

Assessment of Drug Utilisation and Guideline-Directed Medical Therapy in Patients with Congestive Heart Failure at a Tertiary Care Hospital

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Abstract

Background: Heart failure (HF) is a major global health challenge, affecting over 64 million individuals worldwide. India faces a growing burden of HF, necessitating rational pharmacological management. Guideline-directed medical therapy (GDMT) has evolved with agents such as renin-angiotensin system inhibitors/angiotensin receptor-neprilysin inhibitors (ARNI), β -blockers, mineralocorticoid receptor antagonists (MRAs), and sodium-glucose cotransporter-2 (SGLT2) inhibitors. However, real-world prescribing practices often vary, creating gaps in evidence-based therapy.

Objective: To evaluate prescription patterns and pharmacological management of congestive heart failure in a tertiary care hospital, with emphasis on cardiovascular drug utilization and WHO/INRUD prescribing indicators.

Methods: A prospective observational study was conducted among 600 adult HF patients attending outpatient or inpatient services. Prescriptions were analyzed for demographic details, drug classes, generic versus brand prescribing, injections, antibiotics, and Essential Medicines List inclusion. WHO/INRUD indicators were applied to assess rational prescribing.

Results: Of 600 prescriptions, 58% were male patients. A total of 3,420 drugs were prescribed, averaging 5.7 per prescription, indicating polypharmacy. Loop diuretics (76%) and β -blockers (67%) were most frequently prescribed, followed by ACE inhibitors/ARBs (49%), SGLT2 inhibitors (46%), MRAs (44%), and ARNI (28%). Generic prescribing accounted for 94%, while 89% of drugs were from the Essential Medicines List. Injections were used in 27% of encounters, antibiotics in 12%.

Conclusion: Pharmacological management of HF predominantly involved combination therapy with substantial incorporation of GDMT. High rates of generic prescribing and Essential Medicines List use reflect favorable practices, though polypharmacy underscores the need for periodic prescription review and optimization.

Keywords: Congestive heart failure, Prescription pattern, Drug utilization, Pharmacotherapy, WHO/INRUD, SGLT2 inhibitors, ARNI, Polypharmacy.

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Introduction

Heart failure (HF) is a complex clinical syndrome characterized by symptoms and/or signs resulting from a structural or functional cardiac abnormality, with objective evidence of cardiac dysfunction or congestion.[1]

HF is associated with impaired cardiac output, elevated intracardiac pressures, progressive functional limitation, recurrent hospitalization, reduced quality of life, premature mortality, and substantial healthcare expenditure [2,3]. The global burden of HF is considerable; an estimated 64.3

million people were living with HF in 2017, with the absolute number of cases increasing substantially over recent decades. [4] In developed countries, HF generally affects approximately 1–2% of the adult population, while its prevalence rises markedly with advancing age. [5,6]

Population ageing, improved survival following cardiovascular disease, and the increasing prevalence of hypertension, diabetes mellitus, obesity, coronary artery disease, and other cardiovascular risk factors are important

contributors to the growing HF burden. [4,5,6]. The burden of HF is particularly important in low- and middle-income countries, including India, where epidemiological data remain comparatively limited. [8] The INDUS study and subsequent Indian estimates have suggested that HF affects approximately 1% of the Indian population, corresponding to nearly 8–10 million individuals, although considerable regional and methodological variation exists. [9,10] Earlier estimates based on major cardiovascular risk factors suggested approximately 1.3–4.6 million HF cases in India, with an estimated annual incidence ranging from 0.5 to 1.8 million cases. [11] The National Heart Failure Registry (NHFR), comprising 10,851 patients from 53 tertiary-care hospitals across 21 Indian states, demonstrated that ischaemic heart disease was the predominant underlying aetiology, accounting for 72% of cases. [12] Importantly, only 47.5% of eligible patients in the registry received guideline-directed medical therapy (GDMT), highlighting persistent gaps between evidence-based recommendations and routine clinical practice. [12]

Pharmacological management of HF has evolved substantially over the past several decades. In patients with heart failure with reduced ejection fraction (HFrEF), contemporary GDMT includes angiotensin receptor-neprilysin inhibitors (ARNI), angiotensin-converting enzyme inhibitors or angiotensin receptor blockers when appropriate, evidence-based β -blockers, mineralocorticoid receptor antagonists (MRAs), and sodium-glucose cotransporter-2 (SGLT2) inhibitors. [13,14] The mortality and hospitalization benefits of individual therapeutic classes have been demonstrated in landmark trials involving sacubitril/valsartan, [15] β -blockers, [16] MRAs, [19] and SGLT2 inhibitors. [20]

Despite robust evidence supporting GDMT, its implementation in routine practice remains inconsistent, particularly in resource-constrained settings. Therefore, evaluation of prescription patterns is essential for identifying real-world drug utilization, assessing adherence to evidence-based recommendations, recognizing therapeutic gaps, and promoting rational pharmacotherapy.

The present study was undertaken to evaluate the prescribing patterns and pharmacological management of patients with HF in a tertiary-care hospital, with particular emphasis on the utilization of different cardiovascular drug classes.

Materials and Methods

Study Design: A prospective observational study was conducted to assess the prescription patterns and pharmacological management of patients

diagnosed with congestive heart failure in tertiary care teaching hospital.

Study Setting

Study Duration: The study was conducted over a period of 12 months following approval from the Institutional Ethics Committee.

Study Population: The study population comprised adult patients diagnosed with congestive heart failure who attend the outpatient department or are admitted to the medicine/cardiology wards during the study period and fulfil the predefined eligibility criteria.

Inclusion Criteria

Patients meeting the following criteria were included:

1. Patients aged ≥ 18 years.
2. Patients of either sex.
3. Patients with a clinically documented diagnosis of congestive heart failure/heart failure.
4. Patients receiving pharmacological treatment for heart failure.
5. Patients who are willing to participate in the study.
6. Patients providing written informed consent.

Exclusion Criteria

Patients meeting any of the following criteria were excluded:

1. Patients aged < 18 years.
2. Patients unwilling to provide informed consent.
3. Patients with incomplete or unavailable prescription/medical records.
4. Patients with isolated cardiovascular conditions without a diagnosis of heart failure.
5. Patients referred/transferred to another hospital before adequate assessment of their medication profile.
6. Patients participating in another interventional clinical trial, where participation may influence their prescribed pharmacotherapy.
7. Pregnant or lactating women, if considered appropriate according to the study protocol.

Sample Size Calculation: As per WHO recommendations and International Network for Rational Use of Drugs (INRUD) guidelines, a minimum of 600 prescriptions is generally required to evaluate core prescribing indicators.

Data Collection: Data were extracted from prescriptions and recorded using a structured data collection form including: Patient demographic details, Number of drugs prescribed per encounter, Use of injections, Use of antibiotics, Generic vs

brand prescribing, Essential medicines list inclusion, Classes of drugs.

WHO Prescribing Indicators: - The following WHO core prescribing indicators were assessed: 1. Average number of drugs per encounter 2. Percentage of drugs prescribed by generic name 3. Percentage of encounters with injections 4. Percentage of encounters with antibiotics 5.

Percentage of drugs prescribed from the essential medicines list

Results

A total of 600 prescriptions of patients with congestive heart failure were evaluated. The study population comprised 348 (58.0%) males and 252 (42.0%) females. (Figure 1)

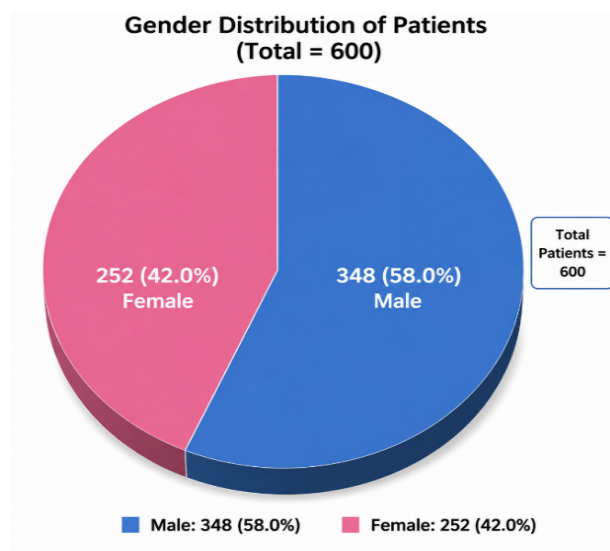


Figure 1: Gender distribution of patients

Table 1 / Figure 1 indicates WHO/INRUD prescribing indicators. A total of 3,420 drugs were prescribed, with an average of 5.7 drugs per prescription. Generic names prescribed 94% drugs. Generic prescribing was observed for 94.0% of drugs, while 89.0% of prescribed drugs were from the Essential Medicines List. Injections were prescribed in 27.0% of encounters and antibiotics in 12.0% of encounters.

Table 1: WHO/INRUD Prescribing Indicator

S. No.	WHO/INRUD Prescribing Indicator	Result
1	Number of prescriptions evaluated	600
2	Total number of drugs prescribed	3,420
3	Average number of drugs per prescription	5.7
4	Drugs prescribed by generic name	3,215 (94.0%)
5	Prescriptions containing injections	162 (27.0%)
6	Prescriptions containing antibiotics	72 (12.0%)
7	Drugs prescribed from Essential Medicines List	3,044 (89.0%)

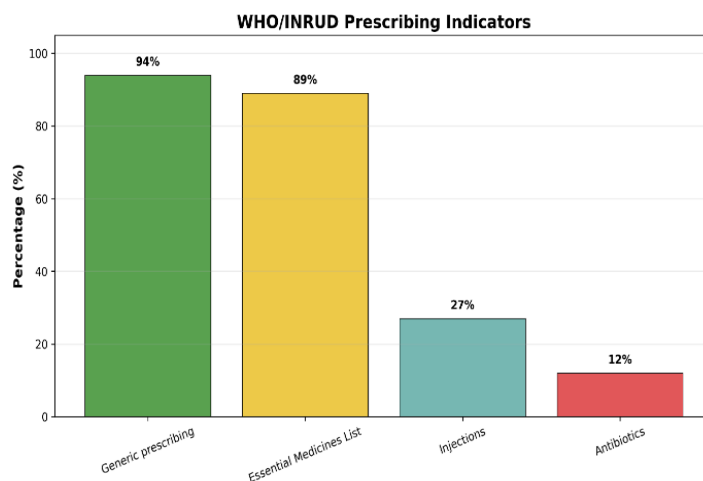


Figure 2: WHO/INRUD Prescribing indicators

Figure 2 indicate that Loop diuretics (76.0%) were the most frequently prescribed drug class, followed by β -blockers (67.0%), ACE inhibitors/ARBs (49.0%), SGLT2 inhibitors (46.0%) and mineralocorticoid receptor antagonists (44.0%). ARNI was prescribed in 28.0% of patients.

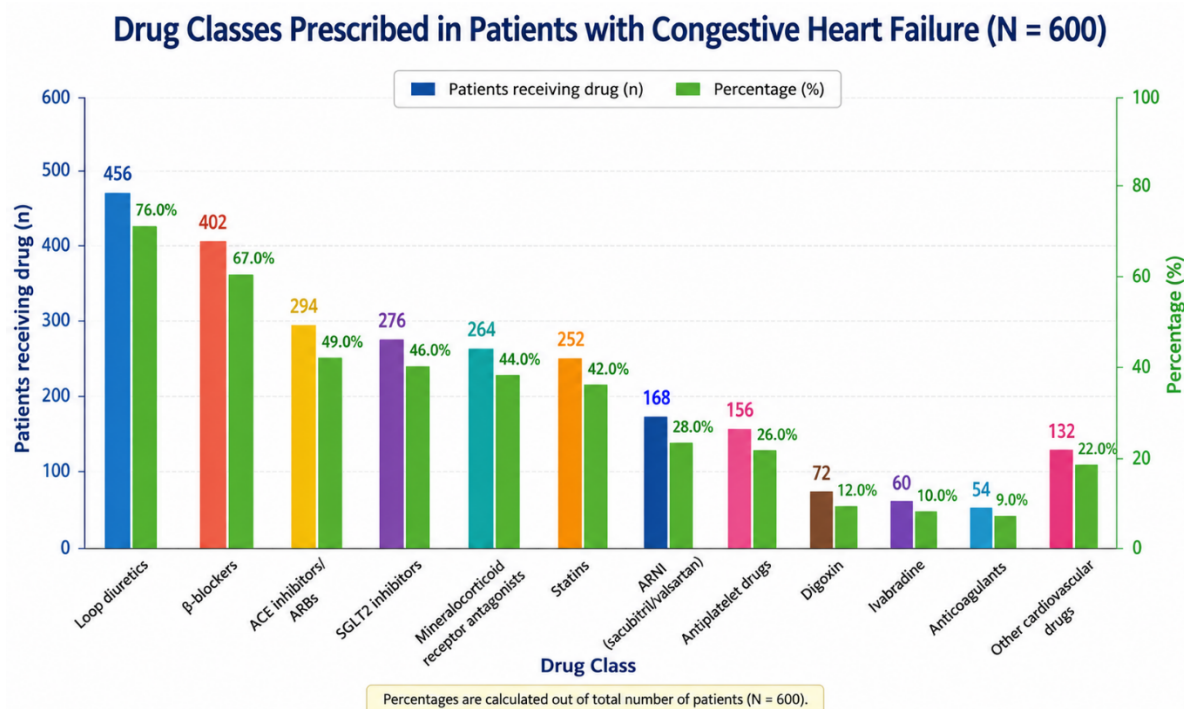


Figure 3: Drug classes prescribed in patients with congestive heart failure (N=600)

Figure 3 indicate Diuretic prescription. Furosemide was used in 65% encounters. Torsemide was used in 13% prescriptions f/b bumetanide in 5.3%.

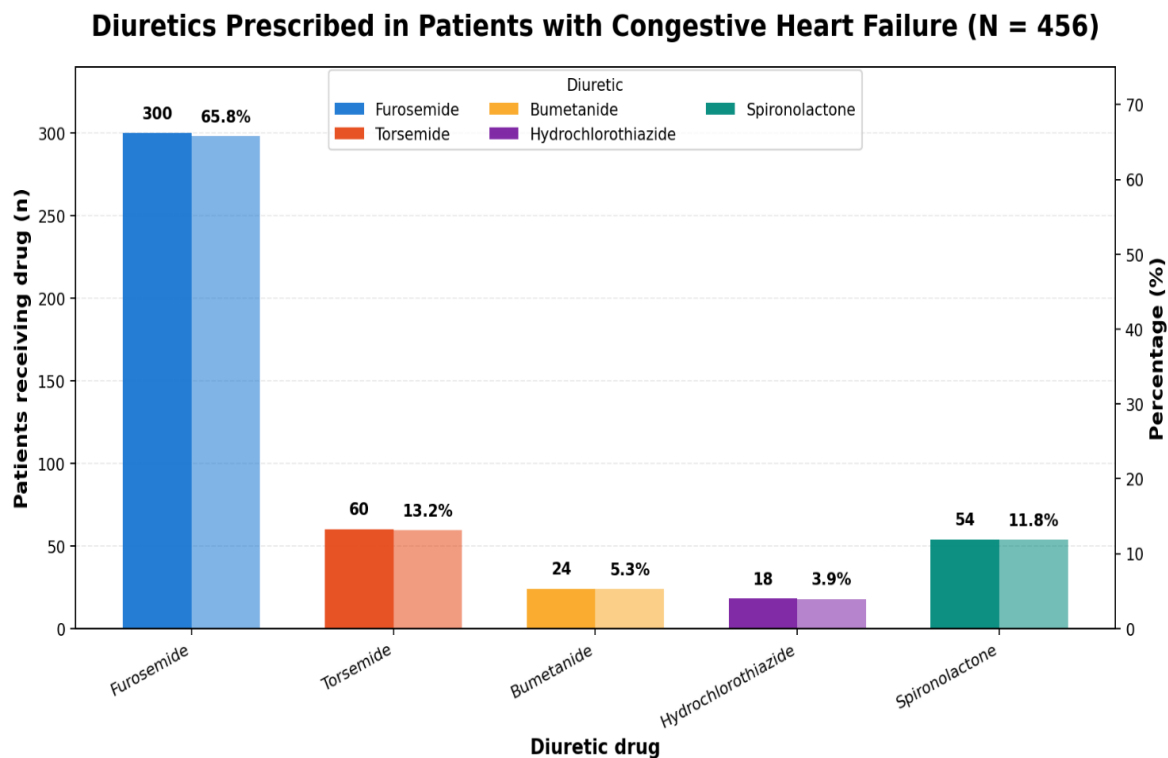


Figure 4: Diuretics prescribed in patients with congestive heart failure (N=456)

Figure 4 depicts trend of anti-platelet drug prescription. 46.2% prescription has aspirin followed by clopidogrel in 26.9%. Some encounter had combination therapy also.

Antiplatelet Drugs Prescribed in Patients with Congestive Heart Failure (N = 156)

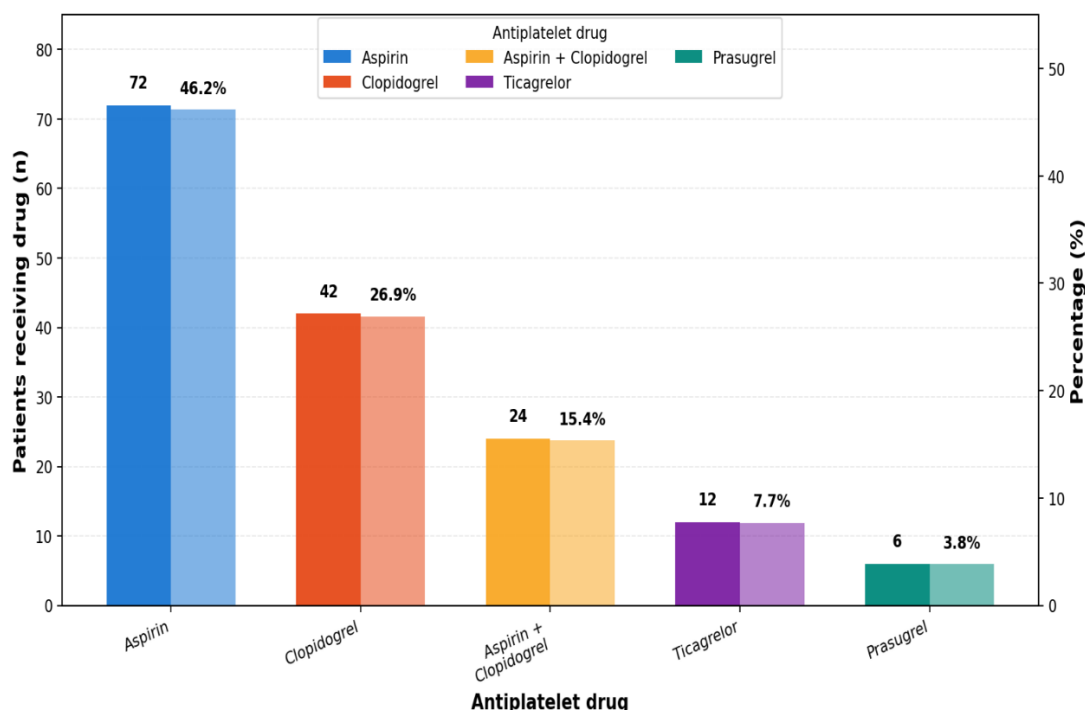


Figure 5: Antiplatelet drugs prescribed in patients with congestive heart failure (N=156)

Overall, the findings demonstrated predominant use of combination pharmacotherapy and substantial incorporation of guideline-directed therapies, although considerable polypharmacy was observed.

Discussion

The present study evaluated the prescription patterns and pharmacological management of 600 patients with congestive heart failure treated at a tertiary care hospital. The findings demonstrate that heart failure management in routine clinical practice relies predominantly on combination pharmacotherapy, reflecting the complex pathophysiology of heart failure and the frequent coexistence of cardiovascular and metabolic comorbidities. The mean number of drugs prescribed per prescription was 5.7, indicating a substantial degree of polypharmacy. This finding is clinically relevant because patients with heart failure commonly require treatment for associated conditions such as hypertension, diabetes mellitus, coronary artery disease and dyslipidaemia in addition to heart-failure-specific therapy. A recent Indian tertiary-care study similarly reported a mean of 6.8 ± 1.9 drugs per encounter, supporting the observation that polypharmacy is common in contemporary heart failure management. [21]

Loop diuretics were the most frequently prescribed class in the present study, being used in 76.0% of patients. This high utilization is consistent with

their central role in controlling congestion, reducing pulmonary and peripheral oedema, and improving symptoms. Comparable findings have been reported in Indian studies. The National Heart Failure Registry of India documented substantial use of diuretics during hospitalization, while a recent South Indian tertiary-care study reported diuretics in 92.6% of patients. [22,23] Another study of hospitalized heart failure patients also demonstrated very high utilization of loop diuretics. [24] The somewhat lower utilization in the present study may reflect differences in disease severity, patient selection, outpatient versus inpatient status, renal function, and the proportion of patients with clinically significant congestion. Importantly, although loop diuretics provide effective symptomatic relief, their principal role is decongestion rather than reduction of long-term mortality; therefore, high diuretic use should not substitute for optimization of disease-modifying therapy.

β -blockers were prescribed to 67.0% of patients in the present study. This finding is comparable with the 64.69% β -blocker utilization reported in the large CSI-HF registry in India [25] and the approximately 60–64% rates reported in the CSI-Kerala acute heart failure registry. [26] International registry data have reported higher prescription rates; for example, β -blockers were used in 67% of patients in CHAMP-HF 27 and

79% in the ASIAN-HF registry. [28] The relatively high use of β -blockers in the present study indicates reasonable adoption of established guideline-directed therapy, particularly for patients with HFrEF. However, prescription alone does not necessarily indicate optimal therapy, as achieving evidence-based target doses is equally important. [27,28]

ACE inhibitors/ARBs were prescribed in 49.0% of patients. This utilisation is broadly comparable with Indian real-world data. In the CSI-Kerala registry, ACEI/ARB therapy at discharge was prescribed to approximately 52% of patients with HFrEF, while the National Heart Failure Registry demonstrated substantial gaps in guideline-directed therapy, with only 47.5% of patients with HFrEF receiving recommended guideline-directed medical therapy. [29] In contrast, international registries such as CHAMP-HF have reported RAS inhibitor use of approximately 73.4%, although achievement of target doses was much lower. These differences may reflect variations in healthcare systems, prescribing practices, patient characteristics, renal dysfunction, and hypotension and treatment affordability.

MRA utilization in the present study was 44.0%. This is comparable with several real-world studies but remains below the rates reported in some contemporary registries. The CSI-HF registry reported MRA use of 63.73%, whereas the CSI-Kerala registry reported approximately 49% MRA use among patients with HFrEF at discharge. The lower utilisation observed in the present study may be related to concerns regarding hyperkalaemia, renal impairment, hypotension and the need for laboratory monitoring. Real-world data also identify kidney dysfunction and hyperkalaemia among important reasons for under prescription or underdosing of GDMT. [30] Nevertheless, MRA therapy remains an important component of guideline-directed treatment in eligible patients with HFrEF.

A particularly important finding was the relatively high use of SGLT2 inhibitors, which were prescribed in 46.0% of patients. This represents substantial incorporation of newer guideline-directed therapy into routine practice. The finding contrasts markedly with the CSI-HF registry, where SGLT2 inhibitors were prescribed in only 3.18% of patients, reflecting the earlier period of data collection and the more recent expansion of evidence supporting SGLT2 inhibitors in heart failure. A recent South Indian study reported SGLT2 inhibitor use in 25.5%, further suggesting that the 46% utilization in the present study represents relatively strong adoption of this newer therapeutic class. Current evidence supports SGLT2 inhibitors as an important component of

contemporary heart failure treatment, including benefits beyond glycaemic control.

Sacubitril/valsartan was prescribed in 28.0% of patients. This represents considerably greater utilization than that reported in earlier Indian registries. The National Heart Failure Registry reported ARNI use of only 4.8% among patients with HFrEF, [29] while the CSI-Kerala registry reported ARNI use of approximately 1.8% at discharge among HFrEF patients. [26] More recent international data demonstrate higher uptake; for example, ARNI was prescribed in 26.4% of patients in the HELP-HF registry. [30] The 28% rate observed in the present study therefore suggests considerable progress in adoption of contemporary heart failure therapy, although further optimization may be possible in eligible patients.

The simultaneous use of multiple guideline-directed classes in the present study indicates a transition from conventional symptom-oriented treatment toward multidrug disease-modifying therapy. Nevertheless, the fact that ACEI/ARB therapy was prescribed in 49%, MRA in 44%, ARNI in 28%, and SGLT2 inhibitors in 46% suggests that a substantial proportion of patients may not have received all appropriate foundational therapies. This observation is consistent with international evidence showing persistent treatment gaps. In the GWTG-HF registry, only 31.4% of eligible patients received triple therapy with ACEI/ARB/ARNI, β -blocker and MRA, while only 9.4% received quadruple therapy including an SGLT2 inhibitor. [31] Similarly, the HELP-HF registry found that although individual classes were commonly prescribed, only 34.5% of patients received three guideline-directed agents. [30]

The prescribing indicators in the present study were encouraging. Generic prescribing was observed in 94.0% of prescriptions, while 89.0% of prescribed medicines were from the Essential Medicines List. These findings indicate a strong orientation toward rational, affordable and essential-medicine-based prescribing. Nevertheless, the mean of 5.7 drugs per prescription emphasizes the importance of periodic medication reconciliation and review to minimize unnecessary duplication, drug-drug interactions, adverse drug reactions and treatment burden. Overall, the present findings demonstrate substantial use of evidence-based pharmacotherapy, including encouraging adoption of SGLT2 inhibitors and sacubitril/valsartan. At the same time, incomplete utilization of foundational therapies and considerable polypharmacy highlight opportunities for further optimization. Prescription audits, assessment of target-dose attainment, regular monitoring of renal function and electrolytes, patient education, and multidisciplinary medication review may help

improve adherence to guideline-directed medical therapy. The findings therefore support the continued use of prescription-pattern studies as an important tool for identifying gaps between evidence-based recommendations and real-world heart failure management.

Conclusion

The present study demonstrated that the pharmacological management of congestive heart failure in the tertiary care setting predominantly involved combination therapy and substantial polypharmacy.

Loop diuretics and β -blockers were the most frequently prescribed drug classes, while contemporary therapies including SGLT2 inhibitors and sacubitril/valsartan were also incorporated into routine clinical practice.

The high rate of generic prescribing (94.0%) and substantial utilization of medicines from the Essential Medicines List (89.0%) indicate generally favorable prescribing practices. However, the average of 5.7 drugs per prescription highlights the complexity of pharmacotherapy and the need for regular medication review to minimize inappropriate polypharmacy and medication-related problems.

Overall, the study provides useful real-world evidence regarding prescribing practices in patients with congestive heart failure.

Continued emphasis on complete and optimized guideline-directed medical therapy, individualized treatment, rational drug selection, dose titration and periodic prescription auditing may further improve the quality and safety of pharmacological management in heart failure.

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Ethical Approval: Yes

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