CROSS-SECTIONAL ANALYSIS OF BETA-BLOCKER THERAPY IN HEART FAILURE: PATIENT OUTCOMES AND ADHERENCE

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Abstract

Background: Beta-blockers are a cornerstone in the management of heart failure (HF), known to reduce mortality and improve quality of life. However, adherence to beta-blocker therapy and its impact on patient outcomes has varied, necessitating a detailed analysis. **Objectives:** To assess the correlation between beta-blocker therapy adherence and patient outcomes, including mortality, hospitalization rates, and quality of life in heart failure patients. **Methods:** A cross-sectional study was conducted involving 120 HF patients at a tertiary care hospital. Data on adherence to beta-blocker therapy were collected through patient self-reports and pharmacy refill records. Outcomes assessed included mortality, hospitalization, and quality of life, with statistical analysis performed to determine correlations and associations using correlation coefficients, odds ratios, and chi-square tests **Results:** The study found that high adherence to beta-blocker therapy was associated with a significant reduction in mortality ($r = 0.24$, $P = 0.010$) and hospitalization rates (OR = 1.58, $P = 0.025$). Furthermore, adherence was strongly correlated with improved quality of life ($r = 0.45$, $P = 0.0001$). Demographic factors such as age and socioeconomic status significantly influenced adherence rates, with older and more educated patients showing better adherence **Conclusions:** This study underscores the importance of adherence to beta-blocker therapy in improving clinical outcomes in HF patients. Enhanced adherence correlates with reduced mortality and hospitalization rates and improved quality of life. These findings highlight the need for targeted interventions to improve medication adherence among heart failure patients, particularly in demographics identified as at risk for low adherence.
Keywords: Heart Failure, Beta-Blocker Adherence, Patient Outcomes.

Introduction

Heart failure (HF) is a global public health issue characterized by high morbidity, mortality, and escalating healthcare costs, affecting an estimated 26 million people worldwide. The

complexity of HF management is evidenced by the broad spectrum of pharmacotherapy options available, with beta-blockers being pivotal in the treatment regimen. Since the first landmark trials in the 1990s, which demonstrated a significant mortality benefit, beta-blockers have become a cornerstone in HF treatment guidelines. However, despite their proven efficacy, real-world patient outcomes and adherence to beta-blocker therapy remain varied.[1]

Beta-blockers improve survival, reduce hospitalization rates, and enhance the quality of life in HF patients. Key clinical trials such as MERIT-HF, CIBIS-II, and COPERNICUS have established the benefits of these agents in reducing all-cause mortality and hospitalization in HF. These findings underpin guideline recommendations for their use across all stages of HF. Yet, the application of this knowledge in clinical practice is inconsistent, impacted by patient adherence, healthcare provider decisions, and varying healthcare system practices.[2]

Adherence to beta-blocker therapy is critical for achieving the optimal outcomes seen in clinical trials. However, studies indicate that adherence rates are less than ideal, with significant discrepancies reported across different demographics and healthcare settings. Factors influencing adherence include side effects, patient education, socioeconomic status, and the complexity of medication regimens. Understanding the dynamics of adherence and patient outcomes within the context of beta-blocker use in HF can provide valuable insights into optimizing treatment strategies and improving overall patient management.[3]

Aim

To analyze the correlation between beta-blocker therapy adherence and patient outcomes in heart failure.

Objectives

1. To evaluate the impact of beta-blocker adherence on mortality and hospitalization rates in HF patients.
2. To assess the relationship between beta-blocker therapy adherence and the quality of life in HF patients.
3. To identify demographic and socio-economic factors that influence adherence to beta-blocker therapy in HF.

Material and Methodology

Source of Data

Data were retrospectively collected from the electronic health records of patients diagnosed with heart failure.

Study Design

A cross-sectional analytical study was conducted to evaluate the impact of beta-blocker therapy adherence on patient outcomes in heart failure.

Study Location

The study was carried out at a tertiary care hospital renowned for its advanced cardiology department.

Study Duration

The study period spanned from January 2022 to December 2022.

Sample Size

A total of 120 patients were included in the study based on the inclusion and exclusion criteria.

Inclusion Criteria

Patients aged 18 years and older, diagnosed with heart failure, prescribed beta-blocker therapy, and having at least one year of follow-up data were included.

Exclusion Criteria

Patients were excluded if they had a history of asthma, chronic obstructive pulmonary disease, atrioventricular block, bradycardia, or if they were not on a stable dose of beta-blockers for at least three months prior to the study commencement.

Procedure and Methodology

Patient adherence was assessed using pharmacy refill records and self-reported medication-taking behavior. Clinical outcomes such as mortality, hospitalization rates, and quality of life (measured using the Minnesota Living with Heart Failure Questionnaire) were documented.

Sample Processing

No specific sample processing was required as the study relied on existing medical records and patient reports.

Statistical Methods

Data were analyzed using SPSS software. Descriptive statistics, Chi-square tests for categorical variables, and t-tests or ANOVA for continuous variables were used to determine the relationships between adherence and outcomes. Logistic regression was employed to adjust for confounders and to identify predictors of poor adherence.

Data Collection

Data collection was performed retrospectively from medical records, including demographic information, clinical characteristics, medication lists, and follow-up data on clinical outcomes.

Observation and Results

Table 1: Correlation between Beta-Blocker Therapy Adherence and Patient Outcomes in Heart Failure

Variable	n	Percentage (%)	Correlation Coefficient (r)	95% CI	P-value
Mortality	120	30	0.24	0.10-0.38	0.010
Hospitalization	120	45	-0.30	-0.42 to -0.18	0.003
Quality of Life	120	75	0.45	0.30-0.60	0.0001

Table 1 presents the correlation between beta-blocker therapy adherence and various patient outcomes in heart failure. For the 120 patients analyzed, adherence showed a positive correlation with quality of life (r = 0.45, P = 0.0001) and a negative correlation with hospitalization rates (r = -0.30, P = 0.003). There was also a significant positive correlation with reduced mortality (r = 0.24, P = 0.010). These findings suggest that better adherence to beta-blocker therapy is associated with improved quality of life and reduced hospitalization and mortality among heart failure patients.

Table 2: Impact of Beta-Blocker Adherence on Mortality and Hospitalization Rates in HF Patients

Outcome	n	Percentage (%)	Odds Ratio (OR)	95% CI	P-value
Mortality	120	20	0.62	0.42-0.92	0.018
Hospitalization	120	40	1.58	1.05-2.36	0.025

Table 2 details the impact of beta-blocker adherence on mortality and hospitalization rates in heart failure patients. Among the 120 patients studied, those adherent to beta-blocker therapy had lower mortality rates (20% incidence, OR = 0.62, P = 0.018) and higher hospitalization rates (40% incidence, OR = 1.58, P = 0.025). This implies that while adherence was

associated with a decreased risk of mortality, those adherent were more likely to be hospitalized, possibly indicating closer monitoring or management of their condition.

Table 3: Relationship between Beta-Blocker Therapy Adherence and Quality of Life in HF Patients

Quality of Life Level	n	Percentage (%)	Chi-Square Value	95% CI	P-value
High	60	50	15.2	45%-55%	0.0004
Moderate	30	25	5.6	20%-30%	0.018
Low	30	25	8.4	20%-30%	0.004

Table 3 explores the relationship between beta-blocker therapy adherence and quality of life among heart failure patients. The study categorized patients based on their quality of life into high (50%), moderate (25%), and low (25%). Higher adherence was linked with a higher quality of life (chi-square value = 15.2, P = 0.0004 for high quality of life). This supports the notion that adherence to prescribed medication regimens is beneficial in maintaining a better quality of life in heart failure patients.

Table 4: Demographic and Socio-Economic Factors that Influence Adherence to Beta-Blocker Therapy in HF

Factor	n	Percentage (%)	Odds Ratio (OR)	95% CI	P-value
Age > 65	50	41.67	1.75	1.20-2.55	0.003
Low Income	70	58.33	0.66	0.45-0.97	0.035
High Education	40	33.33	2.25	1.50-3.40	0.002

Table 4 analyzes demographic and socio-economic factors that influence adherence to beta-blocker therapy in heart failure. The factors considered were age over 65 years, low income, and high education. Older age and high education were associated with better adherence (OR = 1.75, P = 0.003 for age > 65; OR = 2.25, P = 0.002 for high education), while lower income was linked with poorer adherence (OR = 0.66, P = 0.035). This suggests that socio-economic factors, along with age, significantly impact medication adherence, which in turn affects patient outcomes in heart failure management.

Discussion

The data in table 1 showing a positive correlation between adherence and decreased mortality (r = 0.24, P = 0.010) align with the broader consensus in HF research that consistent medication adherence is crucial for improving survival rates Wernhart S *et al.*(2023)[4]. Similarly, the negative correlation with hospitalization rates (r = -0.30, P = 0.003) is supported by studies indicating that effective management of HF with beta-blockers can reduce acute exacerbations leading to hospital admissions Wheeler MT *et al.*(2023)[5]. Furthermore, the strong positive correlation with quality of life improvements (r = 0.45, P = 0.0001) resonates with findings from the CIBIS-II and MERIT-HF trials, which highlighted enhanced life quality as a key benefit of sustained beta-blocker use Joo SJ.(2023)[6].

Table 2 further emphasizes the protective role of beta-blockers against mortality (OR = 0.62, P = 0.018), which is consistent with previous meta-analyses showing a significant reduction in all-cause mortality with beta-blocker therapy in HF Schurtz G *et al.*(2023)[7]. The increased odds of hospitalization (OR = 1.58, P = 0.025) might seem counterintuitive but could reflect a scenario where adherent patients are more likely to seek care during early symptom exacerbation, potentially leading to better long-term outcomes Gao Y *et al.*(2023)[8].

Table 3 The stark differences in quality of life based on adherence underscore the importance of patient education and support programs. The association between high adherence and

better quality of life (Chi-Square = 15.2, P = 0.0004) aligns with research advocating for comprehensive HF management programs that focus on lifestyle adjustments, education, and psychological support to enhance adherence and patient satisfaction Strauss MH *et al.*(2023)[9].

Table 4 provides critical insights into the socio-economic and demographic disparities affecting medication adherence. Older patients (Age > 65) showing better adherence (OR = 1.75, P = 0.003) might reflect a higher awareness or more stable routines, while the lower adherence among low-income groups (OR = 0.66, P = 0.035) highlights the challenges posed by economic barriers Perry AS *et al.*(2023)[10]. Conversely, patients with higher education levels exhibiting greater adherence (OR = 2.25, P = 0.002) suggest that education is a key facilitator in understanding and managing HF treatment protocols Musse M *et al.*(2023)[11].

Conclusion

The study provides critical insights into the implications of medication adherence on the health outcomes of heart failure (HF) patients. Our analysis confirmed that adherence to beta-blocker therapy is significantly associated with reduced mortality, fewer hospitalizations, and improved quality of life among patients with HF.

The data demonstrated a positive correlation between adherence and a decrease in mortality rates, supporting the hypothesis that consistent use of beta-blockers can extend life expectancy in this patient population. Furthermore, although higher adherence was associated with an increased rate of hospitalization, this may reflect more proactive management of the condition, potentially leading to better long-term outcomes by preventing severe exacerbations.

Importantly, adherence to beta-blockers was strongly correlated with enhanced quality of life, highlighting the beneficial effects of these medications beyond mere survival benefits. These findings underscore the need for healthcare systems to implement strategies that improve patient education and support, particularly targeting populations at risk of low adherence, such as those with lower socioeconomic status or less education.

Our study also identified key demographic factors influencing adherence, such as age and socioeconomic status, providing a basis for tailored interventions to improve health outcomes in specific subgroups. Older patients and those with higher educational levels showed better adherence, suggesting that targeted educational and support interventions could be particularly effective in these groups.

In conclusion, this study affirms the critical role of medication adherence in managing heart failure and emphasizes the need for comprehensive strategies to enhance adherence. By focusing on improving adherence through patient education, support programs, and healthcare provider engagement, we can significantly impact the overall management of heart failure, thereby reducing mortality and improving quality of life for these patients. The findings call for ongoing efforts to understand and mitigate the barriers to medication adherence, ensuring that all patients receive the full benefit of proven HF therapies.

Limitations of Study

1. **Cross-Sectional Design**: The cross-sectional nature of this study limits the ability to establish causality between beta-blocker adherence and outcomes in heart failure. Longitudinal studies would be better suited to determine the causal effects of adherence over time.
2. **Self-Reported Adherence**: Adherence was partially assessed through self-reported measures, which can introduce bias due to patient forgetfulness, misunderstanding, or deliberate misreporting. Objective measures such as pharmacy refill data were used to

mitigate this, but these too can have limitations, such as not capturing whether the patient actually ingested the medication.

3. **Single-Center Study**: Data were collected from a single tertiary care hospital, which may limit the generalizability of the findings to other settings or populations. Multi-center studies could provide a more comprehensive understanding of adherence patterns across different healthcare systems and geographic locations.

4. **Lack of Detailed Clinical Data**: While the study included demographic factors, detailed clinical data such as the severity of heart failure, comorbid conditions, and specific beta-blocker dosages were not comprehensively analyzed. These factors could significantly influence both adherence and patient outcomes.

5. **Potential Confounders**: The study may not have adequately controlled for all potential confounding variables that could affect the relationship between adherence and outcomes, such as patient education, health literacy, and social support systems.

6. **Sample Size**: Although a sample size of 120 patients provides initial insights, it is relatively small for detecting finer nuances in the effects of adherence on diverse outcomes. Larger samples would enhance the statistical power and robustness of the findings.

7. **Selection Bias**: The selection of participants based on those who attended a single hospital and who were already prescribed beta-blockers may introduce selection bias, limiting the applicability of the results to all HF patients.

8. **No Control Group**: The study lacked a control group of HF patients not on beta-blocker therapy, which would have provided comparative insights into the specific impacts of beta-blockers independent of other treatments.

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