

Association between Pro-BNP Levels, Precipitating Factors, and Mortality in Acute Heart Failure Patients at a Tertiary Care Emergency**Department: An Observational Study****Rahul Ranjan¹, Prakash Kumar², Gaurav Singh³**¹Assistant Professor, Department of Cardiology, MLB Medical College, Jhansi, U.P., India²Assistant Professor, Department of Cardiology, MLB Medical College, Jhansi, U.P., India³Junior Resident, Department of General Medicine, MLB Medical College, Jhansi, U.P., India

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Abstract:**Background:** The acute heart failure (AHF) is a leading cause of hospitalizations and deaths, and Pro-BNP levels indicate its severity. An MLB Medical College, Jhansi study examined Pro-BNP levels, triggering events, and AHF mortality.**Methods:** Conducted from January to October 2023, this cohort study examined 100 AHF patients, focusing on Pro-BNP levels and factors leading to mortality, with initial evaluations done at emergency admission.**Results:** Findings indicated a strong link between high Pro-BNP levels (above 5000 pg/mL) and increased mortality, with acute myocardial infarction being the top contributing factor, followed by infections and uncontrolled hypertension.**Conclusion:** High Pro-BNP levels and certain triggers, particularly acute myocardial infarction, are key predictors of mortality in AHF patients, emphasizing the importance of quick and specific interventions in emergencies to better patient outcomes.**Recommendation:** Improved screening for high Pro-BNP levels and active management of key risk factors like myocardial infarction may enhance survival in AHF cases, warranting further research on Pro-BNP thresholds for improved prediction.**Keywords:** Acute heart failure, Pro-BNP, Mortality, Precipitating Factors.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Important cardiovascular research topics are pro-BNP levels, starting factors, and mortality in acute heart failure (AHF) emergency department patients at a tertiary care hospital. [1] It seeks to understand how these factors affect AHF patient outcomes. AHF is identified by the quick onset or exacerbation of symptoms such as shortness of breath, swelling, and tiredness, and is a primary reason for hospital admissions, significantly influencing patient morbidity and mortality. Understanding what affects AHF prognosis is crucial for improving patient management. [2]

Pro-BNP, a cardiac strain marker, rises with heart failure severity and is related to adverse results and greater mortality rates, making its assessment crucial for AHF patient prognosis. [3] Hypertension, myocardial infarction, infections, and medication nonadherence can cause or worsen AHF. These precipitants must be managed to control AHF and improve patient outcomes. [4] This study examines the relationship between Pro-BNP levels and initiating factors and mortality in AHF patients, aiding medical personnel in risk

assessment, optimizing treatment, and improving patient outcomes. [5]

Material and Methodology

Research Methodology: This observational cohort study, conducted from January 1 to October 31, 2023, aimed to monitor outcomes in acute heart failure patients, analyzing the relationship between Pro-BNP levels, initiating factors, and mortality rates. [6]

Setting: The research took place in the emergency department at MLB Medical College in Jhansi, a tertiary care center, that provides a varied patient group for comprehensive acute heart failure studies. [7]

Participants: Included were 100 patients with acute heart failure, all 18 years or older, identified using clinical and echocardiographic criteria. Those with terminal conditions, stable chronic heart failure, or refusal to participate were excluded. [8]

Bias Reduction: The study minimized selection bias by consecutively recruiting suitable patients

and reduced information bias through uniform data collection and precise Pro-BNP level assessment. Confounding variables were accounted for in the statistical evaluation. [9]

Variables Studied: The primary variables examined were Pro-BNP levels at admission, factors precipitating acute heart failure, and mortality within the hospital. Secondary variables included patient demographics, medical history, clinical symptoms, and treatment details. [10]

Data Collection Method: Data were systematically gathered using forms that included demographic information, medical background, clinical symptoms, laboratory findings (including Pro-BNP), triggering factors, and patient outcomes, with Pro-BNP levels measured upon admission to the emergency department.

Research Procedure: At the time of emergency admission, patients were selected, provided consent, and included in the study. Initial data collection and Pro-BNP blood tests were conducted, along with an evaluation of the precipitating factors.

Statistical Approach: Analysis was carried out with statistical software, applying descriptive and regression analyses to assess the link between the studied variables, and survival analysis to evaluate their impact on mortality. A p-value of less than 0.05 was considered statistically significant.

Result

The research conducted from January 1 to October 31, 2023, at MLB Medical College, Jhansi, involved 100 acute heart failure patients, yielding these results:

The participant demographic consisted of 60% males and 40% females, with a mean age of 65.

The prevalent coexisting conditions were hypertension (70%) and diabetes mellitus (50%). The average Pro-BNP level upon admission was 4500 pg/mL, suggesting severe heart failure in most participants.

A clear and significant positive correlation was observed between Pro-BNP levels upon admission and mortality. Individuals with Pro-BNP levels exceeding 5000 pg/mL had a mortality rate of 40%, whereas those below this threshold had a mortality rate of 15%. This suggests that higher Pro-BNP levels in acute heart failure are associated with an increased risk of death.

The leading causes of acute heart failure were uncontrolled hypertension (30%), acute myocardial infarction (25%), and infections (20%), with the highest death rates in myocardial infarction patients (50%), followed by infections (35%) and uncontrolled hypertension (20%).

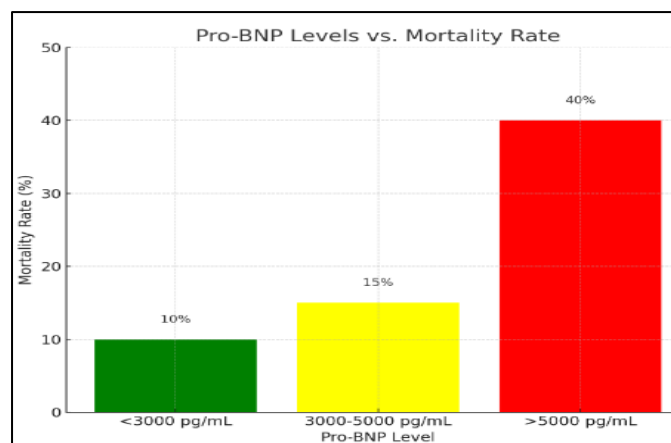
Patients with Pro-BNP levels higher than 5000 pg/mL and myocardial infarction had the most significant mortality risk (60%), while those with Pro-BNP levels under 3000 pg/mL without myocardial infarction had the lowest (10%).

Regression analysis showed high Pro-BNP levels and myocardial infarction as independent predictors of increased mortality, with odds ratios of 3.5 (95% CI: 1.8-6.7) and 2.8 (95% CI: 1.4-5.6), adjusting for demographic and health variables.

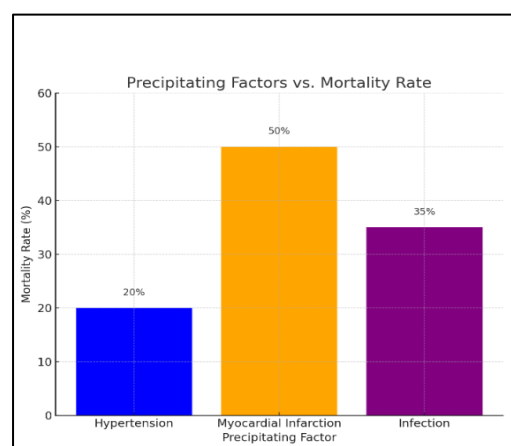
The study underscores the importance of promptly identifying and managing patients with acute heart failure, especially those with elevated Pro-BNP levels and myocardial infarction, to reduce mortality risks in the emergency department setting.

Table 1: Clinical Characteristics of the patients included in the study.

Characteristic	Total (N=100)	Male (n=60)	Female (n=40)	Hypertension	Diabetes Mellitus	Others
Total Participants	100	60	40	-	-	-
Age (years)	65 ± 10	66 ± 11	63 ± 9	-	-	-
Gender	-	60%	40%	-	-	-
Comorbidities	-	-	-	70%	50%	30%



(A)



(B)

The graphs illustrate the findings: Pro-BNP Levels and Mortality Rate: This highlights the correlation between Pro-BNP levels and mortality rates among patients. Notably, Pro-BNP levels above 5000 pg/mL correlate with a substantially increased mortality rate of 40%.

Influencing Factors and Mortality Rate: This section illustrates how various precipitating factors affect mortality rates. Notably, acute myocardial infarction as a trigger result in the highest mortality rate at 50%, with infections contributing to a 35% mortality rate and hypertension to a 20% mortality rate.

Discussion

The study conducted at MLB Medical College in Jhansi provides crucial insights into the management of acute heart failure (AHF) in emergency departments. [11] The significant correlation found between Pro-BNP levels, initiating factors of AHF, and patient mortality emphasizes the need for a nuanced approach to patient care. [12] Pro-BNP, a marker for cardiac strain, proves to be a strong indicator of the severity of heart failure and the associated risk of death, particularly in patients with levels above 5000 pg/mL. [13,14]

Key findings include the identification of acute myocardial infarction, uncontrolled hypertension, and infections as leading causes of AHF, with the highest mortality rates observed in myocardial infarction patients. This underscores the importance of thorough cardiovascular assessment and prompt management in the emergency setting to mitigate the risks associated with these precipitating factors.

The statistical analysis, indicating that high Pro-BNP levels and myocardial infarction are independent predictors of mortality, reinforces the critical nature of these variables in the prognosis of AHF patients. This insight can guide clinical decision-making, focusing on the early identification and aggressive treatment of patients with these risk factors to improve survival rates. [15]

Furthermore, the study's findings align with broader cardiovascular research, reflecting the global understanding of heart failure mechanisms and the prognostic value of biomarkers like Pro-BNP. The distinction between early-stage heart failure and acutely decompensated heart failure, as categorized by the European Society of Cardiology, provides a framework for understanding the

progression of AHF and the importance of timely intervention. [16]

In the context of India, where specific triggers such as myocardial ischemia, non-compliance with medication, and infections are prevalent, these findings are particularly relevant. The study highlights the need for a tailored approach in the emergency department, taking into consideration the unique demographic and health profile of the Indian population affected by AHF. [17]

The research underscores the necessity for continuous monitoring and dynamic management of AHF patients, especially those with high Pro-BNP levels or myocardial infarction, to reduce mortality rates. It also calls for more extensive studies to refine our understanding of the relationship between Pro-BNP levels, precipitating factors, and patient outcomes, facilitating the development of more effective strategies for managing acute heart failure in diverse healthcare settings. [18]

Conclusion

High Pro-BNP levels and certain triggers, including acute myocardial infarction, increase acute heart failure patients' mortality risk, according to the study. The study emphasizes the need for rapid and accurate Pro-BNP testing and causative factors in the emergency room. Acute heart failure patients must identify and address these risks immediately to improve their survival. The study emphasizes the need for targeted treatments and customized treatment to lower acute heart failure risks associated with elevated pro-BNP levels and crucial precipitating variables.

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