

From Prophylaxis to Polypharmacy: An Audit of Proton Pump Inhibitor Practices

Hamza Sajjad¹, Sadia Shah², Muhammad Rehan³, Reygaan Ahmad¹, Arshad Khan¹, Aliya Batool⁴

¹House Officer, King Abdullah Teaching Hospital, Mansehra.

²Dist. Gastroenterologist, King Abdullah Teaching Hospital, Mansehra

³Consultant Burn Surgeon, King Abdullah Teaching Hospital, Mansehra.

⁴Consultant Haematologist, Akbar Niazi Teaching Hospital, Islamabad

Conflict of interest: None

Funding source: None

Article received: 01-02-2026

Article accepted: 13-02-2026

**Correspondence:*

hamzasajjadjehangiri55@gmail.com

DOI: 10.65433/mjms.v3i2.108

ABSTRACT

Background: PPIs are one of the most commonly prescribed drugs and are widely used around the globe. Our study aims to look for justifiable and overuse of the PPIs in the hospital setting.

Methodology: A cross-sectional, questionnaire-based survey was conducted in King Abdullah Teaching Hospital (KATH), Mansehra, Khyber Pakhtunkhwa, over the course of three months (May-July 2025). The number of patients for this study was calculated based on the Cochrane formula, which came out as 227. Written consent was taken from the patient. The study's ethical approval was taken from the Ethical Review Board of KATH, Mansehra.

Results: Out of all of 227 patients included in our study, 60.7% were female. The mean age for the patients was 42.08. Results showed 43.5% of people were already taking PPIs on their own. Out of 227 patients 32.8% used PPIs in the last week. Among the interviewed patients, 60.7% of patients came with a complaint of epigastric heaviness, 50% with pain epigastrium, 45.2% with heartburn, and 25% with Acid reflux. Significantly, 11.9% had a previous history of gastroduodenal ulcers, and H. Pylori was positive in 12.5% patients. Esomeprazole was the most prescribed PPI followed by omeprazole. The 40mg (once daily) was the most commonly prescribed dose among the patients interviewed in our study.

Conclusion: In conclusion, the patients admitted had at least one symptom related to dyspepsia or GERD. Majority of the usage of PPIs was justified among the admitted patients interviewed in our study.

Keywords: PPI Audit, Overuse of PPIs, Side effects of PPIs, Indication of PPIs, Use of PPIs in a tertiary care hospital.

Introduction

Clinicians nowadays are using PPIs like burning candles at both ends. PPIs are also available as an over-the-counter drug in Pakistan. There is an increased self-medication with PPIs. Patients reporting to OPDs are usually already taking PPIs. In hospital settings, there is an inappropriate use of PPIs. Researchers all over the world are now evaluating over overuse of PPIs. A study conducted by Lazaridis showed that during hospital stay the rate of inappropriate PPI use is almost double in comparison to the rates at admission and at discharge¹

Although PPI indications are well defined, they are frequently ignored in daily practice among the admitted patients and outdoor patients, leading to overuse that has been reported in many studies, such as Mohammed states that the study shows a

significant prevalence of PPI misuse among admitted patients, specifically increasing from the time of admission to time of discharge. Major contributors to misuse of PPI included multidrug therapy and elevated comorbidity index at discharge².

Along with many benefits of PPIs, there also come their side effects. With increased use of PPIs in normal practice, patients can develop drug resistance against PPIs, and there is also a psychological side to it that patients may have that any heartburn or pain epigastrium can get better with the use of PPIs. There is also a cost factor and certain side effects with the use of long-term PPIs use such as hypomagnesemia, possible effect on kidneys, and osteoporosis-related fractures. Several studies demonstrated about benefits of the use of PPIs as prophylaxis drug, especially in patients on

dual anticoagulation therapy. Certain drug categories like antiplatelet and anticoagulant drugs in the treatment of many cardiovascular and cerebrovascular diseases. Frequent use of which is associated with moderately frequent complications such as gastrointestinal bleeding, indicating the need for concurrent PPI use³. According to Koggel, misuse of PPI may cause some negative impact on patients through drug related adverse effects. Study shows that PPI use for long term is associated with serious drug induced reactions⁴. Therefore, there should be proper indications, dosage, and treatment regimen for each individual that should be recommended.

There is no doubt in the efficacy and potency of PPIs in a large number of patients, but this good tolerance and high efficacy of PPIs lead to overutilization of PPIs worldwide. In comparison to many available drugs categories used daily in hospitals, PPIs are one of the top selling drug for multiple years⁴. A vast number of studies globally show issues related to appropriate PPI use, demonstrating global over-prescription. On a rough estimate about 36 million dollars were spent on PPIs in Lebanon during the year 2018⁵.

Ashfaq M reported that in our results PPI use was significantly high in female patients when compared to male in our data⁶. The data showed that esomeprazole and omeprazole are the most used PPIs⁶. Omeprazole is the Pakistan's second highest sold drug in the pharmaceutical sector, showing its common use⁷.

The aim of our study is to evaluate the overuse of PPIs in hospitals and how they are being prescribed, self-prescribed, without specific indications, on the basis of guidelines provided.

Methodology

A cross-sectional, questionnaire-based survey was conducted in a District Hospital of Mansehra, Khyber Pakhtunkhwa (King Abdullah Teaching Hospital-KATH, Mansehra), over the course of three months from 1st May 2025 to 31st July 2025. The study involves interviewing 227 patients admitted to different wards with different diagnoses in the hospital on the basis of guidelines about the indication of PPIs and a questionnaire designed for this study. Number of patients for this study was calculated based on the Cochrane formula $n = (Z^2 * p * q) / E^2$ where n is the required sample size, Z is the corresponding confidence level (95%) 1.96,

p is the proportion of the population with interest/expected prevalence (0.18) 18%, $q = 1 - p$ (0.82), and E is the margin of error 0.05 (5%).

$$n = \frac{(1.96)^2 * 0.18 * 0.82}{(0.05)^2} = 226.8 \sim 227$$

The calculated sample size for our study came out as 227. The study's ethical approval was taken from the Ethical Review Board of KATH, Mansehra. Written consent was taken from the patient and attendants before interviewing them about the use of PPIs throughout the hospital stay.

The inclusion criteria of our study were patients prescribed PPIs during their stay in the hospital, patients with chronic use of PPIs, patients using self-prescribed PPIs, and patients experiencing the symptoms included in the indications of PPIs. Patients with H. Pylori positive and a history of gastroduodenal ulcers were also included in the study. Exclusion criteria of our study were patients who didn't give consent were not included in the study, children less than 12 years of age were excluded, patients who were admitted for more than a week were not included in the study, and patients on a ventilator were not included in our study.

The questionnaire comprises demographic details, including Name, Age, Gender, Phone number, and Admission no, any comorbidities (like Hypertension, Diabetes, Ischemic heart disease, Asthma, etc), use of PPIs on their own, condition with which they are admitted, PPIs indications, frequency, dosage, and type. The following conditions were considered as indications of PPIs use;

- Symptoms of Dyspepsia
- GERD (Gastroesophageal reflux disease)
- Peptic ulcer disease
- NSAID-associated ulcers
- Eradication of Helicobacter pylori
- Zollinger-Ellison syndrome

Results

In all of 227 patients included in our study, PPIs were prescribed at some point

during their stay in the hospital. Out of which 60.7% of patients were female.

The mean age for the patients on PPI therapy was 42.08, with ages ranging from 13 to 90 years.(Table 1)

Out of the Patients included in the study, 32.8% of patients used PPIs within a week before admission, and 16.4% used PPIs a month ago. Among the selected patients, 39 patients were diabetic(DM type 1), 17%,17 had Asthma(7.4%), and 15 patients were hypertensive (6.6%) . Due to the availability of PPIs over the counter, 43.5% of people were already taking PPIs on their own without any prescription before their admission to hospital.

Patients with chronic use of PPIs were also included in the study, with 32.8% of those using the PPIs in the last week and 33% of those last used PPIs over a month ago.

The days of hospital stay of admitted patients varied over the diagnosis with which they are in the hospital, with 35% of patients staying in the hospital for treatment for 3 days, and 31.6% for 5 days.

According to protocols of PPIs use and their indications, 33.3% of the patients were prescribed PPI therapy for home use at the time of discharge.

The number of days on PPIs was based on the severity of the symptoms of the admitted patients, with 33.3% of the patients being prescribed PPIs for 2 weeks after discharge on a daily dosage, and 24.9% were prescribed for 5 days after discharge. (chart 1)

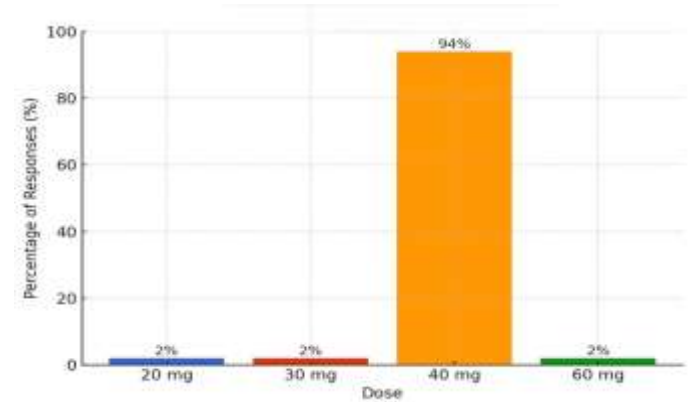
The signs and symptoms with which patients were prescribed PPIs during their stay in hospital were also included in the study, with 60.7% of those with epigastric heaviness, 50% of those having complaints of pain in the epigastrium,45.2% with heartburn, and 25% with Acid reflux Patients also had some comorbidities related to gastric issues, due to which they were frequently on PPI therapy which Significantly were 11.9% had a previous history of gastroduodenal ulcers, and H.Pylori was positive in 12.5% patients, confirmed through the H. pylori stool antigen test. (Table 2).

Esomeprazole was the most prescribed PPI, 52.6% while 44% of the patients were prescribed omeprazole (Graph 1).

The 40mg(94%) once daily-OD(95.7%) was the most commonly prescribed dose among the patients interviewed in our study.

Table 1. Demographics	
Total selected patients	227
Male	39.3%(89)
Female	60.7%(138)
Age Range	13yrs-90yrs
Mean Age	42.08yrs

Table 2: History Points at time of Prescription	
Pain Epigastrium	50%
Heartburn	45.2%
Epigastric heaviness	60.7%
Acid Reflux	25%
History of Peptic Ulcer	11.9%
Helicobacter Pylori	12.5%



Graph 1: Dosage prescribed

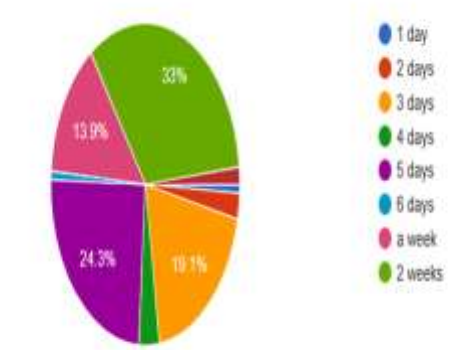


Chart 1: Duration of PPIs prescribed after discharge

Discussion

After interviewing a wide variety of patients admitted in different wards of KATH Mansehra, we came to the conclusion that patients prescribed PPIs in our hospital must have at least one of the symptoms for which they were prescribed PPIs (Table 2). The mean age of patients using PPIs is much less in Pakistan (42.08) as compared to the population in Lebanon (53.17), 42.08 vs 53.17 years. (Table 1)⁸. Lelwala, in his research, states that the data from 65 articles across 23 countries shows 28 million PPI users, indicating almost one in every four adults use PPI, in which about 63% were below than 65 years of age.⁹

The use of PPIs is much more common in females. On the basis of our study, 60.7% of the patients using PPIs were female, which goes along with various studies across the globe where we found a similar pattern. Lelwala's study also shows that 56% of PPI users were female.⁹ The study from Abbottabad, Pakistan, on PPIs consumption shows that most of the patients were female, 60.8%.⁶

Many of the patients were on long-term use of PPIs due to symptoms of indigestion or H.pylori and ulcer patients (table 3). But the prolonged use of PPIs comes with side effects. Over the period of last 10 years, many studies showed the long-term PPI side effects like one of the study states that frequent use of PPIs for long period of time leads to some serious drug induced reactions and conditions like including kidney diseases (acute kidney injury-AKI, chronic kidney disease-CKD, end stage renal disease-ESRD), hepatic disease, infections, Pneumonia (community acquired), COVID 19, micronutrient deficiencies (anemia, vitamin B12 deficiency, calcium deficiency, and gastric carcinomas).¹⁰

Within the past year, data have become available linking PPI use to risk and incidence of dementia and Alzheimer's disease.^{11,12,13}

Due to availability as the over-the-counter drug PPIs are widely used in self-prescription without any proper guidelines and just with one or two symptoms like indigestion and overeating, which may lead to overuse, causing such types of side effects. Also, PPIs are prescribed without proper indications in high doses, leading to side effects. A survey showed that the vast number of the PPI

prescriptions were made with a high-doses, without documenting valid guidelines, including cases with potential Drug-Drug Interactions.¹⁴

The PPIs can be addictive, especially after chronic use, and tapering them off can be slow in most cases. Danielle, in his study, tells us that of the 22 patients who started deprescription of PPI, 19 patients successfully stopped using PPI completely, two patients were able to lower the dose or frequency of PPI, and one was unable to stop or lower the dose of their PPI. This result reported high success rate of PPI discontinuation from the past studies in primary care hospitals (31%-66%).¹⁵

PPIs can be addictive, and tapering off is also necessary, as cessation of PPIs immediately causes alkaline tide phenomena, which is rebound acid hypersecretion after cessation of PPI therapy.¹⁶

In our study, Esomeprazole was the most prescribed PPI among the patients we interviewed, which was 52.6%. The widespread availability of esomeprazole and various brands using esomeprazole makes it cost-effective due to competition in the pharmaceutical market. A study showed that Esomeprazole treatment showed major improvements in GERD's signs and symptoms.¹⁷

In our study, almost all the patients who were prescribed PPIs during their stay in hospital had at least one symptom of dyspepsia on the basis of which the PPI was prescribed, which is the somewhat justified use of PPIs in hospitalized patients.

The usage of esomeprazole in pregnancy can be beneficial according to some research, as it prevents autophagy during preeclampsia (PE). Shengyi G,u in her research said inhibition of AMPK α by esomeprazole treatment leads to activation of mTOR, results in the autophagy inhibition in placenta which in return reduces Preeclampsia symptoms¹⁸. In some other countries, like Shanghai, i China, the most prescribed PPI is omeprazole¹⁹ The 40mg OD was the most prescribed dose for 14 days among the patients we interviewed, admitted to the wards with various signs and symptoms. There are various studies showing the efficacy of different potencies, as in one research conducted by David tells us that PPIs can be substituted based on equivalent potency. Usage of PPIs two times in a day result in improved efficacy than using one time a day. This statement

contradicts the prescribing of PPIs practice in OD dose, especially in our hospital.²⁰

Conclusion

In conclusion, most of the usage of PPIs was justified among the admitted patients interviewed in

References

1. Lazaridis LD, Rizos E, Bounou L, Theodorou-Kanakari A, Kalousios S, Mavroei EA, Roma M, Chatzidakis A, Vlachonicolou G, Miltiadou K, Gkolfakis P, Tziatzios G, Triantafyllou K. An educational intervention to optimize use of proton pump inhibitors in a Greek university hospital. *Ann Gastroenterol*. 2021 Nov-Dec;34(6):781-787. <https://doi.org/10.20524/aog.2021.0654>.
2. Mohamed MR, Itani M, Abohelwa M, Ahmed MA, Abdouni L, Doumat G, Azzo M, Dabdoub F, Al-Tfaily H, Elziny M, Assaf G. The silent epidemic: Inappropriate use of proton pump inhibitors among hospitalized patients. *Arab J Gastroenterol*. 2024 Nov;25(4):414-420. <https://doi.org/10.1016/j.ajg.2024.07.001>.
3. Abrignani MG, Lombardo A, Braschi A, Renda N, Abrignani V. Proton pump inhibitors and gastroprotection in patients treated with antithrombotic drugs: A cardiologic point of view. *World J Cardiol*. 2023 Aug 26;15(8):375-394. <https://doi.org/10.4330/wjc.v15.i8.375>.
4. Koggel LM, Lantinga MA, Büchner FL, Drenth JPH, Frankema JS, Heeregrave EJ, Heringa M, Numans ME, Siersema PD. Predictors for inappropriate proton pump inhibitor use: observational study in primary care. *Br J Gen Pract*. 2022 Nov 24;72(725):e899-e906. <https://doi.org/10.3399/BJGP.2022.0178>.
5. IQVIA - powering healthcare with connected intelligence (no date) *IQVIA Healthcare Information Technology and Pharma Clinical Research Company*. (Accessed: 16 October 2025) Available at: <https://www.iqvia.com/>
6. Ashfaq M, Abid SMA, Khan Q, Sharif MJH, Haroon MZ, Khan AN, Alkahraman YM. Consumption of proton pump inhibitors in outpatients of Gastroenterology Clinics in Khyber Pakhtunkhwa: evidence of inexpedient use. *Prz Gastroenterol*. 2024;19(2):159-164. <https://doi.org/10.5114/pg.2024.139429>.
7. Industry Specific Guidelines-The Pharmaceutical Industry, The professional accountants in business, 2018, <https://www.icap.org.pk/paib/pdf/guidelines/PharmaIndustry.pdf>
8. Mohamed MR, Itani M, Abohelwa M, Ahmed MA, Abdouni L, Doumat G, Azzo M, Dabdoub F, Al-Tfaily H, Elziny M, Assaf G. The silent epidemic: Inappropriate use of proton pump inhibitors among hospitalized patients. *Arab J Gastroenterol*. 2024 Nov;25(4):414-420. <https://doi.org/10.1016/j.ajg.2024.07.001>
9. Shanika LGT, Reynolds A, Pattison S, Braund R. Proton pump inhibitor use: systematic review of global trends and practices. *Eur J Clin Pharmacol*. 2023 Sep;79(9):1159-1172. <https://doi.org/10.1007/s00228-023-03534-z>.
10. Maideen NMP. Adverse Effects Associated with Long-Term Use of Proton Pump Inhibitors. *Chonnam Med J*. 2023 May;59(2):115-127. <https://doi.org/10.4068/cmj.2023.59.2.115>.
11. Zhang, P., Li, Z., Chen, P. et al. Regular proton pump inhibitor use and incident dementia: population-based cohort study. *BMC Med* 20, 271 (2022)
12. Torres-Bondia F, Dakterzada F, Galván L, Buti M, Besanson G, Gill E, Buil R, de Batlle J, Piñol-Ripoll G. Proton pump inhibitors and the risk of Alzheimer's disease and non-Alzheimer's dementias. *Sci Rep*. 2020 Dec 3;10(1):21046. <https://doi.org/10.1038/s41598-020-78199-0>.
13. Pourhadi N, Janbek J, Jensen-Dahm C, Gasse C, Laursen TM, Waldemar G. Proton pump inhibitors and dementia: A nationwide population-based study. *Alzheimers Dement*. 2024 Feb;20(2):837-845. <https://doi.org/10.1002/alz.13477>.
14. Algabbani AM, Alangari AS. Proton pump inhibitor prescribing patterns and utilization: A retrospective chart review analysis. *Saudi Pharm J*. 2023 Dec;31(12):101841. <https://doi.org/10.1016/j.jsps.2023.101841>
15. Odenthal DR, Philbrick AM, Harris IM. Successful deprescribing of unnecessary proton pump inhibitors in a primary care clinic. *J Am Pharm Assoc* (2003). 2020 Jan-Feb;60(1):100-104. <https://doi.org/10.1016/j.japh.2019.08.012>.
16. Ken Namikawa and Einar Stefan Björnsson.Rebound Acid Hypersecretion after Withdrawal of Long-Term Proton Pump Inhibitor (PPI) Treatment—Are PPIs Addictive? 2024 www.mdpi.com/1422-0067/25/10/5459
17. Hou M, Hu H, Jin C, Yu X. Efficacy and Safety of Esomeprazole for the Treatment of Reflux Symptoms in Patients with Gastroesophageal Reflux Disease: A Systematic Review and Meta-Analysis. *Iran J Public Health*. 2020 Dec;49(12):2264-2274. <https://doi.org/10.18502/ijph.v49i12.4807>.
18. Gu S, Zhou C, Pei J, Wu Y, Wan S, Zhao X, Hu J, Hua X. Esomeprazole inhibits hypoxia/endothelial dysfunction-induced autophagy in preeclampsia. *Cell Tissue Res*. 2022 Apr;388(1):181-194. <https://doi.org/10.1007/s00441-022-03587-z>.
19. Liu Y, Zhu X, Li R, Zhang J, Zhang F. Proton pump inhibitor utilisation and potentially inappropriate prescribing analysis: insights from a single-centred retrospective study. *BMJ Open*. 2020 Nov 26;10(11):e040473. <https://doi.org/10.1136/bmjopen-2020-040473>.
20. Graham DY, Tansel A. Interchangeable Use of Proton Pump Inhibitors Based on Relative Potency. *Clin Gastroenterol Hepatol*. 2018 Jun;16(6):800-808.e7. <https://doi.org/10.1016/j.cgh.2017.09.033>.

Cite this article as: Sajjad H, Shah S, Rehan M, Ahmed R, Khan A, Batool A. From Prophylaxis to Polypharmacy: An Audit of Proton Pump Inhibitor Practices. *Mirpur J Med Sci*. 2025;3(2): 129-133. <https://doi.org/10.65433/mjms.v3i2.108>.