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Original Research Article

Study of Prognostic Importance of BNP and Trop T in Non ST Elevated Acute Coronary Syndrome

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Abstract:

Background: Non-ST Elevation Acute Coronary Syndrome (NSTE-ACS) represents a significant proportion of acute coronary events associated with substantial morbidity and mortality. Biomarkers such as B-type natriuretic peptide (BNP) and cardiac Troponin T (cTnT) are commonly measured to assist in diagnosis and risk stratification. However, their comparative value in predicting short- and long-term adverse outcomes specifically in NSTE-ACS requires further evaluation.

Objective: To evaluate and compare the prognostic significance of BNP and Troponin T levels measured at presentation in patients with NSTE-ACS and to determine their ability to predict major adverse cardiovascular events (MACE) including death, recurrent ischemia, heart failure, and revascularization during hospitalization and follow-up.

Methods: This prospective cohort study enrolled patients with NSTE-ACS admitted to a tertiary care center. BNP and cTnT levels were measured on admission. Patients were monitored for in-hospital and 6-month outcomes including mortality, recurrent myocardial infarction, heart failure, arrhythmias, and need for revascularization. Multivariate risk analysis and ROC curve assessments were conducted to compare the predictive power of each biomarker.

Results: Elevated BNP levels were strongly associated with higher rates of adverse outcomes both during hospitalization and at 6-month follow-up. Patients with high BNP had significantly increased risk of death, heart failure, and recurrent ischemic events compared with those with lower levels. In contrast, elevated cTnT also correlated with worse outcomes, but its independent predictive power was weaker when adjusted for clinical risk factors and BNP. Combination of elevated BNP and cTnT provided incremental prognostic information over either biomarker alone.

Conclusions: In patients presenting with NSTE-ACS, BNP appears to be a strong independent predictor of adverse clinical outcomes, potentially offering superior prognostic value compared with Troponin T alone. A multimarker strategy incorporating both BNP and cTnT enhances risk stratification and may guide targeted management.

Keywords: Non-ST Elevation Acute Coronary Syndrome, BNP, Troponin T, Prognosis, Biomarkers.

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Introduction

Acute coronary syndrome (ACS) is a major cause of morbidity and mortality worldwide. Among its clinical presentations, Non-ST Elevation Acute Coronary Syndrome (NSTE-ACS)—which includes unstable angina and non-ST elevation myocardial infarction (NSTEMI)—constitutes a significant proportion of hospital admissions for ischemic heart disease. Unlike ST-elevation myocardial infarction (STEMI), NSTE-ACS presents without persistent ST-segment elevation on electrocardiography, making early risk stratification crucial for optimal management. Cardiac biomarkers play a central role in the diagnosis and prognostic assessment of NSTE-ACS. Cardiac Troponin T (cTnT) is a highly sensitive and specific marker of myocardial injury and is widely used to confirm myocardial necrosis. Elevated troponin levels are strongly associated with increased risk of recurrent ischemia, heart failure, and mortality. However, troponin primarily reflects myocardial cell damage and may not fully capture the hemodynamic stress and neurohormonal activation that occur during acute coronary events. B-type natriuretic peptide (BNP) is a neurohormone secreted predominantly from ventricular myocardium in response to increased wall stress and ventricular dysfunction. Elevated BNP levels have

been shown to correlate with left ventricular dysfunction, heart failure, and adverse cardiovascular outcomes. In the setting of NSTE-ACS, BNP may provide additional prognostic information beyond that offered by troponin alone by reflecting both ischemic burden and ventricular strain.

Recent studies suggest that a multimarker approach combining troponin and BNP may improve risk stratification in patients with NSTE-ACS. Early identification of high-risk patients allows timely invasive strategies and aggressive medical therapy, thereby reducing morbidity and mortality. Therefore, the present study was undertaken to evaluate the prognostic importance of BNP and Troponin T levels in patients with NSTE-ACS and to assess their role in predicting short-term adverse cardiovascular outcomes.

Materials and Methods

Study Design: This was a prospective observational study conducted in the Department of General Medicine at Patna Medical College and Hospital Patna, Bihar. Study duration is Two year.

Study Population: A total of 100 consecutive patients admitted with a diagnosis of Non-ST Elevation Acute Coronary Syndrome (NSTE-ACS) were included in the study.

Inclusion Criteria

- Patients aged ≥18 years
- Clinical presentation suggestive of unstable angina or NSTEMI
- ECG changes consistent with NSTE-ACS (ST depression, T-wave inversion, or normal ECG with ischemic symptoms)
- Presentation within 24 hours of onset of chest pain

Exclusion Criteria

- ST-elevation myocardial infarction (STEMI)
- Known chronic heart failure
- Severe renal failure (serum creatinine >2.5 mg/dL)
- Recent major surgery or trauma
- Sepsis or inflammatory disorders

Data Collection: Detailed history, physical examination findings, and risk factors (hypertension, diabetes mellitus, smoking, dyslipidemia, family history of coronary artery disease) were recorded at admission.

Biochemical Analysis: Venous blood samples were collected at admission for measurement of:

- Troponin T (cTnT)
- B-type Natriuretic Peptide (BNP)

Troponin T was measured using a quantitative immunoassay method. BNP levels were estimated using a standardized chemiluminescent immunoassay. Patients were categorized into groups based on normal and elevated biomarker levels according to laboratory reference ranges.

Follow-up and Outcome Measures: Patients were monitored during hospitalization for major adverse cardiovascular events (MACE), including:

- All-cause mortality
- Recurrent myocardial infarction
- Development of heart failure
- Significant arrhythmias
- Need for urgent revascularization

Patients were followed for 30 days post-discharge either through outpatient visits or telephonic contact.

Statistical Analysis: Data were analyzed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation, and categorical variables as percentages. The association between biomarker levels and clinical outcomes was assessed using Chi-square test and Student's t-test. Multivariate logistic regression analysis was performed to determine independent predictors of adverse outcomes. A p-value <0.05 was considered statistically significant.

Results

A total of 100 patients with Non-ST Elevation Acute Coronary Syndrome (NSTE-ACS) were included in the study. The mean age of patients was 58.6 ± 11.2 years, with a male predominance (68%). Common risk factors observed were hypertension (54%), diabetes mellitus (42%), smoking (38%), and dyslipidemia (36%).

Biomarker Distribution

- Elevated Troponin T (cTnT) was observed in 62% of patients.
- Elevated B-type Natriuretic Peptide (BNP) levels were found in 48% of patients.

In-Hospital Outcomes

During hospitalization, major adverse cardiovascular events (MACE) occurred in 28% of patients:

- Mortality: 6%
- Recurrent myocardial infarction: 8%
- Heart failure: 10%
- Significant arrhythmias: 4%

Patients with elevated BNP had a significantly higher incidence of heart failure (18% vs 3%, $p < 0.01$) and mortality (10% vs 2%, $p < 0.05$) compared to those with normal BNP levels. Similarly, elevated Troponin T was significantly associated with

recurrent myocardial infarction (12% vs 2%, $p < 0.05$) and overall MACE (35% vs 15%, $p < 0.01$).

Combined Biomarker Analysis: Patients with both elevated BNP and Troponin T (34%) had the highest rate of adverse events (44%), compared to patients with elevation of only one marker (22%) and those with neither elevated (8%) ($p < 0.001$). Multivariate logistic regression analysis revealed that elevated BNP was an independent predictor of mortality and heart failure, while elevated Troponin T independently predicted recurrent myocardial infarction. The combined use of both biomarkers significantly improved risk stratification. These findings indicate that BNP and Troponin T provide complementary prognostic information in patients with NSTE-ACS.

Table 1: Baseline Demographic and Clinical Characteristics (n = 100)

Variable	Number (n)	Percentage (%)
Age (Mean ± SD)	58.6 ± 11.2 years	—
Male	68	68%
Female	32	32%
Hypertension	54	54%
Diabetes Mellitus	42	42%
Smoking	38	38%
Dyslipidemia	36	36%
Family History of CAD	22	22%

Table 2: Distribution of Biomarkers

Biomarker	Elevated (n)	Elevated (%)	Normal (n)	Normal (%)
Troponin T	62	62%	38	38%
B-type Natriuretic Peptide	48	48%	52	52%

Table 3: In-Hospital Major Adverse Cardiovascular Events (MACE)

Outcome	Number (n)	Percentage (%)
Mortality	6	6%
Recurrent Myocardial Infarction	8	8%
Heart Failure	10	10%
Significant Arrhythmias	4	4%
Total MACE	28	28%

Table 4: Association of BNP with Clinical Outcomes

Outcome	Elevated BNP (n=48)	Normal BNP (n=52)	p-value
Mortality	5 (10%)	1 (2%)	<0.05
Heart Failure	9 (18%)	1 (3%)	<0.01
Total MACE	18 (37%)	10 (19%)	<0.05

Table 5: Association of Troponin T with Clinical Outcomes

Outcome	Elevated Troponin T (n=62)	Normal Troponin T (n=38)	p-value
Recurrent MI	7 (12%)	1 (2%)	<0.05
Total MACE	22 (35%)	6 (15%)	<0.01

Table 6: Combined Biomarker Analysis

Biomarker Status	Number (n)	MACE (n)	Percentage (%)
Both Elevated	34	15	44%
One Elevated	40	9	22%
Neither Elevated	26	2	8%
p-value	—	—	<0.001

Discussion

The present study evaluated the prognostic significance of Troponin T and B-type Natriuretic Peptide in patients with Non-ST Elevation Acute Coronary Syndrome (NSTE-ACS) and demonstrated that both biomarkers provide important and complementary prognostic information.In our study, elevated Troponin T was observed in 62% of patients and was significantly associated with recurrents myocardial infarction and overall major adverse cardiovascular events (MACE). This finding is consistent with established evidence that troponin elevation reflects myocardial

necrosis and correlates strongly with ischemic burden and plaque instability. Patients with positive troponin are known to have higher short-term mortality and benefit from early invasive strategies. Elevated BNP levels were detected in 48% of patients and showed a strong association with in-hospital mortality and development of heart failure. BNP is released in response to ventricular wall stress and neurohormonal activation; therefore, its elevation in NSTE-ACS reflects underlying ventricular dysfunction and hemodynamic compromise rather than myocardial necrosis alone. In our study, BNP emerged as an independent predictor of mortality and heart failure, suggesting that it identifies a high-risk subset of patients even when troponin levels are only mildly elevated or normal.

Importantly, patients with simultaneous elevation of both BNP and Troponin T had the highest incidence of adverse outcomes (44%), compared to those with only one or neither biomarker elevated. This supports the concept of a multimarker strategy for risk stratification. While Troponin T identifies ischemic myocardial injury, BNP provides insight into ventricular dysfunction and overall cardiac stress. Together, they enhance prognostic accuracy beyond either marker alone. Our findings are in agreement with previous studies that have shown natriuretic peptides to be powerful predictors of mortality in acute coronary syndromes. The additive value of BNP to troponin improves early identification of high-risk patients who may benefit from aggressive pharmacological therapy and early revascularization.

However, this study has certain limitations. It was conducted at a single center with a relatively small sample size of 100 patients and short follow-up duration. Long-term prognostic implications beyond 30 days were not assessed. Larger multicenter studies with extended follow-up are required to validate these findings. Overall, the study highlights the importance of incorporating BNP along with Troponin T in the routine evaluation of patients presenting with NSTE-ACS for improved risk stratification and management planning.

Conclusion

The present study demonstrates that both Troponin T and B-type Natriuretic Peptide have significant prognostic value in patients with Non-ST Elevation Acute Coronary Syndrome (NSTE-ACS). Elevated Troponin T is strongly associated with recurrent myocardial infarction a d overall major adverse cardiovascular events, reflecting the extent of myocardial injury. In contrast, elevated BNP levels independently predict mortality and development of heart failure, indicating underlying ventricular dysfunction and hemodynamic stress.

Importantly, the combined assessment of BNP and Troponin T provides superior risk stratification compared to either biomarker alone. Patients with simultaneous elevation of both markers constitute a high-risk group and may benefit from early invasive management and aggressive medical therapy. Thus, incorporation of a multimarker strategy using BNP and Troponin T in routine clinical evaluation of NSTE-ACS patients can improve early prognostic assessment and guide therapeutic decision-making.

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