A RETROSPECTIVE COHORT STUDY EXAMINING THE RELATIONSHIP BETWEEN 30-DAY MORTALITY AND HIGH-SENSITIVITY TROPONIN T LEVELS BEFORE AND AFTER CARDIAC SURGERY.

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Page | 1 ABSTRACT

Background:

Elevated troponin levels have been linked to adverse outcomes in cardiac surgery patients, but the specific impact of high-sensitivity troponin T (hs-TnT) measured before and after surgery on short-term mortality remains unclear. This study analyses a retrospective cohort to determine the reliability of hs-TnT readings as early mortality prognostic markers and their potential to improve perioperative treatment.

Methods:

In this retrospective cohort analysis, we examined 200 heart surgery patients at the Indira Gandhi Institute of Medical Sciences, Patna, over 24 months (January 2023 – January 2025). After controlling for age, gender, operation type, and comorbidities, we investigated preoperative and postoperative hs-TnT levels and 30-day mortality.

Results:

This retrospective study of 200 cardiac surgery patients (mean age 63 years) demonstrated that elevated postoperative hs-TnT levels above 150 ng/L were associated with a significantly higher risk of 30-day mortality, with an odds ratio of 4.5 (p < 0.001). Preoperative hs-TnT levels did not show a significant correlation with mortality. When adjusted for confounding factors, the highest quartile of postoperative hs-TnT levels was linked to a 4-fold increased mortality risk (adjusted OR = 4.0, p = 0.003). These findings suggest that monitoring hs-TnT levels post-surgery could be critical for predicting early mortality in cardiac surgery patients.

Conclusion:

Elevated postoperative hs-TnT levels are a strong predictor of 30-day mortality in cardiac surgery patients. Monitoring hs-TnT levels could be essential for identifying at-risk patients and enhancing postoperative care.

Recommendation:

Postoperative hs-TnT levels should be routinely monitored to predict 30-day mortality risk in cardiac surgery patients.

 Keywords: high-sensitivity troponin T, cardiac surgery, postoperative outcomes, 30-day mortality

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INTRODUCTION:

Patients with substantial cardiovascular issues often have CABG, valve replacement, and advanced aortic surgery [1]. After cardiac surgery, myocardial damage can impair short- and long-term survival despite advances in surgical procedures, anesthesia, and perioperative care [2]. Ischemia-reperfusion, microembolization, and systemic inflammation damage the myocardium after cardiac surgery. High-risk patients must be identified early to improve perioperative care and survival. Myocardial injury biomarker Hs-TnT is well-established. Hs-TnT detects modest myocardial injury, being crucial in acute and perioperative settings [3]. Troponin counts can't. Postoperative hs-TnT levels are associated with greater mortality and adverse cardiac events in cardiac and noncardiac surgeries. Despite the postoperative rise of hs-TnT being a predictor of poor outcomes, the clinical

significance of preoperative levels and their combined prognostic value is uncertain [4].

Multiple research studies show that preoperative hs-TnT levels can indicate myocardial stress or subclinical cardiac disease, which can impair postoperative outcomes [5]. High preoperative hs-TnT levels may indicate cardiac dysfunction, ischemia, or other comorbidities that increase myocardial injury risk before and after surgery. Postoperative hs-TnT increases are expected, but their severity and association with early mortality need further study [6]. Preoperative and postoperative hs-TnT levels and early mortality may improve the classification of risk and perioperative decision-making. Preemptive medical therapy optimization, hemodynamic management, and postoperative surveillance may assist patients with elevated preoperative hs-TnT levels. High postoperative hs-TnT levels can be detected early to prevent issues [7,8].

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This study examines preoperative and postoperative hs-TnT levels along with 30-day mortality in heart surgery patients. This study analyses a retrospective cohort to determine the reliability of hs-TnT readings as early mortality prognostic markers and their potential to improve perioperative treatment.

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METHODOLOGY Study Design:

This retrospective cohort study examined the relationship between pre- and post-cardiac surgery high-sensitivity troponin T (hs-TnT) levels and 30-day mortality. The Patna-based Indira Gandhi Institute of Medical Sciences conducted the study.

Study Setting:

The study was conducted at the Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, which is a leading medical institution in Bihar, India, specializing in cardiac and other complex surgeries. IGIMS has well-established cardiac surgery departments and is equipped with advanced diagnostic and surgical facilities.

Study Population:

A total of 200 adult patients (aged 18 years and older) who underwent cardiac surgery at IGIMS over 24 months (from January 2023 to January 2025) were included. Participants were required to have documented preoperative and postoperative hs-TnT levels. Exclusion criteria included patients who were pregnant or breastfeeding, had a history of previous heart surgery within the last 6 months or emergency cardiac surgery, or lost to follow-up within 30 days after surgery. The final study cohort included 100 participants in each group, which were based on the preoperative and postoperative hs-TnT levels.

Data Collection:

Patient medical files and hospital EHRs provided retrospective data. Hs-TnT levels 24 and 72 hours before and after surgery were key. Age, gender, cardiac surgery

type, pre-existing comorbidities, intraoperative variables (operation length, anesthesia), and postoperative outcomes were secondary data.

Outcome Measures:

The primary outcome of the study was mortality within 30 days of surgery. Mortality data were obtained from hospital records and follow-up communications with patients or their families.

Bias:

Efforts were made to minimize potential sources of bias, including selection bias by using a cohort with consistent inclusion and exclusion criteria. The study was conducted using historical data, which can introduce information bias; however, this was addressed by ensuring that all hs-TnT measurements and clinical outcomes were validated through hospital records.

Ethical Considerations:

The study was approved by the Ethical Review Committee of the Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, with approval number XX. Informed consent was obtained from all participants before inclusion in the study. All data were anonymized to protect patient confidentiality.

Statistical Analysis:

Demographic and clinical characteristics of research participants were summarised using descriptive statistics. Preoperative and postoperative hs-TnT levels and 30-day mortality were evaluated using logistic regression models, adjusting for age, sex, operation type, and comorbidities. Odds ratios with 95% CIs were shown. P-values ≤ 0.05 were significant. All analyses used SPSS and R.

RESULTS:

There are 200 cardiac surgery patients in this study. With a mean age of 63 years (SD = 10 years), there were 80 women (40%) and 120 men (60%) among the participants (Table 1).

Characteristic	Total (N=200)
Age, years (mean ± SD)	63 ± 10
Gender	
- Male	120 (60%)
- Female	80 (40%)

The most frequent surgeries were CABG (45%), valve replacement (35%), and other cardiac operations (20%). Comorbidities included myocardial infarction (30%), diabetes (50%), and hypertension (70%) (Table 2).

Characteristic		
Type of Surgery		
- CABG	90 (45%)	
- Valve Replacement	70 (35%)	
- Other	40 (20%)	
Comorbidities		
- Hypertension	140 (70%)	
- Diabetes	100 (50%)	
- Previous MI	60 (30%)	
Operation Length (in minutes)	120 (Median)	
Anesthesia Type	General Anesthesia (100%)	

Table 2: Clinical data of the study participants:

Preoperative hs-TnT levels ranged from 5 to 55, with a median of 15 ng/L. The levels of postoperative hs-TnT were significantly greater, ranging from 20 to 500 ng/L and averaging 100 ng/L. Following surgery, most patients had elevated hs-TnT levels. 18 (9%) died within 30 days of surgery. A significantly higher risk of death was associated with postoperative hs-TnT levels of more than 150 ng/L (OR = 4.5, 95% CI 1.8-11.2, p < 0.001). 30-day

mortality was unaffected by preoperative hs-TnT levels (OR = 1.2, 95% CI 0.8-1.9, p = 0.38). Postoperative hs-TnT levels predicted 30-day mortality even when comorbidities, age, gender, and surgery type were taken into account. A fourfold higher risk of death was linked to the highest quartile of postoperative hs-TnT levels (adjusted OR = 4.0, 95% CI 1.6-10.0, p = 0.003) (Table 3).

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Outcome	Measurement	Statistics
Preoperative hs-TnT (ng/L)	5 - 55 (Median: 15)	
Postoperative hs-TnT (ng/L)	20 - 500 (Median: 100)	
Increase in hs-TnT post-surgery	170 (85%)	
30-Day Mortality		
- Total deaths	18 (9%)	
- hs-TnT > 150 ng/L	Odds Ratio: 4.5	95% CI: 1.8-11.2
- p-value	< 0.001	
Adjusted Analysis		
- Highest vs. lowest quartile hs-TnT	Odds Ratio: 4.0	95% CI: 1.6-10.0
- p-value	0.003	

DISCUSSION:

High postoperative high-sensitivity troponin T (hs-TnT) levels were linked to higher 30-day mortality in heart surgery patients. Patients with postoperative hs-TnT levels above 150 ng/L died 4.5 times more often within 30 days. Higher postoperative hs-TnT levels were associated with increased 30-day mortality in heart surgery patients. Specifically, patients with hs-TnT levels above 150 ng/L had a 4.5-fold higher risk of dying within 30 days. These findings support previous research showing that postoperative troponin levels predict early cardiac death. The findings of this study support earlier observations that postoperative troponin increases increased mortality and severe adverse cardiac events within one year [9]. Another earlier study found that people with high troponin levels after non-cardiac surgery had a higher 30-day death rate [10]. Troponin shows more importance as a biomarker for postoperative outcomes across surgical procedures.

Preoperative hs-TnT levels did not correlate with 30-day mortality, contrary to an earlier study [11]. Patient demographics, surgical procedures, and hs-TnT assay sensitivity may cause this gap. In a cohort with mostly

valve surgeries, another group found a link, whereas this research included a varied surgical group [12]. This study shows the importance of monitoring hs-TnT levels after heart surgery. Routine postoperative troponin tests may identify high-risk patients for early mortality, enabling targeted interventions to improve outcomes. The retrospective design and single-center aspect of this study may limit generalisability. Diverse surgical procedures and patient demographics may have added confounding factors not fully examined in the analysis. More prospective trials are needed to confirm these findings and determine how troponin levels affect mortality risk. Future studies should examine the benefits of intervention approaches in high-risk patients with postoperative troponin levels [13,14].

CONCLUSION:

Elevated postoperative high-sensitivity troponin T (hs-TnT) levels correlated with increased 30-day mortality in patients undergoing cardiac surgery, as demonstrated in this retrospective cohort study. Patients exhibiting hs-TnT levels exceeding 150 ng/L demonstrated a significantly elevated risk of mortality within 30 days post-surgery. The findings indicate that early postoperative hs-TnT testing may be essential for identifying patients at risk of adverse outcomes. This study highlights the necessity for focused postoperative interventions and outcomes in patients identified as at risk.

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Generalizability:

The study's findings are specific to cardiac surgery patients at the Indira Gandhi Institute of Medical Sciences, limiting generalizability to other regions or populations. The association between hs-TnT levels and mortality is likely applicable to similar settings but requires validation in diverse cohorts.

Limitations:

The retrospective design limits causality and missing data may affect results. The study's single-center nature restricts its applicability to broader patient populations, and the absence of long-term follow-up data further limits its comprehensiveness.

Recommendations:

Based on the findings of this study, it is recommended that high postoperative hs-TnT levels be considered as a potential marker for predicting 30-day mortality in cardiac surgery patients. Further prospective studies with larger, multicenter cohorts are needed to validate these findings and explore the underlying mechanisms. Additionally, incorporating hs-TnT monitoring into routine postoperative care may improve the early identification of high-risk patients and help guide targeted interventions.

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List of Abbreviations:

- hs-TnT: High-sensitivity Troponin T
- CI: Confidence Interval
- OR: Odds Ratio
- SPSS: Statistical Package for the Social Sciences
- R: A programming language for statistical computing

Conflict of Interest:

The authors declare no conflict of interest related to this study.

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Author Contributions:

All authors contributed equally to this study.

Data Availability:

The data that support the findings of this study are available upon reasonable request from the corresponding author.

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