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ASSESSMENT OF PRESCRIBING PATTERNS AND RISKS OF PROTON PUMP INHIBITORS AT A TERTIARY CARE TEACHING HOSPITAL

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Abstract

Background: The objective of this study was to evaluate the prescribing patterns and associated risks of Proton Pump Inhibitors (PPIs).

Objectives:

1. To analyze the prescribing pattern of PPIs.
2. To identify and report adverse drug reactions (ADRs).
3. To compare different drugs within the PPIs class.
4. To assess potential drug interactions.
5. To evaluate the risks associated with the use of PPIs.

Materials and Methods: This prospective observational study was conducted at Parul Sevashram Hospital, involving data collection from 214 patients across various departments including general medicine, surgery, orthopedics, and respiratory, over a six-month period. Data analysis utilized graphical representations, charts, figures, tabulations, and statistical methods such as unpaired t-tests, chi-square tests, and ANOVA performed using MS-Excel.

Results: During the study period, a total of 214 patients were included, with 99 males and 115 females. Most cases were from the medicine ward (52%), followed by the surgery ward (27.7%), and other departments including gynecology, pulmonary, respiratory, orthopedics, and others. Pantoprazole was the most frequently prescribed drug among the PPIs class. The analysis indicated that long-term/high-dose PPI use was associated with increased risks of fragility fractures, renal impairment, thrombocytopenia, and rebound hypersecretion of acid. Approximately 91% of PPIs were prescribed by brand name, with 85% of pantoprazole prescriptions combined with domperidone. Secondary sources such as MicroMedex and Drugs.com were found useful for reference purposes.

Conclusion: This study highlights pantoprazole as the predominant PPI prescribed, and underscores the risks associated with prolonged or high-dose PPI therapy, including specific adverse effects. Utilization of databases like MicroMedex and Drugs.com proved beneficial as secondary resources for clinical decision-making.

KEY WORDS- WHO (World Health organization), PPIs(Proton Pump Inhibitors), AEBE (Auditory Brainstem evoked response), GI (Gastrointestinal), AGE(Acute Gastroenteritis).

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Introduction

Proton pump inhibitors (PPIs) are pharmaceuticals that reduce stomach acid production by inhibiting the H+/K+ ATPase proton pump in the stomach lining glands. This class of drugs is highly effective, causing a significant and sustained decrease in gastric acid secretion. PPIs have largely supplanted H_2-receptor antagonists, which function differently but achieve similar outcomes. They rank among the most widely prescribed medications globally [1].

A nationwide drug utilization study conducted in 2018 reviewed 1,372,790 prescriptions filled over the study period, revealing that 95% of these were for higher-dose PPIs. While the annual incidence of PPI use remained stable (3.3-4.1 per 100 persons per year), the annual prevalence increased from 8.5 to 15.5 per 100 persons. Over time, there was a decrease in concurrent use of PPIs with nonsteroidal anti-inflammatory drugs (NSAIDs) and an increase with acetylsalicylic acid, oral anticoagulants, or platelet inhibitors [2].

A survey of 1000 clinicians in India highlighted a high prevalence of gastroesophageal reflux disease (GERD) (39.2%), peptic ulcer disease (PUD) (37.1%), and non-ulcer dyspepsia (25.2%), with nearly half of patients requiring prompt endoscopy [3]. The FDA Adverse Event Reporting System identified various adverse reactions associated with PPIs since 1989, including skin reactions such as rashes, urticaria, erythema, pruritus, and anaphylactic shock, though these represent a small proportion (0.37%) [4].

Pantoprazole emerged as the most commonly allergenic PPI. While PPIs are generally considered safe and effective for short-term use, concerns persist regarding potential long-term complications, including drug interactions, increased infection risk, reduced absorption of vitamins and minerals, and associations with kidney damage and dementia, investigated primarily through case-control and cohort studies [5].

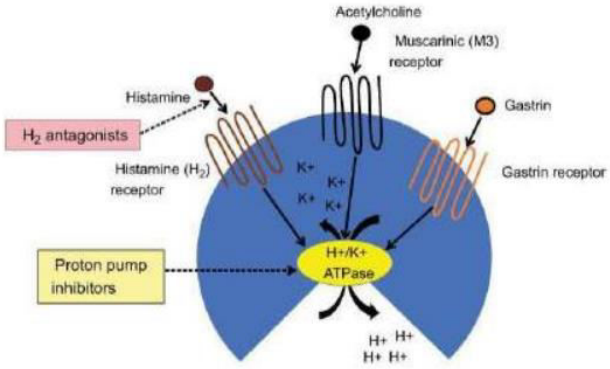

Figure 1: Mechanism of proton pump Inhibitors

Proton pump inhibitors (PPIs) function by irreversibly blocking the hydrogen/potassium adenosine triphosphatase (H+/K+ ATPase) enzyme system, commonly known as the gastric proton pump, within the parietal cells of the stomach [6]. This proton pump is crucial in the final step of gastric acid secretion, directly responsible for releasing H+ ions into the gastric lumen, making it an ideal target for acid suppression therapies [7]. By targeting this terminal

step and through irreversible inhibition, PPIs are significantly more effective than H2 antagonists, reducing gastric acid secretion by nearly 100%[8].

Lowering stomach acid levels aids in the healing of duodenal ulcers and alleviates symptoms of acid reflux and heartburn [9]. However, stomach acid is essential for digesting proteins, absorbing nutrients like vitamin B12 and calcium, and maintaining overall digestive health. Insufficient stomach acid can lead to hypochlorhydria.

PPIs are administered in an inactive form that is lipophilic (fat-soluble) and charged, allowing them to readily cross cell membranes into acidic compartments such as the parietal cell canaliculus. In an acidic environment, the inactive drug becomes protonated and converts into its active form. Once activated, it covalently binds irreversibly to the gastric proton pump, deactivating it [10].

In the eradication of H. pylori, PPIs raise the stomach pH, prompting the bacterium to transition from its acid-resistant coccoid form to a susceptible state. PPIs also exhibit additional, albeit weaker, effects in bacterial eradication [11].

How Do Proton Pump Inhibitors Work?

Your stomach naturally produces acid to aid in food digestion and to combat bacteria. To protect the stomach lining from this corrosive acid, your body produces a natural mucous barrier. However, this barrier may break down in some individuals, allowing acid to damage the stomach lining and lead to ulcers. In other cases, a malfunctioning muscular band at the top of the stomach (the sphincter) can allow acid to escape, irritating the esophagus—a condition known as acid reflux, which can cause heartburn and esophagus inflammation [12].

PPIs work by inhibiting cells in the stomach lining from producing excessive amounts of acid [13]. This helps prevent ulcer formation and supports the healing process. By reducing acid production, PPIs also alleviate symptoms associated with acid reflux, such as heartburn. They are named "Proton Pump Inhibitors" because they block (inhibit) the hydrogen-potassium adenosine triphosphatase enzyme system, also known as the proton pump, found in stomach lining cells that produce stomach acid [14].

RESULTS AND DISCUSSION

AGE WISE DISTRIBUTION	NUMBER OF PATIENT	PERCENTAGE (%)
18-25	22	10
26-35	47	22
36-45	50	23
46-55	48	23
56-65	32	15
ABOVE 65...	15	7

TABLE:1. AGE WISE DISTRIBUTION

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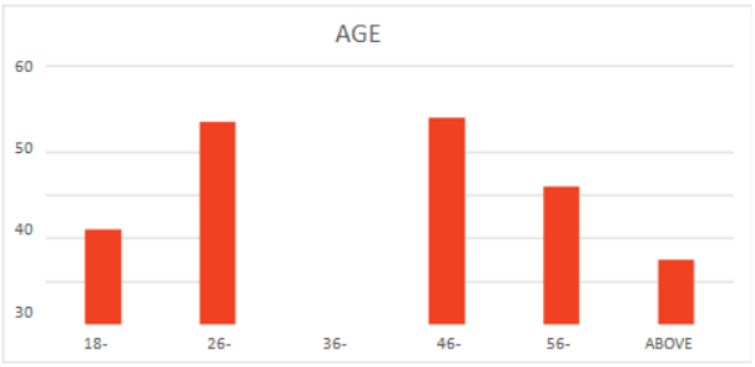
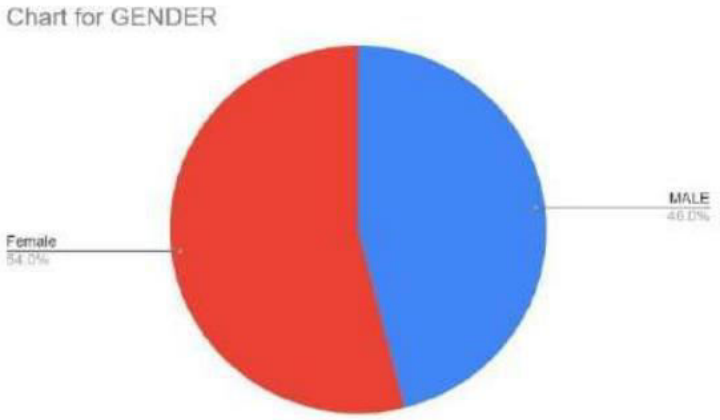


FIGURE: 1. HISTOGRAM CHART OF AGE RATIO.

TABLE 2. GENDER WISE DISTRIBUTION

GENDER	SAMPLE COLLECTED	PERCENTAGE (%)
MALE	99	46
FEMALE	115	54
TOTAL	214	100

During the study, as depicted in Table 1, out of 214 patients, 10% were aged between 18-25 years, 22% were aged between 26-35 years, 23% were aged between 36-45 years, 23% were aged between 46-55 years, 15% were aged between 56-65 years, and 7% were aged above 65 years.



FUGURE 2. GENDER WISE DISTRIBUTION

TABLE:3. DEPARTMENT WISE DISTRIBUTION

DEPARTMENT	SAMPLE COLLECTED	PERCENTAGE (%)
MEDICINE	111	52.11
SURGERY	59	27.7
GYNEC	19	8.9
PULMONARY	6	2.8
RESPIRATORY	4	1.41
ORTHO	11	5.2
EMERGENCY	1	0.47
SKIN WARD	1	0.47
PSYCHIATRIC	1	0.47
COVID SPECIAL	1	0.47
TOTAL	214	100

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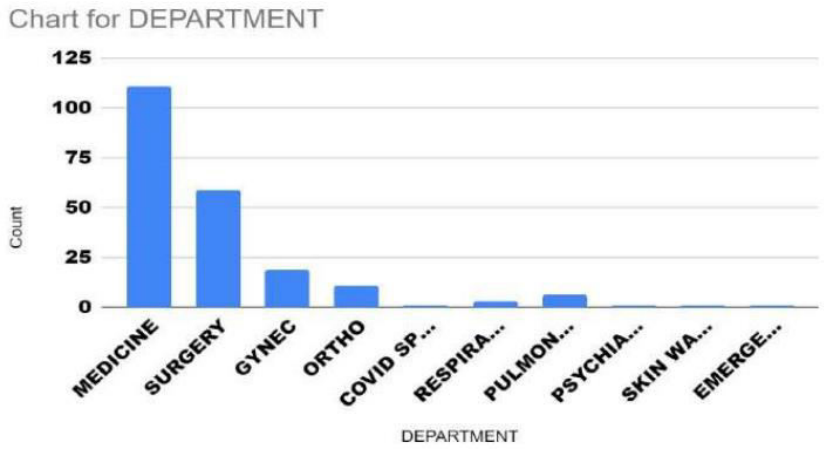

FIGURE: 3. DEPARTMET WISE DISTRIBUTION

Conclusion:

This study highlights pantoprazole as the most commonly prescribed drug among PPIs. Analysis indicates that long-term or high-dose PPI use is associated with increased risks such as fragility fractures, renal impairment, thrombocytopenia, and hypersecretion of acids upon withdrawal. The study found that 91% of PPI prescriptions were in brand name form, with 85% of pantoprazole prescribed in combination with domperidone. PPI use may contribute to various micronutrient deficiencies, which appear to be influenced by additional patient risk factors rather than solely by PPI use. Further investigation into the long-term effects and clinical implications of PPI-related micronutrient deficiencies is recommended. The study also underscores the utility of databases like MicroMedex and Drugs.com as valuable secondary references.

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