



Original Article

Incidence Gastric Ulcer in Patients Undergoing Coronary Artery Bypass Surgery – A Prospective Study

Dr Jayakumar¹, Dr Saipriya S V²

¹Professor, Department of General Surgery, Sree Mookambika Institute of Medical Sciences, Kanyakumari, Tamil Nadu, India

²Junior Resident, Department of General Surgery, Sree Mookambika Institute of Medical Sciences, Kanyakumari, Tamil Nadu, India

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Corresponding Author:

Dr Saipriya S V

Junior Resident, Department of
General Surgery, Sree Mookambika
Institute of Medical Sciences,
Kanyakumari, Tamil Nadu, India.

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ABSTRACT

Background: Gastric ulcer is a known complication in critically ill patients and those undergoing major surgeries such as coronary artery bypass grafting (CABG). Factors such as stress response, hemodynamic fluctuations, prolonged mechanical ventilation, and use of antiplatelet or anticoagulant therapy increase the risk of gastrointestinal mucosal injury. Despite routine prophylaxis, the incidence of gastric ulcers in post-CABG patients remains a concern, necessitating further evaluation to improve perioperative management and outcomes.

Aims: To determine the incidence of gastric ulcer in patients undergoing coronary artery bypass graft surgery and to analyze associated perioperative risk factors.

Materials and Methods: This prospective observational study was conducted over a period of 6 months in a tertiary care hospital and included 75 patients undergoing elective CABG surgery. Patients aged above 18 years were enrolled after obtaining informed consent. Preoperative evaluation included detailed clinical assessment and relevant laboratory investigations. All patients received standard perioperative care, including stress ulcer prophylaxis. Postoperatively, patients were monitored for gastrointestinal symptoms. Upper gastrointestinal endoscopy was performed in patients with suspected symptoms or high-risk features to confirm the presence of gastric ulcers. Data regarding demographic variables, comorbidities, duration of surgery, cardiopulmonary bypass time, use of inotropes, and duration of ICU stay were recorded. Statistical analysis was performed with $p < 0.05$ considered statistically significant.

Results: Out of 75 patients, gastric ulcers were identified in 7 (9.33%) patients during the postoperative period. The majority of affected patients were above 60 years of age and had associated comorbidities such as diabetes mellitus and hypertension. Patients who developed gastric ulcers had significantly longer cardiopulmonary bypass times and increased duration of ICU stay ($p < 0.05$). The use of inotropic support and prolonged mechanical ventilation were also significantly associated with ulcer development. Most ulcers were detected within the first week following surgery.

Conclusion: The incidence of gastric ulcers in post-CABG patients remains clinically significant despite standard prophylactic measures. Advanced age, comorbidities, prolonged bypass time, and increased ICU stay are important risk factors. Routine surveillance in high-risk patients and optimization of perioperative care may help reduce the incidence and associated complications.

Keywords: Coronary artery bypass grafting, Gastric ulcer, Gastrointestinal complications, ICU, Stress ulcer.

INTRODUCTION

Coronary artery bypass grafting (CABG) is one of the most commonly performed cardiac surgical procedures for the management of advanced coronary artery disease. Although advances in surgical techniques, anesthesia, and perioperative care have significantly improved patient outcomes, postoperative complications remain an important concern.¹ Among

these, gastrointestinal complications, particularly stress-related mucosal disease and gastric ulcer formation, are often under-recognized but can contribute to increased morbidity, prolonged hospital stay, and higher healthcare costs.² The incidence of gastric ulcer in post-CABG patients varies widely depending on patient characteristics, perioperative factors, and the use of prophylactic measures.³

The pathophysiology of gastric ulcer formation in patients undergoing CABG is multifactorial. Major surgery induces a systemic stress response characterized by increased catecholamine release, reduced splanchnic blood flow, and mucosal ischemia.⁴ The use of cardiopulmonary bypass (CPB) further exacerbates this condition by triggering inflammatory cascades, oxidative stress, and microcirculatory disturbances.⁵ These changes impair the protective mechanisms of the gastric mucosa, making it susceptible to acid-mediated injury. Additionally, postoperative factors such as prolonged mechanical ventilation, use of vasopressors or inotropes, and hemodynamic instability can further compromise gastric mucosal perfusion.^{6,7}

Another important contributor to gastric ulcer formation in CABG patients is the use of medications. Antiplatelet agents, anticoagulants, and nonsteroidal anti-inflammatory drugs (NSAIDs), which are frequently administered in the perioperative period, can disrupt mucosal integrity and increase the risk of gastrointestinal bleeding.⁸ Although stress ulcer prophylaxis using proton pump inhibitors (PPIs) or H₂ receptor blockers is routinely employed, it does not completely eliminate the risk, especially in high-risk patients with multiple comorbidities such as diabetes mellitus, hypertension, and chronic kidney disease.^{9,10}

Despite the clinical significance of this complication, gastric ulcers in post-CABG patients are often clinically silent or present with non-specific symptoms, leading to delayed diagnosis. In some cases, they may manifest only when complications such as bleeding or perforation occur. Early identification of patients at risk is therefore essential for timely intervention and prevention of adverse outcomes. However, there is limited prospective data evaluating the true incidence of gastric ulcers in this specific population, particularly in the context of standardized perioperative care protocols.

The novelty of the present study lies in its prospective evaluation of gastric ulcer incidence in patients undergoing CABG, along with the assessment of perioperative risk factors in a real-world clinical setting. Unlike retrospective analyses, this study allows for systematic monitoring of patients during the postoperative period, thereby improving the accuracy of incidence estimation and identification of associated variables. Identifying modifiable risk factors such as duration of cardiopulmonary bypass, need for inotropic support, and length of ICU stay may help in optimizing perioperative management.

AIMS AND OBJECTIVES

- To determine the incidence of gastric ulcer in patients undergoing coronary artery bypass graft surgery and to analyze associated perioperative risk factors.

MATERIALS AND METHODS

The present prospective observational study was conducted over a period of 6 months from August 2025 to January 2026 at Sree Mookambika Institute of Medical Sciences. A total of 75 patients undergoing elective coronary artery bypass grafting (CABG) were included in the study.

Inclusion Criteria:

- Patients aged ≥ 18 years undergoing elective CABG
- Patients willing to provide informed consent
- Both male and female patients

Exclusion Criteria:

- Patients with known pre-existing peptic ulcer disease
- Patients with history of gastrointestinal bleeding
- Patients on long-term NSAIDs or steroid therapy
- Patients with chronic liver disease or coagulopathy
- Patients with malignancy or severe systemic illness
- Emergency CABG procedures
- Pregnant women

Written informed consent was obtained from all participants prior to enrolment. Preoperative evaluation included detailed history, clinical examination, and relevant laboratory investigations such as complete blood count, renal and liver function tests, coagulation profile, and baseline cardiac assessment.

All patients underwent CABG under standardized general anesthesia and cardiopulmonary bypass techniques. Intraoperative variables including duration of surgery, cardiopulmonary bypass time, aortic cross-clamp time, and

hemodynamic parameters were recorded. Postoperatively, patients were managed in the intensive care unit as per institutional protocols, including mechanical ventilation, inotropic support when required, and routine stress ulcer prophylaxis with proton pump inhibitors. Patients were closely monitored for gastrointestinal symptoms such as epigastric pain, abdominal discomfort, hematemesis, or melena.

Upper gastrointestinal endoscopy was performed in patients who developed suggestive clinical features or were identified as high risk based on prolonged ICU stay, hemodynamic instability, or requirement of high-dose inotropes. The presence of gastric ulcer was confirmed endoscopically and documented. Additional data including duration of mechanical ventilation, length of ICU stay, and postoperative complications were recorded.

All collected data were entered into a structured proforma and analyzed using appropriate statistical methods. Continuous variables were expressed as mean \pm standard deviation and categorical variables as frequencies and percentages. Associations between risk factors and occurrence of gastric ulcer were assessed using chi-square test or independent t-test, with a p value <0.05 considered statistically significant.

OBSERVATION AND RESULTS

The majority of patients were in the 51–60 years age group (37.33%), indicating that CABG is more commonly performed in middle-aged and elderly individuals. (Table 1) There was a male predominance (69.33%), reflecting the higher prevalence of coronary artery disease among males. (Table 2)

Table 1: Age Distribution

Age Group (Years)	Number (n)	Percentage (%)
40–50	12	16.00
51–60	28	37.33
61–70	24	32.00
>70	11	14.67
Total	75	100

Table 2: Gender Distribution

Gender	Number (n)	Percentage (%)
Male	52	69.33
Female	23	30.67
Total	75	100

The incidence of postoperative gastric ulcer was 9.33%, indicating that although relatively low, it remains a clinically relevant complication. Gastric ulcer occurrence increased with longer duration of surgery, and the association was statistically significant, suggesting prolonged operative stress as a risk factor. (Table 3)

Table 3: Duration of Surgery vs Gastric Ulcer

Duration (hours)	Ulcer Present n (%)	Ulcer Absent n (%)	p value
<4 hrs	1 (2.67)	29 (38.67)	0.03*
4–6 hrs	3 (4.00)	25 (33.33)	
>6 hrs	3 (4.00)	14 (18.67)	
Total	7 (9.33)	68 (90.67)	

Patients with prolonged ICU stay (>3 days) had a significantly higher incidence of gastric ulcers, indicating the impact of critical illness and stress response. (Table 4)

Table 4: ICU Stay vs Gastric Ulcer

ICU Stay (days)	Ulcer Present n (%)	Ulcer Absent n (%)	p value
≤ 3 days	1 (1.33)	40 (53.33)	0.01*
>3 days	6 (8.00)	28 (37.33)	
Total	7 (9.33)	68 (90.67)	

Gastric ulcers were more common among patients with diabetes mellitus, and the association was statistically significant, suggesting impaired mucosal defense mechanisms. (Table 5)

Table 5: Comorbidities vs Gastric Ulcer

Comorbidity	Ulcer Present n (%)	Ulcer Absent n (%)	p value
Diabetes Mellitus	4 (5.33)	30 (40.00)	0.04*
Hypertension	2 (2.67)	25 (33.33)	

None	1 (1.33)	13 (17.33)	
Total	7 (9.33)	68 (90.67)	

Postoperative NSAID use was significantly associated with higher gastric ulcer incidence, indicating its ulcerogenic potential. (Table 6).

Table 6: Postoperative NSAID Use vs Gastric Ulcer

NSAID Use	Ulcer Present n (%)	Ulcer Absent n (%)	p value
Yes	5 (6.67)	20 (26.67)	0.01*
No	2 (2.67)	48 (64.00)	
Total	7 (9.33)	68 (90.67)	

DISCUSSION

In the present study, 75 patients undergoing CABG were evaluated, among whom 7 (9.33%) developed postoperative gastric ulcers, indicating a relatively low yet clinically significant incidence. This finding is consistent with recent literature, where gastrointestinal (GI) complications following cardiac surgery are uncommon but clinically important. A large contemporary analysis by Gao Z et al.¹¹ reported that GI complications occur in approximately 1 in 20 cardiac surgery patients, emphasizing their continued relevance in modern practice.

Similarly, a systematic review by Duman ZM et al.¹² reported a pooled incidence of around 2.5% for GI complications, although variations exist depending on patient population and diagnostic criteria. The slightly higher incidence in the present study may be attributed to inclusion of stress-related gastric ulcers specifically and differences in perioperative risk factors.

Age distribution in this study showed predominance in the 51–70 years group, with higher ulcer occurrence among elderly patients. This was comparable with Schwarzova K et al.¹³ who identified advanced age as a major risk factor due to reduced mucosal perfusion and physiological reserve. These findings are also supported in the Indian context by Jain R et al.¹⁴ who highlighted that elderly cardiac surgery patients have higher postoperative complication rates due to comorbid burden and reduced stress tolerance.

A marked male predominance (69.33%) was observed in this study, which aligns with epidemiological trends. Although recent GI-specific studies do not emphasize sex differences, the higher representation of males undergoing CABG indirectly explains this distribution, as also noted in contemporary cardiac surgery cohorts.

Duration of surgery showed a clear association with gastric ulcer development in the present study. This observation is consistent with findings from Duman ZM et al.¹² who demonstrated that prolonged cardiopulmonary bypass and operative duration significantly increase the risk of GI complications due to splanchnic hypoperfusion and ischemia. Likewise, Schwarzova K et al.¹³ emphasized that prolonged operative time and intraoperative hemodynamic instability are key contributors to gastrointestinal mucosal injury.

ICU stay was another important determinant, with most ulcer cases occurring in patients with ICU stay beyond 3 days. This finding correlates with Mekhail A et al.¹⁵ who showed that critically ill cardiac surgery patients have increased risk of upper GI bleeding, particularly in the absence of adequate stress ulcer prophylaxis. Furthermore, prolonged ICU stay reflects severity of illness, mechanical ventilation, and increased physiological stress, all of which predispose to stress-related mucosal disease.

Comorbidities such as diabetes mellitus were associated with gastric ulcer development in the present study. This is supported by Duman ZM et al.¹² who identified comorbid conditions as significant contributors to postoperative GI complications due to impaired microcirculation and delayed healing. Indian studies have similarly emphasized the high prevalence of diabetes in cardiac surgery patients and its role in adverse postoperative outcomes, particularly due to impaired tissue repair mechanisms.

Postoperative NSAID use showed a significant association with gastric ulcer formation in this study. While recent cardiac surgery literature focuses more on anticoagulants and antiplatelet therapy, Chor CYT et al.¹⁶ highlighted that gastrointestinal bleeding after cardiac surgery is multifactorial and often related to drug-induced mucosal injury in addition to stress-related mechanisms.

The multifactorial nature of gastric ulcer development observed in the present study is strongly supported by recent evidence. A contemporary cohort study by Smith J et al.¹⁷ demonstrated that GI complications are associated with prolonged ICU stay, increased mortality, and multiple perioperative risk factors including hemodynamic instability and operative stress.

CONCLUSION

Postoperative gastric ulcer occurred in 9.33% of patients undergoing coronary artery bypass graft surgery, indicating a notable but preventable complication. Key risk factors included prolonged surgery, extended ICU stay, NSAID use and diabetes mellitus. These findings highlight the multifactorial nature of stress-related mucosal injury in cardiac surgical patients. Early risk stratification, routine use of gastroprotective agents, careful analgesic selection, and optimization of comorbid conditions are essential to reduce incidence. Timely preventive and supportive measures can significantly improve postoperative outcomes and reduce gastrointestinal morbidity in this high-risk population.

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Conflicts Of Interest: There are no conflicts of interest.

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