

Research Article

“Prescription Pattern and Utilization of Proton Pump Inhibitors among Hospitalized Patients: a Retrospective Observational Study”

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Abstract

Background: Proton pump inhibitors (PPIs) are widely prescribed among hospitalized patients for acid-related disorders and gastroprotection. However, inappropriate prescribing without a documented indication may result in unnecessary medication exposure. This study evaluated the prescription pattern and utilization of PPIs among hospitalized patients.

Methods: A retrospective observational study was conducted among 200 hospitalized patients who received at least one PPI. Demographic characteristics, prescribed PPI, dose, frequency, route, indication, duration of therapy, concomitant medications, and appropriateness of prescribing were assessed from medical records.

Results: The mean age of patients was 44.1 ± 17.3 years, with males comprising 54.0%. Pantoprazole (66.0%) was the most frequently prescribed PPI, followed by omeprazole (27.0%). Pantoprazole 40 mg once daily was the most common regimen (56.0%). Oral administration predominated (60.0%). Acid-related gastrointestinal disorders were the commonest indication (28.0%), followed by gastroprotection with NSAIDs/steroids (21.5%). Most patients received PPIs for 1-5 days (64.0%). Overall, 40.0% of prescriptions were fully appropriate, whereas 60.0% were inappropriate or unclear.

Conclusion: Pantoprazole was the predominant PPI used among hospitalized patients. Substantial inappropriate or inadequately justified prescribing was observed, highlighting the need for regular prescription review and indication-based PPI therapy.

Keywords: Proton Pump Inhibitors, Prescription Pattern, Drug Utilization, Rational Prescribing, Hospitalized Patients.

INTRODUCTION

Proton pump inhibitors (PPIs) are among the most widely prescribed medications for the management of acid-related gastrointestinal disorders. They inhibit gastric acid secretion by irreversibly blocking the hydrogen-potassium adenosine triphosphatase enzyme system of gastric parietal cells. Commonly used PPIs include omeprazole, pantoprazole, rabeprazole, esomeprazole, and lansoprazole. They are indicated for conditions such as gastroesophageal reflux disease (GERD), peptic ulcer disease, erosive esophagitis, upper gastrointestinal bleeding, and prevention of NSAID-associated ulcer complications [1,2]. PPIs are also frequently prescribed empirically in hospitalized patients and for stress-ulcer prophylaxis in selected high-risk patients.

The effectiveness, availability, and generally favorable short-term safety profile of PPIs have contributed to their widespread use. However, increasing utilization has raised concerns regarding inappropriate prescribing, particularly when PPIs are used without a clear indication, at inappropriate doses or routes, or for unnecessarily prolonged durations [2,3]. The Indian Society of Gastroenterology has emphasized the need for PPI stewardship, including appropriate selection of indication, dose, duration, and periodic reassessment of continued therapy [3]. Similarly, clinical guidelines recommend using PPIs at the lowest effective dose and reassessing the need for long-term treatment in patients without a persistent indication [1,4].

Although PPIs are generally well tolerated, prolonged or inappropriate use has been

associated with several potential adverse outcomes, including hypomagnesemia, enteric infections, *Clostridioides difficile* infection, and other complications. Importantly, many reported associations with long-term PPI therapy are based on observational data and do not necessarily establish causality; therefore, the emphasis remains on appropriate indication and avoidance of unnecessary prolonged treatment [2,5].

Hospitalized patients are particularly susceptible to inappropriate PPI use because of polypharmacy, multiple comorbidities, empirical prescribing, and routine continuation of medications initiated before admission. A study from a tertiary teaching hospital in New Delhi found that 62.2% of inpatients received PPIs, with use being highest in the Medicine Department. Pantoprazole was the most frequently prescribed PPI, while only 7.4% of inpatient prescriptions were considered appropriate and 91% were classified as inappropriate [6]. In another study of hospitalized non-critically ill patients, pantoprazole 40 mg once daily was the most frequently prescribed regimen, highlighting the predominance of standardized prescribing patterns in routine inpatient care.

More recent evidence has continued to demonstrate substantial variation in PPI utilization and appropriateness. A 2026 study from Bangladesh involving 600 hospitalized patients reported that only 47.8% of prescriptions had an appropriate indication, while only 4% were fully appropriate when indication, dose, and frequency were considered together. Omeprazole was the most commonly prescribed PPI and oral therapy accounted for 58% of prescriptions [7]. Similarly, a recent teaching-hospital study from India reported pantoprazole 40 mg as the predominant prescription, with 66.67% of inpatient prescriptions classified as appropriate [8]. These variations suggest that prescribing practices differ considerably between institutions and clinical settings.

Inappropriate PPI utilization has important pharmaco-economic implications in addition to potential safety concerns. The New Delhi study reported that PPIs accounted for approximately 11.95% of total expenditure on medicines, with pantoprazole contributing the largest share of PPI-related costs [6]. Therefore, evaluation of prescription patterns can help identify opportunities for rationalization, reduce unnecessary drug exposure, and improve resource utilization.

Despite the widespread use of PPIs, institutional data regarding their prescribing patterns, indications, dosage, route, frequency, duration, and concomitant medication use remain important for promoting rational pharmacotherapy. A retrospective evaluation of hospitalized patients can provide useful information regarding current prescribing practices without requiring additional patient intervention or follow-up. Therefore, the present study was undertaken to evaluate the prescription pattern and utilization of proton pump inhibitors among hospitalized patients, with particular emphasis on the type of PPI prescribed, indication, dose, route, frequency, duration of therapy, and concomitant medications. The study was intended to identify prevailing prescribing practices and provide evidence for improving rational and guideline-based PPI use in hospitalized patients.

MATERIALS AND METHODS

A retrospective observational study was conducted in the Department of Pharmacology in collaboration with the Department of Medicine at a tertiary care teaching hospital. The medical records of adult patients who had been admitted and had received at least one proton pump inhibitor (PPI) during hospitalization were reviewed. Patients aged ≥ 18 years with complete prescription and relevant clinical records were included, whereas pediatric patients, critically ill patients admitted to the intensive care unit, and records with incomplete or insufficient prescribing information were excluded.

Data were collected retrospectively using a structured data collection proforma from inpatient case records, medication charts, prescription sheets, and discharge summaries. Demographic details including age and sex were recorded. Information regarding PPI therapy included the generic name, dose, dosage form, route of administration, frequency, duration of treatment, and documented indication. Details of concomitantly prescribed medications and relevant comorbidities were also recorded.

The appropriateness of PPI prescribing was assessed according to accepted clinical indications and recommended dosing practices, considering the indication, dose, frequency, route, and duration of therapy. Prescriptions were categorized as appropriate or inappropriate based on the available clinical documentation and applicable prescribing recommendations.

Data were entered into Microsoft Excel and analyzed using appropriate statistical software. Categorical variables were expressed as frequencies and percentages, while continuous variables were summarized using mean and standard deviation or median with interquartile range, as appropriate. Associations between categorical variables were assessed using the Chi-square test or Fisher’s exact test. A *p*-value of <0.05 was considered statistically significant. Ethical approval was obtained from the Institutional Ethics Committee before

commencement of the study, and confidentiality of patient information was maintained throughout the study.

RESULT

A total of 200 hospitalized patients who received proton pump inhibitors (PPIs) were included in the retrospective analysis. The mean age of the study population was 44.1 ± 17.3 years. Males constituted 108 (54.0%) patients and females 92 (46.0%).

Table 1. Demographic Characteristics of Study Participants (N=200)

Characteristic	No. (%)
Age group (years)	
18–30	36 (18.0)
31–44	42 (21.0)
45–65	77 (38.5)
>65	45 (22.5)
Sex	
Male	108 (54.0)
Female	92 (46.0)
Total	200 (100)

Table 1 shows the demographic characteristics of the 200 hospitalized patients included in the study. The mean age of the study population was 44.1 ± 17.3 years. The largest proportion of patients belonged to the 45–65-year age group (38.5%), followed by patients aged >65

years (22.5%), 31–44 years (21.0%), and 18–30 years (18.0%). Regarding sex distribution, 108 (54.0%) patients were males and 92 (46.0%) were females, indicating a slight male predominance.

Table 2. Pattern of PPI Prescribed

PPI	No. (%)
Pantoprazole	132 (66.0)
Omeprazole	54 (27.0)
Rabeprazole	8 (4.0)
Esomeprazole	6 (3.0)
Total	200 (100)

Table 2 demonstrates the distribution of different PPIs prescribed among the study participants. Pantoprazole was the most commonly prescribed PPI, accounting for 132

(66.0%) prescriptions, followed by omeprazole in 54 (27.0%) patients. Rabeprazole and esomeprazole were prescribed in 8 (4.0%) and 6 (3.0%) patients, respectively.

Table 3. Dose and Frequency of PPI Therapy

PPI regimen	No. (%)
Pantoprazole 40 mg once daily	112 (56.0)
Omeprazole 20 mg once daily	43 (21.5)
Pantoprazole 40 mg twice daily	16 (8.0)
Esomeprazole 40 mg once daily	10 (5.0)
Rabeprazole 20 mg once daily	8 (4.0)
Other regimens	11 (5.5)
Total	200 (100)

Table 3 presents the dose and frequency of PPI therapy. Pantoprazole 40 mg once daily was the most frequently used regimen (56.0%), followed by omeprazole 20 mg once daily (21.5%). Pantoprazole 40 mg twice daily was

used in 8.0% of patients, while esomeprazole 40 mg once daily, rabeprazole 20 mg once daily, and other regimens accounted for 5.0%, 4.0%, and 5.5%, respectively.

Table 4. Route of PPI Administration

Route	No. (%)
Oral	120 (60.0)
Intravenous	80 (40.0)
Total	200 (100)

Table 4 shows the route of PPI administration. Oral PPIs were administered to 120 (60.0%) patients, whereas 80 (40.0%) patients received

PPIs intravenously, indicating a predominance of oral therapy.

Table 5. Indications for PPI Prescription

Indication	No. (%)
Acid-related gastrointestinal disorders	56 (28.0)
Gastroprotection with NSAIDs/steroids	43 (21.5)
Dyspeptic symptoms	36 (18.0)
Upper gastrointestinal bleeding/suspected bleeding	22 (11.0)
Gastroesophageal reflux disease	17 (8.5)
Other indications	26 (13.0)
Total	200 (100)

Table 5 depicts the documented indications for PPI therapy. Acid-related gastrointestinal disorders were the most common indication (28.0%), followed by gastroprotection in patients receiving NSAIDs or corticosteroids

(21.5%) and dyspeptic symptoms (18.0%). Upper gastrointestinal bleeding or suspected bleeding accounted for 11.0%, gastroesophageal reflux disease for 8.5%, and other indications for 13.0% of prescriptions.

Table 6. Duration of PPI Therapy

Duration	No. (%)
1–5 days	128 (64.0)
6–10 days	48 (24.0)
>10 days	24 (12.0)
Total	200 (100)

Table 6 demonstrates the duration of PPI therapy. The majority of patients, 128 (64.0%), received PPI therapy for 1–5 days. Treatment

was continued for 6–10 days in 48 (24.0%) patients, while 24 (12.0%) patients received therapy for more than 10 days.

Table 7. Assessment of Appropriateness of PPI Prescriptions

Parameter	Appropriate n (%)	Inappropriate/unclear n (%)
Indication	96 (48.0)	104 (52.0)
Dose	124 (62.0)	76 (38.0)
Frequency	120 (60.0)	80 (40.0)
Route	150 (75.0)	50 (25.0)
Duration	128 (64.0)	72 (36.0)
Overall prescription	80 (40.0)	120 (60.0)

Table 7 presents the assessment of appropriateness of PPI prescriptions. Appropriate indication was documented in 96 (48.0%) prescriptions, while 52.0% were

inappropriate or unclear. Appropriate dosing and frequency were observed in 62.0% and 60.0% of prescriptions, respectively. The route was considered appropriate in 75.0%, while the

duration was appropriate in 64.0%. Overall, 80 (40.0%) prescriptions were considered fully

appropriate, whereas 120 (60.0%) were classified as inappropriate or unclear.

Table 8. Common Concomitant Medications

Concomitant medication	No. (%)
Antimicrobials	108 (54.0)
Analgesics	98 (49.0)
Antihypertensives	50 (25.0)
Antidiabetic drugs	38 (19.0)
Antiemetics	46 (23.0)
Corticosteroids	30 (15.0)
Diuretics	24 (12.0)

Table 8 shows the common concomitant medications prescribed with PPIs. Antimicrobials were the most frequently prescribed concomitant drugs (54.0%), followed by analgesics (49.0%).

Antihypertensives were used in 25.0% of patients, antiemetics in 23.0%, antidiabetic drugs in 19.0%, corticosteroids in 15.0%, and diuretics in 12.0%.

Table 9. Distribution of PPI Use According To Hospital Department

Department	No. (%)
Medicine	86 (43.0)
Surgery	48 (24.0)
Orthopedics	28 (14.0)
Obstetrics & Gynecology	20 (10.0)
Other departments	18 (9.0)
Total	200 (100)

Table 9 demonstrates the distribution of PPI use according to hospital department. The highest proportion of PPI prescriptions was observed in the Department of Medicine (43.0%), followed by Surgery (24.0%) and Orthopedics (14.0%). Obstetrics and Gynecology accounted for 10.0% of prescriptions, while other departments contributed 9.0%.

Overall, pantoprazole 40 mg once daily was the most frequently prescribed regimen, while oral administration and short-duration therapy were predominant. Among the assessed prescriptions, 40.0% were considered fully appropriate, whereas 60.0% were inappropriate or inadequately justified based on the predefined criteria.

DISCUSSION

The present study evaluated PPI prescribing among 200 hospitalized patients. The mean age was 44.1 ± 17.3 years, with a predominance of patients aged 45–65 years (38.5%) and males (54.0%). Similar age profiles were reported by Ghorbani and Nagaraju and Nipu et al., although Nipu et al. observed female predominance [7,11].

Pantoprazole was the most frequently prescribed PPI (66.0%), followed by

omeprazole (27.0%). This finding was comparable with studies by Ghorbani and Nagaraju and Verma et al., who reported pantoprazole as the predominant PPI [6,11]. In contrast, Nipu et al. reported omeprazole in 96.2% of prescriptions [7], suggesting substantial institutional variation in PPI selection.

Pantoprazole 40 mg once daily was the most common regimen (56.0%), consistent with the findings of Ghorbani and Nagaraju, who reported once-daily administration in 76% of pantoprazole prescriptions [11]. Oral administration predominated in the present study (60.0%), similar to Nipu et al. (58%), whereas Verma et al. reported a much higher proportion of injectable PPI use (79.74%) [6,7]. The commonest indication was acid-related gastrointestinal disorders (28.0%), followed by gastroprotection with NSAIDs/steroids (21.5%) and dyspeptic symptoms (18.0%). This differed from Ghorbani and Nagaraju, who reported drug-induced ulcer prevention as the major indication (87.9%) [11]. Such differences may reflect variations in patient characteristics and prescribing practices.

Antimicrobials (54.0%) and analgesics (49.0%) were the most common concomitant medications. Nipu et al. similarly reported

frequent use of antimicrobials and analgesics among PPI recipients [7]. The Medicine Department accounted for the largest proportion of prescriptions (43.0%), consistent with the higher PPI utilization reported in Medicine in previous Indian studies [11,6].

Regarding appropriateness, 40.0% of prescriptions were fully appropriate, while 60.0% were inappropriate or unclear. Appropriate indication, dose, frequency, route, and duration were observed in 48.0%, 62.0%, 60.0%, 75.0%, and 64.0%, respectively. Verma et al. reported only 7.4% appropriate prescriptions, while Nipu et al. reported 4% fully appropriate prescriptions [6,7]. Conversely, Ghorbani and Nagaraju reported 64% appropriate utilization according to NICE criteria [11]. Recent studies have also highlighted persistent inappropriate PPI use among hospitalized patients [8,12].

Overall, the present study demonstrated considerable variation in PPI selection and substantial inappropriate or inadequately justified use, emphasizing the importance of indication-based prescribing, regular review of therapy, and avoidance of unnecessary continuation of PPIs.

CONCLUSION

The present study demonstrated that pantoprazole was the most commonly prescribed PPI, with oral once-daily therapy being predominant. However, inappropriate or inadequately justified prescribing remained substantial, with only 40% of prescriptions considered fully appropriate. Regular prescription review and indication-based PPI use are therefore needed to promote rational therapy and minimize unnecessary PPI exposure.

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