Research Article

Study on Drug Utilization and Evaluation of Proton Pump Inhibitors in Surgery Unit of Tertiary Care Teaching Hospital

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ABSTRACT

Proton pump inhibitors (PPIs) are one of the most commonly given prescribed drug in both outpatient and inpatient settings. Hence in this present scenario, where the use of PPIs is overwhelming, the present study aims to know the rational use of PPIs in the patients of General Surgery ward of a rural tertiary care hospital. The objective of the study is to study the drug utilization and evaluation of proton pump inhibitors in surgery unit at Adichunchanagiri Hospital and Research Center (AH&RC) BG Nagara, Mandya of tertiary care teaching hospital. A Prospective and Observational study was carried out for 6 months in the surgery department. A suitably designed patient profile form was used to record all the necessary data and the collected data is subjected to suitable statistical method for analysis. In the study, out of 200 patients on PPI, 73% were females and the rest were males. Most of the patients belonged to the age group of 36-55 years. PPIs were most frequently prescribed mainly to treat gastritis and to prevent the gastric irritation caused by analgesics. Most commonly prescribed PPIs were found to be Pantoprazole through IV route and oral route. Majority of the PPIs prescribed were appropriate based on NICE guidelines. Pantoprazole was the PPI having the greatest number of interactions with other drugs in the prescription and no ADRs were reported during our study period. PPIs should be used only when there is valid documented evidence and when their use is clinically justified. Various efforts should be made to reduce the unnecessary use of PPIs to minimize drug interactions, related risk, and the health care burden of the patients.

Keywords: PPIs, Surgery, Pantoprazole, Rationality.

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INTRODUCTION

According to the World Health Organization (WHO), drug utilisation research (DUR) is defined as "the marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting medical, social, and economic consequences." PPIs are one of the most commonly prescribed drugs in both outpatient and inpatient settings. Prescriptions for proton pump inhibitors (PPIs) have increased exponentially in hospital and ambulatory care settings over the last few years. According to a recent literature review, inappropriate use of PPIs has increased the risk of adverse drug reactions (ADRs) and medication interactions. PPIs are overused due to their simplicity of use, high efficacy, competitive marketing, and extended indications. Constipation, headache, abdominal pain, flatulence, and diarrhoea are some of the minor and self-limiting adverse effects of PPIs.[1]

Proton pump inhibitors (PPIs) are a class of medications that reduce stomach acid production significantly and for a long period of time. They are now the most effective stomach acid-suppressing medicines in clinical use. PPIs decrease both basal and induced stomach output by irreversibly inhibiting the gastric H+-K+ ATPase pump, also known as the proton pump. Currently, the PPIs available in India are omeprazole, esomeprazole, pantoprazole, rabeprazole, and lansoprazole. PPIs are being used to treat active ulcers, Zollinger-Ellison syndrome, Gastroesophageal Reflux Disease (GERD), GI bleeding, NSAID-induced dyspepsia, and Helicobacter pylori antibiotics. PPIs are also used prophylactically with NSAIDs or steroids in individuals with a history of peptic ulcers, previous GI bleeding, or the elderly.[2]

Due to these prevalent medical conditions, PPIs are one of the most often given drugs in the world, and there is a widespread notion that they have very low toxicity and good efficacy. However, evidence is accumulating that these drugs can cause a variety of bothersome and even life-threatening side effects. The National Institute for Health and Clinical Excellence (NICE) guidelines have recommended PPI doses and duration for various clinical conditions.[9] PPIs (proton pump inhibitors) have been available for a long time and are near the top of several lists of the most commonly prescribed medications. However, studies reveal that many PPI prescriptions, both inpatient and outpatient, are inappropriate, resulting in higher healthcare expenses and long-term negative repercussions.[11]

PPIs have proven to be effective in treating symptoms associated with excessive acid secretion, but there are growing concerns about inappropriate indications and potential overuse, both in hospitals and in primary care. These concerns are intensified by reports of increased long-term use, which has been linked to an increase in morbidity and mortality. Long-term usage of PPIs has also been associated with a higher risk of hip fractures and community-acquired pneumonia.[7] Hence, in this present scenario, where the use of PPIs is overwhelming, the present study is planned to know the rational use of PPIs in the patients of general surgery wards of a rural tertiary care hospital.

MATERIALS AND METHODS

Study Design, Site and Ethical Approval

A prospective and observational study was carried out for a period of 6 months from August to September in the surgery department of Adichunchanagiri Hospital and Research Centre (AH&RC), B.G. Nagara 571448. The study was approved by the Institutional Ethical Committee, AH&RC,BG Nagara (No.IEC/AH&RC/AC/019/2021) before the study.

Method of data collection

This is a prospective observational study. The patients satisfying the inclusion criteria were enrolled in the study. Patient case notes, medication charts, laboratory data, and other relevant documents were reviewed. A properly designed patient profile form was used to record all necessary data, such as patient demographics, medication history, and reason for admission, any allergic reaction, medication details, and lab investigations. Details about drug therapy, such as drug name, dose, duration, frequency, route, time of administration, and concurrent drug, will be collected and documented in a specially designed patient profile form. The collected data is subjected to a suitable statistical method for analysis. The sources of data include patient case sheets, prescriptions, patient profile forms, and patient interviews.

Study criteria and sample size

Prescriptions with PPIs prescribed in the surgery unit were included in the study, and prescriptions without PPIs prescribed in the surgery unit were excluded from the study. A sample size of 200 prescriptions with PPIs was collected from the surgery unit.

Statistical Analysis

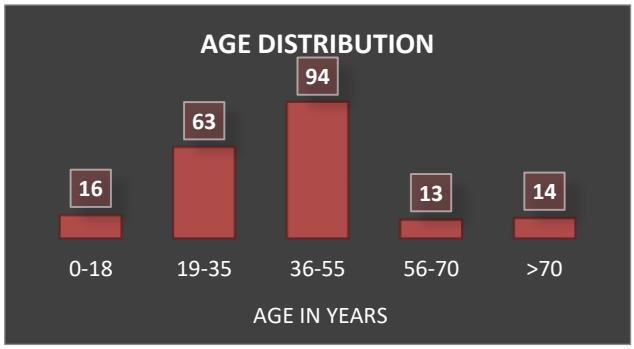
The data was entered into Microsoft Excel by using suitable descriptive statistics like percentage and cumulative percentage. This method, including frequency, was determined for the socio demographic details.

RESULTS AND DISCUSSION

Age Distribution of Patients Prescribed with PPIs

Out of 200 patients, the majority of the subjects were under the age group of 36-55 years—94 (47%) patients, followed by the age groups 19-35(31.5%), 0-18(8%),>70 (7%) and the least were between 56-70 years—13 (6.5%) as shown in **Figure 1.** While in the study conducted by Anisha Marita D'Souza et al. (2016)[1], most of the patients were in the age group of 50–59 years.

Figure 1: Age Distribution of Patients Prescribed with PPIs



Gender distribution (n=200)

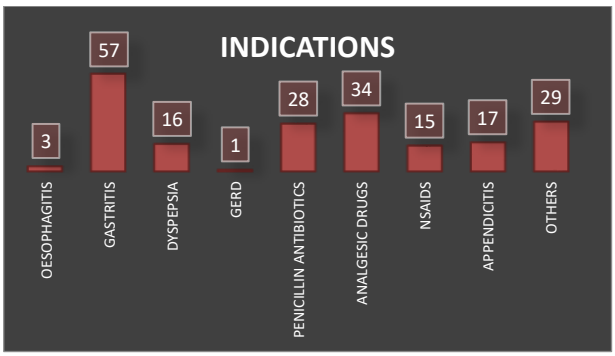
Out of 200 patients, the majority of the patients in this study were male (73%) and only a minimum of (27% were female), which was similar to the studies conducted by Anisha Marita D'Souza et al. (2016-2017)[1].

Duration of Hospital Stay (n=200)

In the study, the percentage of the length of hospital stay for 1–5 days was found in 26 patients (13%), for 6–10 days in 79 patients (39.5%), for 11–15 days in 62 patients (21%), for 16–20 days in 27 patients (13.5%), and 6 patients (3%) were found in more than 20 days.

Indication and Utilization for Prescribing PPIs

Figure 2: Indication and Utilization for Prescribing PPIs



*others: diabetes, hypertension, pancreatitis

According to the above Figure 2, few patients (13%) were prescribed PPIs for other reasons than those indicated in NICE guidelines and most of the PPIs were prescribed for gastritis (28.5 %).

However, these findings contradicted those of Anisha Marita D'Souza et al., (2016)[1] and Nousheen et al., (2013)[2], who found that PPIs were frequently prescribed alongside NSAIDs.

Rationality of PPIs

According to the NICE guidelines, the appropriate use of PPIs was found in 193 patients (98%), whereas

inappropriate use of PPIs was found in 6 patients (3%) and the inappropriateness of PPI duration was found in 1 patient (0.5%). The study conducted by Anisha Marita d'souza et al. (2016)[1] showed comparable results.

Distribution pattern of Concurrent Drugs Prescribed with PPIs

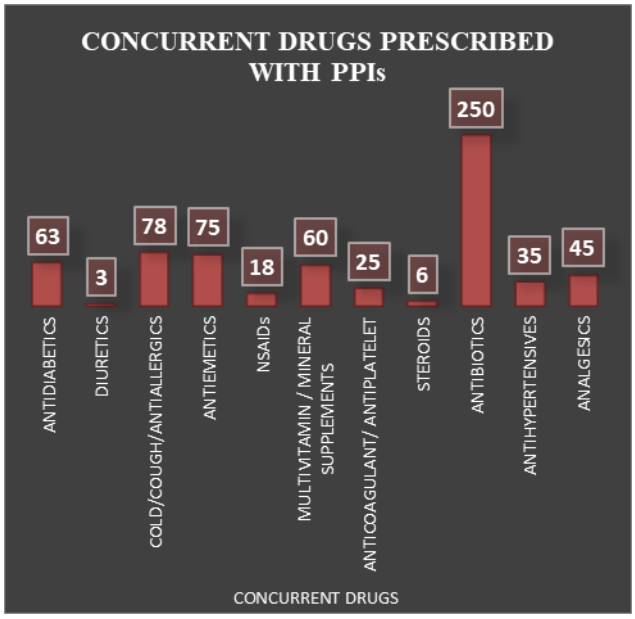


Figure 3: Distribution pattern of Concurrent Drugs Prescribed with PPIs

Figure 3 shows that antibiotics were the most commonly prescribed drugs (250) 37.9%, followed by cold/cough/antiallergic drugs (78) 11.8%, and then antiemetics (75) 11.3%. Here, diuretics (3) (0.45%) were the least prescribed drugs. These findings were similar to the study conducted by Nousheen et al., (2013)[2] and Anisha Marita D'Souza et al., (2016)[1].

Comorbidity of the Patients Prescribed with PPIs

Out of 200 patients, 144 patients have no comorbid conditions. Twenty (10%) patients have hypertension, 18 (9%) patients have diabetes mellitus, and 12(6%) patients have both hypertension and diabetes mellitus. Others include (TB, thyroid) as shown in Figure 4.

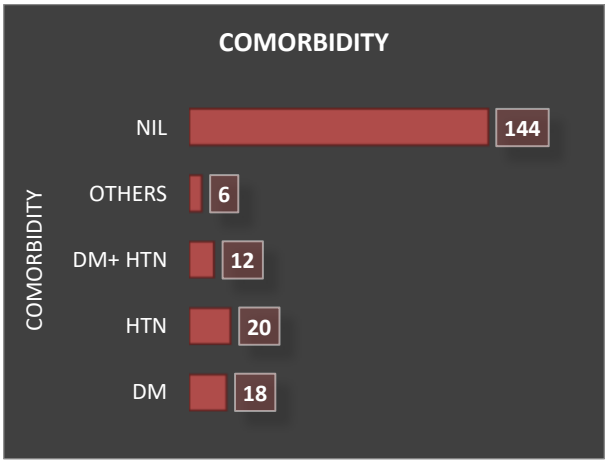


Figure 4: Comorbidity of the Patients Prescribed with PPIs

PPIs Prescribed for Patients

Table 1 shows that most of the patients were prescribed with Pantoprazole (81.5%). Esomeprazole was prescribed for only 16.5%, and a minimum of 2% of patients were prescribed with Rabeprazole. These results were similar to the study conducted by Nousheen et al. (2013) [2], where it was reported that pantoprazole was the most commonly prescribed drug.

Table 1: PPIs Prescribed

PPIs Given	No. of Patients (n=200)	Percentage %	Cumulative Percentage
Pantoprazole	163	81.5%	81.5
Esomeprazole	33	16.5%	98
Rabeprazole	4	2%	100
Total	200	100%	

Route of Administration of PPIs given

Table 2: Route of Administration of PPIs given

Route	No. of Patients (n=200)	Percentage (%)	Cumulative Percentage
Injection	143	71.5 %	71.5
Tablet	48	24%	95.5
Capsule	9	4.5%	100
Total	200	100%	

As shown in Table 2, a maximum of 71.5% of the 200 patients were given an injection, 24% were given a tablet, and 4.5% were given the medication in the form of a capsule. These results were in contrast to the study conducted by Anisha Marita D'Souza et al., (2016-2017)[1].

Formulation of the PPIs

About 95 patients were prescribed with pantoprazole injection (47.5%) followed by Pantoprazole tablet in 52 patient (26%), esomeprazole injection in 29 patients (14.5%). These were the commonly prescribed formulation of drug as shown in fig.5

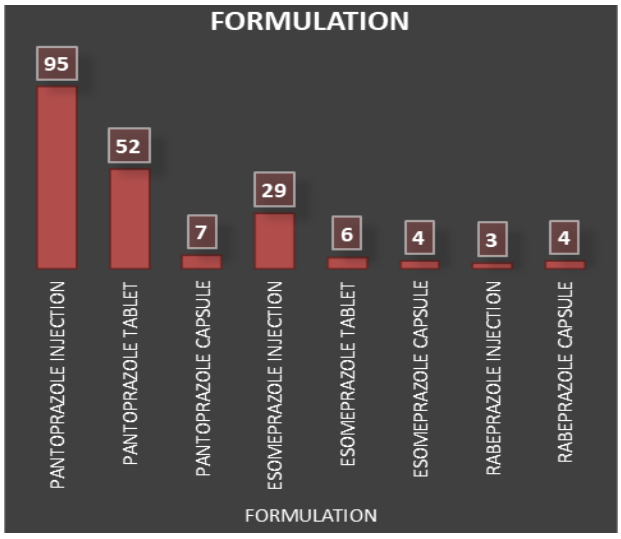


Figure 5: Formulation of PPIs

Frequency of the prescribed drugs

In the study population, most of the patients (95%) were prescribed with PPIs once in a day and the rest of the patients (5%) were prescribed twice daily.

Drug Interaction and Adverse drug reaction in the Prescription of Enrolled Patients

Out of 200 prescriptions, we found 61 drug-drug interactions, and according to the severity of classification, the majority of the interactions were moderate 42 (21%), 12 (6%) were minor interactions and 7(3.5%) were major interactions. And during our study period, there were no adverse drug reactions reported.

Frequency and outcomes of potential drug-drug interactions

Table 3: Frequency and outcomes of potential drug -drug interactions

PDDIs involving PPIs	Outcomes of Interaction	Number (n=61)	Percentage (%)	Cumulative Percentage
Amikacin + Pantoprazole	Hypomagnesemia	**25**	**40.9%**	**40.9**
Aspirin + Pantoprazole	Decrease bioavailability of aspirin	**8**	**13.1%**	**54**
Aspirin + Esomeprazole	Decrease bioavailability of aspirin	**1**	**1.6%**	**55.7**
Iron + Pantoprazole	Reduce the absorption of iron	**7**	**11.4%**	**67**
Budesonide + Pantoprazole	Decrease the absorption of budesonide	**4**	**6.5%**	**73.5**
Phenytoin + Pantoprazole	Decrease the level of CYP2C19 metabolism	**2**	**3.2%**	**76.9**
Phenytoin + Esemoprazole	Decrease the level of CYP3A4 metabolism	**1**	**1.6%**	**78.4**
Metalazone + Pantoprazole	Hypomagnesemia	**1**	**1.6%**	**80**
Atorvastatin + Pantoprazole	Increased blood levels of atorvastatin	**4**	**6.5%**	**86.4**
Clopidogrel + Pantoprazole	Increased effectiveness of clopidogrel	**1**	**1.6%**	**88.1**
Fluconazole + Pantoprazole	Increased plasma concentration of CYP2C19	**2**	**3.2%**	**91.2**
Dexamethasone + Pantoprazole	Decrease the level of CYP3A4 metabolism	**3**	**4.9%**	**96.1**
Cilostazol + Pantoprazole	Increased cilostazol exposure	**2**	**3.2%**	**100**
Total		**61**	**100%**	

Out of 200 prescriptions, 61 potential drug interactions of PPIs with other prescribed drugs were formed. Pantoprazole is the PPI which has the greatest number of interactions with other drugs like amikacin (40.9%), aspirin (13.1%), iron (11.4%), budesonide (6.5%), phenytoin (3.2%), metolazone (1.6%), atorvastatin (6.5%), clopidogrel (1.6%), fluconazole (3.2%), dexamethasone (4.9%), and cilostazol (3.2%). The other interactions are Esomeprazole with aspirin (1.6%) and phenytoin (1.6%) as shown in Table 3. These findings were similar to the study conducted by Anisha Marita D'Souza et al. (2016–2017)[1].

CONCLUSION

From the present study, conducted in the surgery department for six months to assess the drug utilization pattern of PPIs, it can be concluded that the PPIs are used in a wide range of indications and their use were common. Pantoprazole is the most commonly prescribed PPI. PPIs were most frequently prescribed, mainly to treat gastritis and to prevent the gastric irritation caused by analgesics. Rationality of drugs was followed in almost all of the cases. Out of 200 patients, appropriateness of PPIs was seen in 193 patients (98%), whereas inappropriateness of choice of PPIs was found in 6 patients (3%) and inappropriateness of duration of PPIs was found in 0.5% of cases. The rationality of prescribing PPIs can further be improved with strict adherence. Drug interactions were also seen in nearly 1/3of the prescriptions. Most of the potential drug-drug interactions were moderate. 61 drug-drug interactions of PPIs with other prescribed drugs were formed. Pantoprazole is the PPI which has the greatest number of interactions with other drugs. PPIs should be used only when there is valid documented evidence and when their use is clinically justified. Various efforts should be made to reduce the unnecessary use of PPIs to minimise drug interactions, related risks, and the health care burden of patients. Urgent steps are also needed to be taken, like training and monitoring of drug use, so that we can minimise drug-drug interactions.

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