

Analysis of Factors Contributing to Readmission in Congestive Heart Failure Patients at Kota Kendari Hospital

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ABSTRAK

Pasien gagal jantung menunjukkan risiko readmisi yang signifikan. Penelitian ini bertujuan untuk mengkaji pengaruh usia, komorbiditas, dan kepatuhan pengobatan sebagai determinan readmisi pada pasien gagal jantung kongestif di RSUD Kota Kendari. Penelitian ini menggunakan metodologi analitik observasional dengan desain kasus-kontrol. Sampel kasus terdiri dari pasien gagal jantung kongestif yang mengalami readmisi, sedangkan kelompok kontrol terdiri dari pasien yang tidak mengalami readmisi. Sampel penelitian terdiri dari 43 sampel kasus dan 43 sampel kontrol. Data dievaluasi menggunakan uji chi-square, yang dianggap signifikan jika nilai p kurang dari 0,05, di samping uji odds ratio untuk menilai nilai faktor risiko. Hasil analisis bivariat menunjukkan bahwa karakteristik yang berhubungan dengan risiko readmisi pada pasien gagal jantung kongestif meliputi usia ($p = 0,009$, OR = 3,168), komorbiditas ($p = 0,004$, OR = 3,675), dan kepatuhan pengobatan ($p = 0,000$, OR = 7,719). Terdapat korelasi antara readmisi gagal jantung kongestif dengan usia, komorbiditas, dan kepatuhan pengobatan.

Kata Kunci: Readmisi, Usia, Komorbiditas, Kepatuhan Pengobatan, Gagal Jantung Kongestif.

ABSTRACT

Patients with heart failure exhibit a significant risk of readmission. This study seeks to examine the influences of age, comorbidities, and medication adherence as determinants of readmission in patients with congestive heart failure at Kota Kendari Hospital. This research employed an observational analytic methodology with a case-control design. The case sample comprises congestive heart failure patients who experience readmission, whereas the control group consists of those who do not. The study sample comprised 43 case samples and 43 control samples. The data were evaluated utilizing the chi-square test, deemed significant if the p-value was less than 0.05, alongside the odds ratio test to assess the value of risk factors. Bivariate analysis results revealed that the characteristics associated with readmission risk in congestive heart failure patients included age ($p = 0.009$, OR = 3.168), comorbidities ($p = 0.004$, OR = 3.675), and medication adherence ($p = 0.000$, OR = 7.719). There is a correlation between congestive heart failure readmissions and age, comorbidities, and medication adherence.

Keywords: Readmission, Age, Comorbidities, Medication Adherence, Congestive Heart Failure.

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INTRODUCTION

In 2022, cardiovascular diseases (CVDs) were predicted to have killed 19.8 million people, or almost 32% of all deaths worldwide. Eighty-five percent of these deaths were caused by heart attacks and strokes. More than 75% of deaths from CVD occur in low- and middle-income nations. At least 38% of the 18 million premature deaths (those under 70) attributed to noncommunicable diseases in 2021 were brought on by CVDs. (World Health Organization, 2025) HF is characterized by a high rate of occurrence and death, as well as a reduction in quality of life, functional ability, and significant medical costs. In many

nations, heart failure is one of the leading causes of mortality. For those over 65, it is also the leading cause of hospitalization. (Zhang et al., 2024) The incidence of congestive heart failure reaches 64.34 million cases and 8.52 per 1000 people diagnosed with heart failure worldwide. Heart failure has a high morbidity and mortality rate and contributes to increased health care financing worldwide. Heart failure became the second leading cause of death in Indonesia in 2019 after stroke (Lippi & Sanchis-Gomar, 2020)

Recurrent stays of less than or equal to 30 days at the same advanced referral health facility with the same primary diagnosis from the previous inpatient episode are referred to as readmissions. Grewall et al. state that alcohol abuse, morbid obesity, depression, congestive heart failure, and chronic pulmonary disease are risk factors for readmission. (Grewall et al., 2022) Heart failure is the chronic condition with the longest readmission duration in Indonesia, with a rate of 29%. (Siallagan et al., 2018) Readmission with congestive heart failure related to comorbidities, such as hypertension and diabetes mellitus. (Akkineni et al., 2020; Sadeq et al., 2020) Readmissions lead to increased health care costs and have a negative impact on patients' health and well-being. (Mohanty et al., 2022) Comorbidities, sociodemographic characteristics such as male gender, age, Black ethnicity, and Medicare coverage, along with extended length of stay, are correlated with a heightened risk of readmission in patients with congestive heart failure (CHF). (Mirkin et al., 2017) The other factors can contribute to the readmissions of heart failure patients from hospitals, including flaws in care delivery, non-adherence to treatment, and cases with trivial expected benefits; thus, providers face the challenge of improving the management and administration of health services. (Liu et al., 2024) In this study, we focused to analyze the influences of age, comorbidities, and medication adherence as risk factor of readmission in patients with congestive heart failure at Kota Kendari Hospital.

Literature Review

According to the American Heart Association (AHA) and the American College of Cardiology (ACC), heart failure (HF) is a complex clinical disease that arises from any anatomical or functional defect of ventricular filling or blood ejection. Heart failure is a prevalent condition that has a high rate of morbidity and death worldwide. CHF, which is thought to affect 26 million people globally, lowers functional ability, raises healthcare expenses, and has a major negative impact on quality of life. To improve patient outcomes, reduce morbidity and mortality, and avoid repeated hospitalizations, the condition must be accurately diagnosed and treated. (Shams et al., 2025).

Congestive heart failure patients who experience relapse can result in rehospitalization. Patients who are readmitted when experiencing a relapse are usually due to non-compliance with medication therapy, excessive physical activity, non-compliance with medical care, inability to recognize clinical signs and symptoms of congestive heart failure, and violating dietary restrictions. (Mohanty et al., 2022) The ACC Foundation and AHA characterize heart failure (HF) as “a multifaceted clinical syndrome arising

from any structural or functional impairment of ventricular filling or blood ejection.” Their joint recommendations describe heart failure with reduced ejection fraction (HFrEF) as an ejection fraction of $\leq 40\%$, whereas heart failure with maintained ejection fraction (HFpEF) is defined as an ejection fraction of $\geq 50\%$. Patients with an ejection fraction within this range are classified as having borderline HFpEF. (Ziaieian & Fonarow, 2016)

Prevalent risk factors for the onset of heart failure include coronary artery disease, a prior myocardial infarction, hypertension, atrial fibrillation, valvular heart disease, diabetes, chronic obstructive pulmonary disease, chronic kidney disease, obesity, a history of excessive alcohol consumption, exposure to cardiotoxic medications (e.g., trastuzumab), and a familial predisposition to cardiomyopathy. (Docherty et al., 2023) Lung illness is the leading cause of readmission in the United States, followed by myelodysplastic syndrome (MDS), hyperthyroidism, sepsis, cirrhosis, morbid obesity, and sickle cell disease. (Uddin et al., 2023). Those are the independent risk factors related to readmission in USA, especially after cardiac surgery. (Sabe et al., 2023)

Consequently, a diagnosis of heart failure should be considered in patients with a history of these conditions (or a familial history of cardiomyopathy) who exhibit one or more of the aforementioned symptoms. Numerous patients exhibiting one or more of these factors will frequently engage with their primary care team, and we strongly recommend that undiagnosed heart failure be contemplated and examined in patients presenting new symptoms of dyspnea, fatigue, exercise intolerance, and peripheral edema. (Docherty et al., 2023)

Tests utilized in the assessment of patients with heart failure (HF) encompass electrocardiogram (ECG), chest X-ray, Blood analysis: Cardiac troponin (T or I), complete blood count, serum electrolytes, blood urea nitrogen, creatinine, liver function tests, brain natriuretic peptide (BNP), and transthoracic echocardiography to assess ventricular function and hemodynamics.

Diuretics, beta-blockers, angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, angiotensin receptor neprilysin inhibitors, hydralazine in conjunction with nitrate, digoxin, and aldosterone antagonists may alleviate symptoms and are advised for heart failure patients based on their functional classification and symptom severity. Combination therapy employing these drugs improves outcomes and reduces hospitalizations in patients with heart failure. (Shams et al., 2025)

RESEARCH METHODOLOGY

This study is an observational analytic study using a case-control approach, and the data collected are retrospective secondary data derived from medical records. The population in this study were congestive heart failure patients who had undergone hospitalization at Kendari City Hospital in 2023, totaling 121 people. Matching in the study was carried out based on gender, with the ratio between cases and controls being 1:1, where the number of case samples was equal to the number of control samples.

The sample in this study amounted to 86 people, consisting of 43 case samples and 43 control samples. The case sample is a group of congestive heart failure patients who are readmitted, while the control sample is a group of patients who are not readmitted. Sampling was done using the purposive sampling technique. Data were analyzed using univariate and bivariate analysis. The statistical test used in this study was the chi-square test, and it continued with the odds ratio test to determine the value of risk factors.

RESULT AND DISCUSSION

Age of Patient

Table 1. Correlation of patient's age to readmission of CHF Patient

Age (years)	Case	Readmission of CHF Patient			P value	OR
			Control			
	N	%	n	%	0.009	3.168
>60	29	67,4	17	39,5		
19-59	14	32,6	26	60,5		
Total	43	100	43	100		

This table examines the age differences between congestive heart failure (CHF) patients who were readmitted (case group) and those who were not (control group). For a total of 86 patients (43 cases and 43 controls), 29 (67.4%) of the case patients were older than 60, whereas only 17 (39.5%) of the control group were in this age range. In contrast, the control group had more patients (26 individuals, 60.5%) than the case group (14 individuals, 32.6%) in the 19–59 age range. According to the results of the statistical test, $p = 0.009$ indicates that the incidence of readmission in patients with congestive heart failure is significantly correlated with age. According to the odds ratio (OR) value of 3.168, individuals over 60 are around 3.2 times more likely to require readmission than patients between the ages of 19 and 59.

Cardiovascular aging is a multifaceted process involving adaptive structural and functional alterations throughout time. As individuals age, the arterial system undergoes thickening and reduced compliance, leading to elevated pulse wave velocity, systolic blood pressure, and left ventricular afterload. In reaction to these vascular alterations, the myocardium undergoes remodeling to preserve systolic function and facilitate diastolic filling. These adaptive processes are not inherently pathological but heighten the vulnerability to myocardial ischemia and cardiac failure in the context of prevalent age-related comorbidities. (Singam et al., 2020)

Comorbidities Factor

Table 2. Correlation of Comorbidities factor with Readmission of CHF Patient

Comorbidities	Case	Readmission of CHF Patient			P value	OR
			Control			
	n	%	N	%		
With comorbidities	32	74.4	19	44.2		

Without comorbidities	11	25.6	24	55.8	0.004	3.675
Total	43	100	43	100		

This study analyzes the correlation between comorbidities and readmission rates in patients with congestive heart failure (CHF). Among 86 patients (43 cases and 43 controls), the case group (readmission) had a predominance of comorbidities, with 32 individuals (74.4%) affected, while 11 individuals (25.6%) were free of comorbidities. In the control group, a lesser number of patients had comorbidities, amounting to 19 individuals (44.2%), whereas the majority, including 24 individuals (55.8%), did not have comorbidities. The research reveals a p-value of 0.004, indicating a significant correlation between the prevalence of comorbidities and the incidence of readmission in CHF patients. The Odds Ratio (OR) of 3.675 signifies that individuals with comorbidities are around 3.7 times more likely to be readmitted than those without comorbidities.

Patients with comorbidities, like hypertension, diabetes mellitus, chronic renal disease, Hypothyroidism, atrial fibrillation, anemia or COPD, endure a compounded illness load that exacerbates the clinical state of heart failure. This combination renders patients more vulnerable to heart decompensation and recurrence. (Akkineni et al., 2020).

Medication Adherence Factors

Table 5. Correlation of Medication Adherence with Readmission of CHF Patient

		Readmission of CHF Patient			p value	OR
medication adherence	Case		Control			
	n	%	N	%	0.000	7.719
With Compliant	19	44.2	4	9.3		
Without compliant	24	55.8	39	90.7		
Total	43	100	43	100		

This study evaluates the correlation between medication adherence and readmission rates in individuals with congestive heart failure (CHF). Among the 43 patients who were readmitted, 19 (44.2%) adhered to their drug regimen, whereas 24 (55.8%) did not comply. In the control group (no readmission), just 4 individuals (9.3%) shown compliance, whereas the majority, 39 individuals (90.7%), demonstrated non-compliance. The statistical test results indicate a p-value of 0.000, signifying a highly significant correlation between medication adherence and readmission rates in CHF patients. The Odds Ratio (OR) of 7.719 signifies that non-adherent patients face a readmission risk nearly eightfold higher than that of adherent patients.

Medication adherence denotes the extent to which patient behavior aligns with health directives from healthcare providers, whereas nonadherence pertains to patients who fail to take their medication as prescribed or disregard the recommendations of healthcare providers regarding medication intake. The literature demonstrated many advantages associated with drug adherence.

Prior research indicates that adherence is crucial for sustaining patients' physiological capabilities, enhancing their quality of life (QOL), and decreasing hospitalizations. Moreover, medication adherence facilitates symptom management, prevents worsening, and enhances therapeutic results. (Jarrah et al., 2023)

With careful integration, analysis, and critique of current evidence, we propose three pillars for preventable readmission judgement criteria, namely, comprehensiveness, explicitness, and disease-specificity. Comprehensiveness represents the ability to capture various types of preventable readmissions, e.g., readmissions caused by flaws of care delivery, readmissions caused by non-adherence, readmissions with trivial expected benefit, etc. Explicitness means that the judgement criteria should be pre-specified, validated, and consistent to avoid ambiguity and bias. Disease-specificity requires the judgement criteria to be sensitive to disease-specific factors and able to differentiate using this detailed information. As shown in Fig. 2, current available judgement criteria only stand on two out of three pillars. Comprehensive, explicit, and disease-specific judgement criteria for preventable readmissions are urgently needed to meet the accountability and financial purposes, to advance heart failure management, and to improve health and economic outcomes of both patient families and healthcare systems. Though it's challenging to develop and implement a list of judgement criteria that are accurate, transparent, consistent, and agreed by various stakeholders, the three pillars could at least serve as a starting point and essential elements of conceptualizing a workable one. (Liu et al., 2024)

CONCLUSION

This study identifies three primary characteristics substantially correlated with readmission rates in patients with congestive heart failure (CHF): advanced age, comorbidities, and medication adherence. Patients aged over 60 years exhibit a readmission risk roughly 3.2 times greater than that of the 19–59 age demographic. This pertains to the cardiovascular aging process, which induces structural and functional alterations in the heart, thereby heightening susceptibility to decompensation. Secondly, the existence of comorbidities exacerbates the clinical status of CHF patients, with those possessing comorbid conditions being nearly four times more likely to have readmission than those without such conditions. Third, adherence to therapy was found to be very important, as non-adherent patients had approximately an 8-fold increased risk of readmission relative to adherent patients. Adherence enhances quality of life, preserves physiological function, and decreases readmission rates. This study substantiates the necessity for a holistic strategy to avert CHF readmissions by addressing advanced age risk factors, comorbidities, and enhancing patient compliance with treatment. The establishment of detailed, unambiguous, and disease-specific criteria for readmission evaluation is crucial for enhancing accountability, optimizing heart failure management, and positively influencing patients, families, and the healthcare system.

Future researchers are expected to develop this research by considering other variables that can be used to continue existing research. In addition, it is hoped that hospitals and communities can work together to increase promotion and preventive efforts, so as to reduce readmission rates in congestive heart failure patients, especially in Kota Kendari.

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