

Analysis of the Clinical and Epidemiological Profile of Patients with Heart Failure with Reduced Ejection Fraction in a Hospital in Southern Santa Catarina

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Abstract

Background: Heart failure with reduced ejection fraction (HFrEF) accounts for approximately half of all heart failure hospitalizations, negatively impacts patients' functional capacity and quality of life, and is associated with high financial costs in health care.

Objectives: To analyze the clinical and epidemiological profile of patients with heart failure with HFrEF in a hospital in southern Santa Catarina in the year 2023.

Methods: 147 patients with HFrEF were evaluated in a reference hospital in southern Santa Catarina. The data were collected through electronic medical records from which information such as left ventricular ejection fraction (LVEF), sex, age, race/color, weight, height, medications in use, and associated conditions was extracted.

Results: The mean age of the study population was 68.14 ± 12.88 years. Males represented 57.8% of the patients, and 88.4% were white. Of the total, 25.5% presented some degree of obesity. Systemic arterial hypertension was observed in 68.7%, diabetes mellitus in 56.5%, and ischemic cardiomyopathies in 31.3% of the individuals. The mean LVEF value was $28.54 \pm 6.72\%$. The recommended triple pharmacological therapy was present in 45.6% of the individuals, while the association with iSGLT2 was observed in 34.8%.

Conclusions: It was possible to identify the clinical and epidemiological profile of the study population and, above all, to highlight that more than half of this population was not using optimized drug therapy. Therefore, the importance of clinical and epidemiological data for reviewing and optimizing patient management is emphasized.

Keywords: Systolic Heart Failure; Clinical Epidemiology; Clinical Medicine.

Introduction

Heart failure (HF) has been identified as a major public health problem and considered a new epidemic, with high mortality and morbidity, despite advances in current therapies.^{1,2} In Brazil, data from the I Brazilian Registry of Acute Heart Failure show that HF is one of the main causes of hospital readmission¹. In this sense, attempts to reduce its social burden, in the clinical and economic spheres, have become an important global public health priority.³

A wide range of heart conditions, hereditary defects, and systemic diseases can result in heart failure, most notably ischemic heart disease and hypertensive heart disease, congenital heart disease, dyslipidemia, and diabetes.^{1,4} Additionally, Advanced age,^{5,6} sedentary lifestyle,

and smoking are important factors associated with heart failure, and the estimated contribution of each of these risk factors may vary over time and by race and ethnicity.^{2,5,7}

To aid in better management, patients with HF can be classified according to several aspects. Differentiating patients according to left ventricular ejection fraction (LVEF) is of great importance, since they differ in relation to the main etiologies, associated comorbidities, and, especially, the response to therapy.⁵ Heart failure with reduced ejection fraction (HFrEF) is defined as LVEF <40% and negatively impacts patients' functional capacity and quality of life, as well as healthcare costs. However, despite investments in improving the management of HFrEF, this condition is still associated with high hospitalization and mortality rates.^{1,8,9}

In this context, continuous evaluation of the epidemiology of HFrEF is necessary to provide a scientific basis for the rational allocation of health resources and for the development of strategies aimed at reducing the impacts of this condition.¹⁰ However, in Brazil, there are few studies that comprehensively and prospectively evaluate the demographic, clinical, and prognostic characteristics of patients admitted with a clinical diagnosis of HF.¹

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Considering the functional and economic impacts of HFrEF and the scarcity of studies on this topic in Brazil, research is needed to contribute to the epidemiological knowledge and the demographic and clinical characterization of this population. Therefore, the objective of this study was to analyze the clinical and epidemiological profile of patients with HFrEF in a hospital in southern Santa Catarina.

Materials and methods

Ethical aspects

This study was approved by the Research and Human Ethics Committee of the educational institution, through opinion number 6.582.013, and by the Research Ethics Committee of the hospital where the study was conducted, through opinion number 6.705.122.

Study Design

This is a descriptive observational study, with secondary data collection and a quantitative approach.

Population

One hundred and forty-seven patients with HFrEF at a hospital in southern Santa Catarina were analyzed between January and December 2023. For initial patient selection, the ICD-10 classification corresponding to HF (I50, I50.0, I50.1, and I50.9) recorded in the medical records was used. Subsequently, echocardiography was considered, using the Teichholz or Simpson methods, for HF classification according to LVEF. Figure 1 illustrates the sample selection flowchart for the study.

Exclusion criteria

There were no exclusions in this study.

Data collected

Patients were evaluated using electronic medical records, from which the following information was extracted: LVEF (obtained through echocardiographic examination), sex, age, race/color, height, weight, body mass index (BMI), medications in use, and associated comorbidities.

Data analysis

The collected data were analyzed using IBM Statistical Package for the Social Sciences (SPSS) software, version 23.0. The variables age (years) and LVEF (%) were expressed as mean and standard deviation. The qualitative variables (sex, race/color, medications in use, and comorbidities) were expressed as frequency and percentage.

Results

The Central Figure illustrates the main findings of the research. Table 1 shows the clinical and epidemiological profile of the study population. The mean age was 68.14 ± 12.88 years, and males represented 57.8% of the patients. Regarding race/color, white corresponded to 88.4%. As for BMI, 43.4% had adequate weight, 29.7% were overweight, and 25.5% presented some degree of obesity. Among the comorbidities, systemic arterial hypertension was present in 68.7% of the patients, diabetes mellitus in 56.5%, and ischemic cardiomyopathy in 31.3% of the study population. Beta-blockers were the medications used by 81.0% of the patients, followed by diuretics (70.1%) and ACEis/ARBs, used by 65.3%. The LVEF had a mean of $28.54 \pm 6.72\%$. Of the 147 patients analyzed, 19 died during the same hospitalization.

Table 2 shows the medications used by patients diagnosed with HFrEF. Regarding therapeutic combinations, 29.2% of patients used four medications, 25.2% used five medications, 22.4% used three medications, and 13.6% used two medications. Only nine patients (6.1%) used one medication, and five (3.4%) did not use any medication. In

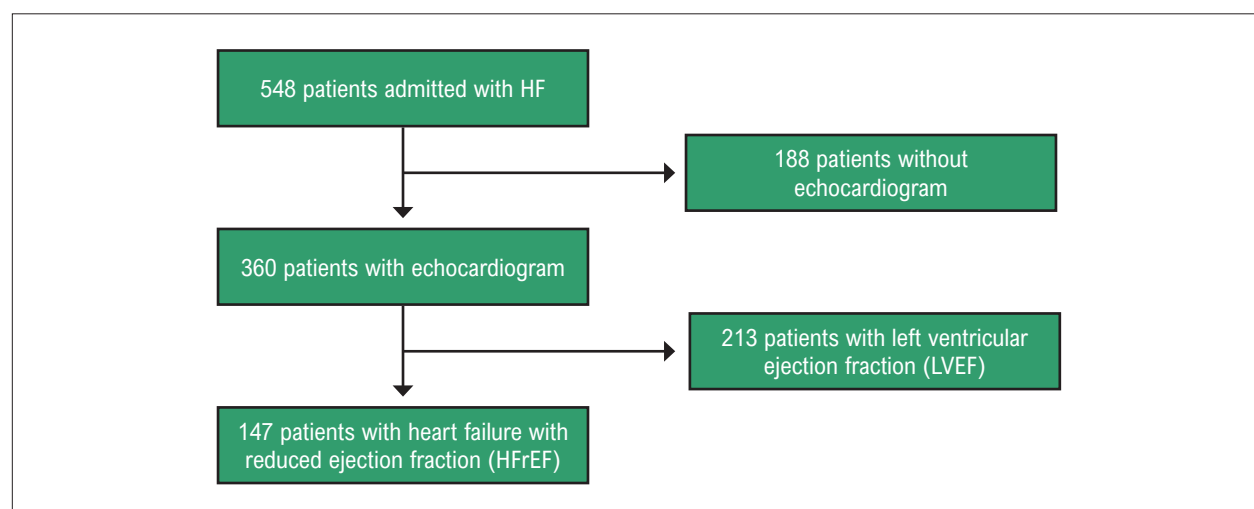


Figure 1 – Flowchart of the study sample selection. HF: Heart Failure; LVEF: Left Ventricular Ejection Fraction; HFrEF: Heart Failure with Reduced Ejection Fraction. Source: Prepared by the authors.

Original Article

the combinatorial analysis of drugs, considering the use of only one medication, diuretics were used by 2.7% of patients. The combination of diuretics with beta-blockers was observed in 4.8% of patients, and the combination of these two drugs with ACEis/ARBs was present in 6.1%. Among patients using four medications, the combination of beta-blockers, ACEis/ARBs, mineralocorticoid antagonists, and iSGLT2 accounted for 8.2%. Twenty-seven patients (18.4%) were identified as using a combination of beta-blocker, ACEi/ARB, mineralocorticoid antagonist, iSGLT2, and diuretic.

Discussion

HFrEF is a condition that presents negative physiological, economic, and social impacts. In this context, analyzing the clinical and epidemiological profile of patients with this condition is essential to support strategies aimed at reducing its impacts.

In the present study, the population with HFrEF had a mean age of 68.14 years, with a predominance of males (57.8%). Age is recognized as an important risk factor for HF and cardiovascular diseases in general, since aging is associated with progressive deterioration of cardiac structure and function, increasing susceptibility to the development of the disease.^{11,12} It is estimated that approximately 1% of individuals over 50 years of age are affected by HF, and this number doubles with each decade of life, making HF a major cause of mortality in the elderly.¹³

Regarding sex, the higher prevalence of men observed in this study is consistent with data from the literature, which attributes this predominance to greater exposure to ischemic risk factors, as well as hormonal differences and pathophysiological mechanisms that favor systolic dysfunction.¹⁴ These findings are consistent with previous studies, such as those by Albuquerque et al.¹ (2015), Desai et al.¹⁵ (2021), Petersen et al.¹⁶ (2021), and Tsao et al.⁶ (2023), which also describe predominantly elderly populations with HFrEF and a higher prevalence of males.

Regarding race/color, this study observed a predominance of white individuals, corresponding to 88.4% of the population with HFrEF. This finding differs from international epidemiological data, in which black individuals present a higher incidence of HF, earlier onset of the disease, and worse clinical outcomes, partly due to the higher prevalence of risk factors such as hypertension, obesity, and systolic dysfunction.¹⁷ Epidemiological assessments in different countries demonstrate a substantially higher burden in this population, both in terms of disease occurrence and hospitalizations.^{2,4,6,18} However, in the Brazilian context, particularly in the southern region, a higher percentage of heart failure among white individuals may reflect the interaction between regional genetic composition, the epidemiological profile of etiologies, and the social determinants of health. Corroborating this scenario, the study by Albuquerque et al.¹ (2015), conducted in a Brazilian population, identified a predominance of individuals of self-reported white race/color (59%), showing similarity with the findings of the present study.

Several studies demonstrate that the presence of comorbidities in patients with HFrEF negatively impacts prognosis, contributing to increased mortality, readmissions,

Table 1 – Clinical and epidemiological profile of patients diagnosed with heart failure with reduced ejection fraction treated at a high-complexity hospital in southern Santa Catarina in 2023

	Mean ± SD, n (%)
	n = 147
Age (years)	68.14 ± 12.88
Sex	
Masculine	85 (57.8)
Feminine	62 (42.2)
Race/Color	
White	130 (88.4)
Black	15 (10.2)
Brown	2 (1.4)
Body mass index	
Underweight	2 (1.4)
Appropriate weight	63 (43.4)
Overweight	43 (29.7)
Grade I obesity	27 (18.6)
Grade II obesity	8 (5.5)
Grade III obesity	2 (1.4)
No information	2
Comorbidities	
Systemic arterial hypertension	101 (68.7)
Diabetes mellitus	83 (56.5)
Ischemic heart disease	46 (31.3)
Obesity	37 (25.2)
Smoking	32 (21.8)
No comorbidities reported.	6 (4.1)
Medications in use	
Beta blocker	119 (81.0)
Diuretic	103 (70.1)
ACEi/ARB	96 (65.3)
Mineralocorticoid antagonist	87 (59.2)
iSGLT2	83 (56.5)
ARNi	20 (13.6)
LVEF (%)	28.54 ± 6.72
Death	19 (12.9)

ACEi/ARB: angiotensin-converting enzyme inhibitor/Angiotensin receptor blocker; iSGLT2: sodium/glucose cotransporter type 2 inhibitor; ARNi: neprilysin inhibitor; Diuretic: loop diuretic; LVEF: left ventricular ejection fraction. Source: Research data, 2024.

Table 2 – Combination of medications for patients diagnosed with heart failure with reduced ejection fraction treated at a high-complexity hospital in southern Santa Catarina in 2023

	n (%) n = 147
Combination of medications	
No medication	5 (3.4)
Only 1 medication	9 (6.1)
Diuretic	4 (2.7)
ACEi/ARB	2 (1.4)
ARNi	2 (1.4)
Beta blocker	1 (0.7)
2 medications	20 (13.6)
Beta-blocker, Diuretic	7 (4.8)
ACEi/ARB, Diuretic	6 (4.1)
Beta-blocker, ACEi/ARB	4 (2.7)
Beta blocker, iSGLT2	1 (0.7)
Mineralocorticoid antagonist, Diuretic	1 (0.7)
iSGLT2, Diuretic	1 (0.7)
3 medications	33 (22.4)
Beta blocker, ACEi/ARB, Diuretic	9 (6.1)
Beta blocker, Mineralocorticoid antagonist, Diuretic	7 (4.8)
Beta blocker, ACEi/ARB, iSGLT2	5 (3.4)
Beta blocker, ACEi/ARB, Mineralocorticoid antagonist	4 (2.7)
Beta blocker, Mineralocorticoid antagonist, iSGLT2	2 (1.4)
Mineralocorticoid Antagonist, iSGLT2, Diuretic	2 (1.4)
Beta blocker, Mineralocorticoid antagonist, ARNi	1 (0.7)
Beta blocker, ARNi, Diuretic	1 (0.7)
Beta-blocker, SGLT2 inhibitor, Diuretic	1 (0.7)
ACEi/ARB, Mineralocorticoid antagonist, Diuretic	1 (0.7)
4 medications	43 (29.2)
Beta blocker, ACEi/ARB, Mineralocorticoid antagonist, iSGLT2	12 (8.2)
Beta blocker, ACEi/ARB, iSGLT2, Diuretic	10 (6.8)
Beta blocker, ACEi/ARB, Mineralocorticoid antagonist, Diuretic	8 (5.4)
Beta blocker, Mineralocorticoid antagonist, ARNi, iSGLT2	3 (2.0)

Beta blocker, Mineralocorticoid antagonist, ARNi, Diuretic 3 (2.0)

Beta blocker, Mineralocorticoid antagonist, iSGLT2, Diuretic 3 (2.0)

ACEi/ARB, Mineralocorticoid Antagonist, iSGLT2, Diuretic 2 (1.4)

Beta blocker, ARNi, iSGLT2, Diuretic 1 (0.7)

ACEi/ARB, Mineralocorticoid Antagonist, ARNi, iSGLT2 1 (0.7)

5 medications 37 (25.2)

Beta blocker, ACEi/ARB, Mineralocorticoid antagonist, iSGLT2, Diuretic 27 (18.4)

Beta blocker, Mineralocorticoid antagonist, ARNi, iSGLT2, Diuretic 7 (4.8)

Beta blocker, ACEi/ARB, Mineralocorticoid antagonist, ARNi, iSGLT2 2 (1.4)

ACEi/ARB, Mineralocorticoid antagonist, ARNi, iSGLT2, Diuretic 1 (0.7)

ACEi/ARB: angiotensin-converting enzyme inhibitor / Angiotensin receptor blocker; iSGLT2: sodium/glucose cotransporter type 2 inhibitor; ARNi: neprilysin inhibitor; Diuretic: loop diuretic. Source: Research data, 2024.

and a decline in quality of life.¹⁹⁻²² Among the comorbidities most frequently associated with HFrEF are systemic arterial hypertension, coronary artery disease, obesity, diabetes mellitus, and acute myocardial infarction.^{1,16,23} Furthermore, the presence of multiple comorbidities is frequent in this population, and the number of associated conditions is directly related to worse clinical outcomes. In this sense, the identification and active management of these comorbidities are fundamental in the approach to these patients.²⁰⁻²²

Ischemic heart disease is recognized as the main cause of HFrEF and was identified in 31.3% of the population in the present study. This proportion is comparable to that described by Dutra et al.²³ (2022), who observed a prevalence of 26.3%, but lower than that reported by Petersen et al.¹⁶ (2021), who found 46.3% of patients with ischemic heart disease. In large international registries and reviews, this proportion is even higher, with more than 50% of patients with HFrEF presenting ischemic heart disease as an underlying cause.^{9,24} The presence of ischemia is associated with a worse prognosis, a higher risk of arrhythmias and hospitalizations, and influences the response to pharmacological treatment and the indication for devices such as implantable cardioverter-defibrillators.^{9,25}

Systemic arterial hypertension was observed in 68.7% of patients in this study and constitutes one of the main modifiable risk factors for the development of HFrEF. The central pathophysiological mechanism involves chronic overload, with consequent ventricular remodeling, culminating in systolic dysfunction and reduced ejection

fraction.^{26,27} The high prevalence of hypertension observed in this sample is consistent with epidemiological data, which indicate a frequency between 57% and 75% in patients with HFrEF, in addition to contributing to approximately 20% to 30% of HF cases, with a greater impact in younger populations.²⁸ The risk is dose-dependent, so that higher blood pressure levels proportionally increase the risk of heart failure.²⁶ Furthermore, the presence of hypertension in patients with HFrEF is associated with a worse prognosis, a higher risk of hospitalizations, and mortality. Thus, rigorous blood pressure control is fundamental in both the prevention and management of HF, since reducing blood pressure levels can improve symptoms and cardiac function.²⁸

In the present study, diabetes mellitus was identified in 56.5% of patients. Its relationship with HFrEF is considered bidirectional and multifactorial. Diabetes constitutes an independent and potent risk factor for the development of HFrEF, increasing this risk by more than two times, even after adjusting for other factors such as hypertension and coronary artery disease. This risk is mediated by both indirect mechanisms and direct effects on the myocardium, culminating in fibrosis and ventricular dysfunction.²⁹⁻³¹ The prevalence of diabetes in patients with HFrEF is high, around 40% in large cohorts, and its presence is associated with a worse prognosis, with a higher risk of hospitalization and mortality.^{32,33} The management of patients with HFrEF and diabetes requires an integrated approach, including rigorous glycemic control and the use of agents with proven cardiovascular benefit, such as sodium-glucose cotransporter 2 inhibitors (SGLT2), which reduce hospitalizations and mortality from heart failure and are recommended by national and international guidelines.^{32,34}

Obesity was identified in 25.5% of the patients with HFrEF evaluated, constituting a risk factor not only for systemic arterial hypertension, dyslipidemia, and diabetes mellitus, but also for the development of left ventricular hypertrophy. This is a condition that exerts indirect effects on HF, through the development of risk factors, as well as direct effects on the myocardium.¹⁷ The association between obesity and HF is consistently described in the literature, with international studies reporting a prevalence of around 23%.³⁵ Additionally, the cohort study by Léo et al. (2025)¹⁹ stands out, which identified important modifiable risk factors in the Brazilian population, reinforcing the need for preventive strategies and public policies aimed at early detection and management of HF.

The LVEF observed in this study had a mean of $28.54 \pm 6.72\%$, consistent with various studies described in the literature. The association between reduced LVEF and a worse prognosis in patients with HFrEF is well established, and studies indicate that most patients with HFrEF have a mean LVEF between 25% and 35%.^{23,36,37} As LVEF decreases, a progressive increase in the risk of mortality, hospitalizations, and adverse events is observed, regardless of other clinical factors.^{38,39} In this context, LVEF remains one of the main parameters for the evaluation and follow-up of patients with HFrEF, being widely validated by international studies and consensus guidelines.^{9,40}

In the present study, only 34.8% of patients with HFrEF were concomitantly using the four recommended classes of prognostic-modifying drugs. Current pharmacological treatment for HFrEF advocates the early initiation of four

fundamental classes of medications: renin-angiotensin system inhibitors or angiotensin-neprilysin receptor inhibitors, beta-blockers, mineralocorticoid receptor antagonists, and SGLT2. This therapeutic strategy is supported by consensus among European, American, and Brazilian guidelines, based on robust evidence of reduced mortality and hospitalizations.^{41,42} Loop diuretics constitute another widely used drug class, indicated for symptomatic control of congestion, without prognostic impact.⁴³ Despite well-established recommendations, studies demonstrate that adherence to triple or quadruple therapy remains suboptimal in clinical practice, with less than half of eligible patients receiving all recommended classes.^{1,9,44} Factors such as the complexity of the therapeutic regimen, polypharmacy, the presence of comorbidities, adverse effects, socioeconomic difficulties, and barriers in the health system contribute to low adherence.⁴³ This low adherence is concerning, as it can favor disease decompensation¹⁶ and contribute to high morbidity, mortality, and associated costs.¹

The mortality rate in patients with HFrEF remains high, even with therapeutic advances. Most deaths in this population are due to cardiovascular causes, mainly progressive heart failure and sudden death.⁴⁵ The present study found that 12.9% of patients with HFrEF died during the study period. In large international registries and multicenter studies, the 1-year mortality rate for outpatients with HFrEF is approximately 8% to 9%. In patients hospitalized for decompensation, this rate can reach 17% to 18%.⁴⁶ In Brazil, the BREATHE study¹ observed mortality from any cause in 12.6% of cases, a result similar to that found in the present study. In turn, Desai et al.¹⁵ (2021) reported an even higher percentage of 27.4%. These findings demonstrate that HFrEF continues to represent a significant public health problem, reinforcing the need for rigorous implementation of pharmacological therapy recommended by guidelines to modify the prognosis of these patients.

Study limitations

Several limitations inherent to this study should be considered. The study was conducted in a single tertiary care center, a regional referral center, which may limit the external validity of the results. Furthermore, a sample of 147 individuals may not adequately represent the diversity of the population, leading to biased results. This study did not aim to evaluate medication dosages due to the lack of standardization in recording this information in medical records. However, understanding the relevance of this analysis, it is suggested that it be included in future studies for further discussion. Additionally, the data were collected from electronic medical records; therefore, the accuracy and completeness of the information in the records may vary, interfering with the analyses. Furthermore, different professionals may record information in different ways, which can lead to inconsistencies and variability in the collected data.

Conclusions

This study described the clinical, epidemiological, and therapeutic profile of patients with HFrEF treated at a reference hospital in southern Brazil, highlighting a predominantly elderly, male population with a high burden of comorbidities,

significantly reduced ejection fraction, and relevant in-hospital mortality (Central Illustration).

The results demonstrate that, despite the consolidated recommendations of national and international guidelines, the optimization of pharmacological therapy is still limited in actual clinical practice. These findings highlight the existence of a gap between clinical guidelines and care practice, reinforcing the need for strategies aimed at optimizing the pharmacological treatment of HFrEF. Understanding the clinical and therapeutic profile of this population can contribute to improving the management of heart failure and reducing adverse outcomes in similar care settings.

Author Contributions

Conception and design of the research, Analysis and interpretation of the data and Critical revision of the manuscript for intellectual content: Borges GA, Luca M, Bolan AC; Acquisition of data, Statistical analysis and Writing of the manuscript: Borges GA, Luca M.

References

1. Albuquerque DC, Souza JD Neto, Bacal F, Rohde LE, Bernardes-Pereira S, Berwanger O, et al. I Brazilian Registry of Heart Failure - Clinical Aspects, Care Quality and Hospitalization Outcomes. *Arq Bras Cardiol.* 2015;104(6):433-42. doi: 10.5935/abc.20150031.
2. Roger VL. Epidemiology of Heart Failure: A Contemporary Perspective. *Circ Res.* 2021;128(10):1421-34. doi: 10.1161/CIRCRESAHA.121.318172.
3. Savarese G, Becher PM, Lund LH, Seferovic P, Rosano GMC, Coats AJS. Global Burden of Heart Failure: A Comprehensive and Updated Review of Epidemiology. *Cardiovasc Res.* 2023;118(17):3272-87. doi: 10.1093/cvr/cvac013.
4. Ziaeian B, Fonarow GC. Epidemiology and Aetiology of Heart Failure. *Nat Rev Cardiol.* 2016;13(6):368-78. doi: 10.1038/nrcardio.2016.25.
5. Bui AL, Horwich TB, Fonarow GC. Epidemiology and Risk Profile of Heart Failure. *Nat Rev Cardiol.* 2011;8(1):30-41. doi: 10.1038/nrcardio.2010.165.
6. Tsao CW, Aday AW, Almarazooq ZI, Anderson CAM, Arora P, Avery CL, et al. Heart Disease and Stroke Statistics-2023 Update: A Report from the American Heart Association. *Circulation.* 2023;147(8):e93-e621. doi: 10.1161/CIR.0000000000001123.
7. Ebong IA, Goff DC Jr, Rodriguez CJ, Chen H, Bertoni AG. Mechanisms of Heart Failure in Obesity. *Obes Res Clin Pract.* 2014;8(6):e540-8. doi: 10.1016/j.orcp.2013.12.005.
8. Triposkiadis F, Giamouzis G, Parissis J, Starling RC, Boudoulas H, Skoularigis J, et al. Reframing the Association and Significance of Co-Morbidities in Heart Failure. *Eur J Heart Fail.* 2016;18(7):744-58. doi: 10.1002/ejhf.600.
9. Murphy SP, Ibrahim NE, Januzzi JL Jr. Heart Failure with Reduced Ejection Fraction: A Review. *JAMA.* 2020;324(5):488-504. doi: 10.1001/jama.2020.10262.
10. Bocchi EA. Heart Failure in South America. *Curr Cardiol Rev.* 2013;9(2):147-56. doi: 10.2174/1573403x11309020007.
11. Li H, Hastings MH, Rhee J, Trager LE, Roh JD, Rosenzweig A. Targeting Age-Related Pathways in Heart Failure. *Circ Res.* 2020;126(4):533-51. doi: 10.1161/CIRCRESAHA.119.315889.
12. Lakatta EG, Levy D. Arterial and Cardiac Aging: Major Shareholders in Cardiovascular Disease Enterprises: Part I: Aging Arteries: A "Set Up" for Vascular Disease. *Circulation.* 2003;107(1):139-46. doi: 10.1161/01.cir.0000048892.83521.58..
13. Mosterd A, Hoes AW. Clinical Epidemiology of Heart Failure. *Heart.* 2007;93(9):1137-46. doi: 10.1136/hrt.2003.025270.
14. Lam CSP, Arnott C, Beale AL, Chandramouli C, Hilfiker-Kleiner D, Kaye DM, et al. Sex Differences in Heart Failure. *Eur Heart J.* 2019;40(47):3859-3868. doi: 10.1093/eurheartj/ehz835.
15. Desai RJ, Mahesri M, Chin K, Levin R, Lahoz R, Studer R, et al. Epidemiologic Characterization of Heart Failure with Reduced or Preserved Ejection Fraction Populations Identified Using Medicare Claims. *Am J Med.* 2021;134(4):e241-51. doi: 10.1016/j.amjmed.2020.09.038.
16. Petersen LC, Danzmann LC, Bartholomay E, Bodanese LC, Donay BG, Magedanz EH, et al. Survival of Patients with Acute Heart Failure and Mid-Range Ejection Fraction in a Developing Country - A Cohort Study in South Brazil. *Arq Bras Cardiol.* 2021;116(1):14-23. doi: 10.36660/abc.20190427.
17. White-Williams C, Rossi LP, Bittner VA, Driscoll A, Durant RW, Granger BB, et al. Addressing Social Determinants of Health in the Care of Patients with Heart Failure: A Scientific Statement from the American Heart Association. *Circulation.* 2020;141(22):e841-63. doi: 10.1161/CIR.0000000000000767.
18. Fernandes-Silva MM, Shah AM, Hegde S, Goncalves A, Claggett B, Cheng S, et al. Race-Related Differences in Left Ventricular Structural and Functional Remodeling in Response to Increased Afterload: The ARIC Study. *JACC Heart Fail.* 2017;5(3):157-65. doi: 10.1016/j.jchf.2016.10.011.
19. Léo APO, Matos SMA, Almeida MDCC, Aras R. Incidence and Risk Factors for Heart Failure in the ELSA-Brasil Cohort. *PLoS One.* 2025;20(8):e0329113. doi: 10.1371/journal.pone.0329113.
20. Lee KS, Park DI, Lee J, Oh O, Kim N, Nam G. Relationship between Comorbidity and Health Outcomes in Patients with Heart Failure: A Systematic Review and Meta-Analysis. *BMC Cardiovasc Disord.* 2023;23(1):498. doi: 10.1186/s12872-023-03527-x.
21. Miró Ò, Conde-Martel A, Llorens P, Salamanca-Bautista P, Gil V, González-Franco Á, et al. The Influence of Comorbidities on the Prognosis after an Acute Heart Failure Decompensation and Differences According to Ejection Fraction: Results from the EAHFE and RICA Registries. *Eur J Intern Med.* 2023;111:97-104. doi: 10.1016/j.ejim.2023.02.026..

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any thesis or dissertation work.

Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee of the Universidade do Extremo Sul Catarinense under the protocol number 6.582.013. All the procedures in this study were in accordance with the 1975 Helsinki Declaration, updated in 2013.

22. Pandey A, Vaduganathan M, Arora S, Qamar A, Mentz RJ, Shah SJ, et al. Temporal Trends in Prevalence and Prognostic Implications of Comorbidities among Patients with Acute Decompensated Heart Failure: The ARIC Study Community Surveillance. *Circulation*. 2020;142(3):230-43. doi: 10.1161/CIRCULATIONAHA.120.047019.
23. Dutra GP, Gomes BFO, Carmo PRD Jr, Petriz JLF, Nascimento EM, Pereira BB, et al. Mortality from Heart Failure with Mid-Range Ejection Fraction. *Arq Bras Cardiol*. 2022;118(4):694-700. doi: 10.36660/abc.20210050.
24. Pagliaro BR, Cannata F, Stefanini GG, Bolognese L. Myocardial Ischemia and Coronary Disease in Heart Failure. *Heart Fail Rev*. 2020;25(1):53-65. doi: 10.1007/s10741-019-09831-z.
25. Elgendy IY, Mahtta D, Pepine CJ. Medical Therapy for Heart Failure Caused by Ischemic Heart Disease. *Circ Res*. 2019;124(11):1520-35. doi: 10.1161/CIRCRESAHA.118.313568.
26. Khan SS, Berwanger O, Fiuzat M, McMurray JJ, Narula J, Prabhakaran D, et al. Prioritising the Primary Prevention of Heart Failure. *Lancet*. 2025;406(10508):1138-53. doi: 10.1016/S0140-6736(25)01393-5.
27. Metra M, Teerlink JR. Heart Failure. *Lancet*. 2017;390(10106):1981-95. doi: 10.1016/S0140-6736(17)31071-1.
28. Arundel C, Lam PH, Gill GS, Patel S, Panjraht G, Faselis C, et al. Systolic Blood Pressure and Outcomes in Patients with Heart Failure with Reduced Ejection Fraction. *J Am Coll Cardiol*. 2019;73(24):3054-63. doi: 10.1016/j.jacc.2019.04.022.
29. Kenny HC, Abel ED. Heart Failure in Type 2 Diabetes Mellitus. *Circ Res*. 2019;124(1):121-41. doi: 10.1161/CIRCRESAHA.118.311371.
30. Ho KL, Karwi QG, Connolly D, Pherwani S, Ketema EB, Ussher JR, et al. Metabolic, Structural and Biochemical Changes in Diabetes and the Development of Heart Failure. *Diabetologia*. 2022;65(3):411-23. doi: 10.1007/s00125-021-05637-7.
31. Packer M. Differential Pathophysiological Mechanisms in Heart Failure with a Reduced or Preserved Ejection Fraction in Diabetes. *JACC Heart Fail*. 2021;9(8):535-549. doi: 10.1016/j.jchf.2021.05.019.
32. Pop-Busui R, Januzzi JL, Bruemmer D, Butalia S, Green JB, Horton WB, et al. Heart Failure: An Underappreciated Complication of Diabetes. A Consensus Report of the American Diabetes Association. *Diabetes Care*. 2022;45(7):1670-90. doi: 10.2337/dci22-0014.
33. Mentz RJ, Kelly JP, von Lueder TG, Voors AA, Lam CS, Cowie MR, et al. Noncardiac Comorbidities in Heart Failure with Reduced versus Preserved Ejection Fraction. *J Am Coll Cardiol*. 2014;64(21):2281-93. doi: 10.1016/j.jacc.2014.08.036.
34. Marcondes-Braga FG, Moura LAZ, Issa VS, Vieira JL, Rohde LE, Simões MV, et al. Emerging Topics Update of the Brazilian Heart Failure Guideline - 2021. *Arq Bras Cardiol*. 2021;116(6):1174-212. doi: 10.36660/abc.20210367.
35. Kittleson MM, Benjamin EJ, Blumer V, Harrington J, Januzzi JL, McMurray JJV, et al. 2025 ACC Scientific Statement on the Management of Obesity in Adults with Heart Failure: A Report of the American College of Cardiology. *J Am Coll Cardiol*. 2025;86(20):1953-75. doi: 10.1016/j.jacc.2025.05.008.
36. DeVore AD, Hellkamp AS, Thomas L, Albert NM, Butler J, Patterson JH, et al. Improvement in Left Ventricular Ejection Fraction in Outpatients with Heart Failure with Reduced Ejection Fraction: Data from CHAMP-HF. *Circ Heart Fail*. 2020;13(7):e006833. doi: 10.1161/CIRCHEARTFAILURE.119.006833.
37. Lerman BJ, Popat RA, Assimes TL, Heidenreich PA, Wren SM. Association of Left Ventricular Ejection Fraction and Symptoms with Mortality after Elective Noncardiac Surgery among Patients with Heart Failure. *JAMA*. 2019;321(6):572-9. doi: 10.1001/jama.2019.0156.
38. Carnicelli AP, Clare RM, Hofmann P, Chiswell K, DeVore AD, Vemulapalli S, et al. Clinical Trajectory of Patients with a Worsening Heart Failure Event and Reduced Ventricular Ejection fraction. *Am Heart J*. 2022;245:110-6. doi: 10.1016/j.ahj.2021.12.003.
39. Liang M, Bian B, Yang Q. Characteristics and Long-Term Prognosis of Patients with Reduced, Mid-Range, and Preserved Ejection Fraction: A Systemic Review and Meta-Analysis. *Clin Cardiol*. 2022;45(1):5-17. doi: 10.1002/clc.23754.
40. Rosano GMC, Teerlink JR, Kinugawa K, Bayes-Genis A, Chioncel O, Fang J, et al. The Use of Left Ventricular Ejection Fraction in the Diagnosis and Management of Heart Failure. A Clinical Consensus Statement of the Heart Failure Association (HFA) of the ESC, the Heart Failure Society of America (HFSA), and the Japanese Heart Failure Society (JHFS). *Eur J Heart Fail*. 2025;27(7):1174-87. doi: 10.1002/ehf.3646.
41. van Essen BJ, Ceelen DCH, Ouwkerk W, Teng TK, Tharshana GN, Hew FM, et al. Pharmacologic Treatment of Heart Failure with Reduced Ejection Fraction: An Updated Systematic Review and Network Meta-Analysis. *J Am Coll Cardiol*. 2025;86(24):2513-26. doi: 10.1016/j.jacc.2025.08.054.
42. Cannata A, Crespo-Leiro MC, Bromage DI, Ruschitzka F, McDonagh TA. Heart Failure with Reduced Ejection Fraction. *Lancet*. 2026;407(10527):529-42. doi: 10.1016/S0140-6736(25)01851-3.
43. Maddox TM, Januzzi JL Jr, Allen LA, Breathett K, Brouse S, Butler J, et al. 2024 ACC Expert Consensus Decision Pathway for Treatment of Heart Failure with Reduced Ejection Fraction: A Report of the American College of Cardiology Solution Set Oversight Committee. *J Am Coll Cardiol*. 2024;83(15):1444-88. doi: 10.1016/j.jacc.2023.12.024.
44. Greene SJ, Butler J, Albert NM, DeVore AD, Sharma PP, Duffy CI, et al. Medical Therapy for Heart Failure with Reduced Ejection Fraction: The CHAMP-HF Registry. *J Am Coll Cardiol*. 2018;72(4):351-66. doi: 10.1016/j.jacc.2018.04.070.
45. Settergren C, Benson L, Shahim A, Dahlström U, Thorvaldsen T, Savarese G, et al. Cause-Specific Death in Heart Failure Across the Ejection Fraction Spectrum: A Comprehensive assessment of Over 100 000 Patients in the Swedish Heart Failure Registry. *Eur J Heart Fail*. 2024;26(5):1150-9. doi: 10.1002/ehf.3230.
46. Writing Committee Members. HF STATS 2025: Heart Failure Epidemiology and Outcomes Statistics An Updated 2025 Report from the Heart Failure Society of America. *J Card Fail*. 2026;32(2):439-98. doi: 10.1016/j.cardfail.2025.07.007.

