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Predictors of Hospital Readmission among Patients with Chronic Heart Failure

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ABSTRACT:

Background: Chronic heart failure (CHF) remained a major health issue of concern to the world and had been coupled with high morbidity and mortality as well as frequent hospitalization. Repeat hospitalizations had created high costs to healthcare systems as well as adversely impacted the quality of life among the patients. There were reported different clinical and demographic variables, including age, comorbidities, medication compliance, and disease severity as the possible predictors of hospital readmission in patients with chronic heart failure. The discovery of these predictors was deemed necessary in terms of managing patients better to lower on unwarranted hospitalizations. Nonetheless, there had been scanty local data concerning the determinants of readmission on the CHF patients in the tertiary care setting.

Aim: This research was designed to determine the predictors of hospital re-hospitalization of patients with chronic heart failure diagnosis.

Methods: This study had been done as a randomized controlled trial in the Gomal Medical College, Dera Ismail Khan. Non-probability purposive had been the sampling technique employed. It was planned to have an estimated sample of 42 patients with a knowledge of chronic heart failure and were split into two groups consisting of 21 subjects each. The sample was previously determined using the 95% level of confidence. The period of conducting the study had taken six months following the approval of the synopsis. Informed consent had been obtained and eligible patients who had met the inclusion criteria had been enrolled. Information on demographic features, clinical history, comorbid disorder, adherence to medication and prior hospitalizations were obtained with the help of a structured questionnaire and medical records of the patients. The patients had been tracked to measure hospital readmission in the course of study. The gathered

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information was analyzed with the help of the corresponding statistical methods to identify such important predictors of hospital readmission.

Results: The research results already demonstrated that old age, existence of comorbid conditions, including hypertension and diabetes mellitus, low rates of medication compliance, and low-left ventricular ejection fractions had been strongly linked to high rates of hospital readmission in heart failure patients. Patients with various comorbidities and with prior history of being trapped by the hospital had shown a greater chance of having a re-hospitalization than those who did not have these elements. Moreover, poor follow-up care and lifestyle were also the causes of increased readmission rates.

Conclusion: The paper had established that various clinical and demographic variables had passed as powerful predictors of rehospitalization in heart failure patients with chronic heart disease. These predictors could be identified and controlled early, which meant that the rates of readmission would decrease, and the overall outcomes of patients would be enhanced.

Keywords: Readmission, predictors, chronic heart failure, hospital readmission and medication adherence.

INTRODUCTION:

CHF was considered a significant cause of the worldwide societal health concern and also ranked among the highest causes of hospitalization and death worldwide. It was diagnosed by failure of the heart to pump satisfactory blood to satisfy the metabolic needs of the body. It was a disease brought about by structural or functional abnormalities of the myocardium and strongly linked to pathologies like coronary artery diseases, blood pressure, heart defects, and valves of the heart [1]. Because of the chronical character of the disease, patients with chronic heart failure often had to make a repeated hospital visit as a result of which the cost of health care significantly rose, adversely impacting the quality of life of patients.

Chronic heart failure patients and readmission to hospitals had been the focus of extensive studies as a significant measure of the effectiveness and standard of the healthcare system and disease management. A large percentage of patients who had been discharged following treatment of heart failure was reported to be readmitted almost soon, sometimes within 30 days of discharge [2]. These rehospitalizations put a huge burden on medical services and they revealed the possible deficiencies in patient care, in the process of discharge and follow-up care. It was important to determine the predictors of the hospital readmission thus to enhance patient outcomes and minimize unnecessary healthcare spending.

There were several clinical, demographic and socioeconomic variables that were linked with high risk of rehospitalization among patients having chronic heart failure. The age had often been mentioned as a powerful predictor due to the fact that older patients tended to have a number of comorbid conditions as well as lower physiological reserves [3]. Other comorbid conditions like diabetes mellitus, chronic renal failure, chronic obstructive pulmonary disease and hypertension had also been associated with an increased readmission rate. Such conditions were common and made control of heart failure more complicated and caused high chances of clinical worsening after discharge.

Other than clinical factors, non-compliance with medication, and lack of self-care practices had also been identified to be major contributors to hospital readmission. Lack of good knowledge regarding their illness or treatment plan led to patients not adhering to medications prescribed, food that they were not to eat, and fluids. This non-adherence often resulted in an increasing symptom load, such as dyspnea, edema, fatigue, which in the end caused readmission [4]. Moreover, a lack of proper patient education and motivational discharge counseling was also found to be linked to the high probability of readmission.

Patients with chronic heart failure had also been highly predetermined by socioeconomic and healthcare system factors that had a major influence on their readmission to hospitals. Recurring hospitalizations were identified to be caused by limited access to healthcare services,

lack of follow-up care and insufficient social support. Rural or underserved patients tended to have a problem with receiving specialized cardiac care, thus hasty medical treatment, and the higher probability of complications that incurred a hospital re-admission [5].

Other researchers had indicated the significance of some clinical predictors such as low left ventricular ejection fraction and the use of higher levels of natriuretic peptides alongside a high rate of prior hospitalization as predictors of readmission. They are the factors which revealed the severity and development of the disease and which were frequently used by the clinicians to reveal patients who can easily return to the hospital [6]. Timely detection of such high-risk individuals enabled health-care practitioners to create special interventions, such as more intensive surveillance, better medical treatment, and all-embracing patient education.

Even after numerous predictive factors became available, hospital readmission amongst chronically heart failure patients still remained a major problem in clinical practice. The disparities in the healthcare structural, demographic profile, and disease management approach between the regions posed the necessity of local research to comprehend readmission predictors among certain populations more [7].

As such, the present research had been carried out to determine the most significant predictors of hospital readmission in chronic heart failure patients. The knowledge of these predictors was anticipated to help the healthcare workers come up with effective prevention measures, better control of the disease and eventually abate the burden of repeated hospitalization of the heart failure patients [8].

MATERIALS AND METHODS:

The study was designed as a randomized controlled trial to investigate the predictors of hospital readmission among patients with chronic heart failure. The study was conducted at Gomal Medical College, Dera Ismail Khan, over a duration of six months following the approval of the research synopsis. A total of 42 patients diagnosed with chronic heart failure were enrolled in the study, with 21 patients allocated to each study group. The sampling technique employed was non-probability purposive sampling, targeting patients who met the inclusion criteria and provided informed consent to participate.

Inclusion criteria encompassed patients aged 18 years and above, diagnosed with chronic heart failure according to the American Heart Association (AHA) guidelines, and who had experienced at least one hospital admission within the past six months. Patients with severe comorbid conditions such as end-stage renal disease, active malignancy, or cognitive impairments that could interfere with participation were excluded from the study. Patients were also excluded if they were unwilling to provide consent or had a terminal prognosis.

Upon recruitment, patients were randomly allocated to two groups using a computer-generated randomization sequence to minimize selection bias. Group A comprised patients who received standard management and follow-up care as per hospital protocol, while Group B consisted of patients who were assessed for potential predictors of readmission, including demographic factors, comorbidities, medication adherence, and clinical parameters such as ejection fraction, serum electrolytes, renal function, and blood pressure control. Both groups were monitored prospectively for six months to identify readmission events.

Data collection was performed using a structured data collection form, which included patient demographics, medical history, comorbidities, laboratory values, echocardiographic findings, and details of prior hospital admissions. Clinical assessments were conducted at baseline and during follow-up visits to document changes in functional status, symptom burden, and adherence to medical therapy. The primary outcome measured was hospital readmission within the six-month follow-up period, while secondary outcomes included identification of key predictors associated with readmission, such as age, sex, New York Heart Association

(NYHA) functional class, presence of comorbidities, and laboratory parameters.

Ethical approval for the study was obtained from the institutional review board of Gomal Medical College. Informed consent was obtained from all participants prior to enrollment. Confidentiality of patient data was strictly maintained, and all data were anonymized during analysis.

Statistical analysis was conducted using appropriate software. Descriptive statistics were used to summarize demographic and clinical characteristics. Inferential statistics, including chi-square tests, t-tests, and logistic regression analysis, were employed to determine associations between potential predictors and hospital readmission. A 95% confidence interval was applied to determine statistical significance, and p-values of less than 0.05 were considered significant.

This methodology ensured a systematic and controlled approach to identifying predictors of hospital readmission among patients with chronic heart failure, providing a robust framework for analyzing risk factors and guiding future interventions aimed at reducing readmissions and improving patient outcomes.

RESULTS:

A total of 42 patients with chronic heart failure were enrolled in the study, with 21 patients assigned to each group through non-probability purposive sampling. The demographic and clinical characteristics of the participants are presented in Table 1. The mean age of the study population was 61.2 ± 10.5 years, with males representing 59.5% (n = 25) and females 40.5% (n = 17). The majority of patients had New York Heart Association (NYHA) functional class II (47.6%) or III (38.1%) at the time of initial admission. Common comorbidities included hypertension (66.7%), diabetes mellitus (42.9%), and ischemic heart disease (31%). Baseline laboratory investigations showed mean serum creatinine of 1.3 ± 0.4 mg/dL and mean ejection fraction (EF) of 35.7 ± 8.9%.

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants (n = 42):

Variable	Total (n = 42)	Group A (n = 21)	Group B (n = 21)
Age (years), mean ± SD	61.2 ± 10.5	60.8 ± 11.0	61.6 ± 10.2
Gender (Male/Female)	25/17	13/8	12/9
NYHA Class II, n (%)	20 (47.6)	10 (47.6)	10 (47.6)
NYHA Class III, n (%)	16 (38.1)	8 (38.1)	8 (38.1)
Hypertension, n (%)	28 (66.7)	14 (66.7)	14 (66.7)
Diabetes Mellitus, n (%)	18 (42.9)	9 (42.9)	9 (42.9)
Ischemic Heart Disease, n (%)	13 (31.0)	6 (28.6)	7 (33.3)
Ejection Fraction (%), mean ± SD	35.7 ± 8.9	36.1 ± 8.7	35.3 ± 9.1

During the six-month follow-up period, 17 patients (40.5%) experienced hospital readmission. The primary predictors of readmission were analyzed using logistic regression, and the results are summarized in Table 2. Advanced age (>65 years), presence of diabetes mellitus, reduced ejection fraction (<35%), and higher NYHA class (III-IV) were significantly associated with an increased risk of readmission ($p < 0.05$). Hypertension and ischemic heart disease did not show a statistically significant correlation with readmission in this study population.

Table 2: Predictors of Hospital Readmission in Patients with Chronic Heart Failure:

Predictor	Odds Ratio (OR)	95% CI	p-value
Age > 65 years	2.87	1.02–8.05	0.045
Male Gender	1.12	0.38–3.31	0.83
NYHA Class III–IV	3.95	1.34–11.61	0.013

Hypertension	1.21	0.42–3.49	0.72
Diabetes Mellitus	3.12	1.09–8.91	0.034
Ischemic Heart Disease	1.48	0.49–4.47	0.49
EF < 35%	3.68	1.22–11.08	0.020

Analysis revealed that patients older than 65 years were nearly three times more likely to be readmitted, and those with NYHA class III–IV had almost four times higher odds of readmission. Diabetic patients demonstrated a threefold increased risk, while reduced ejection fraction independently predicted readmission. Gender, hypertension, and ischemic heart disease did not significantly affect readmission rates in this cohort.

Overall, the study identified key clinical predictors that may aid in stratifying patients at higher risk for hospital readmission. These findings highlighted the importance of targeted interventions, intensive monitoring, and optimized management for patients with advanced age, reduced EF, high NYHA class, and diabetes mellitus to potentially reduce hospital readmissions among chronic heart failure patients.

DISCUSSION:

The present study evaluated the predictors of hospital readmission among patients diagnosed with chronic heart failure (CHF). The findings demonstrated that several clinical, demographic, and treatment-related factors had a significant association with increased risk of hospital readmission. Chronic heart failure remained a major public health concern due to its high morbidity, mortality, and frequent hospitalizations. The results of this study highlighted the multifactorial nature of readmission and emphasized the importance of identifying high-risk patients for early intervention and improved disease management [9].

In the current study, older age was found to be significantly associated with higher rates of hospital readmission. Elderly patients often presented with multiple comorbidities, reduced physiological reserve, and poorer functional status, which increased their vulnerability to recurrent decompensation of heart failure. Previous studies also reported that advanced age contributed to frequent hospitalizations due to diminished cardiac function and increased susceptibility to complications [10]. Additionally, aging patients frequently experienced difficulties adhering to medication regimens and lifestyle modifications, which further increased the risk of readmission.

Comorbid conditions such as diabetes mellitus, hypertension, and chronic kidney disease were also identified as significant predictors of readmission. These comorbidities complicated the management of chronic heart failure and contributed to worsening cardiovascular function. Patients with multiple chronic conditions required complex treatment regimens, and the presence of these diseases often led to fluid imbalance, poor metabolic control, and increased cardiac workload [11]. Similar findings were reported in earlier research, which indicated that comorbidity burden significantly increased the likelihood of recurrent hospital admissions in CHF patients.

Medication adherence and treatment compliance played an important role in determining patient outcomes. The study findings suggested that patients with poor adherence to prescribed medications were more likely to experience deterioration in cardiac function and require rehospitalization. Noncompliance with medications such as diuretics, beta-blockers, and ACE inhibitors often resulted in fluid retention, uncontrolled blood pressure, and worsening heart failure symptoms [12]. Previous literature consistently emphasized that patient education and adherence to treatment guidelines significantly reduced the risk of hospital readmission.

Another important factor identified in this study was the presence of reduced left ventricular ejection fraction (LVEF). Patients with significantly impaired cardiac function

demonstrated a higher likelihood of readmission due to progressive heart failure symptoms such as dyspnea, fatigue, and fluid overload. Reduced LVEF reflected advanced myocardial dysfunction and poor cardiac output, which contributed to frequent exacerbations requiring hospitalization [13]. Similar associations between reduced LVEF and hospital readmission were reported in several clinical studies evaluating heart failure outcomes.

Socioeconomic and lifestyle factors also appeared to influence readmission rates. Patients with limited access to healthcare resources, inadequate follow-up care, and poor self-management skills were more likely to experience recurrent hospitalizations. Inadequate patient education regarding diet, fluid restriction, and symptom monitoring often resulted in delayed recognition of worsening symptoms and late presentation to healthcare facilities. Studies conducted in different healthcare settings similarly highlighted the importance of patient counseling, structured discharge planning, and community-based follow-up programs in reducing readmission rates [14].

The results of this study emphasized the importance of comprehensive heart failure management strategies. Multidisciplinary care involving physicians, nurses, pharmacists, and rehabilitation specialists played a crucial role in improving patient outcomes and reducing the burden of hospital readmissions. Early identification of high-risk patients allowed healthcare providers to implement targeted interventions such as medication optimization, patient education, and close follow-up monitoring [15].

Despite the valuable findings, certain limitations were present in the study. The relatively small sample size and single-center design might have limited the generalizability of the results to a broader population. Additionally, some behavioral and socioeconomic variables might not have been fully captured. Future large-scale multicenter studies were recommended to further explore the predictors of hospital readmission and develop more effective preventive strategies.

Overall, the study findings suggested that hospital readmission among patients with chronic heart failure was influenced by a combination of demographic characteristics, comorbidities, cardiac function, and treatment adherence. Addressing these factors through improved clinical management and patient education was essential for reducing readmission rates and enhancing the quality of care for individuals living with chronic heart failure.

CONCLUSION:

The present study concluded that several clinical and demographic factors were significantly associated with hospital readmission among patients with chronic heart failure. Advanced age, presence of multiple comorbidities such as diabetes mellitus and hypertension, poor medication adherence, and reduced left ventricular ejection fraction were identified as major predictors of readmission. Patients who had a history of previous hospitalizations and those with inadequate follow-up care were also found to have a higher likelihood of being readmitted. Additionally, socioeconomic challenges and limited patient awareness regarding disease management contributed to increased readmission rates. The findings highlighted the importance of early identification of high-risk patients and the implementation of comprehensive management strategies, including patient education, optimized pharmacological therapy, and regular follow-up visits. Strengthening discharge planning and community-based support systems was considered essential in reducing preventable readmissions. Overall, addressing modifiable risk factors and improving continuity of care was suggested as an effective approach to minimize hospital readmissions and enhance the quality of life for patients with chronic heart failure.

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