



KNOWLEDGE, ATTITUDES AND PRACTICES OF COMMUNITY PHARMACISTS ABOUT PROTON PUMP INHIBITORS

SERBEST ECZACILARIN PROTON POMPASI İNHİBİTÖRLERİ HAKKINDAKİ BİLGİ, TUTUM VE UYGULAMALARI

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ABSTRACT

Objective: This study aimed to evaluate the knowledge, attitudes, and practices of community pharmacists about proton pump inhibitors (PPIs).

Material and Method: The study was a cross-sectional online survey study. It was conducted with community pharmacists in Türkiye between 1 November 2022 and 15 April 2023. The survey questions were created by revising the previous study and consisted of 32 questions. Of these, 4 were about demographic information, 16 were about knowledge, 6 were about attitude, and 6 were about practices.

Result and Discussion: The vast majority of pharmacists who participated into the study (97.6%) knew that drugs such as pantoprazole, omeprazole, etc. were PPIs, and a majority of pharmacists (84.5%) knew that PPIs were inactive pro-drugs. 63.1% of the pharmacists answered correctly that omeprazole had the most individual variability. The vast majority (93.5%) of pharmacists believed that PPIs were overused in Türkiye. 86.3% of pharmacists believed that excessive consumption of PPIs resulted in increased costs and adverse drug reactions. 46 pharmacists (27.38%) declared that they have used PPIs in the last 1 year. Pantoprazole (15.5%) and lansoprazole (7.7%) were the most commonly used PPIs, respectively. According to our study, although pharmacists' knowledge, attitudes, and practices about PPIs were generally good, there were also some deficiencies in their knowledge. Therefore, pharmacists need to update themselves and be supported by interdisciplinary continuous educations.

Keywords: Attitudes, community pharmacists, knowledge, practices, proton pump inhibitors

ÖZ

Amaç: Bu çalışma, serbest eczacıların proton pompası inhibitörleri (PPI'ler) hakkındaki bilgi, tutum ve uygulamalarını değerlendirmeyi amaçlamıştır.

Gereç ve Yöntem: Çalışma, kesitsel bir çevrimiçi anket çalışmasıydı. 1 Kasım 2022-15 Nisan 2023 tarihleri arasında Türkiye'deki serbest eczacılarla yapılmıştı. Anket soruları bir önceki çalışmanın revize edilmesiyle oluşturulmuş olup 32 sorudan oluşmaktadır. Bunlardan 4'ü demografik bilgiler, 16'sı bilgi, 6'sı tutum ve 6'sı uygulamalara ilişkindir.

Sonuç ve Tartışma: Eczacıların büyük çoğunluğu (%97.6) pantoprazol, omeprazol vb. ilaçların PPI olduğunu, eczacıların büyük çoğunluğu (%84.5) PPI'lerin inaktif ön ilaç olduğunu biliyordu. Eczacıların %63.1'i omeprazolün bireysel değişkenliğe sahip olduğunu doğru yanıtlamıştı. Eczacıların büyük çoğunluğu (%93.5) PPI'lerin Türkiye'de gereğinden fazla kullanıldığına

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Submitted / Gönderilme : 03.07.2023

Accepted / Kabul : 13.11.2023

Published / Yayınlanma : 20.01.2024

inanmaktaydı. Eczacıların %86.3'ü aşırı PPI tüketiminin maliyet artışına ve advers ilaç reaksiyonlarına yol açtığına inanmaktaydı. 46 eczacı (%27.38) son 1 yılda PPI kullandığını beyan etti. Pantoprazol (%15.5) ve lansoprazol (%7.7) sırasıyla en sık kullanılan PPI idi. Çalışmamıza göre eczacıların PPI'lerle ilgili bilgi, tutum ve uygulamaları genel olarak iyi olmakla birlikte bazı bilgi eksiklikleri de vardı. Bu nedenle eczacıların kendilerini güncellemeleri ve meslek içi sürekli eğitimlerle desteklenmeleri gerekmektedir.

Anahtar Kelimeler: *Bilgi, proton pompa inhibitörleri, serbest eczacılar, tutum, uygulamalar*

INTRODUCTION

Proton pump inhibitors (PPIs) are acid secretion-inhibiting prodrugs that are widely used to treat gastric acid-related pathologies, including gastroesophageal reflux disease, duodenal ulcer, and gastric ulcer [1]. PPIs are the most widely prescribed and most effective class of gastrointestinal drugs. Omeprazole, esomeprazole, lansoprazole, dexlansoprazole, pantoprazole, and rabeprazole are among the PPIs approved by the Food and Drug Administration (FDA) [2].

One of the reasons why they are widely prescribed is that they have very few side effects, but with the research, it has been understood that there are many adverse effects of inappropriate and/or long-term use. These adverse effects include an increased risk of both acute and chronic kidney diseases, hypomagnesemia, Clostridium difficile infection, pneumonia, and osteoporotic fractures. Before using PPIs for patients with the potential for these adverse effects, the benefit-harm relationship and whether it is necessary for the patient should be considered [3-5].

Many studies show positive results in pharmacist-led proton pump inhibitor (PPI) management [6-10]. In a study conducted by Tandun et al. in a long-term care facility, pharmacists recommended deprescribing PPI and 80% of residents successfully completed deprescribing PPI [6]. Wahking et al. reduced the use of inappropriate PPIs in both inpatients and outpatients as part of a pharmacist-led PPI stewardship program [7]. In a study conducted in a family medicine clinic, deprescribing long-term PPI therapy was successful by implementing a clinical pharmacist-led program that included detailed dose reduction instructions, patient education, and follow-up [8]. A clinical pharmacist-led guidance team at a tertiary hospital in China implemented the Plan-Do-Check-Act (PDCA) method to increase rational PPI use. As a result, the irrational PPI rate and cost, including duration, route of administration, indication, and dosing frequency, were significantly reduced [9]. In a study of hospitalized older adults in Türkiye, appropriate PPI use increased with a pharmacist-led stewardship program [10]. Community pharmacists also have an important role in providing drug counseling to patients [11]. They need to inform patients about when to take PPIs, how long they should use them, and their long-term side effects [12]. Therefore, the knowledge, attitudes, and practices of community pharmacists towards PPIs are important to prevent side effects, drug-drug interactions, and inappropriate PPI use [13].

This study aimed to evaluate community pharmacists' knowledge, attitudes and practices regarding PPIs. It was also designed to identify community pharmacists' knowledge gaps in properly counseling patients about PPIs.

MATERIAL AND METHOD

Study Design and Participants

The study was an observational cross-sectional online survey study. A convenience sampling technique was used. It was conducted with community pharmacists in Türkiye between 1 November 2022 and 15 April 2023. Ethical approval of the study was obtained from Suleyman Demirel University Clinical Research Ethics Committee (Approval No: 194 / Date: 07.07.2022).

The survey was created with Google Form. Before their participation, pharmacists were informed about the purpose and definition of the research on the first page of the questionnaire. Those who read and approved the Informed Consent Form electronically participated in the study.

There are approximately 26,759 community pharmacists in Türkiye [14] and the sample size was determined as 96 with a sampling error of 0.10 and a probability of occurrence of 0.5 [15-17].

Data Collection

The questionnaire was created by 2 pharmacists by revising the previous study [13]. In addition, expert opinion was obtained from 2 pharmacists. A pilot study was conducted among 30 participants to check the intelligibility and readability of the questionnaire. As a result, minor changes were made. For internal consistency, the Cronbach alpha score was calculated and found to be 0.64. (%95 confidence interval (0.510-0.791), $F=2.995$, $p<0.001$).

The questionnaire consisted of 32 questions. Of these, 4 were about demographic information, 16 were about knowledge, 6 were about attitude, and 6 were about practices. The answers to all of the knowledge questions were “Yes” or “No”. The correct answer was scored as “1” and the incorrect answer as “0”. A 5-point Likert scale was used in questions about attitude. It was scored as 5 for Strongly Agree, 4 for Agree, 3 for Uncertain, 2 for Disagree and 1 for Strongly Disagree. In the practical questions, the first question was about whether the PPI was used, and if it was, the next 5 questions were answered by the participants.

It was always scored as 1 point, frequently 2 points, occasionally 3 points, rarely 4 points, and never 5 points. More than $\geq 80\%$ of the total score was associated with a higher level of knowledge, attitude, and practice, and $<80\%$ was associated with a lesser level of knowledge, attitude, and practice.

Statistical Analysis

Data were analyzed with the Statistical Package for the Social Sciences (SPSS) 20.0. Descriptive statistics were calculated as numbers, percentage, mean \pm standard deviation (SD). Normality of the data were evaluated by the Kolmogorov–Smirnov test. The Chi-square test was used to compare categorical variables and the Student’s t-test was used to compare non-categorical variables. P values less than 0.05 were considered statistically significant.

RESULT AND DISCUSSION

The questionnaire was answered by 168 (23.24%) community pharmacists. About half of the pharmacists (51.2%) were women and the mean \pm SD age was 46.26 ± 14.053 . 93.5% of the pharmacists had a bachelor’s degree and 85.1% had more than 5 years of experience. Table 1 shows the sociodemographic characteristics of pharmacists.

Table 1. Sociodemographical characteristics of pharmacists

Characteristics	Values
Gender (%)	
Female	86 (51.2)
Male	82 (48.8)
Age, years (mean\pmSD)	46.26 \pm 14.053
Education (%)	
Bachelor's degree	157 (93.5)
Postgraduate	11 (6.5)
Work experience, years (%)*	
< 5	25 (14.9)
≥ 5	143 (85.1)

SD: standard deviation, * ≥ 5 years was considered more experienced

Knowledge

The vast majority of pharmacists (97.6%) knew that drugs such as pantoprazole, omeprazole, etc. were PPIs, and a majority of pharmacists (84.5%) knew that PPIs were inactive pro-drugs. 63.1% and 69% of pharmacists answered correctly that omeprazole had the most individual variability and could be used in pediatric patients, respectively. Most of the pharmacists (98.2%) answered correctly to the question of whether PPIs are taken after meals. Only 33.9% of pharmacists answered correctly to the

duration of treatment of PPIs in gastric ulcers. Table 2 shows the level of knowledge of pharmacists about the use of PPIs.

The knowledge level of 64.3% of the pharmacists was found to be good. Education level at bachelor level (bachelor level etc. postgraduate, $p=0.018$) and more work experience (<5 years etc. ≥ 5 years, $p=0.003$) were associated with better knowledge level (Table 5).

Table 2. Pharmacists' knowledge of proton pump inhibitors (PPIs)

Questions	Correct answers frequency (%)
Is a PPI an inactive pro-drug?	142 (84.5)
Are omeprazole, pantoprazole, lansoprazole, rabeprazole, esomeprazole PPIs?	164 (97.6)
Do PPIs treat acid-related diseases by suppressing hydrochloric acid secretion?	158 (94)
Can PPIs be used to prevent stress ulcers?	156 (92.9)
Can PPIs be used in the treatment of acute pancreatitis?	105 (62.5)
Does omeprazole have the most individual variability compared to other PPIs?	106 (63.1)
Should omeprazole be selected for pediatric patients?	116 (69)
Is rabeprazole first choice in pregnant patients?	131 (78)
Do you think that more PPI consumption will create a better and safer effect?	155 (92.3)
Are PPIs usually available as enteric-coated capsules or tablets?	137 (81.5)
Should the PPI usually be taken before breakfast?	160 (95.2)
Should a PPI be taken after a meal?	165 (98.2)
Is it advisable to increase the dose frequency rather than a single dose to improve effect?	108 (64.3)
Should patients take PPI for only 7 days in Helicobacter pylori eradication treatment?	143 (85.1)
Does PPI treatment of gastric ulcer take 2 weeks to 4 weeks?	57 (33.9)
Do you think long-term use of PPI may cause adverse reactions such as osteoporosis, etc.?	150 (89.3)

Attitude

The vast majority (93.5%) of pharmacists believed that PPIs were overused in Türkiye. 68.4% of pharmacists stated that the reason for the high use of PPIs was abuse by the patient or physician. 86.3% of pharmacists believed that excessive consumption of PPIs resulted in increased costs and adverse drug reactions. 86.9% of pharmacists believed that health workers should receive extensive training on this subject, and 80.3% believed that community pharmacy management should be strengthened. Table 3 shows the attitudes of pharmacists towards PPIs.

The attitude level of 61% of the pharmacists was found to be good. There was no significant relationship between any socio-demographic variable and the level of attitudes of the pharmacists ($p>0.05$) (Table 5).

Practices

46 pharmacists (27.38%) declared that they have used PPIs in the last 1 year. Figure 1 shows the PPIs used by pharmacists in the last 1 year. Pharmacists declared that they never used PPIs for abdominal pain, ventosity, nausea, and vomiting in 19%, 16.7%, 19.6% and 17.3%, respectively. Table 4 shows pharmacists' practices regarding the use of proton pump inhibitors.

There was no significant relationship between any socio-demographic variable and pharmacists' use of PPIs ($p>0.05$) (Table 5).

Table 3. Pharmacists' attitudes to proton pump inhibitors (PPIs) use

Questions	Agreement	Frequency (%)
Currently, PPIs are overused in Türkiye.	Strongly agree	89 (53)
	Agree	68 (40.5)
	Uncertain	6 (3.6)
	Disagree	4 (2.4)
	Strongly disagree	1 (0.6)
The main cause of PPI overuse is physician or patient abuse of the PPI.	Strongly agree	56 (33.3)
	Agree	59 (35.1)
	Uncertain	25 (14.9)
	Disagree	27 (16.1)
	Strongly disagree	1 (0.6)
Stress ulcer prophylaxis is the main reason for the overuse of PPIs.	Strongly agree	48 (28.6)
	Agree	72 (42.9)
	Uncertain	25 (14.9)
	Disagree	20 (11.9)
	Strongly disagree	3 (1.8)
Overuse of PPIs will result in increased adverse drug reactions and medical cost.	Strongly agree	64 (38.1)
	Agree	81 (48.2)
	Uncertain	15 (8.9)
	Disagree	5 (3)
	Strongly disagree	3 (1.8)
Large scale education on the rational use of PPIs is needed for healthcare professionals and the public.	Strongly agree	67 (39.9)
	Agree	79 (47)
	Uncertain	9 (5.4)
	Disagree	11 (6.5)
	Strongly disagree	2 (1.2)
In this regard, community pharmacy management should be strengthened.	Strongly agree	57 (33.9)
	Agree	78 (46.4)
	Uncertain	14 (8.3)
	Disagree	18 (10.7)
	Strongly disagree	1 (0.6)

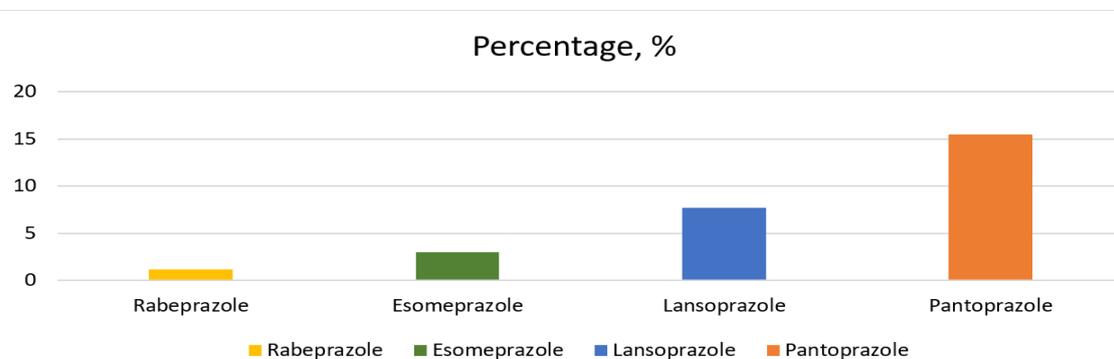
**Figure 1.** Types of proton pump inhibitors used by pharmacists in the last 1 year

Table 4. Pharmacists' practices on the use of proton pump inhibitors (PPIs)

Questions	Agreement	Frequency (%)*
Use PPI when abdominal pain	Always	1 (0.6)
	Often	-
	Sometimes	4 (2.4)
	Rarely	9 (5.4)
	Never	32 (19)
Use PPI when ventosity	Always	1 (0.6)
	Often	1 (0.6)
	Sometimes	7 (4.2)
	Rarely	9 (5.4)
	Never	28 (16.7)
Use PPI when nausea	Always	-
	Often	-
	Sometimes	4 (2.4)
	Rarely	9 (5.4)
	Never	33 (19.6)
Use PPI when vomiting	Always	-
	Often	-
	Sometimes	6 (3.6)
	Rarely	11 (6.5)
	Never	29 (17.3)

* Only 46 pharmacists using PPIs responded

Table 5. Responses to questions related to knowledge, attitudes and usages in relation to PPIs use

Variables	Knowledge Level			Attitude Level			PPI Usage		
	Poor (%) n	Good (%) n	p	Poor (%) n	Good (%) n	p	Unused (%) n	Used (%) n	p
Gender									
Male	30 (50)	52 (48.1)	0.818	36 (56.2)	46 (44.2)	0.13	58 (47.5)	24 (52.2)	0,717
Female	30 (50)	56 (51.9)		28 (43.8)	58 (55.8)		64 (52.5)	22 (47.8)	
Age years (mean±SD)	45.17 ±16.26	46.86 ±12.7	0.487	45.55 ±14.107	46.59 ±14.069	0.609	45.29± 13.95	48.8± 14.15	0.146
Education									
Bachelor's degree	52 (86.7)	105 (97.2)	0.018	58 (90.6)	99 (95.2)	0.336	113 (92.6)	44 (95.7)	0.729
Postgraduate	8 (13.3)	3 (2.8)		6 (9.4)	5 (4.8)		9 (7.4)	2 (4.3)	
Work experience, years (%)									
< 5	16 (26.7)	9 (8.3)	0.003	10 (15.6)	15 (14.4)	1	20 (16.4)	5 (10.9)	0,47
≥ 5	44 (73.3)	99 (91.7)		54 (84.4)	89 (85.6)		102 (83.6)	41 (89.1)	

PPIs: proton pump inhibitors, SD: standard deviation

In our study, although pharmacists' knowledge, attitudes, and practices regarding PPIs were generally good, there were also some deficiencies in their knowledge. In the study conducted in China, which drug is a PPI was answered correctly 76.61% by doctors, 66.42% by nurses and 77.78% by pharmacists. The mechanism of action was answered correctly 93.2% by doctors, 89.93% by nurses, and 92.36% by pharmacists. 68.48% of physicians, 52.61% of nurses, and 74.65% of pharmacists knew that PPIs were prodrugs [13]. These rates were 100%, 81.4% and 71.2%, respectively, in the study conducted with community pharmacists in Cyprus [18]. The results of our study are in line with the literature. In our study, only 33.9% of the participants correctly answered the duration of PPI treatment in gastric ulcers. These results were low in line with other studies. In other studies, this rate was 30%, 54.51%, and 20.3% in pharmacists, respectively [13,18,19]. This may be because the dose and duration of the PPI are the responsibility of the prescribing physician. However, pharmacists must also collaborate with the prescriber to reduce healthcare costs and improve outcomes [10,20].

In our study, pharmacists thought that PPIs were overused (93.5%) and believed that this would cause an increase in adverse drug reactions and medical costs (86.3%). PPIs are one of the most commonly prescribed drugs worldwide. There were many studies on the unnecessary and misuse of PPIs [21,22]. There were also studies in Türkiye about the unnecessary and widespread use of PPIs [10,23]. Inappropriate long-term use of PPIs, especially in elderly patients, causes serious adverse effects [24]. These adverse effects are; pneumonia, vitamin B12, calcium deficiency, increased risk of fracture, *Clostridium difficile* infection and gastric carcinoid tumor [25].

In our study, 86.9% of pharmacists believed that the public and health workers should be trained on the rational use of PPI, and 80.3% of pharmacists believed that community pharmacy management should be strengthened. Both community pharmacists and clinical pharmacists play an important role in reducing the inappropriate use of PPIs, reducing healthcare costs and preventing adverse reactions. Many studies have shown that pharmacists reduce the use of inappropriate PPIs [10,26,27]. Due to the low knowledge of the patients and easy access to PPIs from the pharmacy, it causes excessive use of PPIs, so the public and community pharmacists should be made aware of this issue [13].

In our study, 27.4% of pharmacists used PPIs in the last 1 year. The most commonly used PPIs were pantoprazole (56.5%) and lansoprazole (28.26%). In a study conducted in China [13], 40% of pharmacists used PPIs in the last 1 year, and omeprazole was the most commonly used PPI. In a study conducted in Cyprus [18], about half of the pharmacists used PPIs in the last 1 year and omeprazole was used most frequently. The reason why pantoprazole was frequently used by pharmacists in our study may be that pantoprazole was frequently prescribed by doctors and the number of generic drugs and their availability in the market were high. A study investigating the impact of PPI consumption on the budget in Türkiye revealed that physicians preferred omeprazole less over the years and preferred more expensive molecules instead. Pantoprazole, esomeprazole, and rabeprazole, which were preferred with low rates in 2006, dominated more than 50% of the market in 2011 [28]. Additionally, omeprazole may have been less preferred because it has a greater potential for drug-drug interactions than other PPIs [29].

In our study, there was no pharmacist who always and frequently used PPIs in the presence of vomiting and nausea. Only 1 person (0.6%) declared that they always used PPIs when they had abdominal pain and ventosity. This rate was quite low compared to other studies [13,19].

This study has some limitations. The number of pharmacists participating in the study was low, so the generalizability of the study was limited. In addition, since the survey was an online survey, the participants administered it on their own. Therefore, the participants could not be observed by the researchers, and we do not know whether they looked at any material while answering the questions.

According to our study, although pharmacists' knowledge, attitudes, and practices about PPIs were generally good, there were also some deficiencies in their knowledge. Therefore, pharmacists need to update themselves and be supported continuously with various trainings.

AUTHOR CONTRIBUTIONS

Concept: A.A.; Design: A.A., İ.Y.; Control: A.A., İ.Y.; Sources: A.A., İ.Y.; Materials: A.A., İ.Y.; Data Collection and/or Processing: İ.Y.; Analysis and/or Interpretation: A.A.; Literature Review: A.A., İ.Y.; Manuscript Writing: A.A., İ.Y.; Critical Review: A.A.; Other: -

CONFLICT OF INTEREST

The authors declare that there is no real, potential, or perceived conflict of interest for this article.

ETHICS COMMITTEE APPROVAL

Ethical approval of the study was obtained from Suleyman Demirel University Clinical Research Ethics Committee (Approval No: 194 / Date: 07.07.2022).

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