

FREQUENCY OF ACUTE MYOCARDIAL INJURY AMONG PATIENTS PRESENTING WITH UPPER GASTROINTESTINAL BLEEDING: A CROSS-SECTIONAL STUDY FROM PESHAWAR, PAKISTAN

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Abstract

Background: Upper gastrointestinal bleeding (UGIB) is a common medical emergency with significant morbidity and mortality. Acute myocardial injury may occur in UGIB due to hemodynamic compromise and is commonly identified using elevated cardiac troponin levels.

Objective: To determine the frequency of acute myocardial injury among patients presenting with UGIB and its association with demographic and clinical variables.

Material and Methods: A cross-sectional study was conducted in the Department of Medicine at Khyber Teaching Hospital, Peshawar, from 11 January 2024 to 11 July 2024. A total of 163 patients aged 20–80 years presenting with UGIB were enrolled using consecutive non-probability sampling. Patients with pre-existing cardiac disease were excluded. Cardiac troponin I levels were measured twice, 12 hours apart, and acute myocardial injury was defined as troponin I >0.2 ng/mL. Data were analyzed using SPSS version 23. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. The Chi-square test was used to assess associations, with $p \leq 0.05$ considered statistically significant.

Results: The mean age of patients was 58 ± 11.5 years. Among the 163 patients, 108 (66%) were male and 55 (34%) were female. Acute myocardial injury was observed in 13 patients (8%), while 150 patients (92%) had normal troponin I levels. No statistically significant association were identified between myocardial injury and age ($p = 0.6878$) or gender ($p = 0.8131$).

Conclusion: Acute myocardial injury was identified in 8% of patients presenting with upper gastrointestinal bleeding. Although no statistically significant association was observed with age or gender, myocardial injury remains a clinically important consideration in UGIB. Selective troponin assessment in clinically high-risk patients may assist in early recognition and risk stratification.

Keywords: Gastrointestinal hemorrhage; myocardial ischemia; troponin I; cross-risk assessment; Pakistan.

Cite this article: Ullah F, Iqbal S, Ullah I, Ullah N, Ullah N, Ur R S, Abdullah . Frequency Of Acute Myocardial Injury Among Patients Presenting With Upper Gastrointestinal Bleeding: A Cross-Sectional Study From Peshawar, Pakistan. BMC J Med Sci. 2026; 7(1):65-69 <https://doi.org/10.70905/bmcj.07.01.0638>

Introduction:

Upper gastrointestinal bleeding (UGIB) remains a major medical emergency worldwide, with an incidence of 80–150 per 100,000 population and mortality rates ranging from 2% to 15%^{1,2}. UGIB

typically presents with hematemesis, melena, or hematochezia and continues to pose significant morbidity despite advances in endoscopic and pharmacological therapy^{3,4}.

Authorship Contribution: ^{1,7}Substantial contributions to the conception or design of the work; or the acquisition, Data analysis, Literature review, ²Drafting the work or revising it critically for important intellectual content, ^{3,4,6}Final approval of the version to be published, Topic Selection & Supervision

Funding Source: none

Conflict of Interest: none

Received: December, 18, 2025

Accepted: March, 26, 2026

Published: June, 30, 2026

One of the most serious complications of UGIB is acute myocardial injury, which arises from hypovolemia, anemia, and reduced coronary perfusion, resulting in myocardial oxygen supply-demand mismatch and myocardial injury ^{5, 6}. Cardiac troponins, particularly troponin I, are highly sensitive biomarkers of myocardial injury and have been shown to predict adverse cardiovascular outcomes in UGIB patients ⁷⁻⁹

Recent studies highlight the prognostic significance of troponin elevation in UGIB. Hao et al. (2022) developed a prediction model demonstrating that myocardial injury complicating UGIB is associated with poor prognosis ⁷, while Orpen- Palmer & Stanley (2023) emphasized the role of troponin in risk scoring systems ¹⁰. Sarajlic et al. (2022) further reported that UGIB following myocardial infarction is linked to increased mortality and adverse outcomes ¹¹. Recent cohort data confirm that gastrointestinal bleeding is not only a gastrointestinal emergency but also a cardiovascular risk factor, with hospitalization for UGIB linked to subsequent acute myocardial infarction ¹² despite advances in therapy, mortality rates for UGIB remain heterogeneous worldwide. A systematic review by Jairath, Martel, and Barkun (2022) demonstrated marked differences in non-variceal UGIB outcomes across regions, reflecting the need for local studies to guide management.¹³

Despite these findings, data from South Asia remain limited. Given the high prevalence of UGIB in Pakistan, particularly variceal bleeding in chronic liver disease, understanding the frequency and risk factors for myocardial injury in this population is crucial. This study therefore aims to determine the frequency of acute myocardial injury among UGIB patients in a tertiary care hospital in Peshawar and to explore its association with demographic and clinical variables.

Material and Method:

Study Design and Setting:

This was a cross-sectional study conducted in the Department of Medicine, Khyber Teaching Hospital, Peshawar, over a period of six months, from 11 January 2024 to 11 July 2024 following approval from the College of Physicians and Surgeons Pakistan (CPSP) and the institutional ethical review board with ethical approval No 760/DME/KMC.

Sample size:

The sample size was calculated using the WHO Sample Size Calculator. Taking the expected frequency of acute myocardial injury as 12%¹⁴, a margin of error of 5%, and a confidence level of 95%, the required sample size was calculated to be 163 patients.

Participants:

A total of 163 patients aged 20–80 years presenting with upper gastrointestinal bleeding (UGIB) were enrolled using consecutive no probability sampling. UGIB was defined as bleeding proximal to the ligament

of Treitz, confirmed by endoscopy. Patients with pre-existing ischemic heart disease, heart failure, chronic kidney disease, chronic pulmonary disease, or use of cardiotoxic medications were excluded to minimize confounding causes of elevated troponin unrelated to acute upper gastrointestinal bleeding.

Data Collection:

After informed consent, demographic and clinical data were recorded, including age, gender, BMI, residence, profession, monthly income, socioeconomic status, and education level. Blood pressure and serum ALT were measured to assess hypertension and liver disease. Cardiac troponin I was measured twice, 12 hours apart, using standard laboratory protocols. Acute myocardial injury was defined as troponin I >0.2 ng/mL in both samples. The cut-off value was selected according to the reference range and diagnostic threshold used by the hospital laboratory during the study period.

Statistical Analysis:

Data were analyzed using SPSS version 23. Continuous variables (age, BMI, troponin I) were expressed as mean $\pm$ standard deviation (SD) or median (interquartile range, IQR) depending on distribution. Categorical variables were presented as frequencies and percentages. Acute myocardial injury was stratified by age and gender. The Chi-square test was applied, with $p \leq 0.05$ considered statistically significant

Results:

A total of 163 patients with upper gastrointestinal bleeding were included. The mean age was 58 ± 11.5 years, with the majority (89%) aged 41–80 years. Males comprised 66% of the study population. The mean BMI was 27 ± 2.97 kg/m², and 53% of patients had a BMI above 27 kg/m². Nearly half of the patients were from rural areas (51%).

Acute myocardial injury was observed in 13 patients (8%), while 150 patients (92%) had normal troponin I levels. Stratification by age and gender did not reveal any statistically significant association with myocardial injury ($p = 0.6878$ and $p = 0.8131$, respectively).

Table 1: Association of Acute Myocardial Injury with Age (n = 163)				
Age Group (years)	Myocardial Injury Present (n=13)	Myocardial Injury Absent (n=150)	Total (n)	p-value
20–40	1 (7.7%)	17 (11.3%)	18	0.6878
41–80	12 (92.3%)	133 (88.7%)	145	
Total	13	150	163	

A chi square test applied. A p-value ≤ 0.05 was considered statistically significant.

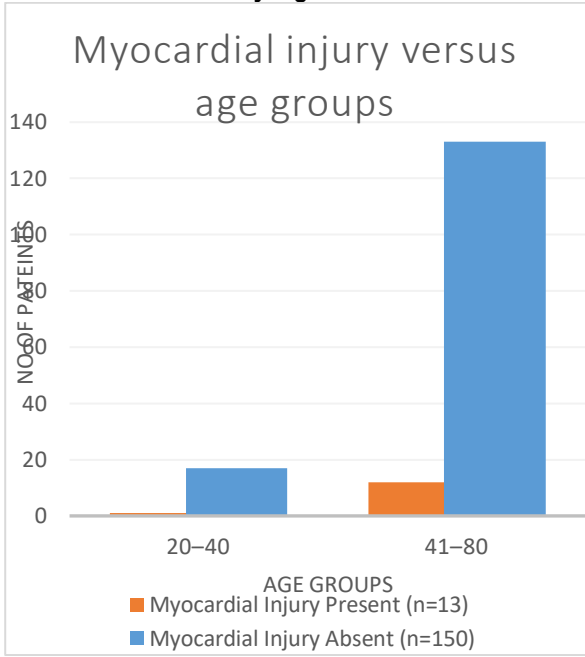


Figure 1: Distribution of myocardial injury across age groups. The bar chart illustrates the number of patients with myocardial injury (orange, n=13) and without myocardial injury (blue, n=150) in two age categories (20–40 years and 41–80 years), as well as the overall totals. Although more cases of myocardial injury were observed in the 41–80 year age group, the association between age and myocardial injury was not statistically significant.

Table 2: Association of Acute Myocardial Injury with Gender (n = 163)				
Gender	Myocardial Injury Present (n=13)	Myocardial Injury Absent (n=150)	Total (n)	p-value
Male	9 (69.2%)	99 (66.0%)	108	0.8131
Female	4 (30.8%)	51 (34.0%)	55	
Total	13	150	163	

A chi square test applied. A p-value ≤ 0.05 was considered statistically significant.

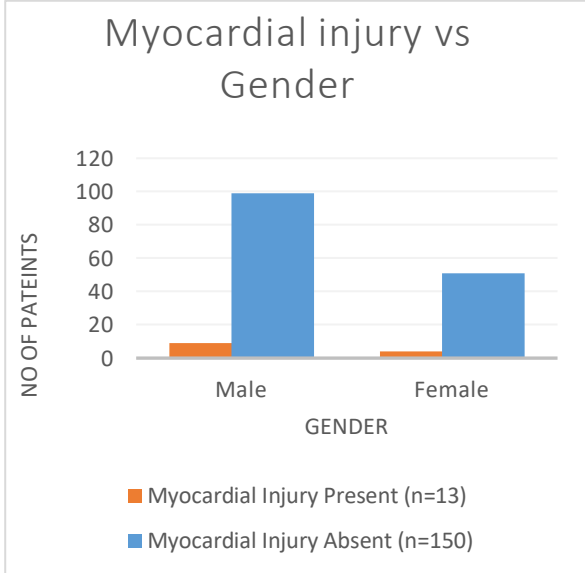


Figure 2: Distribution of myocardial injury by gender. The bar chart compares the number of patients with myocardial injury (orange, n=13) and without myocardial injury (blue, n=150) across male and female groups, as well as overall totals. Myocardial injury was numerically more frequent among males; however, the association between gender and myocardial injury was not statistically significant.

Discussion:

In this study, acute myocardial injury was observed in 8% of UGIB patients, a frequency lower than that reported in earlier cohorts ¹⁴. The lower frequency observed in our study compared with some previous reports may be explained by differences in patient selection, exclusion of patients with pre-existing cardiovascular and chronic systemic diseases, variations in troponin thresholds, and differences in study populations and healthcare settings. In addition, the relatively younger and clinically stable subgroup of patients included in our cohort may have contributed to fewer detected cardiac complications. Recent evidence, however, continues to underscore the clinical importance of troponin elevation in UGIB. Hao et al. (2022) demonstrated that myocardial injury after UGIB is an independent predictor of poor prognosis ⁷, while Benedeto- Stojanov et al. (2023) validated risk scoring systems that incorporate troponin for predicting in- hospital mortality ¹⁵. In the present study, elevated troponin levels were interpreted as evidence of myocardial injury rather than confirmed acute coronary syndrome. Since electrocardiographic findings, cardiac imaging, and coronary angiographic assessment were not systematically evaluated, differentiation between type 1 myocardial infarction, type 2 myocardial infarction, and non-ischemic myocardial injury was beyond the scope of this study.

The path physiological link between UGIB and myocardial injury is well established. Acute hemorrhage reduces circulating blood volume and coronary perfusion, while anemia and hypoxia exacerbate myocardial oxygen supply–demand mismatch ⁵. Hemodynamic stress and reduced oxygen delivery may contribute to myocardial injury, particularly in vulnerable patients with underlying cardiovascular risk factors ⁶. These mechanisms explain why troponin elevation is consistently associated with adverse outcomes, including prolonged hospitalization and increased short-term mortality ^{11,16}.

Transfusion practices also influence outcomes in UGIB. Villanueva et al. (2022) demonstrated that a restrictive transfusion strategy was associated with improved survival compared to liberal transfusion, underscoring the importance of evidence-based supportive care in minimizing cardiovascular complications ¹⁷.

Interestingly, no significant association was found between myocardial injury and age or gender in our

cohort. While some studies suggest older age and male sex as risk factors ^{9, 10} our findings may reflect sample size limitations or population homogeneity. Larger multicenter studies are needed to clarify these associations. ¹⁸

From a practical perspective, these findings suggest that clinicians managing UGIB should maintain awareness of possible concurrent myocardial injury, particularly in patients presenting with hypotension, anemia, persistent tachycardia, or symptoms suggestive of cardiac ischemia. Early recognition may help optimize monitoring and multidisciplinary management.

The present study primarily focused on estimating the frequency of myocardial injury in UGIB patients rather than identifying independent predictors. Important clinical variables such as hemoglobin level, severity of bleeding, transfusion requirement, endoscopic findings, liver disease severity, medication history, and hemodynamic instability were not analyzed in relation to troponin elevation. Inclusion of these variables in future prospective studies may allow development of more clinically useful risk stratification models.

This study has limitations, including its single center design and exclusion of patients with chronic comorbidities, which may underestimate the true burden of myocardial injury in UGIB. Furthermore, outcomes beyond the acute phase were not assessed. Nevertheless, our findings provide valuable local data and highlight the importance of selective troponin testing in UGIB patients, particularly in resource limited settings where cardiac complications may be overlooked (15). Early recognition of myocardial injury can guide management, improve risk stratification, and potentially reduce mortality

Conclusion:

Acute myocardial injury was identified in 8% of patients presenting with upper gastrointestinal bleeding. Although no statistically significant association was observed with age or gender, the coexistence of gastrointestinal bleeding and myocardial injury remains clinically important. Selective troponin assessment in clinically high-risk patients may assist in early recognition and risk stratification. Larger prospective multicenter studies are required to better define predictors, mechanisms, and clinical outcomes.

Limitations:

This study has several limitations. First, its single-center cross-sectional design limits generalizability and prevents assessment of temporal or causal relationships. Second, only limited clinical variables were analyzed, and potentially important predictors such as severity of bleeding, hemoglobin level, transfusion requirement, hemodynamic instability, medication use, comorbidity burden, and endoscopic findings were not evaluated. Third, exclusion of patients with chronic comorbidities may have underestimated the true burden of myocardial injury in

UGIB. Finally, long-term cardiovascular outcomes and mortality were not assessed.

Conflict of Interest:

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

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgment: The authors acknowledge the support of the Department of Internal Medicine, Khyber Teaching Hospital, Peshawar, for facilitating this study.

References:

1. Barkun AN, Almadi M, Kuipers EJ, Laine L, Sung J, Tse F, Leontiadis GI, Abraham NS, Calvet X, Chan FK, Douketis J. Management of nonvariceal upper gastrointestinal bleeding: guideline recommendations from the International Consensus Group. *Annals of internal medicine*. 2019 Dec 3;171(11):805-22.
2. Stanley AJ, Laine L. Management of acute upper gastrointestinal bleeding. *Bmj*. 2019 Mar 25;364.
3. Sung JJ, Chiu PW, Chan FK, Lau JY, Goh KL, Ho LH, Jung HY, Sollano JD, Gotoda T, Reddy N, Singh R. Asia-Pacific working group consensus on non-variceal upper gastrointestinal bleeding: an update 2018. *Gut*. 2018 Oct 1;67(10):1757-68.
4. Kamboj AK, Hoversten P, Leggett CL. Upper gastrointestinal bleeding: etiologies and management. *In Mayo Clinic Proceedings* 2019 Apr 1 (Vol. 94, No. 4, pp. 697-703). Elsevier.
5. Chi T, Zhao Q, Wang P. Risk factors for acute coronary syndrome in upper gastrointestinal bleeding patients. *Gastroenterology Research and Practice*. 2021;2021(1):8816805.
6. Nozowski J, Grzesk G, Klopocka M, Wicinski M, Nicpon-Nozewska K, Konieczny J, Włodarczyk A. Management of Patient with Simultaneous Overt Gastrointestinal Bleeding and Myocardial Infarction with ST-Segment Elevation—Priority Endoscopy. *Vascular Health and Risk Management*. 2021 Mar 31:123-33.
7. Hao J, Dang P, Quan X, Chen Z, Zhang G, Liu H, Shi T, Yan Y. Risk factors, prediction model, and prognosis analysis of myocardial injury after acute upper gastrointestinal bleeding. *Frontiers in Cardiovascular Medicine*. 2022 Dec 8;9:1041062.
8. Seo DW, Yi H, Park B, Kim YJ, Jung DH, Woo I, Sohn CH, Ko BS, Kim N, Kim WY. Prediction of adverse events in stable non-variceal gastrointestinal bleeding using machine learning. *Journal of clinical medicine*. 2020 Aug 11;9(8):2603.
9. Iqbal U, Siddique O, Jameel A, Anwar H, Chaudhary A. Prognostic significance of elevated cardiac troponin in acute gastrointestinal bleeding. *Gastroenterology Research*. 2017 Aug 31;10(4):238.
10. Orpen-Palmer J, Stanley AJ. A review of risk scores within upper gastrointestinal bleeding. *Journal of Clinical Medicine*. 2023 May 26;12(11):3678.
11. Sarajlic P, Simonsson M, Jernberg T, Bäck M, Hofmann R. Incidence, associated outcomes, and predictors of upper gastrointestinal bleeding following acute myocardial infarction: a SWEDEHEART-based nationwide cohort study. *European Heart Journal-Cardiovascular Pharmacotherapy*. 2022 Sep;8(5):483-91..
12. Rubinfeld GD, Berger JS, Smilowitz NR. Acute myocardial infarction following hospitalization for gastrointestinal

bleeding: incidence, predictors, management, and outcomes. *The American journal of medicine*. 2022 Aug 1;135(8):e263-78.

13. Jairath V, Martel M, Logan RF, Barkun AN. Why do mortality rates for nonvariceal upper gastrointestinal bleeding differ around the world? A systematic review of cohort studies. *Canadian Journal of Gastroenterology and Hepatology*. 2012;26(8):537-43.
14. Bellotto F, Fagioli S, Pavei A, Gregory SA, Cati A, Silverj E, Plebani M, Zaninotto M, Mancuso T, Iliceto S. Anemia and ischemia: myocardial injury in patients with gastrointestinal bleeding. *The American journal of medicine*. 2005 May 1;118(5):548-51.
15. Benedeto-Stojanov D, Bjelaković M, Stojanov D, Aleksovski B. Prediction of in-hospital mortality after acute upper gastrointestinal bleeding: cross-validation of several risk scoring systems. *Journal of International Medical Research*. 2022 Mar;50(3):03000605221086442.
16. Radaelli F, Rocchetto S, Piagnani A, Savino A, Di Paolo D, Scardino G, Paggi S, Rondonotti E. Scoring systems for risk stratification in upper and lower gastrointestinal bleeding. *Best Practice & Research Clinical Gastroenterology*. 2023 Dec 1;67:101871.
17. Villanueva C, Colomo A, Bosch A, Concepción M, Hernandez-Gea V, Aracil C, Graupera I, Poca M, Alvarez-Urturi C, Gordillo J, Guarner-Argente C. Transfusion strategies for acute upper gastrointestinal bleeding. *New England Journal of Medicine*. 2013 Jan 3;368(1):11-21.
18. Laursen SB, Oakland K, Laine L, Bieber V, Marmo R, Redondo-Cerezo E, Dalton HR, Ngu J, Schultz M, Soncini M, Gralnek I. ABC score: a new risk score that accurately predicts mortality in acute upper and lower gastrointestinal bleeding: an international multicentre study. *Gut*. 2021 Apr 1;70(4):707-16.