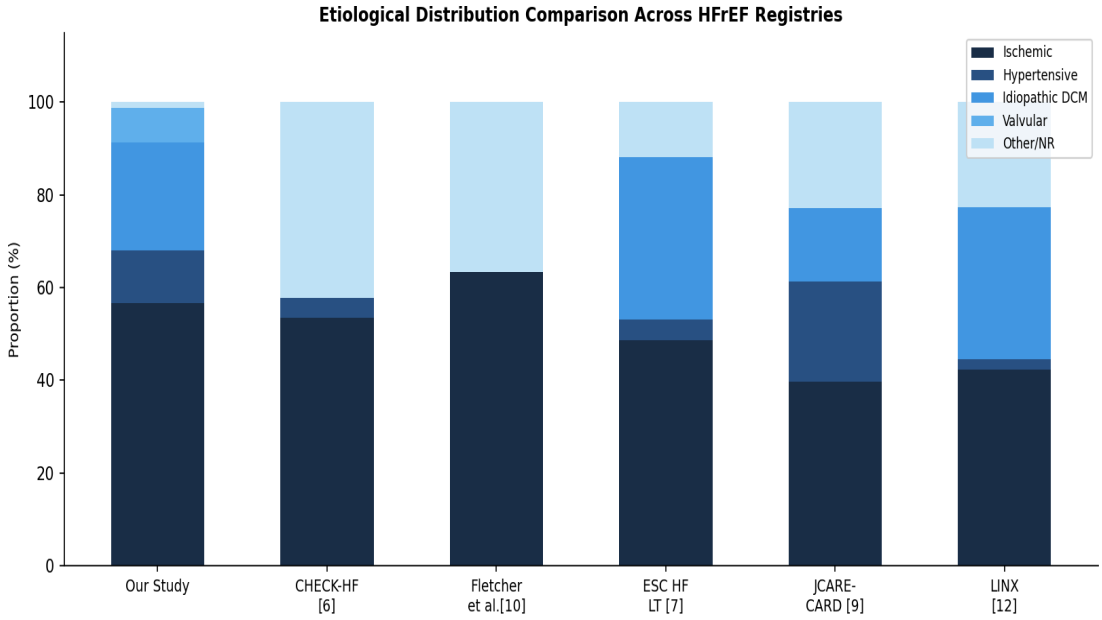

Figure 2. Comparative etiological distribution of HFrEF across international registries. DCM = Dilated Cardiomyopathy; NR = Not Reported.

Etiology	Our Study	CHECK-HF [6]	ESC HF LT [7]	JCARE-CARD [9]	LINX [12]	Fletcher [10]
Ischemic (%)	56.6	53.5	48.6	39.8	42.3	63.4
Hypertensive (%)	11.5	4.2	4.5	21.6	2.3	NR
Idiopathic DCM (%)	23.1	NR	35.1	15.7	32.7	NR
Valvular (%)	7.5	NR	NR	NR	NR	NR
Toxic (%)	1.7	NR	NR	NR	NR	NR

Table 1. Comparative etiological distribution of HFrEF across major registries. DCM = Dilated Cardiomyopathy; NR = Not Reported.

4. Discussion

Ischemic cardiomyopathy was the dominant etiology in our cohort (56.6%), aligning with data from the British cohort (63.4%) and CHECK-HF (53.5%), but exceeding Asian registries (JCARE-CARD: 39.8%) and Spanish registries (LINX: 42.3%). This pattern is concordant with the high prevalence of classical coronary risk factors in our population, particularly smoking (53%) and diabetes (45%), which synergistically accelerate atherosclerosis and ischemic injury [13].

The prevalence of idiopathic DCM (23.1%) was lower than that reported by the ESC HF Long-Term Registry (35.1%) and the Spanish LINX registry (32.7%). This discrepancy may reflect diagnostic gaps in identifying genetic cardiomyopathies, limited access to advanced imaging modalities such as cardiac MRI for tissue characterization, and potential misclassification of post-ischemic DCM as idiopathic in centers with limited angiographic resources [14].

Hypertensive cardiomyopathy (11.5%) was more prevalent in our cohort than in most Western registries but less so than in the Japanese JCARE-CARD (21.6%). Hypertension-related HFrEF in North Africa may be partly attributable to inadequate blood pressure control, late presentation, and non-adherence to antihypertensive therapy [15]. Toxic cardiomyopathy (1.7%), predominantly alcohol-related, was rare, possibly reflecting underreporting in a Muslim-majority population with cultural and religious norms discouraging alcohol consumption.

5. Conclusion

This analysis confirms that ischemic cardiomyopathy dominates the etiological spectrum of HFrEF in the Moroccan military hospital setting. The high burden of ischemic disease highlights the critical need for aggressive primary and secondary cardiovascular prevention, systematic coronary artery disease screening, and expanded access to coronary revascularization in this population. Enhanced diagnostic workup including cardiac MRI should be considered to improve etiological classification and guide individualized management.

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