



## **Use of Proton Pump Inhibitors in Saudi Arabia: A Cross-Sectional Retrospective Drug Utilization Study**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Author MDA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors AA and NB managed the analyses of the study. Author LSK managed the literature searches. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Objective:** Chief aim of the current study was to draw attention in the prescribing pattern and utilization of PPIs in one year at a single private hospital of Saudi Arabia.

**Methods:** This is a cross-sectional, retrospective drug utilization research on Proton pump inhibitors (PPIs). The PPI usage pattern of in- and out- patients of Al-Mana Group of Hospital (AGH) Al-Khobar between January 1, 2019 and December 31, 2019 were investigated, including incidence, prevalence, and duration.

**Results:** We observed 27229 items of PPI were dispensed in the inpatient and outpatient pharmacy department of AGH-Al-khobar. Among all the PPI user more than the half {(52.98%, n = 14426), 95%CI (52.0-53.5)} were male. Nearly equal number of PPI users belongs between 18-40 years {(39.22%, n =10680), 95%CI (38.64-39.80)} and 41-60 years {(39.15%, n =10662), 95%CI

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(38.6-39.75)}. Among all the PPI users 61.46% (n=16736) were from community of Saudi Arabia while 38.53% (n=10493) from Non-Saudi. Among all the dispensed PPIs drugs Pantoprazole is dispensed to the highest number of patients {79% (95%CI, 78.53-79.50) (n=21515), p<0.05} while their average duration of therapy was 18.78 days. All the PPI prescribed to the AGH-Al-khobar patients adhere to the NICE guideline (p-value <0.05).

**Conclusions:** We also observed that PPIs was prescribed in AGH Al-khobar adhere to clinical guidelines. In our study among all the PPI Pantoprazole was prescribed to the highest number of patients, hence their safe and effective use must be warranted.

**Keywords:** Drug utilization; Proton-pump inhibitors (PPIs); Al-Mana group of hospital (AGH); Al-khobar; Saudi Arabia.

## 1. INTRODUCTION

Proton pump inhibitors (PPIs) are belongs to the category of reduction of gastric acid secretion, these works by the inhibition of H<sup>+</sup>/ K<sup>+</sup> ATPase enzyme [1]. These are commonly prescribed for numerous kinds of gastric acid related disorders [2], like gastroesophageal reflux disease (GERD), peptic ulcer disease (PUD) and *Helicobacter pylori* (H. pylori) infection [2-4]. These drugs are likewise prescribed in the treatment of gastric ulcer disease (GUD) happened by the use of nonsteroidal anti-inflammatory drugs (NSAIDs) and low dose aspirin [5,6]. Treatment by the use of PPI, their dose and duration recommended depending on disease status [7,8]. Use of PPI rarely recommend more than 8–12 weeks by the Clinical guidelines. When starting therapy for GERD and PUD High dose treatment is advisable. Whereas low dose medication is typically given as a maintenance therapy for improving patients [8].

As per safety concern of PPIs usually considers safe [9]. Although, utilization of PPIs has been complementary with greater risks of adverse drug reactions (ADRs), like kidney disease [10], breaking of bone [11], hypomagnesemia and microscopic colitis [12]. Recommendation for prescribing of the PPIs would be given if there is changes in the constituent of gastrointestinal microbial flora, elevation of the risk of *Clostridium difficile* infection and chronic hepatic infection [13,14]. Moreover, PPIs therapy cessation may be related to hypersecretion of acid plus progression of peptic disorder signs in fit person [15,16].

There is no doubt if there are signs related to hyperacidity arises PPIs has been prescribed, but the main anxiety about their inadequate and excessive utilization within community and healthcare setting [17,18]. These misuse give us as an alarming signal in long term caring patients

especially geriatric patients [19], while excessive prescribing of these drugs related to their safety concern [20].

Due to above mentioned alarms, my aim to express real world data on PPIs utilization within one year in a private teaching hospital in Saudi Arabia. Precisely my aim was to conclude the prescribing pattern of PPIs and their utilization among various Saudi populations.

## 2. MATERIALS AND METHODS

### 2.1 Study Design

It was a cross-sectional, retrospective observational study.

### 2.2 Study Place

A retrospective observational study was carried out in Al-Mana Group of Hospital (AGH), Al-Khobar, Saudi Arabia. AGH Al-Khobar is 250 bedded teaching private hospital with 74 out-patient clinics to provide health care facilities to the community of Saudi Arabia.

### 2.3 Data Source

The AGH archives separate information of about prescription and non-prescription medications given in the inside and outside hospital pharmacy. We observed 1 year prescriptions dispensed PPIs at AGH Al-Khobar. Hospital pharmacy database records provide us as the types of drugs, date and year of dispensing, person, age and gender and drug quantity. All data were archived in hospital with a unique identification number of all dispensed prescription. The therapeutic indication for prescribing is not available in the hospital pharmacy database. Anatomic therapeutic chemical (ATC) system was used for the categorization of drugs. Number of drugs dispensed for every prescription is given by the quantity and strength of the pharmaceutical

entities (Such as capsule or tablet), and the (DDDs), both ways of categorization of drugs are given by World Health Organization (WHO) [21-25].

## 2.4 Study Drugs and Population

We have taken all patients prescription dispensed PPIs between 1<sup>st</sup> January 2019 and 31<sup>st</sup> December 2019. WHO, ATC group were used only for the classification PPIs, ATC of PPIs is A02BC. The five PPIs was marketed in Saudi Arabia, beside with DDDs definitions, details available in Table 1. Several investigation has been done to identify whether each one was a recent 'user' of a PPI on known particular date. I succeed by assuming everyone considered as a recent user, if they had taken a PPI drug with adequate PPI doses to complete the duration of therapy. The magnitude of individual prescribed demand was expected as the number of capsules or tablets dispensed which is, considered as a consumption of one capsule or tablet per day, however addition of 25% for the period to account for non-compliance and filling of irregular prescriptions.

## 2.5 Statistical Analysis

Statistical Package for the Social Sciences (SPSS®) IBM Corp Inc, USA, Version (V. 21) used for the statistical analysis of data. Demographic characteristics were reported in frequencies and percentages (with Wilson 95% confidence intervals for proportions). Chi-square test ( $\chi^2$ ) is used for the computation of p-value, which helps in the estimation of adherence of prescribing pattern as per National Institute for Health and Care Excellence (NICE) guideline. Less than equal to 0.05 P-value is considered as significant.

1. I compute the utilization of PPIs (considered as the quantity of dispensed DDDs). Indicated by kinds of PPIs and duration of study (1<sup>st</sup> January 2019-31<sup>st</sup> December 2019).

2. We calculated the gender and age-specific prevalence of PPIs use.
3. To determine the length of therapy, I have taken the average duration.

In view to express probable causes for utilization PPIs, we assessed the frequency of ulcerogenic drug utilization amongst consumers of PPI. Only dispensed prescriptions by individuals presently taking PPI were listed.

## 3. RESULTS

### 3.1 Characteristics of Study Participants

In AGH Al-khobar from 1<sup>st</sup> January 2019 to 31<sup>st</sup> December 2019 total 788394 items were dispensed in the inpatient and outpatient pharmacy department in which 27229 (3.47%) items of PPI were dispensed. As described in Table 2, among all the PPI user more than the half {(52.98%, n = 14426), 95%CI (52.0-53.50)} were male. Nearly equal number of PPI users belongs between 18-40 years {(39.22%, n =10680), 95%CI (38.64-39.80)} and 41-60 years {(39.15%, n =10662), 95%CI (38.60-39.75)}. Among all the PPI users 61.46% (n=16736) were from community of Saudi Arabia while 38.53% (n=10493) from Non-Saudi.

### 3.2 Use of PPI among Different Age Group of Study Participants

As illustrated in Table 3, Highest number of Esomeprazole prescription received from 41-60 years age group patients {39.69% (95%CI, 38.2-41.2) (n=1629)} while least number of prescription received from 0-17 years age patients {1.73% (95%CI, 1.37-2.18) (n=71)}. Highest number of Lansoprazole dispensed to the 41-60 years age group {37.08% (95%CI, 33.63-40.67) (n=267)}, while least number of prescription were received from 0-17 years age group patients {0.69% (95%CI, 0.29-0.16) (n=5)}. Among all the Omeprazole users maximum number of prescription dispensed to the 41-60 years age group {36.13% (95%CI, 32.88-39.60) (n=288)} while least number of users

**Table 1. Proton pump inhibitors approved by SFDA for marketing in Saudi Arabia**

Drug	ATC	DDD (mg)	Dose
Esomeprazole	A02BC05	30	10-20mg o.d/20-40 mg bid
Lansoprazole	A02BC03	30	15 -30mg o.d
Omeprazole	A02BC01	20	10-40mg o.d/10-20 mg bid
Pantoprazole	A02BC02	40	20-40mg o.d
Rabeprazole	A02BC04	20	20mg o.d

ATC, anatomical therapeutic chemical; DDD, defined daily dose. SFDA, Saudi Food and Drug Authority

**Table 2. Baseline demographic characteristics of the studied patient's prescription**

Characteristics	Total 27229% (95%CI) (n)
<b>Gender</b>	
Male	52.98% (52.0-53.5) (14426)
Female	47.02% (46.4-47.6) (12803)
<b>Age (Years)</b>	
0-17	1.6% (1.4-1.7) (431)
18-40	39.22% (38.64-39.8) ( 10680)
41-60	39.15% (38.6-39.75) (10662)
>61	20.03% (19.6-20.5) (5456)
<b>Nationality</b>	
Non-Saudi	38.53% (37.9-39.1) (10493)
Saudi	61.46% (60.8-62.0) (16736)

**Table 3. Age wise prevalence of PPIs use among studied patients**

Age (Years)	Esomeprazole 4104% (95%CI) (n)	Lansoprazole 720%, (95%CI) (n)	Omeprazole 797% (95%CI) (n)	Pantoprazole 21515% (95%CI) (n)	Rabeprazole 93%(95%CI) (n)
0-17	1.73% (1.37-2.18)(71)	0.69% (0.29-0.16)(5)	4.26% (3.07-5.91) (34)	1.47% (1.33-1.65) (318)	3.22% (1.11-9.07) (3)
18-40	37.96% (36.49-39.46)(1558)	29.58% (26.36-33) (213)	34.25% (31.04-37.61) (273)	39.97% (39.32-40.63) (8600)	38.7% (29.45-48.87) (36)
41-60	39.69% (38.2-41.2)(1629)	37.08% (33.63-40.67)(267)	36.13% (32.88-39.60) (288)	39.26% (38.61-39.91) (8447)	33.33% (24.58-43.4), 31
>61	20.61% (19.4-21.87) (846)	32.63% (29.32-36.15) (235)	25.34% (22.45-28.48) (202)	19.28% (18.77-19.82) (4150)	24.73%(17.08-34.38) (23)

were from 0-17 years age group {4.26% (95%CI, 3.07-5.91) (n=34)}. Among all the Pantoprazole users between 18-40 and 41-60 year age were nearly equal number of users {39.97% (95%CI, 39.32-40.63) (n=8600)} and 39.26% (95%CI, 38.61-39.91) (n=8447) respectively, while least Pantoprazole were used by 0-17 years age group patients {1.47% (95%CI, 1.33-1.65) (n=318)}. Among all the Rabeprazole prescription dispensed highest number of prescription were dispensed to the 18-40 years age group patients {38.7% (95%CI, 29.45-48.87) (n=36)}.

**3.3 Frequency of PPI Prescription and Duration of Therapy**

As illustrated in Table 4, among all the dispensed PPIs drugs Pantoprazole is dispensed to the highest number of patients {79% (95%CI, 78.53-79.5) (n=21515)} while their average duration of therapy was 18.78 days. Esomeprazole was second most common dispensed PPI {15.07% (95%CI, 14.65-15.5) (n=4104)}. Average duration of therapy of Esomeprazole was 26.76 days. Lansoprazole and Omeprazole prescribed to the all most same number of patients {2.64%

(95%CI, 2.46-2.84) (n=720)} and {2.92% (95%CI, 2.74-3.14) (n=797)}. Lansoprazole average therapy duration was 30.28 days while Omeprazole average therapy duration was 24.38 days. Among all the PPIs Rabeprazole is prescribed to few number of patients comparatively other PPIs {0.34% (95%CI, 0.28-0.42) (n=93)}. Average therapy duration of Rabeprazole was 25.7 days.

**3.4 Adherence of Prescribing Pattern of PPI According to NICE Guideline 2014**

Prescribing pattern of PPI according to NICE guideline illustrated in Table 5. All the PPI prescribed to the AGH-Alkhubar patients adhere to the NICE guideline (p-value <0.05).

**4. DISCUSSION**

This study provides clear findings of the recent pattern of use of PPIs among different patients in Saudi Arabia. In the mentioned study, I just try to cover all PPIs dispensed in AGH-Alkhubar completely in one year. We observed a little raised in the consumption of ulcer causing drugs

**Table 4. Prevalence of PPIs use and therapy duration among studied patient**

PPIs	Number of prescription dispensed, total 27229% (95% CI) (n)	Average therapy duration in days
Esomeprazole	15.07% (14.65-15.5) (4104)	26.76
Lansoprazole	2.64% (2.46-2.84) (720)	30.28
Omeprazole	2.92% (2.74-3.14) (797)	24.38
Pantoprazole	79% (78.53-79.5) (21515)	18.78
Rabeprazole	0.34% (0.28-0.42) (93)	25.7

**Table 5. Pattern of PPI prescription according to NICE guideline among studied patients**

PPIs	≤ 5 weeks	≥ 5 weeks	P-value ( $\chi^2$ test)
Esomeprazole	3134,76.34%	970,23.63%	<0.05
Lansoprazole	533,74.02%	187,25.97%	<0.05
Omeprazole	667,83.68%	130,16.31%	<0.05
Pantoprazole	21001,97.61%	513,2.38%	<0.05
Rabeprazole	72,77.41%	21,22.58%	<0.05

amongst PPI consumers, which did not elucidate the perceived raised in utilization of PPI. I observed frequent and raised in utilization of PPIs, particularly amongst the intermediate age group (18-60 years) which is comparable to other study [26]. The average age of drug utilized patients were 41–60 years. This is reliable with the findings of Pendhari et al. [27]. Among all the PPIs Pantoprazole (79%) is prescribed for the highest number of patients. This is in agreement with the findings of Ali et al. [28]. In my study utilization of PPIs were amongst males in contrast to the females. Which is consistent by the findings of Mayet [29]. Among all the PPIs Lansoprazole average duration of therapy was highest. This is in agreement with the findings of Madi L et al. [26] among all the PPIs.

According to the latest NICE guideline [30], early slight tenure of PPI treatment is 4–6 weeks (average 5 weeks) is guided for the most of gastric acid suppressant drugs. In our study pattern of PPIs prescribed is adhered to NICE guideline.

## 5. CONCLUSION

We observed considerable growth in the consumption of PPIs, especially after 40 years of patients. We also observed that PPIs prescribes in AGH Al-khobar adhere to clinical guidelines. According to the result of my study of further initiatives towards maintains of relevant prescribing of PPIs, particularly with respect of the adherence of re-prescribing approaches, are acceptable. In our study among all the PPIs Pantoprazole was prescribed to the more than two third gastric disorder patients. So, we recommend to keep in mind about severity of

adverse drug reaction due to the use of Pantoprazole. Their safe and effective use must be warranted.

## DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

## CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

## ETHICAL APPROVAL

Prior to conduction of Study, study protocol has been submitted to the Scientific Research Unit (SRU) of Mohammed Al-Mana College for Medical Sciences for research protocol review and obtaining Ethical Approval Number. SRU study protocol approval number of mentioned study is SR/RP/32. Study has been conducted in compliance of recent ICH-GCP guidelines.

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### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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