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Original Article

Factors Contributing to Re-Hospitalization in Heart Failure Patients at a Tertiary Care Center in Karachi, Pakistan

Deepak Lal[1], Barkha Bai[1], Poonam Bai[1], Pashmina Kumari[1], Munawar Khursheed[1], Sher Muhammad Chaudary[1]

[1]National Institute of Cardiovascular Diseases (NICVD), Karachi, Pakistan

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Corresponding Author:
Dr. Deepak Lal Bajaj, Fellow, National Institute of Cardiovascular Diseases (NICVD), Karachi, Pakistan.
Email: dr.deepbajaj11@gmail.com

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Abstract

Objectives: To identify the factors associated with re-hospitalization of heart failure (HF) patients at a tertiary care cardiac center in Karachi, Pakistan.

Methodology: This cross-sectional study was conducted at the emergency department of the National Institute of Cardiovascular Diseases (NICVD), Karachi, Pakistan, from February 2021 to August 2021. A total of 307 adult patients, aged ≥18 years, diagnosed with HF of any etiology for at least 4 weeks, were included. Patients were assessed for socio-demographics, risk profiles, and various reasons for re-hospitalization. Data was recorded using a pre-designed questionnaire by the researcher and analyzed with SPSS version 23.

Results: The mean age of the patients was 59.20±13.27 years, with the majority being male (66.8%). The most common reason for re-hospitalization was non-compliance with treatment (42.7%), followed by lack of regular follow-up (39.4%). Additionally, 28.3% of patients showed non-adherence to fluid intake, and 29% presented with myocardial ischemia. Significant associations were found between 90-day readmission and non-adherence to fluid restriction (p=0.046) as well as lack of regular follow-up (p=0.024).

Conclusion: Re-hospitalization of HF patients is primarily associated with non-compliance with medication, lack of regular follow-up, non-adherence to fluid restriction, and myocardial ischemia. Enhanced patient counseling on treatment adherence and lifestyle modifications is essential to reduce the rate of HF-related re-hospitalizations.

Keywords: Heart failure, re-hospitalization, treatment adherence, myocardial ischemia, follow-up, comorbidities

INTRODUCTION

Heart failure (HF) is a prevalent syndrome and the leading cause of hospitalization and readmission globally, affecting over 26 million people worldwide. This condition results in significant morbidity, mortality, and escalating treatment costs [1,2]. In the United States alone, more than 5 million people are currently living with HF, a number expected to rise to over 8 million by 2030, affecting one in every thirty-three individuals. In the Asia-Pacific region, HF prevalence ranges from 1.3% to 7%. For instance, India has an estimated 1.3 to 23 million HF patients, China has approximately 4.2 million, and Pakistan is home to 2.8 million affected individuals [3,4].

The management of HF is complex, with many patients facing frequent readmissions. Despite increased attention and interventions, the re-hospitalization rate following HF remains high, with about 30% of patients readmitted within 2 to 3 months, and 50% within 6 months [5,6]. In Pakistan, a small study revealed that 37.2% of patients experienced readmission due to systolic HF, and the overall death rate was 28% within one year of acute decompensated HF [7].

Several factors contribute to the re-hospitalization of HF patients, including alcohol and drug abuse, non-adherence to prescribed medication, inappropriate diet, anemia, worsening comorbidities, renal impairment, myocardial ischemia, infection, and arrhythmias [2,8-13]. A study by Sial et al. in Pakistan identified frequent causes of HF re-hospitalization as non-adherence to medication (55%), chest infections (17%), cardiac rhythm issues (11%), and myocardial ischemia (7%) [14]. Understanding the factors leading to hospitalization after HF, especially those that are preventable, is crucial for improving patient outcomes and reducing the burden of re-hospitalization [15,16].

There is a notable lack of data on the factors contributing to HF re-hospitalization within the South Asian community, particularly in Pakistan. This study aims to evaluate the various factors contributing to re-hospitalization and 90-day readmission of HF patients in a tertiary care cardiac center in Karachi, Pakistan. The findings will help identify key causes and inform the development of interventions to reduce the rate of HF-related re-hospitalizations.

METHODOLOGY

Study Design: This was a cross-sectional study conducted to investigate the factors associated with re-hospitalization in heart failure patients.

Setting: The study took place at the emergency department of the National Institute of Cardiovascular Diseases (NICVD) in Karachi, Pakistan, over a period from February 2021 to August 2021.

Participants: The study included adult patients aged 18 years and older of either gender who had a diagnosis of heart failure for at least four weeks. The exclusion criteria were patients with impaired cognitive function, those who were pregnant or lactating, and those presenting with new onset of heart failure. Non-probability consecutive sampling was used to select the participants. The sample size was estimated at 307, based on the prevalence of myocardial ischemia at 6.7%, with a margin of error of 2.8% and a 95% confidence level.

Variables: The primary variables included baseline risk factors such as diabetes mellitus, hypertension, smoking status, and family history of premature coronary artery disease. Factors assessed for their association with re-hospitalization included non-compliance with treatment, non-adherence to diet and fluid restriction, non-optimal medication regimen, chest infections, cardiac rhythm issues, myocardial ischemia, drug abuse, COPD exacerbation, use of antibiotics, pro-arrhythmic medications, and lack of regular follow-up.

Data Sources / Measurement: Data were collected through patient interviews and physical examinations conducted by the researcher. A pre-designed questionnaire was used to record information on presenting concerns (e.g., shortness of breath, orthopnea, pulmonary edema, paroxysmal nocturnal dyspnea), baseline risk factors, and reasons for re-hospitalization. Verbal informed consent was obtained from each patient before participation.

Bias: To minimize bias, all data collection was performed by the researcher using a standardized questionnaire. Patients identities were anonymized to ensure confidentiality, and ethical approval was obtained from the institutional review committee (Ref# ERC-11/2021).

Study Size: The sample size was calculated to be 307 participants, based on a myocardial ischemia prevalence of 6.7%, with a 2.8% margin of error and a 95% confidence level.

Quantitative Variables: Quantitative variables included age, duration of heart failure, and numeric values related to treatment adherence and fluid consumption. These variables were summarized using means and standard deviations or medians and interquartile ranges as appropriate.

Statistical Methods: Data were analyzed using SPSS version 23. Descriptive statistics included means and standard deviations for continuous variables, and frequencies and percentages for categorical variables. Associations between factors and re-hospitalization within 90 days were assessed using Chi-square tests or Fisher's exact tests. A p-value of ≤0.05 was considered statistically significant.

RESULTS

Participants: The study included a total of 307 patients who were re-hospitalized for heart failure (HF) at the emergency department of NICVD, Karachi, from February to August 2021. The mean age of these patients was 59.20±13.27 years, with an age range from 18 to 85 years. Out of these, 54.1% were aged ≤60 years, while 45.9% were aged >60 years. The majority of the participants were male (66.8%), and 33.2% were female.

Descriptive Data: The baseline characteristics of the patients are presented in Table 1. Hypertension was the most common comorbidity (68.4%), followed by diabetes mellitus (44%). A small proportion of patients had a positive family history of coronary artery disease (CAD) (5.2%), and 30.6% were smokers. Presenting symptoms included shortness of breath (70%), orthopnea (32.9%), and frank pulmonary edema (43.6%). Only 7.5% reported paroxysmal nocturnal dyspnea. Regarding the type of heart failure, 90.6% had heart failure with reduced ejection fraction (HFrEF), and 9.4% had heart failure with preserved ejection fraction (HFpEF). The median duration of heart failure was 9 months (IQR 3.5-18 months).

Outcome Data: The most common reasons for re-hospitalization included non-compliance with treatment (42.7%) and lack of regular follow-up (39.4%). Within non-compliance of treatment, 42.9% of patients did not take prescribed ACE inhibitors (ACEI) for more than 2 days in the last week, and 34.4% did not take prescribed diuretics for more than 2 days in the last week. Non-adherence to fluid intake was observed in 28.3% of patients, while 29% presented with myocardial ischemia at re-admission. Notably, no patients reported the use of antibiotics, drug abuse, or use of pro-arrhythmic medications (Table 2).

Table 1: Baseline characteristics of study variables

Characteristics	Summary
Total (N)	**307**
Mean age (years)	59.20±13.27
≤ 60 years	166 (54.1%)
> 60 years	141 (45.9%)
Gender	
Male	205 (66.8%)
Female	102 (33.2%)
Co-morbid condition	
Hypertension	210 (68.4%)
Diabetes mellitus	135 (44%)
Obesity	17 (5.5%)
CKD	49 (16%)
COPD	42 (13.7%)
Family history of CAD	16 (5.2%)
Smoking	94 (30.6%)
Presenting complains	
Shortness of breath	215 (70%)
Orthopnea	101 (32.9%)
Frank pulmonary edema	134 (43.6%)
Paroxysmal nocturnal dyspnea	23 (7.5%)
Type of HF	
HFpEF	29 (9.4%)
HFrEF	278 (90.6%)
Median duration since HF (months)	9 (3.5-18)

HF=heart failure, HFrEF=heart failure with reduced ejection fraction, HFpEF=heart failure with preserved ejection fraction, CAD=coronary artery disease, COPD=chronic obstructive pulmonary disease

Main Results: Factors associated with re-hospitalization within 90 days were analyzed (Table 3). Non-adherence to fluid restriction was significantly associated with re-hospitalization, with 19.5% of re-hospitalized patients showing non-adherence compared to 31.3% who adhered (p=0.046). Additionally, 28.6% of patients with re-hospitalization within 90 days lacked regular follow-up compared to 43% who had regular follow-up (p=0.024).

DISCUSSION

Heart failure (HF) is a critical health issue and the leading cause of hospitalization among the elderly, significantly contributing to morbidity and mortality

[17]. The majority of re-admissions occur early in the post-discharge period, primarily due to deteriorating HF. Predictors for re-admission vary across different reasons and time intervals [18].

Table 2: Reasons of Re-Hospitalization of Patients with HF

Reasons of re-hospitalization	Summary
Total (N)	**307**
Non-compliance of treatment	131 (42.7%)
ACEI	96 (42.9%)
Beta blockers	51 (22.8%)
Diuretics	77 (34.4%)
Non-optimal medication regimen	81 (26.4%)
ACEI	84 (23.9%)
Beta blockers	39 (11.1%)
Diuretics	56 (15.9%)
Digoxin	173 (49.1%)
Non-adherence to fluid intake	87 (28.3%)
Lack of regular follow-up	121 (39.4%)
Non-adherence to diet	28 (9.1%)
Other reasons	
Chest infection	67 (21.8%)
Myocardial ischemia	89 (29%)
Exacerbation of COPD	21 (6.8%)
Cardiac rhythm	47 (15.3%)

ACEI=angiotensin-converting enzyme inhibitors

Consistent with existing literature, our findings underscored several key factors associated with HF re-hospitalization. Non-compliance with medication regimens emerged as a primary driver, with a notable proportion of patients failing to adhere to prescribed treatments. Lack of regular follow-up also featured prominently, suggesting gaps in post-discharge care continuity. Additionally, non-adherence to fluid restriction and the presence of myocardial ischemia were identified as significant contributors to re-hospitalization, highlighting the multifactorial nature of HF exacerbations. Another study by Farooqui et al. found that 43% of HF patients were non-adherent to treatment [19]. Wideqvist et al. also identified non-compliance with therapy as an independent predictor of re-admission after HF [20]. Al-Tamimi MA et al. reported that 42% of re-hospitalized HF patients were non-compliant with their medications, with 72% facing financial problems [21]. Similarly, Tun et al. observed that lack of counseling (40%) and non-compliance with medication (15%) were frequent factors for readmission [22,23].

Treatment compliance is crucial, as certain medications significantly reduce both morbidity and mortality. Targeting individuals at high risk for HF readmission with disease management programs can enhance medication adherence, thereby lowering morbidity and mortality [24,25]. A systematic review by Ruppar et al. [26] revealed that effective interventions could improve treatment compliance among HF patients, reducing the risk of re-hospitalization (OR=0.79, 95% CI=0.71 to 0.89) and mortality (RR=0.89, 95% CI=0.81 to 0.99).

Table 3: Factors associated with re-hospitalization of patients with HF

	90 days re-hospitalization		P-value
	Yes	No	
Non-compliance of treatment			
Yes	28 (36.4%)	103 (44.8%)	0.196
No	49 (63.6%)	127 (55.2%)	
Non-adherence to fluid restriction			
Yes	15 (19.5%)	72 (31.3%)	0.046
No	62 (80.5%)	158 (68.7%)	
Non-optimal medication regimen			
Yes	57 (74%)	169 (73.5%)	0.925
No	20 (26%)	61 (26.5%)	
Lack of regular follow-up			
Yes	22 (28.6%)	99 (43%)	0.024
No	55 (71.4%)	131 (57%)	
Non-adherence to diet			
Yes	4 (5.2%)	24 (10.4%)	0.167
No	73 (94.8%)	206 (89.6%)	
Chest infection			
Yes	16 (20.8%)	51 (22.2%)	0.798
No	61 (79.2%)	179 (77.8%)	
Myocardial ischemia			
Yes	27 (35.1%)	62 (27%)	0.175
No	50 (64.9%)	168 (73%)	
Exacerbation of COPD			
Yes	7 (9.1%)	14 (6.1%)	0.366
No	70 (90.9%)	216 (93.9%)	
Cardiac rhythm			
Yes	9 (11.7%)	38 (16.5%)	0.308
No	68 (88.3%)	192 (83.5%)	

The association between non-compliance with treatment and re-hospitalization was not statistically significant (p=0.196). Other factors such as non-optimal medication regimen, non-adherence to diet, chest infection, myocardial ischemia, exacerbation of COPD, and cardiac rhythm issues also did not show significant associations with re-hospitalization within 90 days (all p-values > 0.05)

Our study did not find any statistical significance between 90-day re-admission after HF and non-compliance with treatment (p=0.196), non-optimal medication regimen (p=0.925), non-adherence to diet (p=0.167), chest infection (p=0.789), myocardial ischemia (p=0.175), exacerbation of COPD (p=0.366), and cardiac rhythm (p=0.308). However, there was a statistically significant association between 90-day re-admission and non-adherence to fluid restriction (p=0.046) and lack of regular follow-up (p=0.024).

Sadiq et al. found that the odds of early readmission after HF were 3.8 times higher among those with poor compliance to medication [27]. Similarly, another study reported that poor compliance to medication

resulted in 1.7 times greater odds of early re-admission [28]. Al-Tamimi et al. demonstrated that non-compliance with medication increased the risk of re-admission within 90 days by 3.6 times (OR = 3.6, 95% CI: 1.57-8.28, p=0.02). They also discovered that the New York Heart Association (NYHA) class of HF (OR=2.22, 95% CI: 1.12-4.43, p=0.023) was associated with re-admission within 90 days. However, factors such as hypertension, CAD, gender, age, and systolic BP on arrival showed no significant association with 90-day readmission.

Studies suggest that post-discharge care for HF patients, including treatment compliance and managing comorbidities, is critical in preventing re-admissions. Patient counseling at discharge plays a vital role in improving post-discharge outcomes and reducing re-hospitalization rates.

Limitation

This study has a few limitations. Firstly, it was conducted in a single cardiac center with a limited sample size, which may affect the generalizability of the results. Additionally, the study's cross-sectional design limits the ability to infer causality between the identified factors and re-hospitalization. Future research should include larger, multicenter investigations to validate and extend these findings.

CONCLUSION

The common factors associated with re-admission after HF include non-compliance with medication, lack of regular follow-up, non-adherence to fluid restriction, and myocardial ischemia. A higher rate of re-admission within 90 days was associated with a lack of regular follow-up and non-adherence to fluid restriction. Therefore, proper counseling on treatment adherence and lifestyle changes is essential to reduce re-admission rates. Our study highlights the need for larger, multicenter investigations to improve the generalizability of these findings.

RECOMMENDATIONS

Based on our findings, we recommend implementing comprehensive patient counseling programs focused on medication adherence, regular follow-up, and lifestyle modifications, particularly fluid restriction. Health care providers should prioritize these areas to reduce re-hospitalization rates among HF patients. Additionally, targeted interventions for high-risk individuals and robust outpatient management programs can further enhance patient outcomes and reduce the burden of HF-related re-admissions.

AUTHORS' CONTRIBUTION

DLB, BB, PBL, MK, and SMC: Concept and design, data acquisition, interpretation, drafting, final approval, and agree to be accountable for all aspects of the work. DLB, BB, PBL, MK, and SMC: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

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