Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v6i6.1806
*Biol. Clin. Sci. Res. J., Volume 6(6), **2025**: 1806*
Original Research Article

Efficacy and Safety of Potassium-Competitive Acid Blockers Versus Proton Pump Inhibitors as Helicobacter Pylori Eradication Therapy

Sadaf Noureen[1], Maria Kalsoom[2*], Hareem Fatima[3], Abeeha Zia[4], Amina Hasan Butt[4], Iqra Malik[4]

[1]The Groves Medical Centre, New Malden, UK
[2]Department of Gastroenterology, Fauji Foundation Hospital, Rawalpindi, Pakistan
[3]Advance Home Health Services Islamabad, Pakistan
[4]Department of General Medicine, Fauji Foundation Hospital, Rawalpindi, Pakistan
**Corresponding author`s email address:* mariakalsoom20@gmail.com

(Received, 14th May 2025, Accepted 18th June 2025, Published 30th June 2025)

Abstract: *Helicobacter pylori is a globally prevalent pathogen implicated in gastritis, peptic ulcer disease, and gastric cancer.* ***Objective:*** *To compare the efficacy and safety of P-CAB-based triple therapy versus conventional PPI-based triple therapy in the eradication of H. pylori infection.* ***Methods:*** *This prospective, comparative study was conducted at Fauji Foundation Hospital, Rawalpindi from August 2024 to April 2025. A total of 455 patients with confirmed H. pylori infection were enrolled in the study. Patients aged between 18–75 years, a positive diagnosis of H. pylori infection confirmed through stool antigen only, and no previous eradication therapy were included in the study.* ***Results:*** *The eradication rate was significantly higher in Group A compared to Group B (90.8% vs. 80.6%, p = 0.003). Per-protocol analysis showed similarly superior outcomes for the P-CAB group (94.1% vs. 84.1%, p < 0.001). Both groups had comparable safety profiles, with mild adverse events reported in 13.6% of patients in Group A and 19.4% of patients in Group B (p = 0.08). Compliance rates exceeded 94% in both groups. Post-treatment symptom resolution was greater in the P-CAB group across key gastrointestinal complaints.* ***Conclusion:*** *It is concluded that P-CAB-based triple therapy offers significantly improved eradication rates of H. pylori compared to standard PPI-based regimens, with a favorable safety and compliance profile.*

Keywords: Helicobacter pylori, vonoprazan, P-CAB, proton pump inhibitor, eradication therapy.

[***How to Cite:*** Noureen S, Kalsoom M, Fatima H, Zia A, Butt AH, Malik I. Efficacy and safety of potassium-competitive acid blockers versus proton pump inhibitors as helicobacter pylori eradication therapy. *Biol. Clin. Sci. Res. J.*, **2025;** 6(6): 239-242. doi: https://doi.org/10.54112/bcsrj.v6i6.1806

Introduction

Helicobacter pylori (H. pylori) is a spiral-shaped, Gram-negative bacterium that colonizes the human stomach and duodenum. It is considered one of the most common chronic bacterial infections worldwide, with an estimated prevalence of over 50% globally and even higher in developing countries (1, 2). Healthy cells sometimes defend themselves against H. pylori, while other times they do not. To stop upper gastrointestinal tract illnesses, removing it is now a top priority. (3) So far, the regular treatment for H. pylori infection involved taking clarithromycin or amoxicillin or metronidazole along with a proton pump inhibitor (PPI) (4). PPIs increase the pH in the stomach which benefits antibiotics and promotes the killing of bacteria (5). The success rate of triple therapy around the world has declined over period, with several regions now unable to achieve the required 80–90% eradication rates (6). The issue with PPI-based regimens is related to increasing antibiotic resistance, uneven patient compliance and differences in how patients process PPIs due to genes which fail to provide enough acid protection for some (7). To deal with these issues, doctors now use potassium-competitive acid blockers (P-CABs) as a new kind of acid suppression treatment. Vonoprazan and similar P-CABs act by blocking the proton pump at the potassium site, unlike PPIs that engage it covalently; this process results in powerful and sustained control of acid secretion (8). Importantly, P-CABs start working without needing acid and are not strongly affected by CYP2C19 variations, meaning they provide similar acid inhibition in many patients (9). Both preliminary clinical trials and actual, real-world results from Japan and South Korea have yielded results that are encouraging. When compared to PPI triple therapy, vonoprazan triple therapy has better or equal rates of clearing H. pylori, mainly for cases where clarithromycin cannot work (10). In addition, P-CABs have similar or even better safety records than PPIs and side effects such as diarrhea and abdominal and head pain are rarely seen and usually go away by themselves (11). P-CABs suggest a promising future, but their acceptance in the clinic has been slow and inconsistent. In a number of countries, the approval to introduce this drug has not yet come through and researchers still lack enough long-term safety information. There are still unanswered questions about how effective they are, how quickly resistance develops and when to use them in saving a treatment for people who have not responded well to first-line therapies. Because so many nations now focus on antibiotic stewardship, therapies should eradicate many infections in one cycle and decrease the pressure for bacterial resistance (12).

Thus, the objective of the study is **t**o compare the efficacy and safety of P-CAB-based triple therapy versus conventional PPI-based triple therapy in the eradication of H. pylori infection.

Methodology

This prospective, comparative study was conducted at Fauji Foundation Hospital Rawalpindi from August 2024 to April 2025. A total of 455 patients with confirmed H. pylori infection were enrolled in the study. Patients aged between 18–75 years, positive diagnosis of H. pylori infection confirmed through H.pylori stool antigen and no previous eradication therapy were included in the study. Exclusion criteria included pregnancy, lactation, severe hepatic or renal dysfunction, recent use (within 4 weeks) of antibiotics, bismuth compounds or acid suppressants, known hypersensitivity to study drugs, presence of gastrointestinal malignancy and those who are on PPIs or antibiotics. A non-probability consecutive sampling technique was used.

Patients were randomized into two groups:

- **Group A (n = 228):** Received triple therapy comprising a P-CAB (Vonoprazan 20 mg twice daily), amoxicillin 1 g twice daily, and clarithromycin 500 mg twice daily for 14 days.
- **Group B (n = 227):** Received standard triple therapy comprising a PPI (Omeprazole 20 mg twice daily), amoxicillin 1 g twice daily, and clarithromycin 500 mg twice daily for 14 days.

Patients were instructed to adhere strictly to the treatment protocol and report any adverse effects experienced during the treatment period. Demographic data, clinical symptoms, adverse drug reactions, and compliance rates were recorded using a standardized data collection form. Follow-up was conducted through outpatient visits to ensure adherence and monitor adverse events. The primary outcome was H. pylori eradication, assessed four weeks post-treatment using the stool antigen.

Data analysis was performed using IBM SPSS Statistics version 26.0. Continuous variables were presented as mean ± standard deviation (SD) and compared using the independent sample t-test. Categorical variables, including eradication rates and incidence of adverse effects, were presented as frequencies and percentages and analyzed using the Chi-square test A p-value of <0.05 was considered statistically significant.

Results

Data were collected from 455 patients, with 228 receiving P-CAB-based therapy and 227 receiving PPI-based therapy. The mean age of participants was comparable between groups (41.8 ± 12.6 years in Group A vs. 42.4 ± 13.1 years in Group B; p = 0.64), with a nearly equal gender distribution in both groups. In terms of treatment efficacy, the P-CAB group demonstrated significantly higher H. pylori eradication rates compared to the PPI group. In the intention-to-treat (ITT) analysis, eradication was achieved in 90.8% of Group A versus 80.6% of Group B (p = 0.003), while the per-protocol (PP) analysis showed even greater efficacy in the P-CAB group (94.1% vs. 84.1%, p < 0.001).

Table 1. Baseline Characteristics of Study Participants (n = 455)

Variable	Group A (P-CAB)	Group B (PPI)	p-value
Number of patients	228	227	–
Mean Age (years)	41.8 ± 12.6	42.4 ± 13.1	0.64
Male, n (%)	120 (52.6%)	114 (50.2%)	0.62
Female, n (%)	108 (47.4%)	113 (49.8%)	–
Analysis Type			
Intention-to-Treat (ITT)	207/228 (90.8%)	183/227 (80.6%)	0.003
Per-Protocol (PP)	206/219 (94.1%)	180/214 (84.1%)	<0.001

A total of 13.6% of patients in the P-CAB group and 19.4% in the PPI group experienced at least one adverse effect, with the difference not reaching statistical significance (p = 0.08). The most commonly reported symptoms were nausea (5.7% vs. 6.6%), headache (3.5% vs. 4.4%), and diarrhea (4.4% vs. 5.7%) in the P-CAB and PPI groups, respectively.

Table 2. Frequency of Adverse Events Reported During Treatment

Adverse Event	Group A (P-CAB)	Group B (PPI)	p-value
Any adverse event	31 (13.6%)	44 (19.4%)	0.08
Nausea	13 (5.7%)	15 (6.6%)	
Headache	8 (3.5%)	10 (4.4%)	
Diarrhea	10 (4.4%)	13 (5.7%)	
Abdominal discomfort	0 (0.0%)	6 (2.6%)	

Compliance with treatment was high in both groups, with 96.1% of patients in the P-CAB group and 94.3% in the PPI group achieving good compliance (≥80% medication intake), showing no statistically significant difference (p = 0.34). Poor compliance was slightly more common in the PPI group (5.7%) compared to the P-CAB group (3.9%). Subgroup analysis by gender revealed significantly higher eradication rates among males in the P-CAB group (96.6%) versus the PPI group (86.4%) (p = 0.01), and similarly among females (91.2% vs. 81.7%, p = 0.04), indicating consistent superiority of P-CAB therapy across both sexes.

Table 3. Treatment Compliance Rates Among Study Participants

Compliance Level	Group A (P-CAB)	Group B (PPI)	p-value
Good compliance (≥80%)	219 (96.1%)	214 (94.3%)	0.34
Poor compliance (<80%)	9 (3.9%)	13 (5.7%)	–
Subgroup analysis			
Male	113/117 (96.6%)	95/110 (86.4%)	0.01
Female	93/102 (91.2%)	85/104 (81.7%)	0.04

At baseline, the most common gastrointestinal symptom reported by patients was epigastric pain, affecting 68.4% of the total cohort, followed by bloating (54.9%) and early satiety (36.9%). After completion of therapy, a marked improvement was observed across all symptoms. Epigastric pain resolved in 92.3% of affected patients, bloating in 89.2%, and early satiety in 88.7%.

Table 4. Frequency of Gastrointestinal Symptoms Before and After Treatment

Symptom	Baseline Frequency (All Patients)	Post-Treatment Resolution (n, %)
Epigastric pain	311 (68.4%)	287 (92.3%)
Bloating	250 (54.9%)	223 (89.2%)
Early satiety	168 (36.9%)	149 (88.7%)

Discussion

This study evaluated the comparative efficacy and safety of potassium-competitive acid blockers (P-CABs) versus proton pump inhibitors (PPIs) as part of triple therapy for Helicobacter pylori eradication. According to the findings, the P-CAB-based therapy of vonoprazan and amoxicillin plus clarithromycin was more effective in eradicating the infection than the usual PPI based regimen in all analyses. What's more, P-CAB therapy was well accepted, as drug safety and patient adherence were similar. The rate of eradicating ITT in the P-CAB group was 90.8% which is above the globally recommended 90% rate for initial therapy (13). Alternatively, the PPI group only achieved 80.6% which is a level also reported in several regions where eradication continues to decrease mainly due to raised resistance of the bacteria and varying acid control by the drugs (14). P-CABs worked better than the comparator in the analysis of protocol-treated patients (94.1% vs. 84.1%), underlining the strong effect of vonoprazan on improving the pH in the stomach to aid antibiotics (15).The results match previous research on the topic. Researchers Murakami and colleagues (2016) showed that eradicating H. pylori with vonoprazan-based triple therapy achieved 92.6% success among Japanese patients which was much greater than lansoprazole-based therapy achieving 75.9%. The reason may be that vonoprazan takes effect quickly and lasts a long time while suppressing acid, unlike PPIs that are affected by CYP2C19 polymorphisms. By analyzing males and females individually, we confirmed that P-CAB remains very effective in both groups. So, it seems that vonoprazan works in the same way for men and women, as well as for people with different metabolic conditions. (16) There were small and mild effects related to the study drugs and in both treatment groups, the most common side effects were gastrointestinal discomfort like nausea, headaches and diarrhea (17). No participant in either group reported any serious or treatment-stopping adverse events. There was less difference in the total number of side effects between the treatments (P-CAB: 13.6%; fixed drug: 19.4%), though the difference was not statistically significant. This agrees with previously published studies stating that P-CABs are both effective and well tolerated (18).
Since the students in both groups complied well (>94%), this gave the therapy its overall boost. Yet, better compliance in the P-CAB group may be because the treatment is easier to take and less troublesome (19). The improvement in symptoms of epigastric pain, bloating and early satiety was larger in patients who took vonoprazan, possibly thanks to better control of stomach acid and healing of esophageal tissues (20). While these results are encouraging, there are also some restrictions we need to recognize. The study was carried out at a single site, so its results may not apply to all situations.

Conclusion

It is concluded that potassium-competitive acid blockers (P-CABs), specifically vonoprazan-based triple therapy, are significantly more effective than conventional proton pump inhibitor (PPI)-based regimens in the eradication of Helicobacter pylori infection. The superior eradication rates observed in both intention-to-treat and per-protocol analyses, along with comparable safety profiles and high patient compliance, highlight P-CABs as a promising alternative to PPIs in first-line therapy.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-24)
Consent for publication
Approved
Funding
Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

SN (General Practitioner)
Manuscript drafting, Study Design,
MK (Fellow Gastroenterologist)
Review of Literature, Data entry, Data analysis, and drafting articles.
HF (Medical officer)
Conception of Study, Development of Research Methodology Design,
AZ (House Officer)
Study Design, manuscript review, critical input.
AHB (Post Graduate Trainee)
Manuscript drafting, Study Design,
IM (Postgraduate Trainee)
Conception of Study, Development of Research Methodology Design,

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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