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Research Article

Predicting Mortality in Patients Hospitalized for Acute Decompensated Heart Failure: Analysis of 100 Cases

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Abstract

Background: Acute decompensated heart failure (ADHF) is a leading cause of hospital admissions worldwide and is associated with high in-hospital and short-term post-discharge mortality. Accurate early risk stratification is essential to guide management strategies, optimize resource allocation, and improve patient outcomes. Despite advances in pharmacological therapy and device-based interventions, mortality rates in hospitalized patients remain substantial, underscoring the need for reliable prognostic indicators.

Objective: This study aimed to evaluate clinical, biochemical, and echocardiographic factors that predict mortality in patients hospitalized for ADHF, using a cohort of 100 consecutive cases.

Methods: A prospective observational study was conducted on 100 patients admitted with ADHF to the Cardiology Department of National Institute of Cardiovascular Disease and Hospital from January 2024 to July 2024. Demographic, clinical, laboratory, and echocardiographic data were collected, including age, sex, comorbidities, blood pressure, renal function, hemoglobin, sodium levels, NT-proBNP, and left ventricular ejection fraction (LVEF). The primary outcome was in-hospital mortality, while secondary outcome included 30-day post-discharge mortality. Statistical analyses included univariate and multivariate logistic regression to identify independent predictors of mortality, with a significance threshold of $p<0.05$.

Results: In-hospital mortality was 12%, and 30-day mortality post-discharge was 8%. Multivariate analysis revealed that advanced age (>70 years), low systolic blood pressure (<100 mmHg), elevated serum creatinine (>1.5 mg/dL), severely reduced LVEF (<30%), and high NT-proBNP levels (>4000 pg/mL) were independent predictors of mortality. These factors showed strong discriminatory power in identifying high-risk patients.

Conclusion: The study highlights that simple clinical and laboratory parameters can effectively predict mortality in hospitalized ADHF patients. Early identification of high-risk individuals allows for targeted interventions, including intensive monitoring, optimization of medical therapy, and structured post-discharge follow-up, ultimately improving patient outcomes. Incorporating these predictors into routine clinical practice may enhance risk stratification and guide resource allocation in the management of ADHF.

Keywords: Acute Decompensated heart failure; ADHF; Mortality predictors; Risk stratification; Left ventricular ejection fraction; Renal function; In-Hospital outcomes

Introduction

Heart failure (HF) is a complex clinical syndrome characterized by the inability of the heart to maintain adequate cardiac output to meet the metabolic demands of the body. It represents a major public health burden worldwide, with prevalence steadily increasing due to aging populations and improved survival after myocardial infarction and other cardiovascular events [1]. Acute decompensated heart failure (ADHF) is defined as a sudden or gradual worsening of HF symptoms, often resulting in urgent hospitalization and substantial morbidity and mortality [2]. Hospitalizations for ADHF are associated with high healthcare costs and are considered a marker of disease progression and poor prognosis [3]. Despite advances in pharmacological therapies, including angiotensin-converting enzyme inhibitors, beta-blockers, mineralocorticoid receptor antagonists, and novel agents such as SGLT2 inhibitors, mortality remains high. In-hospital mortality for ADHF patients ranges from 4% to 12%, while 30-day post-discharge mortality may reach 10–15% depending on patient characteristics and comorbidities [4,5]. Identifying patients at higher risk of death is therefore critical for guiding treatment strategies, prioritizing intensive monitoring, and optimizing resource allocation. Several clinical, laboratory, and imaging parameters have been associated with mortality in ADHF. Advanced age, hypotension, renal dysfunction, hyponatremia, anemia, elevated natriuretic peptides, and reduced left ventricular ejection fraction (LVEF) have all been identified as significant predictors [6]. Risk scores such as the EFFECT-HF and ADHERE models incorporate these variables to estimate short- and long-term mortality risk in hospitalized HF patients [7]. However, most risk models were derived from large, heterogeneous populations, and their applicability to smaller, region-specific cohorts remains uncertain. Understanding mortality predictors in specific populations can enhance individualized care and improve outcomes. By systematically evaluating demographic, clinical, laboratory, and echocardiographic variables in 100 patients hospitalized with ADHF, this study aims to identify factors independently associated with in-hospital and 30-day mortality. The findings may facilitate early risk stratification and guide clinicians in implementing targeted interventions to reduce mortality in this high-risk population.

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Methods and Materials

Study design and population

This was a prospective observational study conducted at the Cardiology Department of National Institute of Cardiovascular Disease and Hospital from January 2024 to July 2024. A total of 100 consecutive patients aged ≥18 years, admitted with a clinical diagnosis of acute decompensated heart failure (ADHF), were enrolled. Diagnosis of ADHF was based on the Framingham criteria, supported by clinical assessment, laboratory tests, and imaging studies [1]. Patients with terminal illnesses, pregnancy, or incomplete medical records were excluded.

Data collection

Demographic data, including age, sex, and comorbidities such as hypertension, diabetes mellitus, ischemic heart disease, and chronic kidney disease, were recorded. Clinical parameters collected at admission included systolic and diastolic blood pressure, heart rate, and New York Heart Association (NYHA) functional class.

Laboratory investigations included serum creatinine, blood urea nitrogen, electrolytes, hemoglobin, and N-terminal pro-B-type natriuretic peptide (NT-proBNP). Echocardiographic assessment measured left ventricular ejection fraction (LVEF), left ventricular end-diastolic and end-systolic dimensions, and presence of valvular abnormalities. All tests were performed according to standardized protocols by trained personnel.

Outcome measures

The primary outcome was in-hospital mortality, defined as death occurring during the index hospitalization. Secondary outcome included 30-day post-discharge mortality, verified via hospital records or structured telephone follow-up.

Statistical analysis

Data were analyzed using SPSS version 25. Continuous variables were expressed as mean ± standard deviation (SD) and categorical variables as percentages. Univariate analysis was performed using Student's t-test for continuous variables and chi-square test for categorical variables. Variables with $p<0.10$ in univariate analysis were entered into a multivariate logistic regression model to identify independent predictors of mortality. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. A p-value <0.05 was considered statistically significant.

Results

Baseline characteristics

A total of 100 patients with acute decompensated heart failure were included. The mean age was 65 ± 12 years, and 62% were male. Hypertension was the most common comorbidity (70%), followed by ischemic heart disease (50%) and diabetes mellitus (40%). The mean left ventricular ejection fraction (LVEF) was 35 ± 10%, and mean NT-proBNP level was 4500 ± 1200 pg/mL (Table 1).

Mortality outcomes

In-hospital mortality occurred in 12 patients (12%), while 30-day post-discharge mortality was observed in 8 patients (8%) (Table 2).

Patients with severely reduced LVEF (<30%) had the highest in-hospital mortality (25%), while those with LVEF 30% to 40% had 10% mortality, and LVEF >40% had only 5% mortality (Figure 1).

Table 1: Baseline Characteristics of Study Population (n=100).

Parameter	Value
Age (years)	65 ± 12
Male, n (%)	62 (62%)
Hypertension, n (%)	70 (70%)
Diabetes mellitus, n (%)	40 (40%)
Ischemic heart disease, n (%)	50 (50%)
Chronic kidney disease, n (%)	20 (20%)
Systolic BP (mmHg)	112 ± 18
LVEF (%)	35 ± 10
NT-proBNP (pg/mL)	4500 ± 1200

Table 2: Multivariate Logistic Regression Analysis for In-Hospital Mortality.

Predictor	OR	95% CI	p-value
Age >70 years	2.8	1.2–6.5	0.014
Systolic BP <100 mmHg	3.5	1.5–8.1	0.003
Serum creatinine >1.5 mg/dL	2.6	1.1–6.0	0.023
LVEF <30%	3.1	1.3–7.2	0.008
NT-proBNP>4000 pg/mL	2.9	1.2–6.9	0.015

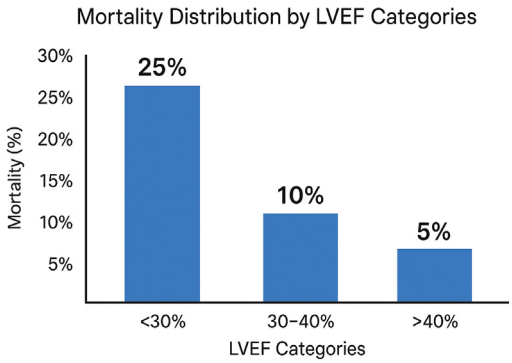

Figure 1: Mortality Distribution by LVEF Categories.

Mortality increased significantly in patients with NT-proBNP>4000 pg/mL (18%) compared to patients with lower levels (5%) (Figure 2).

Discussion

In this prospective cohort of 100 patients hospitalized with ADHF, we identified multiple independent predictors of in-hospital mortality, consistent with previous studies [6-8]. Older age was a significant risk factor, reflecting the diminished physiological reserve and increased comorbidity burden in elderly patients [6]. Low systolic blood pressure, a marker of poor cardiac output, was strongly associated with mortality, emphasizing the prognostic importance of hemodynamic instability [7]. Renal dysfunction, as indicated by elevated serum creatinine, emerged as an independent predictor, highlighting the interplay between heart failure and renal impairment, often described as the cardiorenal syndrome [8]. Reduced LVEF (<30%) was associated with the highest mortality, aligning with previous reports that severe systolic dysfunction confers significant risk for adverse outcomes [9]. Elevated NT-proBNP, a biomarker of myocardial stress, independently predicted mortality, confirming its role in risk stratification in ADHF [10]. These findings underscore the importance of integrating clinical, hemodynamic, and biochemical parameters for early risk assessment. Patients presenting with multiple risk factors may benefit from intensive monitoring, early initiation of guideline-directed therapies, and consideration for advanced interventions such as mechanical circulatory support.

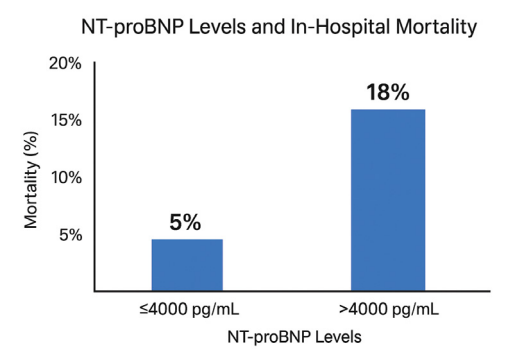

Figure 2: NT-proBNP Levels and In-Hospital Mortality.

While our study provides valuable insights, it has limitations. The single-center design and relatively small sample size may limit generalizability. Additionally, long-term outcomes beyond 30 days were not evaluated. Future multicenter studies with larger cohorts and extended follow-up are warranted to validate these findings and refine risk prediction models. In our study, older age, hypotension, renal dysfunction, severe left ventricular dysfunction, and elevated NT-proBNP are key predictors of mortality in patients hospitalized with ADHF. Early identification of high-risk patients using these parameters can guide targeted management and improve outcomes.

Conclusion

In this cohort of 100 ADHF patients, mortality was significantly influenced by age, blood pressure, renal function, cardiac function, and biomarker levels. These factors should be routinely assessed to identify high-risk patients and improve clinical outcomes.

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