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ORIGINAL RESEARCH

Clinical Profile of Heart Failure Patients and Evaluation of the Prescribing Practice of Guideline Directed Medical Therapy (GDMT) at Rwanda Military Referral and Teaching Hospital: A Retrospective Study

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Background: Heart failure (HF) poses an increasing public health burden in Sub-Saharan Africa (SSA), where non-communicable diseases, particularly cardiovascular conditions, are contributing significantly to morbidity and mortality. In Rwanda, data on the distribution of HF subtypes and the use of guideline-directed medical therapy (GDMT) remain limited. This study aimed to describe the clinical profiles of HF patients at Rwanda Military Referral and Teaching Hospital (RMRTH) and evaluate physician adherence to GDMT in routine clinical practice.

Methods: A retrospective review was conducted for all adult patients (≥18 years) diagnosed with HF and managed at the internal medicine unit of RMRTH between March 2022 and September 2023. Data were extracted from electronic health records and patient files. Descriptive statistics were performed using SPSS version 27.

Results: The study included 108 patients, of whom 57.4% were female. The mean age was 59.2 ± 21.7 years. Most patients were from Kigali (51.9%) and the Eastern Province (29.6%). Among the cohort, 38.9% had HF with reduced ejection fraction (HFrEF), 32.4% had preserved ejection fraction (HFpEF), 13.0% had mid-range ejection fraction (HFmrEF), and 10.2% had isolated right heart failure. Hypertension (30.5%) was the most common comorbidity, followed by atrial fibrillation (15.7%) and diabetes mellitus (13.0%). Adherence to GDMT was suboptimal, with notable gaps in prescribing patterns across medication classes.

Conclusion: HFrEF is the most common HF subtype at RMRTH. Findings highlight the need to improve GDMT implementation. Further national-level studies are warranted to strengthen heart failure care in Rwanda.

Keywords: heart failure, cardiology, non-communicable diseases, Rwanda

Introduction

Heart failure (HF) is a multifaceted clinical syndrome marked by the heart's inability to adequately pump or fill with blood to satisfy the body's metabolic requirements.[1] Physiologically, HF can manifest as either insufficient cardiac output or as a seemingly adequate output sustained by compensatory neurohormonal mechanisms, often reflected by elevated left ventricular filling pressures. Contemporary classifications of HF delineate three distinct subtypes: heart failure with reduced ejection fraction (HFrEF), heart failure with preserved ejection fraction (HFpEF), and heart failure with mid-range ejection fraction (HFmrEF). These categories are primarily defined by measurements of ejection fraction, levels of natriuretic peptides, and the identification of underlying structural cardiac abnormalities or diastolic dysfunction.[2,3]

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Heart failure (HF) is a growing global health challenge, with approximately 55.5 million people affected worldwide in 2021, marking a dramatic rise from 25.4 million in 1990.[4] The age-standardized prevalence rate is 676.7 per 100,000, with higher rates in males.[4] Ischemic heart disease is the leading cause, responsible for 42.3% of cases, followed by hypertensive heart disease and cardiomyopathies.[5] While high-income countries report stable or declining HF rates, low- and middle-income regions, particularly in Africa, are facing increasing prevalence and years lived with disability.[4,5] In sub-Saharan Africa, the rise in HF is driven by escalating rates of hypertension, diabetes, and obesity. Hypertension alone accounts for up to 43% of cases, with cardiomyopathies and rheumatic heart disease remaining significant contributors. Additionally, ischemic heart disease, once uncommon in the region, is now increasing, reflecting shifts in lifestyle and improved access to diagnostic tools.[6,7] In Rwanda, there is limited data, but the recent retrospective study of HF patients in 10 hospitals showed general increasing trend of burden from 254 in 2008 to 511 in 2019.[8]

Heart failure (HF) management is based on an evidence-driven approach to improve survival, reducing hospitalizations, and enhancing quality of life. The 2022 AHA/ACC/HFSA guidelines emphasize accurate diagnosis and classification of HF subtypes—HFrEF, HFmrEF, and HFpEF—to guide treatment.[9] Guideline-Directed Medical Therapy (GDMT) is central, particularly for HFrEF, and includes four key drug classes: renin-angiotensin system inhibitors (ACE inhibitors, ARBs, or ARNIs), beta-blockers, mineralocorticoid receptor antagonists, and sodium-glucose cotransporter-2 inhibitors (SGLT2i), all of which have demonstrated significant reductions in mortality and morbidity.[10] Management also involves controlling comorbidities such as hypertension and atrial fibrillation, implementing lifestyle changes, and providing patient education to support adherence and self-care.[11]

In Rwanda, cardiovascular diseases represent a significant and growing health burden, ranking as the third leading cause of death.[12] However, there is a notable lack of data specifically addressing heart failure (HF) within the country. To date, no study has examined the implementation of Guideline-Directed Medical Therapy (GDMT) in the management of HF patients in Rwanda, highlighting a critical gap in current knowledge. Closing this gap is essential to advancing heart failure care. A comprehensive understanding of the prevalence, clinical characteristics, and management patterns of HF patients, alongside an assessment of GDMT prescribing practices, is crucial for improving patient outcomes. Evaluating adherence to evidence-based therapies and identifying deficiencies in care delivery can guide the development of targeted strategies to optimize treatment, enhance resource utilization, and enable timely interventions. This study seeks to investigate the prevalence, clinical profiles, outcomes, and GDMT application among HF patients in Rwanda's outpatient settings to support more effective, evidence-based management. This is the first study in Rwanda to document HF subtypes and evaluate GDMT adherence in a tertiary referral center.

Methodology

Study Design and Setting

This retrospective study was conducted at the Rwanda Military Referral and Teaching Hospital (RMRTH), specifically within the Internal Medicine Unit. The study included all adult patients (aged 18 years and above), both inpatients and outpatients, who were diagnosed with heart failure between March 2022 and September 2023, with diagnosis confirmed by echocardiography. Patients younger than 18 years, those referred to the Internal Medicine Unit outside the study period, and those diagnosed with heart failure outside the defined timeframe were excluded from the study.

Data Collection and Analysis

Data for this study were obtained from the electronic health records (EHRs) and physical patient files within the Internal Medicine Department at Rwanda Military Referral and Teaching Hospital. The collected data included demographic characteristics, clinical profiles, comorbidities, medication history, hospitalization details, and patient outcomes. All eligible cases were systematically reviewed, and relevant information was extracted and entered into a structured Microsoft Excel database. Patients were categorized into HF phenotypes (HFrEF, HFmrEF, HFpEF) based on echocardiographic findings at diagnosis. All eligible patients were included in the analysis, with missing ejection fraction (EF) values reported without imputation. Data accuracy and completeness were verified prior to analysis. Statistical analysis was performed using SPSS version 27.

Ethical Considerations

This study obtained ethical approval from the Rwanda Military Referral and Teaching Hospital Research Ethics Committee, under the reference number: 215/RMH/COMDT/2024. Since the study involved retrospective analysis of de-identified patient records, individual informed consent was not required. Data privacy and confidentiality were strictly maintained throughout the study. All data were securely stored on password-protected computers, and data will be safely destroyed ten years after collection, in accordance with institutional policies. This study was conducted in accordance with the ethical principles of the Declaration of Helsinki, ensuring compliance with internationally accepted standards for research integrity and ethics.

Results

Characteristics of Participants

This study comprised a cohort of 108 heart failure patients who were receiving treatment at the cardiology clinic within the Internal Medicine Department of Rwanda Military Referral and Teaching Hospital. Of the total participants, 57.4% (n=62) were female, while 42.6% (n=46) were male (Figure 1). The mean age of the cohort was 59.22 years (DS: ±21.7), ranging from a minimum of 18 years to a maximum of 98 years. A large proportion were between 60 to 79 years, followed by those who were 80 and above (Table 1), showing that heart failure was most common in older patients than younger ones.

In terms of geographic distribution, a significant proportion of the patients were residents of Kigali city and the Eastern Province. Specifically, 51.9% (n=56) resided in Kigali city, and 29.6% (n=32) were from the Eastern Province. The remaining participants were distributed across other regions of the country, with 9.3% (n=10) from the Western Province, 5.6% (n=6) from the Southern Province, and 3.7% (n=4) from the Northern Province (Table 2).

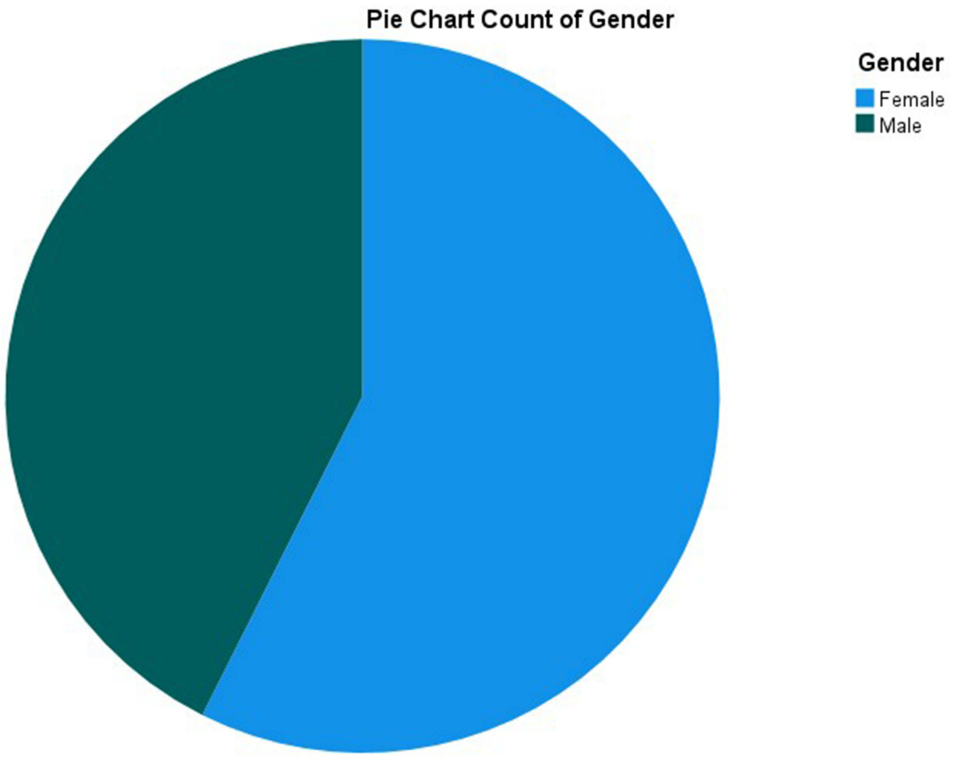

Figure 1 Gender distribution among participants.

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Table 1 Gender Distribution per Age Group

		Gender		Total
		Female	Male	
Age categories	Below 20	1	2	3
	20 - 39	16	7	23
	40 - 59	14	8	22
	60 - 79	19	14	33
	80 and above	12	15	27
Total		62	46	108

Table 2 Distribution of Place of Residency of Study Participants by Gender

Count				
		Gender		Total
		Female	Male	
District	East	15	17	32
	Kigali	34	22	56
	North	2	2	4
	South	4	2	6
	West	7	3	10
Total		62	46	108

Prevalence of Heart Failure Subtypes

Among the 108 patients included in the study, 32.4% (n=35) were diagnosed with heart failure with preserved ejection fraction (HFpEF), while 38.9% (n=42) presented with heart failure with reduced ejection fraction (HFrEF). Additionally, 13.0% (n=14) of the participants were classified as having heart failure with mid-range ejection fraction (HFmrEF). Unfortunately, in 5.6% (n=6) of the cases, the specific type of heart failure could not be recorded due to incomplete or missing data regarding the patients' ejection fraction measurements (Table 3). The distribution of heart failure subtypes among this cohort highlights the prevalence of heart failure with reduced ejection fraction, followed by heart failure with preserved ejection fraction, and a smaller proportion of patients with mid-range ejection fraction. Table 4 shows distribution of heart failure subtypes by gender while Table 5 shows distribution of heart failure subtypes by age group.

Table 3 Prevalence of Heart Failure Subtypes Among Participants

Type of Heart Failure				
	Frequency	Percent	Valid Percent	Cumulative Percent
Not recorded	6	5.6	5.6	5.6
HFMREF	14	13.0	13.0	18.5
HFPEF	35	32.4	32.4	50.9
HFREF	42	38.9	38.9	89.8
RHF	11	10.2	10.2	100.0
Total	108	100.0	100.0	

Table 4 Distribution of Heart Failure Subtypes by Gender

		Gender		Total
		Female	Male	
Type of Heart Failure	Unrecorded	3	3	6
	HFMREF	8	6	14
	HFPEF	25	10	35
	HFREF	21	21	42
	RHF	5	6	11
Total		62	46	108

Table 5 Distribution of Heart Failure Subtypes by Age

		Type of Heart Failure					Total
			HFMREF	HFPEF	HFREF	RHF	
Age categories	Below 20	1	0	1	0	1	3
	20 - 39	2	5	7	7	2	23
	40 - 59	1	3	6	11	1	22
	60 - 79	2	5	10	13	3	33
	80 and above	0	1	11	11	4	27
Total		6	14	35	42	11	108

Comorbidities Associated with Heart Failure Among the Participants

Among participants, a considerable number of participants were diagnosed with various associated conditions, with hypertension being the most prevalent. Specifically, 30.5% (n=33) of participants had hypertension as their primary comorbid condition. The second most comorbidity was atrial fibrillation which was observed in 15.7% (n=17) of patients. Furthermore, 12.96% (n=14) of patients had diabetes mellitus. Table 6 shows all comorbidities that were associated with heart failure patients.

Table 6 Comorbidities in Heart Failure Patients

Comorbidity	Count	Percentage
HTN	33	30.56
DM	14	12.96
CKD	3	2.78
Stroke	2	1.85
Thyroid disorders	3	2.78
Atrial Fib	17	15.74
COPD	4	3.7
PE	3	2.78
Cirrhosis	1	0.93
HIV	1	0.93
CAD	3	2.78
Breast cancer	1	0.93

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Adherence of Clinicians to Guideline Directed Medical Therapy (GDMT) in Management of Heart Failure Among Participants

The adherence of clinicians to guideline-directed medical therapy (GDMT) in the management of heart failure among participants exhibited a changing trend, some with high and low rate of medication up-titration across several key therapeutic drug classes. Among 42 patients with Heart Failure with Reduced Ejection Fraction (HFrEF), the distribution of treatments included 31 receiving angiotensin-converting enzyme inhibitors (ACEIs), 2 angiotensin receptor blockers (ARBs), 10 angiotensin receptor-neprilysin inhibitors (ARNIs), 39 beta-blockers, 17 sodium-glucose co-transporter-2 inhibitors (SGLT2 inhibitors), and 32 mineralocorticoid receptor antagonists (MRAs).

For ACEIs, 41.9% (n=13) of patients were titrated at 3 months, with 8 achieving the maximum dose, while 38.7% (n=12) were titrated at 6 months, with 9 reaching the maximum dose. Among the 2 patients on ARBs, 50% (n=1) were titrated at 3 months without reaching the maximum dose, whereas 50% (n=1) achieved the maximum dose at 6 months. For ARNIs, 50% (n=5) were titrated at both 3 and 6 months, with 3 reaching the maximum dose at 3 months and all 5 achieving it by 6 months.

In the beta-blocker group (n=39), 41% (n=16) were titrated at both 3 and 6 months, with 12 and 14 patients reaching the maximum dose, respectively. Among the 17 patients on SGLT2 inhibitors, 64.7% (n=14) were titrated at 3 months and 70.5% (n=12) at 6 months, with all achieving the maximum dose at both time points. For MRAs, 62.5% (n=20) were titrated at 3 months, with 19 reaching the maximum dose, while 59.3% (n=19) were titrated at 6 months, with 18 achieving the maximum dose (Table 7). These findings demonstrate varying rates of dose titration and achievement of maximum doses across different pharmacological treatments, emphasizing the challenges in optimizing heart failure management over time.

Among 14 patients with Heart Failure with Midrange Ejection Fraction (HFmrEF), the distribution of pharmacological treatments included 8 receiving angiotensin-converting enzyme inhibitors (ACEIs), 1 angiotensin receptor blocker (ARB), 4 angiotensin receptor-neprilysin inhibitors (ARNIs), 12 beta-blockers, 6 sodium-glucose co-transporter-2 inhibitors (SGLT2 inhibitors), and 4 mineralocorticoid receptor antagonists (MRAs). The titration rates and achievement of maximum doses varied across treatment classes.

For 8 patients on ACEIs, 25% (n=2) of patients were titrated at both 3 and 6 months, with 1 and 2 patients achieving the maximum dose, respectively. The single patient receiving an ARB did not undergo titration at either 3 or 6 months. Among the 4 patients prescribed ARNIs, 75% (n=3) were titrated at 3 months, with all reaching the maximum dose. By 6 months, 100% (n=4) had been titrated, with all achieving the maximum dose. Beta-blockers were administered to 12 patients, with 41.6% (n=5) titrated at both 3 and 6 months. At 3 months, 4 of these patients reached the maximum dose, increasing to 5 by 6 months. Similarly, among the 6 patients receiving SGLT2 inhibitors, 66.6% (n=4) were titrated at 3 months, with all reaching the maximum dose, while 83.3% (n=5) were titrated at 6 months, with the same reaching the maximum dose.

Table 7 Up-Titration for Heart Failure with Reduced Ejection Fraction (HFrEF) Patients

Type of Drug	Number of Patients Given Drugs	Up-Titration at 3 Months	Up-Titration at 6 Months
ACEI	31	13 (41.9%) / 8 max	12 (38.7%) / 11 max
ARB	2	1 (50%) / 0 max	1 (50%) / 1 max
ANRI	10	5 (50%) / 3 max	5 (50%) / 5 max
B blockers	39	16 (41%) / 12 max	16 (41%) / 14 max
SGLT2	17	11 (64.7%) / 11 max	12 (70.5%) / 12 max
MRA	32	20 (62.5%) / 19 max	19 (59.3%) / 18 max

Table 8 Up-Titration for Heart Failure Heart Failure with Mid-Range Ejection Fraction (HFmrEF) Patients

Type of Drug	Number of Patients Given Drugs	Up-Titration at 3 Months	Up-Titration at 6 Months
ACEI	8	2 (25%) / 1 max	2 (25%) / 2 max
ARB	1	0 (0.00%) / 0 max	0 (0.00%) / 0 max
ANRI	4	3 (75%) / 3 max	4 (100%) / 4 max
B blockers	12	5 (41.6%) / 4 max	5 (41.6%) / 5 max
SGLT2	6	4 (66.6%) / 4 max	5 (83.3%) / 5 max
MRA	4	4 (100%) / 4 max	4 (100%) / 4 max

All 4 patients on MRAs underwent titration at both 3 and 6 months, with all achieving the maximum dose at each time point (Table 8). These findings highlight a generally higher titration success rate for MRAs and ARNIs compared to other therapeutic agents. However, variability in titration rates across treatments suggests differing challenges in dose optimization for HFmrEF patients.

Discussion

This retrospective study reviewed the clinical profile of heart failure patients and evaluated the prescribing practices of guideline-directed medical therapy (GDMT) at the outpatient cardiology clinic of Rwanda Military Referral and Teaching Hospital. Among the 108 patients included, heart failure with reduced ejection fraction (HFrEF) was the most common, followed by heart failure with preserved ejection fraction (HFpEF) and heart failure with mid-range ejection fraction (HFmrEF). Hypertension was the most common associated comorbidity. The study found varied adherence to GDMT among physicians in managing heart failure, highlighting the need for improved compliance with clinical guidelines to optimize patient outcomes.

Out of 108 heart failure patients who were receiving treatment at the cardiology clinic within the Internal Medicine Department of Rwanda Military Hospital, 57.4% (n=62) were female, while 42.6% (n=46) were male, suggesting that the more affected gender were females. Literature report that while the lifetime risk of HF is similar in men and women, the prevalence of HF with preserved ejection fraction (HFpEF) is higher in women than in men, and increases with age. In the Swedish HF registry, women constituted 55% of patients with HFpEF.[13] This aligns with the results of our study as in 35 patients with heart failure with preserved ejection fraction (HFpEF), 25 were females while 10 were males, confirming high prevalence of HF with preserved ejection fraction (HFpEF) in females than males. The higher prevalence of HFpEF in women highlights the need for targeted clinical management, addressing comorbidities like hypertension, obesity, and diabetes. Service delivery should emphasize early detection, individualized therapy, multidisciplinary care, patient education, and regular follow-up to optimize treatment, improve quality of life, and reduce morbidity in this vulnerable population.

Among the 108 participants, 51.9% (n=56) were from Kigali City, while 29.6% (n=32) were from the Eastern Province. This high representation from these areas is likely due to the fact that Rwanda Military Referral and Teaching Hospital primarily serves Kigali City and the Eastern Province as its main catchment areas. The proximity and accessibility of the hospital to these regions contribute to the majority of patients being drawn from these locations, reflecting the hospital's role as a key healthcare provider for the population in these districts.

Distributing heart failure types among 108 patients basing on their ejection fraction, heart Failure with Preserved Ejection Fraction (HFpEF) was the most common, affecting 32.4% patients (n=35). Heart Failure with Reduced Ejection Fraction (HFrEF) was present in 38.9% patients (n= 42), while heart Failure with mid-range Ejection Fraction (HFmrEF) affected 13.0% patients (n=14), with 6 patients (5.6%) whose ejection fraction data was not recorded. According to Andrew R Harper et al, HFpEF accounts for approximately 30% to 75% of heart failure cases basing on population

studies and registries from around the world, highlighting significant variability across different populations and settings.[14] Additionally, the findings are quite similar to that of Sanna et al, where 31% had HFrEF, 12% with mid-range ejection fraction (HFmrEF) and 43% with preserved ejection fraction (HFpEF).[15] Notably, differences in prevalence may reflect variations in study methodology, clinical setting, or population demographics and should be interpreted in this context.

In addition to the conventional classification of heart failure subtypes, recent literature has described Heart Failure with supra-normal Ejection Fraction (HFsnEF) as a distinct phenotype within the preserved spectrum.[16] Patients with HFsnEF present with unusually high ejection fraction values, typically exceeding 65%.[17] Contrary to the assumption that higher EF reflects better cardiac function, evidence indicates that HFsnEF is associated with adverse outcomes comparable to, or even worse than, conventional HFpEF.[18] This is largely attributed to concentric remodeling, increased arterial stiffness, and impaired myocardial strain despite preserved or exaggerated systolic function.[19] Recognizing HFsnEF carries important clinical implications, as it challenges the protective perception of supra-normal EF and underscores the need for more nuanced classification and tailored management strategies in heart failure care.

Among comorbidities associated with heart failures, hypertension was the most common in this study, accounting for 30.5%. Existing literature shows that hypertension is highly associated with heart failure and add additional risks to heart failure patients.[20–22] Heart failure (HF) and hypertension (HTN) are closely linked, with HTN being the most significant modifiable risk factor for HF.[23] Epidemiological data indicate that hypertension precedes HF in 82–91% of cases and is responsible for 39–59% of HF cases, varying by gender.[24,25] A 2024 meta-analysis of 47 cohort studies showed that HTN increases HF risk by 71%, with every 20 mmHg rise in systolic blood pressure (SBP) and 10 mmHg in diastolic blood pressure (DBP) raising the risk by 28% and 12%, respectively.[25] Mechanistically, chronic HTN leads to left ventricular hypertrophy (LVH) and fibrosis through pressure overload and RAAS activation, promoting diastolic dysfunction, HF with preserved ejection fraction (HFpEF), and progression to impaired contractility.[26] This underscores the importance of hypertension screening, awareness, and tailored control programs to prevent HF onset and progression, particularly in high-risk populations.

In the current study, there were varied adherence level to guideline-directed medical therapy (GDMT) in heart failure management among clinicians. Up-titration rates of key therapeutic drug classes were high for some classes and low for other classes. In patients with Heart Failure with Reduced Ejection Fraction (HFrEF), the highest titration rates were observed with sodium-glucose co-transporter-2 inhibitors (SGLT2 inhibitors), where 64.7% and 70.5% of patients were titrated at 3 and 6 months, respectively. In contrast, the lowest titration rates were seen with angiotensin-converting enzyme inhibitors (ACEIs), with only 41.9% and 38.7% titrated at 3 and 6 months, respectively. Among patients with Heart Failure with Midrange Ejection Fraction (HFmrEF), mineralocorticoid receptor antagonists (MRAs) demonstrated the highest titration success, with 100% of patients titrated to the maximum dose at both 3 and 6 months. Conversely, no titration was achieved for angiotensin receptor blockers (ARBs), as none of the patients were titrated at either time point.

Data on adherence to guideline-directed medical therapy (GDMT) in low- and middle-income countries (LMICs) remain limited, with existing evidence indicating generally low adherence. For instance, a global systematic review and meta-analysis examining GDMT adherence across 334 studies in high-, middle-, and low-income countries reported that the vast majority (82%) originated from high-income regions, predominantly Europe (45%) and the Americas (33%), while Africa was minimally represented (1%) and demonstrated the lowest adherence rates.[27] Region-specific scoping reviews in Africa further highlight significant deficiencies in guideline adherence, particularly the suboptimal prescription of SGLT2 inhibitors, ranging from 8.3% to 24.7%.[28] Individual studies corroborate these findings; in Nigeria, Sotonye and Oluwabunmi observed that among 166 heart failure patients, most medications were prescribed at fixed doses without appropriate up-titration, with only 2.4% achieving dose optimization.[29]

In Brazil, among 289 patients, only 21.2% received guideline-directed medical therapy (GDMT) at target doses of enalapril, losartan, or ARNi, reflecting challenges similar to those observed in other low- and middle-income countries (LMICs).[30] Similarly, a study by Guixia Wang et al in China evaluating physician adherence to GDMT in patients with heart failure with reduced ejection fraction (HFrEF) reported that 23.8% had low compliance, with only 8% having high GDMT compliance.[31] This highlights a concerning gap in adherence to established therapeutic protocols, suggesting the

need for enhanced efforts to improve physician adherence to GDMT in order to optimize patient outcomes in heart failure management.

In low-resource settings, the up-titration of guideline-directed medical therapy (GDMT) for heart failure is frequently constrained by a combination of clinical, systemic, and provider-related factors. Clinically, adverse effects—including hypotension, bradycardia, renal dysfunction, and hyperkalemia—often limit safe dose escalation, with hypotension and impaired kidney function being particularly prevalent and associated with poorer heart failure outcomes.[32] Systemic barriers, such as irregular medication supply, limited access to newer therapies like ARNIs and SGLT2 inhibitors, and inadequate healthcare infrastructure for routine monitoring, further impede optimal management.[33,34] Physician-related factors, including knowledge gaps, clinical inertia, and apprehension about adverse effects, also restrict careful dose titration, particularly in the absence of intensive monitoring. These challenges are compounded by insufficient outpatient follow-up and patient-level barriers, such as financial constraints and transportation difficulties, which hinder regular therapy adjustment.[35] Collectively, these interrelated factors contribute to low rates of dose optimization, limiting the full therapeutic benefit of GDMT and increasing morbidity and mortality in vulnerable populations. Addressing the modifiable barriers is essential to improve dose optimization, enhance the effectiveness of GDMT, and reduce morbidity and mortality in vulnerable populations.

Strengths and Limitations

This retrospective study offers several notable strengths, making it a valuable resource for understanding heart failure management at the Rwanda Military Referral and Teaching Hospital (RMRTH). One of its primary strengths is the comprehensive insight it provides into the prevalence of different types of heart failure, including heart failure with preserved ejection fraction (HFpEF) and heart failure with reduced ejection fraction (HFrEF). By analyzing the prevalence and associated comorbidities, such as hypertension, diabetes, and chronic kidney disease, the study can help establish a broader understanding of the clinical profile of heart failure patients. This knowledge can aid physicians in developing more tailored treatment strategies that address both heart failure and its associated conditions.

In addition to its clinical relevance, the study has important policy implications. It provides valuable data that can inform hospital administrators and healthcare policymakers in designing strategies to improve heart failure management. By identifying gaps in GDMT adherence, the study offers a roadmap for targeted interventions, such as continuous medical education, audits, and the introduction of clinical decision support systems to enhance evidence-based practices. Moreover, the study's findings can serve as a foundation for future research on heart failure management in Rwanda, encouraging further investigation into this area of healthcare. Its role in driving policy changes and serving as a stepping stone for future studies reinforces its importance within the field.

However, this study is not without limitations, and these need to be acknowledged when interpreting the results. One significant limitation is the fact that it was conducted in a single hospital. This limits the generalizability of the findings, as hospitals in different regions of Rwanda may have varying resources, patient demographics, and physician practices. The results from RMRTH might not fully reflect the situation in other healthcare settings across the country. To address this limitation, future research should aim to include multiple hospitals, both rural and urban, to provide a more representative sample and a better understanding of heart failure management throughout Rwanda.

Another limitation of the study is the relatively short study period, which covered only one year (2022–2023). This limited timeframe may not capture the long-term trends in heart failure management, and as a result, the study might miss out on important data, such as seasonal variations in heart failure admissions or shifts in physician practices over time. Extending the study period to cover multiple years would allow for a more comprehensive analysis of the patterns in heart failure management. This could also enable researchers to evaluate the impact of new medical guidelines or healthcare policies introduced over the years, which would further enhance the robustness of the findings.

Furthermore, several methodological constraints warrant consideration. First, the retrospective design precludes causal inference, limiting the ability to determine whether observed patterns in GDMT adherence directly influence patient outcomes. Second, the study did not include key outcome measures, such as mortality, re-hospitalization rates, or adverse events, which are critical to contextualizing the clinical impact of GDMT adherence. Without these endpoints, it is difficult to fully assess the effectiveness of heart failure management. Addressing these limitations in future

prospective studies with comprehensive outcome tracking would strengthen the evidence base and guide more effective interventions.

Conclusion

In Rwanda, there is a substantial gap in adherence to guideline-directed medical therapy (GDMT) for heart failure, which remain suboptimal despite well-established benefits. To address these challenges, actionable strategies are needed, including targeted clinician training on GDMT, development of a national heart failure registry, and integration of routine GDMT monitoring into clinical practice. Implementing these measures could strengthen evidence-based management, optimize therapy adherence, and ultimately improve patient outcomes across Rwanda. Future research should focus on nationwide evaluations and strategies to enhance physician compliance, ensuring that heart failure care is both effective and sustainable.

Data Sharing Statement

Data are available from the corresponding author on reasonable request.

Ethical Approval Statement

Ethical approval was obtained from Rwanda Military Referral and Teaching Hospital Research Ethics Committee. Since the study involved only a review of patients' past medical records without direct participant involvement, the requirement for informed consent was waived by the ethics committee.

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Disclosure

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