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Effectiveness and Medical Adherence of Goal-Directed Medical Therapy in Patients with Heart Failure with Reduced Ejection Fraction

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Abstract
Background: *Heart Failure with Reduced Ejection Fraction (HFrEF) poses significant morbidity and mortality risks globally. Goal-Directed Medical Therapy (GDMT) improves outcomes but is often underutilized due to poor medication adherence.*
Aim: To evaluate the impact of GDMT on clinical outcomes such as quality of life, morbidity, and hospitalizations in HFrEF patients, and to assess the level and predictors of medication adherence.
Methods: *A cross-sectional study was conducted at Shree Krishna Hospital involving 100 adult patients with HFrEF. Adherence was measured using the Morisky Green Levine Scale. Quality of life (QoL) was evaluated utilizing the Minnesota Living with Heart Failure Questionnaire (MLHFQ) at baseline and a 6-month follow-up. Descriptive statistics, Chi-square tests, and logistic regression were used to analyze the data.*
Results: *The cohort (mean age primarily 61–70 years; 64% male) demonstrated low overall adherence: 6% complete, 54% medium, and 40% low adherence. Despite this, 78% of patients were on some form of GDMT. At 6 months, patients receiving GDMT had significantly better QoL outcomes compared to non-recipients (p=0.006). Education level emerged as a strong, statistically significant predictor of higher medication adherence.*
Conclusion: *While GDMT profoundly improves Quality of Life for HFrEF patients, medication adherence remains a pervasive challenge. Tailored, patient-centered interventions focusing on education and continuous monitoring are essential to optimize therapeutic benefits.*

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I. Introduction

Heart failure with reduced ejection fraction (HFrEF) is a chronic, progressive cardiovascular syndrome defined by a left ventricular ejection fraction (LVEF) of 40% or less. It is characterized by the heart's inability to pump blood efficiently, leading to inadequate tissue perfusion, dyspnea, fatigue, and fluid retention. HFrEF affects millions globally and constitutes a substantial economic and healthcare burden, particularly due to frequent hospitalizations and high mortality rates.

The cornerstone of HFrEF management is Goal-Directed Medical Therapy (GDMT). GDMT encompasses evidence-based pharmacological treatments that target neurohormonal activation and reverse cardiac remodeling. Standard regimens include Angiotensin-Converting Enzyme Inhibitors (ACEIs), Angiotensin Receptor Blockers (ARBs), or Angiotensin Receptor-Neprilysin Inhibitors (ARNIs), combined with Beta-Blockers, Mineralocorticoid Receptor Antagonists (MRAs), and Sodium-Glucose Cotransporter-2 inhibitors (SGLT2is).

Despite robust clinical trial evidence demonstrating that GDMT reduces cardiovascular mortality and heart failure hospitalizations, its real-world effectiveness is frequently hindered by suboptimal medication adherence. Non-adherence leads to exacerbated symptoms, rapid disease progression, and avoidable readmissions. This study aimed to evaluate the real-world effectiveness of GDMT on quality of life and clinical outcomes in HFrEF patients, while simultaneously identifying gaps in medication adherence and associated contributing factors.

II. Materials and Methods

2.1 Study Design and Population

This cross-sectional, observational study was conducted at the Department of Medicine and Cardiology, Shree Krishna Hospital, Karamsad, Gujarat. The study included 100 adult patients (aged ≥ 18 years) diagnosed with HFrEF who had consulted the hospital within the preceding year. Patients with Heart Failure with Preserved Ejection Fraction (HFpEF), mildly reduced Ejection Fraction (HFmrEF), NYHA Class IV symptoms, acute decompensated heart failure, end-stage renal disease, or active malignancies were excluded from the study.

2.2 Data Collection and Assessments

Patient demographics, socioeconomic status (classified using the Modified Kuppuswami classification), occupational history, addiction history, and comorbidity profiles were collected using a structured questionnaire. Medication adherence was objectively quantified utilizing the validated Morisky Green Levine Medication Adherence Scale.

Quality of life (QoL) was measured using the Minnesota Living with Heart Failure Questionnaire (MLHFQ). Clinical improvements, hospitalizations, morbidity, New York Heart Association (NYHA) functional class, and biomarker profiles (hemoglobin, sodium, potassium, creatinine) were tracked. Follow-up assessments comparing baseline QoL to QoL at 6 months were recorded.

2.3 Statistical Analysis

Descriptive statistics (frequencies, percentages) were used to summarize baseline variables. Chi-square tests were utilized to evaluate the association between GDMT uptake and Quality of Life, as well as adherence levels. Logistic regression analysis was applied to identify independent sociodemographic and clinical predictors of medication adherence. A p-value of <0.05 was considered statistically significant.

III. Results

3.1 Baseline Characteristics

Of the 100 patients included in the study, 64% were male and 36% were female. The most frequently affected age group was 61–70 years (33%), followed by 51–60 years (29%). A significant proportion of the cohort was overweight (54%) or obese (22%). Comorbidities were highly prevalent, with hypertension (37%) and Type 2 Diabetes Mellitus (18.5%) being the most common isolated conditions, and 16.7% presenting with both. Regarding lifestyle, 67% of patients lacked regular physical activity, though 93.9% reported adhering to a healthy diet.

3.2 Medication Adherence and GDMT Uptake

Medication adherence was generally suboptimal. Only 6% of the cohort demonstrated complete adherence to their prescribed regimens. The majority had medium adherence (54%), and 40% had low adherence. Despite adherence challenges, a substantial majority of the patients (78%) were receiving GDMT. Patients who were not on GDMT (22%) primarily lacked therapy due to clinical contraindications such as elevated creatinine or hyperkalemia.

Adherence Level	GDMT Taken (n=78)	GDMT Not Taken (n=22)	Total (n=100)
Complete Adherence	5	1	6
Medium Adherence	45	9	54
Low Adherence	28	12	40

Table 1: Association between Medication Adherence and GDMT Uptake (p = 0.42).

3.3 Effectiveness of GDMT on Quality of Life

Quality of life was assessed using the MLHFQ at baseline and after 6 months of follow-up. At baseline, the majority of the cohort exhibited moderate impairment (52%) or poor QoL (40%). However, significant discrepancies emerged when cross-tabulating GDMT status with QoL outcomes at 6 months.

QoL at 6 Months (MLHFQ)	GDMT Taken (n=72)	GDMT Not Taken (n=28)	Total
Good Quality of Life	5	1	6
Moderate Impairment	38	5	43
Poor Quality of Life	29	22	51

Table 2: Impact of GDMT on 6-Month Quality of Life (p = 0.006).

Patients actively receiving GDMT had significantly better QoL outcomes (p = 0.006), with higher rates of good and moderate QoL compared to the non-GDMT group, which overwhelmingly remained in the poor QoL category.

3.4 Predictors of Adherence

Logistic regression analysis indicated that education was a strong and statistically significant predictor of medication adherence. Individuals with graduate-level education (OR = 27.4, $p < 0.001$) and high school education (OR = 9.6, $p < 0.001$) exhibited vastly higher odds of adherence compared to reference groups. A non-sedentary lifestyle also showed a positive trend toward improved adherence (OR = 9.35, $p = 0.064$), though it marginally missed statistical significance. Variables such as age, gender, occupation, and family history of CAD did not show statistically significant impacts on medication adherence in this cohort.

IV. Discussion

This study evaluated the real-world adherence and effectiveness of Guideline-Directed Medical Therapy among HFrEF patients. Aligning with major trials like PARADIGM-HF and DAPA-HF, our cohort was predominantly older (61–70 years), male, and carried a high burden of cardiometabolic comorbidities like hypertension and diabetes.

A central finding of this research is the stark reality of medication non-adherence. With only 6% of patients achieving complete adherence, and 40% exhibiting low adherence, this study highlights a critical gap between clinical guidelines and real-world execution. The heavy pill burden, fear of side effects, and socioeconomic factors frequently derail long-term compliance. In our logistic regression model, higher educational attainment was the most significant predictor of adherence, underscoring health literacy as a pivotal determinant in chronic disease management.

Despite the high rates of partial or low adherence, 78% of the cohort was prescribed GDMT. Crucially, the data demonstrated a statistically significant improvement in Quality of Life ($p=0.006$) for patients maintained on GDMT at 6 months compared to those who were not. Even with imperfect adherence, the pharmacological benefits of ACEI/ARNI, Beta-blockers, MRAs, and SGLT2 inhibitors translate to tangible symptom relief and functional capacity improvements for patients.

Limitations: The study is constrained by its single-center nature and relatively small sample size (n=100). The 6-month follow-up provides a restricted temporal window, and the reliance on self-reported questionnaires for adherence (Morisky scale) may introduce recall or social desirability biases.

V. Conclusion

Guideline-Directed Medical Therapy profoundly mitigates the morbidity associated with HFrEF and significantly improves patient quality of life. However, its effectiveness is bottlenecked by pervasive medication non-adherence. Complete adherence remains alarmingly low in real-world clinical practice, heavily influenced by patient education levels. Integrating patient-centered strategies—such as individualized counseling, simplified regimens, remote monitoring, and targeted health literacy programs—is imperative to bridge the gap between evidence-based guidelines and optimized clinical outcomes.

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