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Heart failure outcomes in Sub-Saharan Africa: a scoping review of recent studies conducted after the 2022 AHA/ACC/HFSA guideline release

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Abstract

Background Heart failure (HF) in Sub-Saharan Africa (SSA) presents unique challenges, with high prevalence and distinct epidemiological features compared to high-income settings. Despite its burden, recent comprehensive data are lacking, especially amidst recent 2022 AHA/ACC/HFSA guideline release**.** This scoping review aims to map the literature on HF in SSA, focusing on aetiologies, structural abnormalities, management practices, and outcomes to identify research gaps and inform clinical practice.

Methods Studies from 2022–2024 published in English or French were included, covering adult patients > 18 years, all study designs except case reports. Studies not reporting any outcomes or focusing solely on one HF subtype were excluded. Literature from all SSA countries was searched using a FACET approach in databases including PubMed, Google Scholar, Cochrane and Scopus.

Results Ten studies, evaluating 2039 patients, were analysed. Dilated cardiomyopathy (DCM), and Hypertensive cardiomyopathy (HCM) emerged as prominent aetiologies. Rheumatic heart disease was reported in only four studies. Common issues included high rates of electrolyte disturbances and anemia, which influenced patient outcomes. Guideline adherence exhibited significant deficiencies, notably with a suboptimal prescription rate of SGLT2 inhibitors (8.3–24.7%). Mortality rates ranged from 3.7% to 19%, linked to factors like low blood pressure and electrolyte imbalances. Hospital stays were variable but significant rehospitalization were common within 8–15 days post discharge and associated with non-compliance and lifestyle factors.

Conclusion HCM and DCM are prevalent heart failure aetiologies in SSA. Longitudinal studies are recommended to contextualise aetiological diagnosis and validate prognostic tools amidst limited resources. Enhanced guideline adherence, hypertension control and efficient post-discharge care are essential to reduce morbidity and mortality.

Keywords Heart failure, Sub-Saharan Africa, Aetiologies, Guideline adherence, Mortality rates

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Introduction

Background

Heart failure (HF) in Sub-Sharan Africa (SSA) has emerged as a dominant cardiovascular disease, with hospital-based studies reporting prevalence of 12.0% in Sudan, 17.6% in Burkina Faso, 28.6% in Togo and 30% in Cameroon [1]. HF affects about 1–3% of the general adult population globally, with a stable incidence of 1–20 cases per 1000 person-years, costing 25 500 euros annually [2]. In SSA, HF aetiologies include hypertension, rheumatic heart disease, cardiomyopathies and infections, differing from high-income countries [2]. African patients are typically younger, often lack formal education, lack health and medication insurance, and are more likely to be in New York Heart Association (NYHA) functional class IV compared to other regions [3].

Despite this burden, no population-based studies exist in SSA [1], and therefore, it has been difficult to determine the overall prevalence of this pathology in this region [2]. Moreover, one of the latest (published in 2021) large-scale study in a high-burden country like Cameroon reported a post-hoc analysis using data from a registry of patients enrolled between 2007 and 2010 [4], limiting relevance amidst updated 2022 ACC/AHA guidelines. Although insightful, the use of over 10 year old data in this study constitutes a significant limitation to the current understanding of heart failure among patients in SSA especially in light of the initial updated guidelines on HF published by the American College of Cardiology (ACC)/American Heart Association (AHA) Joint Committee on Clinical Practice Guidelines in 2022 [5]. The different clinical profile and region specific challenges in managing HF in SSA [3, 4], further highlights the critical need for a more recent understanding of Heart failure in SSA.

Rationale for a scoping review

The most recent review on heart failure in SSA was conducted in 2018 [3] and in Africa as a whole in 2021 [1]. An updated understanding of HF is warranted and therefore a review is necessary to broadly map out updated existing literature on HF in SSA. The scoping review methodology was chosen as it adapted to provide a pragmatic and holistic understanding of the wide breadth of literature on HF, enabling gaps in current studies to be determined, and future interventions to be planned.

Review purpose

To comprehensively map out the literature on HF in SSA, focusing on aetiologies, structural and biological abnormalities, management practices and outcomes.

Review question

This study used the PCC framework (Population, Concept, and Context) recommended by Joanna Briggs Institute (JBI) in formulating review questions [6] as follows:

> Population: Patients with Heart Failure.
> Concepts: Aetiologies, structural abnormalities, pattern of electrolyte disturbances and anaemia, alignment of management practices with 2022 AHA/ACC guidelines, mortality rates and its contributing factors, outcomes post-discharge and follow-up practices.
> Context: Patients living in Sub-Saharan Africa.

Our review question was therefore: What are the aetiologies, structural abnormalities, patterns of electrolyte disturbances and anemia, the extent of alignment with the 2022 AHA/ACC/HFSA guidelines in management practices, mortality rates along with contributing factors, post-discharge outcomes and follow-up practices for heart failure patients in Sub-Saharan Africa?".

Review methods

Protocol registration

Due to resource constraints and the primary objective of rapidly generating clinical insights on HF in SSA, this review did not undergo prospective protocol registration as recommended by JBI [6], which may introduce bias from potential mid-review methodological adjustments. However, this scoping review was conducted using a systematic approach as guided by a five-step process recommended by the Joanna Briggs Institute [7]. After the research question was drafted (Step 1), relevant studies were then identified (Step 2). This was followed by the selection of studies (Step 3), data extraction (Step 4), and finally (Step 5), compiling, summing up, and presentation of the results [7]. The approach in this study conformed with the PRISMA extension for scoping reviews, combining established methods with scoping review best practices [8].

Eligibility criteria

- Participants: Studies that include adult patients > 18 years diagnosed with heart failure in SSA.
- Study designs: Cohort, case–control, cross-sectional, clinical trials, and reviews/meta-analyses designs on HF in SSA were included. Case reports/series were excluded.
- Language and study period: Studies published in English or French from January 2022 to December 2024. This is because the most recent review on Heart Failure we found was published in 2018/2021

[1, 3]. Therefore, using the most recent three years, away from the COVID- 19 pandemic which may threaten the validity of the results was deemed most appropriate. Moreover, given that the AHA/ACC released guidelines on HF management in 2022 [5], ensures only relevant data is analysed and reported. Similarly, studies published after or in 2022 but exploiting data from patients before 2022 were excluded from the review.

- Type of Heart Failure: Studies exclusively reporting on only one heart failure subtype, such as Heart failure with reduced ejection fraction (HFrEF) or Heart failure with preserved ejection fraction (HFpEF), or only one particular aetiology such as peripartum cardiomyopathy only, were excluded. Although we recognise the potential for discarding valuable subtype specific data, necessary for a holistic understanding of the nuances in HF outcomes, this methodology was preferred to ensure that heart failure outcomes are analysed more holistically, and the results are more generalizable, and comparable.
- Outcome Measures: Only studies reporting on at least one of the following outcomes: mortality, length of stay or hospital readmissions were included. This was to ensure that the review aligns with the objectives of mortality and follow-up care analysis.
- Publication Type: All publication types were included except commentaries, protocols and conference abstracts.

Types of evidence sources

PubMed, Cochrane, Scopus, Google Scholar, and Health Science and Diseases Journal were selected to ensure a comprehensive review. PubMed, Cochrane and Scopus provide high-quality, peer-reviewed articles, while Google Scholar offers broad access to regionally relevant research. Health Science and Diseases Journal was included for its free access to Sub-Saharan Africa-focused studies. Due to time and human resource constraints, only the top 1004 classified by Google Scholar as most relevant, were selected. Although this was an arbitrary value, authors selected this cut-off because the relevance beyond this number decreased significantly.

Search strategy

The evidence sources were searched using the three FACET analysis portrayed in the Table 1 below. The FACET 3 involved searching all 50 countries in Sub-Saharan Africa as recognised by UNESCO [9] from "Angola" to "Zimbabwe". Detailed search results can be found in the supplementary materials.

Table 1 FACET analysis table for search strategy

FACET 1: Population	FACET 2: Concept	FACET 3: Context
"Heart failure"	"etiology"OR	"Sub-Saharan Africa"OR
"HF"	"aetiology" OR	"Sub Saharan Africa"OR
"CHF"	"structural"OR	"Angola" OR
"Cardiac failure"	"electrolyte"OR	"Benin" OR
	"anemia"OR	"Botswana" OR
	"anaemia" OR	"Burkina Faso" OR
	"mortality"OR	"Burundi" OR
	"follow-up care" OR	"Cabo Verde" OR
	"guideline"OR	"Cameroon" OR
		...
		"Zimbabwe" OR

Selection of study/source of evidence

- Title and abstract screening was done by two independent reviewers (EMML and DS).
- Full-text review of articles was done to assess for relevance. A full list of excluded studies and the reason for their exclusion can be found in the supplementary materials.
- Discrepancies were resolved by discussion or consultation with a third reviewer.

Data items, extraction and charting

- The following data items were extracted from the studies: Author and year of publication, country of study, title of the study, study objectives, study setting, ethical oversight, type of study design, case definitions for HF, power calculations, demographics, aetiologies of heart failure, diagnostic investigations, electrolytes, haemoglobin level, guideline adherence, mortality, duration of hospitalisation, and follow-up information/readmission rates, and author reported study limitations.
- A custom data extraction form was created and systematically organized using Covidence software [10].

Critical appraisal of individual evidence sources

This study did not employ a critical appraisal, aligning with the inherent aim of scoping reviews to map and describe existing research rather than evaluate quality and bias, a focus more relevant to systematic reviews and deemed optional by the JBI, the methodological reference framework in this study [7, 8]. Nonetheless, this review

examined study settings, case definitions, ethical oversight and authors' self-reported bias as a perspective on study quality.

Synthesis of findings

- Narrative synthesis was used due to expected heterogeneity amongst the study designs. Thematic analysis was used to categorize findings according to review questions.

Ethical considerations

No primary data collection was involved in this review, hence no primary ethical issues. However, patient data confidentiality in the included studies was maintained, and the ethical issues identified from primary studies were reported, if any.

Review findings

Selection of sources of evidence

In total, 2315 studies were screened (2307 from database search and 8 from journal searching). A total of 880 duplicates were removed, 1198 articles were removed for irrelevance, 227 articles did not meet eligibility criteria. A table displaying all excluded studies and the reasons for exclusion can be found in the supplementary materials. A total of ten ($n = 10$) studies were finally included in the review as depicted in Fig. 1.

Characteristics of sources of evidence

All studies were quantitative and specific designs included cross-sectional ($n = 6/10$), and cohort studies ($n = 4/10$). The studies spanned various countries in Sub-Saharan Africa, mostly from Ethiopia ($n = 4$), and Mali ($n = 2$), with one study each from Nigeria, Chad. Gabon and Kenya. Sample sizes ranged from 59 [11] to 383 [12], with a total of 2039 patients across East, West and Central Africa. There was no study from the Southern Africa sub-region that fit the inclusion criteria.

Results of individual sources of evidence

Detailed results of individual sources of evidence can be found in Tables 2, 3 and 4.

Synthesis of results

Sociodemographic characteristics of the patients

The proportion of female patients varied from 34.8% [12] to 59.0% [18], with most studies reporting a relatively balanced gender distribution (median female percentage: 51.4%). The mean age of patients ranged from 48.0 years [14] to 61.2 years [12], reflecting a broad age spectrum, with an overall tendency toward middle-aged and older adults (median age: 54.8 years).

Aetiologies of HF

The aetiologies of HF was unreported in two studies [13, 19]. Dilated cardiomyopathy (DCM) was frequently reported in studies examining aetiologies, ranging from 10.9% [20] to 46.9% [12] and was the most common aetiology in Mali [12, 14]. Hypertensive cardiomyopathy (HCM) was prevalent (39%) in some areas [11] but lower rates at 4.5%, 9.6, and 9.8% were also reported [12, 14, 18]. Ischemic heart disease (IHD) was noted in 6.3% in Kenya [21] to 32.9% in Mali [12]. Valvular heart disease (VHD), including rheumatic heart disease (RHD), was reported in up to 27.2% in Ethiopia [18] and 19.7% in Kenya [21], with RHD specifically highlighted in Ethiopia (13.3–17.6%) and Kenya (19.7%) [21]. Cor pulmonale (CP) was most common aetiology in two studies [20, 21] and ranged from 1.8% [12] to 28.9% [21]. Other aetiologies like congenital heart disease (CHD), thyroid cardiomyopathy (TCM) and arrythmia-induced cardiomyopathy (AiCM), were less consistently reported. It is also worth noting that idiopathic/unidentified causes were reported prominently in Gabon (35.0%).

Diagnostic investigations

Echocardiographic data were inconsistently reported with three studies [12, 16, 20] reporting no information on Left ventricular ejection fraction (LVEF). LVEF averages were provided in only three studies: 39.9% [14], 36.4% [17], and 35.7% [19]. Heart failure classifications based on LVEF included heart failure with preserved ejection fraction (HFpEF, 26.6–55.2%), mildly reduced ejection fraction (HFmrEF, 7.9–12.7%) and reduced ejection fraction (HFrEF, 35.7–63.3%) [11, 13, 18, 21]. Electrocardiogram (ECG) findings were detailed in only one study [14], reporting sinus tachycardia (46.6%), atrial fibrillation (16.5%), left ventricular hypertrophy (33.8%) and ischemia (22.2%). Limitations in diagnostic capacity, such as the absence of coronary angiography, CT-scans and natriuretic peptide testing (BNP/NT-proBNP), were noted as challenges in accurately identifying aetiologies in several studies [16–18].

Electrolytes and renal function

Electrolyte abnormalities were reported in five studies. Hypokalaemia ($K+ < 3.5$ mEq/L) ranged from 12.8% [14] to 16.5% [19], with hyperkalaemia ($K+ > 5$ mEq/L) noted in 14.2% of cases [20]. Hyponatremia ($Na+ < 135$ mEq/L) was observed in 16.9% [18] to 36.3% [19], while hypernatremia ($Na+ > 145$ mEq/L) occurred in 6.4% [20]. Chloride imbalances (Cl- <96 mEq/L or >105 mEq/L) were reported to affect up to 36.7% of patients

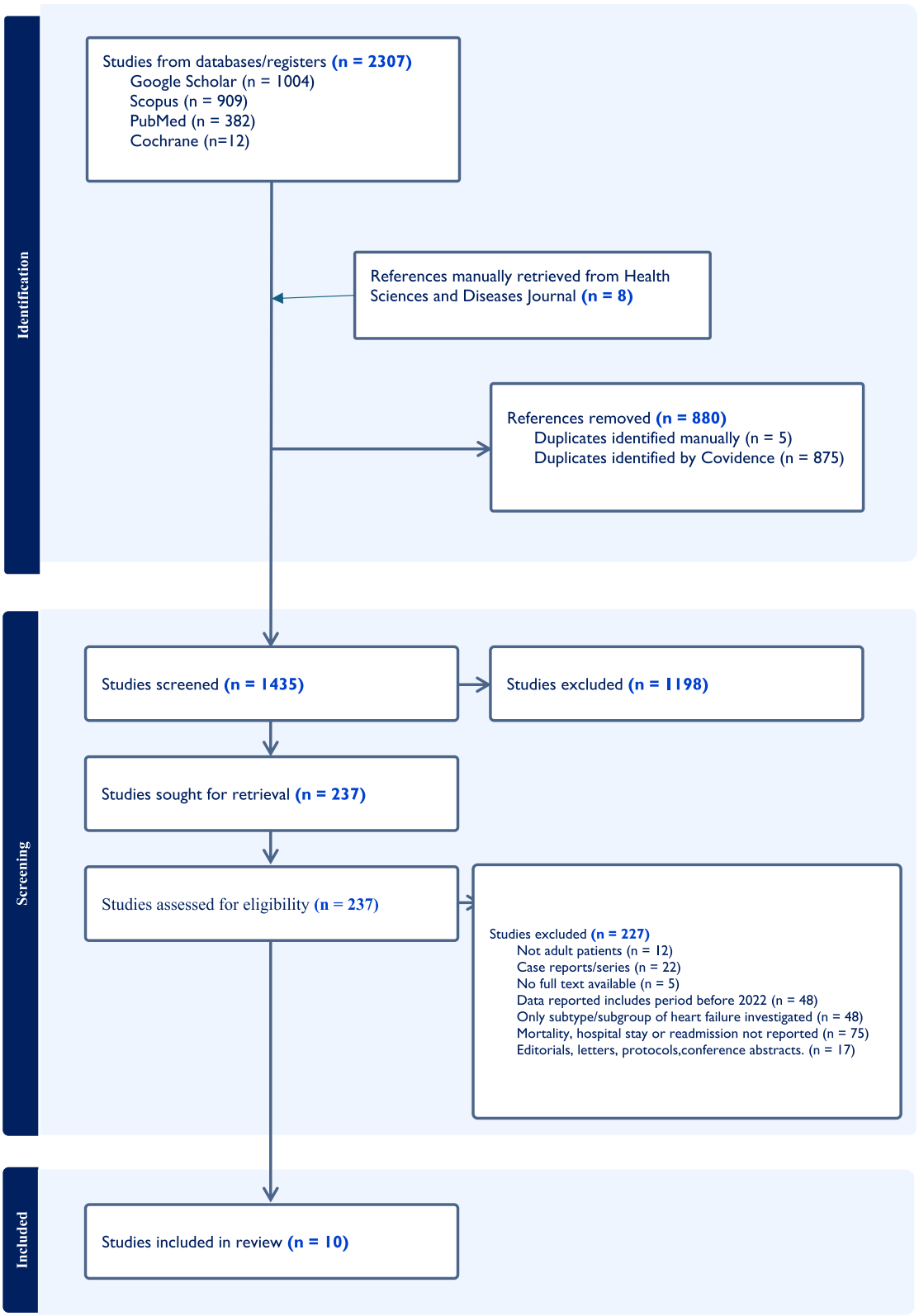

Fig. 1 PRISMA flowchart for the selection of studies on Heart Failure outcomes in Sub-Saharan Africa (2022–2024)

Table 2 Country of study, sample size, gender, age and aetiologies of HF in Sub-Saharan Africa from 2022–2024

Author, year of publication	Country of study	Sample size	F (%)	Age	Aetiologies (*RHD in bold)													
					HCM (%)	DCM (%)	CHD (%)	IHD (%)	VHD (%)	RHD (%)	TCM (%)	PDX (%)	PCM (%)	CP (%)	REH (%)	AICM (%)	CAD (%)	ID (%)
Ogbemudia et al., 2023 [13]	**Nigeria**	**79**	**48.1**	**60.3**	**NR**	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Traoré et al., 2023 [14]	Mali	**266**	**57.9**	**48.0**	**4.5**	36.8	NR	16.2	NR	NR	NR	NR	32	2.6	5.6	NR	NR	NR
Zakaria et al., 2023 [15]	**Chad**	**59**	**54.2**	**54.8**	39	23.9	NR	16.9	11.9	NR	3.4	1.7	NR	3.4	NR	NR	NR	NR
Bekele et al., 2024 [16]	**Ethiopia**	**241**	**42.7**	**52.1**	**14.5**	23.2	5.0	7.1	19.8	**13.3***	NR	NR	NR	10.4	NR	NR	19.9	NR
Christian et al., 2024 [17]	**Gabon**	**60**	**51.6**	**56.0**	**18**	NR	NR	17.0	17.0	NR	NR	NR	NR	NR	NR	NR	NR	46.9
Dakouo et al., 2024 [12]	**Mali**	**383**	**34.8**	**61.2**	**9.8**	30.5	NR	32.9	NR	NR	NR	NR	NR	1.8	NR	NR	NR	NR
Mezgebu et al.,2024 [18]	**Ethiopia**	**239**	**59.0**	**53.1**	**9.6**	11.3	NR	35.0	27.2	**17.6***	NR	NR	NR	17.2	NR	NR	NR	NR
Solela, 2024 [19]	**Ethiopia**	**267**	**50.0**	**56.7**	**NR**	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Solela & Yimer 2024 [20]	Ethiopia	**303**	**51.5**	**56.7**	**17.8**	10.9	NR	17.2	9.9	**7.9***	1.0	NR	2.0	22.8	NR	4.6	NR	NR
Wauye et al., 2024 [21]	**Kenya**	**142**	**51.4**	**54.0**	**16.9**	26.1	NR	6.3	NR	**19.7***	NR	3.1	NR	28.9	NR	NR	NR	NR

AICM Arrhythmia-induced cardiomyopathy, *CAD* Coronary Artery Disease, *CHD* Congenital Heart Disease, *CP* Cor pulmonale, *DCM* Dilated cardiomyopathy, *F* Female, *HCM* Hypertensive cardiomyopathy, *ID* Idiopathic Heart Disease, *IHD* Ischemic Heart disease, *NR* Not reported, *PCM* Peripartum cardiomyopathy, *PDX* Pericardial disease, *VHD* Valvular Heart Disease (including RHD), *REH* Restrictive Heart Disease, *RHD* Rheumatic heart disease, *TCM* Thyroid cardiomyopathy

Boxes highlighted in gray (▭) represent the most common aetiology of heart failure in that given study

*Represents cases of Rheumatic heart disease (RHD)

Table 3 Echocardiographic, ECG, anaemia, electrolyte abnormalities, medications and outcomes of patients with HF in Sub-Saharan Africa from 2022–2024

Author, year of publication	Echocardiographic (LVEF %)				ECG findings	Anaemia (%)	Electrolytes	Medications prescribed **A:** Admission. **H:** During hospitalisation **D:** At discharge	Outcome
	Average	HFpEF	HFmrEF	HFrEF					
Ogbemudia et al., 2023 [13]	NR	26.6	10.1	63.3	NR	63.3	NR	None reported	**LOS = 10.28 days**
Traoré et al., 2023 [14]	39.9	NR	NR	NR	ST (46.6%): AF (16.5%); LVH (33.8%) Ischemia (22.2%)	22.2	Hypokalaemia = 12,8%	***A:*** Diuretics = 95.8%;, BB = 93.6%; RAAS = 91.3% ***D:*** Diuretics = 92.1%: BB = 90.9%; RAAS = 87.2%: MRA = 41.7%	Mortality rate = 3.7% LOS = 5.7 days
Zakaria et al., 2023 [15]	NR	28.8	NR	NR	NR	NR	**NR**	***A:*** Diuretics = 98,3% RAAS = 84,7%: BB = 79,7%	Mortality = 13.6% Rehospitalisation between 8–15 days = 83%
Bekele et al., 2024 [16]	NR	NR	NR	NR	NR	NR	NR	***H:*** Diuretics = 87.14%: BB: 27.4%, MRA = 39.8%: RAAS = 34.4% Medication-related problems (68.5%)	Mortality = 14.9%
Christian et al., 2024 [17]	36.4	NR	NR	NR	NR	37	NR	***H:*** Diuretics = 70% Dobutamine = 5%, Noradrenaline = 2%	Mortality = 18.3%.
Dakouo et al., 2024 [12]	NR	NR	NR	NR	NR	NR	NR	None reported but Compliance in 89.6%	Mortality = 7.9%
Mezgebu et al.,2024 [18]	NR	55.2	7.9	36.8	NR	29.3	Hypokalaemia (21.2%) Hyponatraemia (16.9%)	None reported	LOS > 7 days = 51.9%
Solela, 2024 [19]	NR	NR	NR	35.7	NR	29.1	Cl < 96(36.7%); Na + < 135 (36.3%) K < 3.5 (16.5%)	None reported	Mortality = 16.3% LOS = 9 days
Solela & Yimer 2024 [20]	NR	NR	NR	NR	NR	28	Na^+: > 145(6.4%) Na^+ < 135(35.7%) K^+ < 3.5(16.3%): K^+ > 5 (14.2%) Cl^- < 96 (36.6%) Cl^- > 106 (9%)	***A:*** Diuretics = 47.2%, RAAS = 25.7$, MRAs = 21.8%, CCBs = 21.8% ***H:*** Diuretics = 96%, MRAs = 42.2%, BB = 39.6%, RAAS = 37.6%, vasopressor = 9.2%, Antibiotics = 62% ***D:*** Diuretics (loop) = 89..4% BBs = 47.9%: MRAs = 42.8% RAAS = 38.6%: SGLT2I = 8.3% CCB = 23.1%	Mortality = 8.6% LOS = 9 days
Wauye et al., 2024 [21]	NR	38.0	12.7	49.3	NR	26.1	NR	***H:*** Diuretics = 92.3%; MRAs = 58.5%; RAAS = 52.1%; SGLT2I = 24.7%; BB = 21.1%; Digoxin = 20.4%; Amiodarone = 19.0% CCBs = 13.4%	Mortality = 19% LOS = 10.1 days

AF Atrial Fibrillation, *BB* Beta-Blocker, *CCB* Calcium Channel Blocker, *HFmrEF* Heart failure with mid-range reduced ejection fraction, *HFpEF* Heart failure with preserved ejection fraction, *HFrEF* Heart failure with reduced ejection fraction, *LOS* Length of stay, *LVH* Left Ventricular Hypertrophy, *MRA* Mineralocorticoid Receptor Antagonist, *RAAS* Renin Angiotensin Aldosterone System Inhibitors, *NR* Not reported, *SGLT2I* Sodium-Glucose Co-Transporter- 2 Inhibitor, *ST* Sinus Tachycardia

Table 4 Critical appraisal of studies reporting on outcomes of patients with HF in Sub-Saharan Africa from 2022–2024

Author, year	Setting	Case definitions	Power	Ethical oversight (EC or IRB)	Gaps reported by the authors
Ogbemudia et al., 2023 [13]	Cardiology department	Discharged with a primary diagnosis of Acute Heart Failure	Not calculated	Not reported	Guideline and contraindications may alter quality indicators
Traoré et al., 2023 [14]	Medical Ward	Clinical syndrome of heart failure and increase in left ventricular filling pressures with or without left ventricular dysfunction	Not calculated	Not reported	Small sample, limited BNP or NT-proBNP testing, lack of finances, and security issues hinder generalization, access
Zakaria et al., 2023 [15]	Cardiology unit	Not reported	Not calculated	Faculté des Sciences de la Santé Humaine- UNABA	Not reported
Bekele et al., 2024 [16]	General cardiology Admissions	A clinical diagnosis and an echocardiography done	Yes	Research Ethics Review Committee (RERC) of the Mattu University	The absence of CT-scan hindered full identification heart failure aetiologies. Data collection during COVID- 19 pandemic could have hindered access to patients for fear of contagion
Christian et al., 2024 [17]	Cardiac ICU	Acute cardiac decompensation, acute pulmonary edema, isolated right ventricular failure (RVF) and cardiogenic shock	Not calculated	Not reported	Absence of coronary angiography could have overestimated IHD. High mortality may be due to poor access to life saving drugs like anti-arrhythmics, vaso-active drugs that were out of stick for extended periods
Dakouo et al., 2024 [12]	General cardiology admissions	Not reported	Not calculated	Not reported	Lipid profile was absent in most patients; therefore, cardiovascular risk was evaluated using the *WHO/ISH risk prediction charts*
Mezgebu et al.,2024 [18]	Admissions in the medical ward and medical ICU	Patient with previously diagnosed or new-onset heart failure who showed rapid worsening of signs and symptoms of heart failure and whose primary admission diagnosis was ADHF	Not met Expected = 257	University of Gondar, School of Medicine Ethics Committee (Ref No.71207/2021)	Incomplete echocardiography and laboratory reports. Risk of etiological misclassification because the use of Diagnostic tests such as angiography and stress ECG tests are not available. The impact of AKI on patient outcomes, such as hospital stay, readmission, and mortality, has not been evaluated

Table 4 (continued)

Author, year	Setting	Case definitions	Power	Ethical oversight (EC or IRB)	Gaps reported by the authors
Solela, 2024 [19]	Medical wards and medical ICU	Clinical syndrome characterized by the development of new HF symptoms (dyspnea, orthopnea, or swelling of the lower extremities) and signs (elevated jugular venous pressure, pulmonary congestion, or peripheral edema), occurring due to decreased cardiac output and/or elevated intracardiac pressures	Yes	Institutional Review Board (IRB) of Y12HMC (Ref.No.178/13)	Retrospective design, small sample, single center, limits generalizability and causation
Solela & Yimer 2024 [20]	Medical wards and medical ICU	Clinical syndrome characterized by a sudden start of new heart failure symptoms or worsening of the existing one	Yes	Institutional Review Board (IRB) of Y12HMC (Ref.No.178/13)	Retrospective design, small sample, single center, limits generalizability and causation
Wauye et al., 2024 [21]	Medical wards and 107 cardiac care unit (CCU)	Based on the Modified Framingham clinical criteria	Not calculated	Moi University Institutional Research 176 Ethics Committee (approval number 003738 and reference number IREC/2020/187)	Study limitations include short duration, public facility data, and narrow payer perspective affecting cost generalization

ICU Intensive Care Unit, *CT* scan-Computerized Tomography scan, *BNP* Brain Natriuretic Peptide, *NT* proBNP- N-terminal pro B-type Natriuretic Peptide, *HF* Heart Failure

[19]. Hypochloraemia was associated with increased mortality (16.3% vs 4.7%) [19, 20].

Acute kidney injury (AKI) was reported to occur in 25.1% of patients with HF [18] and elevated Blood Urea Nitrogen (BUN) was associated with increased mortality [20]. Factors associated with AKI included older age (≥ 60 years), diabetes mellitus, hypertension, sepsis, use of loop diuretics and previous history of AKI [18].

Anaemia

Anaemia was documented in eight studies with a prevalence ranging from 22.2% [14] to 63.3% [13]. Other studies reported intermediate rates such as 26.1% [21], 28% [20] and 37% [17]. The absence of clear cut definitions of anaemia in most studies makes the comparison across studies difficult. In the study by Zakaria et al. (2024) in Chad [11], anaemia was responsible for 8.5% of cases of re-hospitalization, attributing anemia with a significant contribution to patient outcome.

Medications prescribed and guideline adherence

Medication use shifted across admission (A), hospitalisation (H) and discharge (D). Diuretics were the most prescribed on admission (47.2%– 98.2%) [11, 20], during hospitalisation (70–96%) [17, 20], and at discharge (70–98.3%) [11, 17, 20]. For other medications, at admission RAAS inhibitors (25.7–91.3%) [14, 20] and beta-blockers (79.7%– 93.6%) [11, 14], were common but SGLT2i were absent. During hospitalisation, MRAs (39.8–58.5%) [16, 21], and beta-blockers (21.1–39.6%) [20, 21] were common. Vasopressors like dobutamine and noradrenaline were also prescribed (< 10%) [17, 20], yet SGLT2i remained unreported. At discharge, RAAS (34.4%– 87.2%), [14, 16], BB (21.1–90.9%) [14, 21], MRAs (39.8–58.5%) [20, 21] were commonly prescribed. SGLT2 inhibitor therapies, newer in development, and included in the 2022 AHA/ACC/HFSA guideline recommendations, were prescribed in only two studies at a rate ranging from as low as 8.3% [14] to 24.7% [21]. Other medications, such as digoxin, amiodarone and calcium channel blockers (CCBs) were infrequently used.

Patient's compliance to drug regimen was reported in 89.6% of patients [12], though medication-related problems were noted in 68.5% of patients in other settings like Ethiopia [16]. These problems include the need for additional therapy (17.02%), inappropriate dosing (12.86%), and ineffective drug therapy (11.62%), as reported in Ethiopia [16], indicating gaps in best practice management.

Mortality, length of stay and follow-up care

Mortality rates varied form 3.7% [14] to 19% [21], with a median of 14.2%. Higher mortality was common with medication related problems, older age [16], hypochloraemia, lipidaemia [19, 20], rehospitalisation [16, 17], low systolic blood pressure or cardiogenic shock [17, 20], renal failure and elevated BUN [17, 20] and rhythm disturbances [17].

Length of stay (LOS) ranged from 5.7 days [14] to 10.28 days [13], with over half (51.9%) of patients staying >7 days in some studies [18]. Follow-up care data were sparse, with one study [11] reporting that, out of patients re-hospitalised, 83% do so within 8–15 days post discharge, indicating significant challenges in post-discharge management. Causes for readmission included therapeutic non-compliance, lifestyle issues, atrial fibrillation, anemia, and infections like pneumonia and malaria [11].

Critical appraisal of the included studies

The studies were conducted in diverse settings, including general cardiology units [12, 13, 16], medical wards [14, 18], and cardiac intensive care units [17]. Case definitions for HF varied, ranging from clinical syndromes with new or worsening symptoms [19, 20] to specific criteria such as the Modified Framingham clinical criteria [21], or acute cardiac decompensation [17]. However, some studies did not explicitly report case definitions [11, 12].

Power calculations were performed in only four studies [16, 18–20], amongst which Mezgebu et al. (2024) did not meet the expected sample size (actual =239; expected =257) [18]. The remaining studies did not report power calculations, limiting the assessment of statistical robustness. Ethical oversight was documented in five studies only [16, 18–21]. Gaps reported by authors included small sample sizes and single-centre designs limiting generalizability [14, 19, 20], incomplete diagnostic data due to the absence of advanced testing tools like coronary angiography, CT-scans, or BNP testing [16–18] and other challenges such as poor access to medications and financial constraints [14, 17]. Retrospective designs [19, 20] and data collection during the COVID- 19 pandemic [16] were also noted as limitations affecting study quality and outcomes.

A summary of the research findings can be found in the Fig. 2.

Review discussion

This scoping review highlights the unique profile of heart failure (HF) in Sub-Saharan Africa (SSA), revealing prevalent aetiologies like dilated cardiomyopathy (up to 46.9%), hypertensive cardiomyopathy (up to 39%), and region-specific causes such as rheumatic heart disease (13.3–19.7%) and peripartum cardiomyopathy (up to 32%). Patients often exhibited low to mildly reduced ejection fraction (HFrEF 35.7–63.3%, HFmrEF 7.0%– 12.7%), with ECG abnormalities including sinus tachycardia

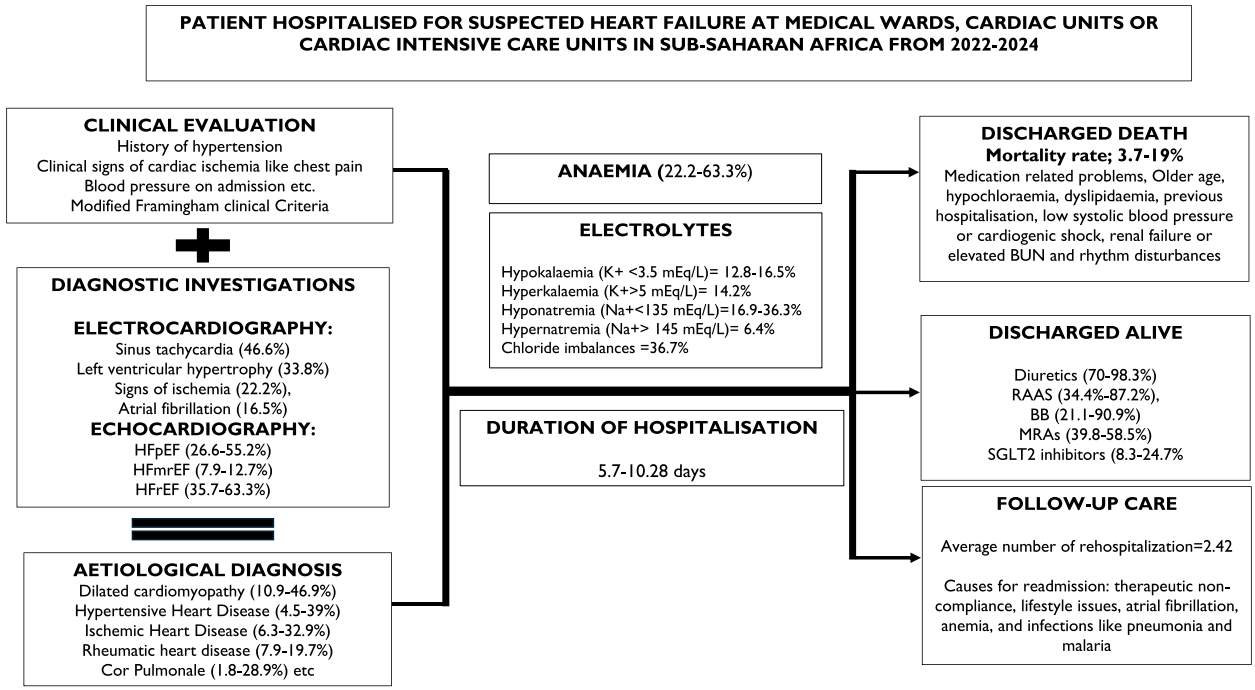

Fig. 2 Schematic representation of heart failure outcomes in Sub-Saharan Africa from 2022–2024

and left ventricular hypertrophy. Electrolyte imbalances (hypokalaemia 12.8–16.5%, hyponatremia 16.9–36.3%) and anemia (22.2–63.3%) were common and driving rehospitalisation. Guideline directed treatments like diuretics (70—98.3%) and RAAS inhibitors (34.4–87.2%) predominated, while SGLT2 inhibitors (8.3%– 24.7%) were less commonly used. Mortality varied (3.7–19%) and was influenced by blood pressure on admission, previous hospitalisations, rhythm problems and poor access to life-saving medications. Hospital stays ranged from 5.7–10.28 days and frequent cases of rehospitalizations (83%) occurred within 8–15 days post discharge, shedding light on the need for enhanced follow-up care practices and tailored strategies in SS.

The findings of this review aligns with prior literature on HF in Sub-Saharan Africa (SSA), highlighting the predominance of non-ischemic aetiologies like hypertensive heart disease (HHD), cardiomyopathies, and rheumatic heart disease (RHD), reported at 39.2%, 21.4%, and 14.1%, respectively [22]. Our findings, with HCM (or HHD) at 39% in Chad [11] and DCM up to 46.9% in Mali [12], reinforce these trends amidst diagnostic limitations, as noted by Kraus et al. in 2016 [23]. The predominance (up to 75.5% of cases) of non-ischemic causes in SSA [4, 24, 25], contrasts with regions like Southeast Asia and Eastern Europe [26], where ischemic heart disease (IHD) prevails particularly in patients with ejection fraction < 50% [27]. Although IHD has been reported to be more common in lower income compared with high-income countries (61% vs. 48%) [26], our data show IHD is a less prevalent aetiology (6.3%–32.9%). This may be due to scarce coronary angiography in SSA, that hinders accurate CAD diagnosis and therefore may over or underestimation the true burden of IHD [17]. Moreover, clear cut-off official criteria for confirmation of diverse heart failure aetiologies may be difficult to align by, especially in the setting of limited resources [3], highlighting the high potential for misclassification in SSA. The robust diagnostic capacity in high-income regions, further accentuates SSA's unique HF profile, as denoted by the higher burden of RHD and significantly younger patients in SSA with an average age of 52 years in SSA as shown in the THESUS-HF reports [24], compared to 71 and 75 years in Eastern and Western Europe respectively as reported in the PARAGON-HF reports [26]. More to this, the high burden of hypertension in patients from SSA adds a significant HF management challenge and has led to an "imperious need for hypertension prevention and control" as suggested by Noubiap (2020) [28].

For patients with chronic heart failure, secondary prevention can be promoted by adherence to clinical guidelines. Regardless of baseline diabetes status, HF guidelines recommend using SGLT- 2 inhibitors (currently only dapagliflozin and empagliflozin) to manage both chronic stable HF as it was proven to decrease both cardiovascular mortality and HF hospitalisations [29].

However, in this review, SGLT2I were not widely prescribed, in accordance with some authors who reported that only one-tenth of patients in the USA are discharged with SGLT- 2 inhibitors [30]. Under prescription of this medication even in rural areas [31] has been attributed to the fact that many practitioners may not be familiar with these medications and therefore, do not use them. More studies should be carried out to understand the breath of their use in SSA.

Multiple factors such as electrolyte imbalances, anaemia, low blood pressure, renal failure, old age, infections, medication related problems etc. were reported as been associated with heart failure outcome in SSA. However, the heterogeneity of the patient population makes comparison difficult. One way to ensure homogenous reporting lies in the use of prognostic scores, which are multiple in heart failure and adapted to the patient status such as the "Get With the Guidelines-Heart Failure (GWTG-HF)" risk score which is recommended for inpatients [32]. However, in our review, no study used this or any other prognostic risk scores. More studies should be carried out to determine reliability and validity of these scores in order to have an adaptable tool for risk-based personalised care in patients with HF in SSA.

Implications for policy and practice

The findings of this scoping review confirm a critical imperative for a thorough update of heart failure (HF) care-related policies and practice in Sub-Saharan Africa (SSA). Policymakers have a critical role in prioritising increased availability and access to diagnostics such as echocardiography, to enable early and timely HF diagnosis, particularly in view of its unique aetiological profile in SSA. There is an imperative for educational interventions for clinicians and for SSA's general population in raising awareness and controlling hypertension, a proven HF causative risk factor in SSA. There is a critical imperative for advocacy for SSA-specific guideline adaptation and contextualization. In addition, it is critical to direct funding towards post-discharge care infrastructure to counteract high rehospitalization rates, possibly through community follow-up programmes and interventions through telehealth platforms. Longitudinal studies, backed with investment in long-term follow-up studies, will be critical in tracking long-term follow-up and in guiding development of interventions that maximise effectiveness and cultural adaptability. Overcoming socioeconomic obstacles to care, including access, cost of medication, and availability of medical care, will become critical in countering HF-related deaths and in improving HF patient quality of life in SSA.

Limitation of the review

This scoping review faces several limitations that may bias its interpretation. Not pre-registering the protocol for the review could have introduced bias to the results as the search criteria may be adjusted mid-process to fit evolving need and deviate from the original research question. Post-review amendments for broader coverage potentially further skewed the study selection. Moreover, some included studies lacked ethical oversight, compromising their credibility and adding bias. Excluding studies focused on single HF subtypes or aetiologies could have discarded valuable specific data, necessary for a holistic understanding of the nuances in HF outcomes. Missing data, underpowered studies, and an exclusively hospital-based focus limit generalizability, while the absence of qualitative designs restricts deeper insights. Representation from only six countries fails to capture the diverse reality of SSA, introducing geographical bias. Publication bias is also a concern, as grey literature was not searched, potentially omitting unpublished perspectives. Studies post- 2022 AHA/ACC/HFSA guidelines were aimed for relevance, but delayed clinical uptake (e.g., low SGLT2 use) may reflect normal expected implementation lags rather than non-adherence to recommendations, potentially affecting validity. These factors—late search adjustments, ethical gaps, selective exclusions, data and design limitations, limited regional coverage, reliance on published studies and implementation lags—collectively undermine the robustness and comprehensiveness of the review's inferences.

Nonetheless, the key strength of this scoping review lies in its comprehensive synthesis of recent (2022–2024) heart failure data from six Sub-Saharan African (SSA) countries, capturing diverse concepts ranging from aetiologies to outcomes, thus providing a timely snapshot of HF diagnostic and management challenges and practices in resource-limited settings like SSA.

Conclusion

This review highlights the distinct epidemiological and clinical profile of heart failure in Sub-Saharan Africa, characterised by dilated cardiomyopathy, hypertensive heart disease, and region-specific aetiologies like rheumatic heart disease and peripartum cardiomyopathy. Contextualising aetiological classifications is essential, as current diagnostic frameworks often rely on extensive laboratory and imaging investigations that are frequently inaccessible or unaffordable for many patients in SSA. There is a critical need for longitudinal, community-based or multicentre research to simplify, contextually adapt and validate prognostic tools. Similarly, clinical practice and health policy should prioritise

improved access to diagnostic investigations, improved adherence to evidence-based guidelines, effective hypertension control and structured post-discharge care to reduce heart-failure related morbidity, mortality and rehospitalisation.

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

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Authors' contributions
EMML designed the study. SD and MMLE conducted the search and review of articles. EMML drafted the article. SD, VN, CN, SM, MSN, AA, and FK reviewed the article for scientific input. All authors agreed to the publication of this final version.

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Data availability
All data produced in this study are included within the article and its supplementary materials.

Declarations

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Not applicable.

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Competing interests
The authors declare no competing interests.

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