

Cost Effectiveness Analysis of Drugs in Gastrointestinal Bleeding Patients

Rokkam Pavani¹, Konduri Raveendra Babu^{2,*}, Koppula Lavanya¹, Magi Prashanthi¹, Saddam Ussain¹, Maram Chinna Eswaraiah³

¹Department of Pharmacy, Anurag Pharmacy College, Ananthagiri (V&M), Kodad, Telangana, INDIA.

²Department of Pharmacy Practice, Anurag Pharmacy College, Ananthagiri (V&M), Kodad, Telangana, INDIA.

³Department of Pharmacognosy, Anurag Pharmacy College, Ananthagiri (V&M), Kodad, Telangana, INDIA.

ABSTRACT

Background: Gastrointestinal (GI) bleeding is a common medical emergency associated with significant morbidity and healthcare costs. Proton Pump Inhibitors (PPIs) are routinely used in its management; however, differences in their cost-effectiveness may affect treatment decisions and resource utilization. **Objectives:** To determine the most cost-effective PPI therapy for GI bleeding, assess prescribing patterns, and evaluate the economic burden of PPI treatment in a tertiary care hospital. **Materials and Methods:** A prospective observational study was conducted among 200 patients diagnosed with GI bleeding in a tertiary care hospital. Data on demographics, prescribing patterns, treatment outcomes, and direct medical costs were collected and analysed. Cost-effectiveness was assessed using the Average Cost-Effectiveness Ratio (ACER) and a cost-effectiveness grid. Percentage effectiveness was considered the primary outcome measure. **Results:** Injection Pantoprazole demonstrated the lowest ACER value (3766) with an effectiveness rate of 94.4%, indicating the greatest cost-effectiveness. Injection Esomeprazole showed the highest effectiveness rate (96.15%) but had the highest ACER value (4820), making it the least cost-effective option. Injection Rabeprazole had an ACER value of 4296 with an effectiveness rate of 90%. Prescribing pattern analysis further supported Pantoprazole as the most economically favourable PPI among the therapies evaluated. **Conclusion:** Pantoprazole was identified as the most cost-effective PPI for the management of GI bleeding, providing an optimal balance between clinical effectiveness and treatment cost. These findings support its preferential use in tertiary care settings to improve healthcare resource utilization and reduce treatment expenditure.

Keywords: Gastrointestinal bleeding, Average Cost-Effectiveness Ratio (ACER), Cost-Effectiveness Analysis, Pantoprazole and Proton Pump Inhibitors (PPIs).

Correspondence:

Dr. Konduri Raveendra Babu

Associate Professor, Department of Pharmacy Practice, Anurag Pharmacy College, Ananthagiri (V&M), Kodad-508206, Telangana, INDIA.
Email: ravipharma36@gmail.com

Received: 21-05-2026;

Revised: 02-06-2026;

Accepted: 15-07-2026.

INTRODUCTION

The gastrointestinal tract is a long tube starting from the esophagus, stomach, small intestine, and large intestine. The small intestine is divided into the duodenum, jejunum, and ileum, large intestine is divided into (cecum, colon and rectum) MacLaren & Campbell *et al.* (2014). The GI tract is a smooth muscle composed of mucosa, submucosa, tunica muscularis and serosa as 4 major layers. The Major functions of the upper gastrointestinal tract is movement of food, digestion with the help of enzymes, and absorption of nutrients essential to the body. Along with these it functions as a protective barrier from the external environment (Krag *et al.*, 2015).

Gastrointestinal bleeding emerges as an acute or chronic bleeding in the emergency department. bleeding tends to reoccur if the exact cause is unidentified (Treuting *et al.*, 2002; Kim *et al.*, 2003). The most prevalent cause of upper Gi bleeding is gastric and duodenal ulcers. *Helicobacter pylori* is associated with 90% of duodenal ulcers and 70% of gastric ulcers. The other most frequent cause of peptic ulcer disease is the nonsteroidal anti-inflammatory drugs. Irrespective of the aetiology, the inflammation that takes place as the ulcer extends past the mucosa into submucosa results in weakening and necrosis of arterial walls which causes pseudoaneurysms which rupture and cause bleeding. The degree of bleed is directly proportional to the size of the vessels involved.

Mallory-Weiss tears, which are longitudinal lacerations of the cardia of the stomach or Gastroesophageal (GE) junction, are the cause of up to 15% of upper GI bleeding. Mucus, bicarbonate, prostaglandins and blood flow protect the mucosa of the stomach against the acidic environment. When the ratio between the secretion of gastric acid and mucosal defences is disturbed, then acid reacts with the epithelium to produce damage. In stress



DOI: 10.5530/ajbls.20260181

Copyright Information :

Copyright Author (s) 2026 Distributed under Creative Commons CC-BY 4.0

Publishing Partner : Manuscript Technomedia, [www.mstechnomedia.com]

gastritis, no acid hypersecretion is seen hence the destruction of the mucosal defences causes injury to the mucosa and consequently bleeding. Gastro-oesophageal varices are caused by portal hypertension, where the portal venous system has been decompressed to the systemic circulation. The cause of varices in the oesophagus is the dilation of the coronary vein and gastric varices are as a result of backflow via short gastric veins. Bleeding usually occurs at the GE junction where the varices are the most superficial and whose wall is the thinnest (Simmering *et al.*, 2021; Medina *et al.*, 2019).

The ulcerative colitis affects the colon and the rectum and is usually limited to the inner lining or mucosa, where there is constant stretching or ulceration of the tissue with no sporadic segments of normal tissue. UC can be insidious and the symptoms gradually emerge or the initial attack can be acute and fulminant. A lower frequency of causes of severe upper GI bleeding includes cancer, hemobilia, and duodenal fistula (Tejasri *et al.*, 2015).

MATERIALS AND METHODS

Design

This study was carried out using a descriptive and analytical research design at a tertiary care hospital in Khammam, Telangana, India. It was conducted as a prospective observational study involving the evaluation of medical records and the assessment of direct medical costs in patients diagnosed with gastrointestinal bleeding. The study population consisted of patients with gastrointestinal bleeding observed over a period of six months who fulfilled the inclusion criteria. The inclusion criteria were: Patients who are aged 20-80 years irrespective of their comorbidities and individuals of both sexes. Data were systematically collected and analysed using descriptive and inferential statistical methods. Cost-effectiveness was assessed by calculating the Average Cost-Effectiveness Ratio (ACER) and by utilizing a cost-effectiveness grid to support decision-making.

Assessment

Therapeutic effectiveness, expressed as the percentage of patients successfully treated, was used as the primary outcome measure for the cost-effectiveness analysis. This was determined based on the proportion of patients who received Proton Pump Inhibitors (PPIs) for a maximum duration of five days. The findings were presented quantitatively through structured tables, supported by descriptive explanations for clarity. A detailed overview of the direct medical costs associated with various PPIs was also provided. This included Inj. Pantoprazole (INJ. PAN) administered for a 3-day treatment course, as well as Inj. Esomeprazole (INJ. NEXPRO) and Inj. Rabeprazole (INJ. Razo), both given for 5-day treatment durations. The comparative cost data are summarized in the table below.

With an ACER of 3766, INJ. PAN is clearly the most economical choice. Additionally, it has a 94.4% efficacy rate. Despite having

a high efficacy rate of 96.15%, INJ. NEXPRO has the highest ACER (4820), making it the least cost-effective of the mentioned options. The ACER value of INJ. RAZO is in the middle (4296) and its effectiveness rate is low at 90%.

RESULTS

The total number of patients diagnosed with Gastrointestinal (GI) bleeding over a six-month period at a tertiary care hospital in Khammam, Telangana, India was recorded. Among these, only 200 patients met the inclusion criteria and were included in the study. The demographic and clinical characteristics of the patients are presented in Table 1. The results indicated a higher prevalence among male patients (71%). Based on age distribution, the majority of patients (26.5%) belonged to the 41-50 years age group. In terms of clinical presentation, 64% of patients had upper GI bleeding, while 36% had lower GI bleeding. Regarding lifestyle factors, alcohol consumption was notably high: 38.5% of patients were regular drinkers, 29% were occasional drinkers, and 32.5% were non-drinkers. The effectiveness of therapy was evaluated using clinical outcomes as the primary parameter as in Table 2.

The percentage of effectiveness of Pantoprazole (inj.Pan) is higher (94.4%) when compared to other two proton pump inhibitors as seen in Table 3. ACER value of total INJ.PAN cost (512.222 per percentage effectiveness) has lower value compared to other PPI'S (Table 3). Using cost- effectiveness grid, Pantoprazole (INJ. PAN) was more effective.

DISCUSSION

GI bleeding is a major clinical issue that has a high level of morbidity, mortality and costly financial implications to health care systems. The current study was designed to determine the cost-effectiveness of pharmacology agents applied in patients with GI bleeding and also evaluate the common practice of prescribing, length of stay, and institutional outcomes of patients admitted in a tertiary care hospital. In this research, a total of 200 samples having GI bleed were used. More patients were affected by the disease are male patients (71%) compared to female patients (29%). This can be said by the increasing proportion of risk factors including alcohol consumption, smoking and lifestyle behaviours among men.

The age was distribution shown that most of the patients fell in the 41-50 years age group followed by 51-60 and 31-40 years. This implies that middle-aged people experience bleeding in the GI

Table 1: Patient demographics and clinical characteristics.

Gender	Frequency	Percentage
Male	142	71%
Female	58	29%
Total	200	100%

Table 2: Patient demographics age wise distribution.

Age (in years)	Male	Female	Percentage
20-30	16	8	24
31-40	26	8	34
41-50	43	10	53
51-60	27	11	38
61-70	16	12	28
71-80	14	9	23
Total	142	58	200

Table 3: Type of GI Bleeding (upper GI bleeding, lower GI bleeding).

Type of GI Bleeding	Frequency	Percentage
Upper GI Bleeding	128	64%
Lower GI Bleeding	72	36%
Total	200	100%

Table 4: Alcohol Consumption Patterns.

Alcohol Consumption	Frequency	Percentage
Regular	77	38.5%
Occasional	58	29.0%
Non drinker	65	32.5%
Total	200	100%

more frequently. Older age, comorbidities, and long-term drug consumption like NSAIDs can be factors that lead to the high prevalence in this age group (Table 2).

In terms of clinical manifestation, hematemesis was the most frequent symptom reported by patients, then hematochezia and melena. These results underscore that upper gastrointestinal bleeding has been the most commonly used form among the participants in the study.

Newton (2011) states that the prevalence of upper GI bleeding is highest in the presence of peptic ulcer disease, portal hypertension, gastritis, and esophageal varices (Table 3). About the nature of GI bleeding, the research revealed that upper GI bleeding was the higher percentage of cases in contrast to lower GI bleeding. The results are in line with previous studies that had indicated that upper GI bleeding is the greatest proportion of GI bleeding cases in hospitalized patients (Table 3).

It was shown in the clinical outcomes of treatment that most of the patients (94.5%) experienced clinical improvement on a background of proper pharmacological control and supportive therapy. There was a low percentage of patients who were rebled (4.5) or referred (1%). This implies that timely diagnosis and effective pharmacological treatment have a high potential to enhance success in patients. Among the 200 study participants, 77 (38.5%) were regular alcohol consumers, 58 (29.0%) were occasional consumers, and 65 (32.5%) were non-drinkers. Overall, 67.5% of participants reported some level of alcohol consumption. These findings indicate a high prevalence of alcohol use among the study population, which may be associated with an increased risk of gastrointestinal bleeding (Table 4). Hospital stay analysis showed that over 50% of the patients had a short hospital stay of 1-3 days, which indicated that the short hospital stay could be caused by timely treatment and effective pharmacotherapy,

which will minimize the period of hospitalization and the cost of healthcare. Another point that was considered in the study was lifestyle factors. Most of the patients were non-smokers, and the proportion of people who had a habitual consumption of alcohol was very high, which is a critical risk factor of gastrointestinal bleeding, especially in situations related to liver disease and portal hypertension. With regard to the diagnostic procedures, endoscopy was the most carried out diagnostic procedure, followed by colonoscopy and ultrasonography. Endoscopy is the gold standard of diagnosis and treatment of GI bleeding, which enables direct visualization and treatment. The laboratory research revealed that Complete Blood Picture (CBP) and Liver Function Tests (LFT) were the most frequently conducted tests, which underscores the need to assess the haematological condition and liver functioning in patients with GI bleeding. In terms of blood transfusion, majority of the participants don't need transfusion and only about 39.5% of the patients needed blood transfusion as a result of the severe blood losses and anaemia. The cost-effectiveness study of Proton Pump Inhibitors (PPIs) demonstrated that there was a significant variation in the treatment cost and effectiveness of the drugs used. Injection Pantoprazole (INJ.PAN) was found to have the lowest Average Cost Effectiveness Ratio (ACER) and high therapeutic efficacy (94.4%), thus the most cost-effective pharmacological agent to use in the treatment of the GI bleeding among the members of this study population. On the contrary, Injection Nexpro (Esomeprazole) exhibited the largest ACER despite slightly greater efficacy, and it is therefore less cost effective in comparison to Pantoprazole. The moderately cost-effective results were demonstrated by Injection Razo (Rabeprazole) and relatively low levels of efficacy. Such results imply that Pantoprazole offers a good ratio of treatment cost and clinical efficacy and the preferred pharmacological agent in the care of GI bleeding in health care institutions with

Table 5: Direct medical cost distribution between the three treatment groups.

Parameters	Service cost	Supporting examination	Activation cost	PPI cost	Accommodation cost	Cost of supporting drugs	Hospital stay in days	Unit cost	Dose	Total cost	P value	Significance
INJ.PAN	32400	166070	8640	17112	72000	216000	3	31	40MG	512222	0.032	YES
INJ.NEXPRO	9100	27780	1560	30070	13000	39000	5	97	40MG	120510		
INJ.RAZO	10500	30500	1800	13200	15000	45000	5	80	20MG	116000		

Table 6: ACER Calculation for each PPI'S.

	INJ.PAN	INJ.NEXPRO	INJ.RAZO
Cost (C)	512222	120510	116000
Effectiveness (E)	94.4%	96.15%	90%
ACER (C/E)	3766	4820	4296

limited resources. In general, the research paper emphasizes the role of cost-effective pharmacotherapy, early diagnosis, and proper management strategies in enhancing patient outcome and minimization of healthcare spending on gastrointestinal bleeding (Tables 5 and 6).

CONCLUSION

The current paper assessed the cost-effectiveness of pharmacological agents in participants having gastrointestinal bleeding in a tertiary care hospital.

The results are indicating that upper GI bleeding was more prevalent than lower gastrointestinal bleeding, and hematemesis was most frequently observed clinical symptom. Most of the participants who got affected were the middle-aged men, and this could be attributed to lifestyle risk factors in the form of alcohol and smoking.

Majority of patients were treated positively and 94.5% clinical improvement was seen in the patients and most patients have only taken short-term hospital stay meaning that clinical care has taken place.

PPI'S were recognised to be very important among the pharmacological interventions that were tested in GI bleeding. Injection Pantoprazole proved to be the most cost-effective drug with more therapeutic efficacy at a reduced treatment cost in comparison to other PPIs.

Thus, it is possible to determine that Pantoprazole regarded as one of the preferred pharmacological agents when it comes to the management of GI bleeding, especially in healthcare facilities that face the problem of resource shortage and in which cost-effective treatment options must be used.

Finally, the paper highlights that proper choice of cost-effective pharmacological management, early diagnosis and adequate clinical treatment can play a crucial role in improving patient outcomes as well as reducing the healthcare expenditures of patients presenting with gastrointestinal bleeding.

ACKNOWLEDGEMENT

The authors wish to thank the management, Chairman Dr. Palla Rajeswar Reddy, M. Sc., Ph. D. MLA Jangaon and M. Chinnaeswaraiiah, Principal and Professor of Anurag Pharmacy College, Kodad, Telangana, India for providing requisite equipment facilities for research, encouragement, and support. The authors would like to express their sincere gratitude to **Dr. K. Raveendra Babu** for his timely assistance, valuable guidance, and significant contribution to the structural preparation and organization of the manuscript. His support greatly facilitated the successful completion of this work.

ABBREVIATIONS

ACER: Average Cost-Effectiveness Ratio; **CBP:** Complete Blood Picture; **GI:** Gastrointestinal; **GE:** Gastroesophageal; **LFT:** Liver Function Test; **NSAIDs:** Non-Steroidal Anti-Inflammatory Drugs; **PPI:** Proton Pump Inhibitor; **UC:** Ulcerative Colitis.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

FUNDING

The authors received no specific financial support for the research, authorship, and/or publication of this article. This study was conducted without any external funding and was supported by the resources available within the institution.

AUTHOR CONTRIBUTIONS

Rokkam Pavani, Koppula Lavanya, Magi Prashanthi, and Saddam Ussain: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing-Original Draft Preparation. **Konduri Raveendra Babu:** Supervision, Methodology, Validation, Formal Analysis, Writing-Review & Editing, Project Administration. **Maram Chinna Eswaraiiah:** Conceptualization, Supervision, Resources, Validation, Writing-Review & Editing. All authors contributed to the study

design, data interpretation, manuscript revision, and approval of the final manuscript. All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

ETHICAL STATEMENT

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Written informed consent was obtained from all participants prior to their inclusion in the study. The confidentiality and anonymity of participant information were strictly maintained throughout the study.

DATA AVAILABILITY STATEMENT

The data supporting the findings of this study are available from the corresponding author upon reasonable request. The data are not publicly available due to privacy and ethical restrictions related to patient confidentiality.

REFERENCES

- Kim, B. S. M., Li, B. T., Engel, A., Samra, J. S., Clarke, S., Norton, I. D., & Li, A. E. (2014). Diagnosis of gastrointestinal bleeding: A practical guide for clinicians. *World Journal of Gastrointestinal Pathophysiology*, 5(4), 467–478. <https://doi.org/10.4291/wjgp.v5.i4.467>
- Krag, M., Perner, A., Wetterslev, J., Wise, M. P., Borthwick, M., Bendel, S., McArthur, C., Cook, D., Nielsen, N., Pelosi, P., Keus, F., Guttormsen, A. B., Møller, A. D., Møller, M. H., & SUP-ICU co-authors. (2015). Prevalence and outcome of gastrointestinal bleeding and use of acid suppressants in acutely ill adult intensive care patients. *Intensive Care Medicine*, 41(5), 833–845. <https://doi.org/10.1007/s00134-015-3725-1>
- MacLaren, R., & Campbell, J. (2014). Cost-effectiveness of histamine receptor-2 antagonist versus proton pump inhibitor for stress ulcer prophylaxis in critically ill patients*. *Critical Care Medicine*, 42(4), 809–815. <https://doi.org/10.1097/CCM.0000000000000032>
- Medina, M., & Castillo-Pino, E. (2019, May 2). An introduction to the epidemiology and burden of urinary tract infections. *Therapeutic Advances in Urology*, 11, Article 1756287219832172. <https://doi.org/10.1177/1756287219832172>
- Simmering, J. E., Polgreen, L. A., Cavanaugh, J. E., Erickson, B. A., Suneja, M., & Polgreen, P. M. (2021, February). Warmer weather and the risk of urinary tract infections in women. *The Journal of Urology*, 205(2), 500–506. <https://doi.org/10.1097/JU.0000000000001383>
- Tejasri, B., Babu, K. R., Sankirthana, M., Akhila, B., Kumar, G. T., & Eswaraiah, C. M. (2025). Assessment of risk factors and cost-effective analysis of antibiotics in urinary tract infections. *Asian J. Biol Life Sci.*, 14(3), 612–616.
- Treuting, P. M., Dintzis, S. M., & Montine, K. S. (2019). *Comparative anatomy and histology: A mouse, rat, and human atlas* (2nd ed.). Academic Press, an imprint of Elsevier.

Cite this article: Pavani R, Babu KR, Lavanya K, Prashanthi M, Ussain S, Eswaraiah MC. Cost Effectiveness Analysis of Drugs in Gastrointestinal Bleeding Patients. *Asian J Biol Life Sci.* 2026;15(2):488-92.