CYP2C19 (CYTOCHROME P450 FAMILY 2 SUBFAMILY C MEMBER

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ABSTRACT

Helicobacter pylori infection is widespread worldwide and increases the risk of gastritis, peptic ulcer disease, and gastric cancer. The main reasons for failure of eradication therapy include antibiotic resistance and individual pharmacokinetic variability [1]. Proton pump inhibitors (PPIs) are an essential component of H. pylori eradication therapy, and their efficacy largely depends on metabolism mediated by the CYP2C19 enzyme. This systematic review aims to evaluate the impact of CYP2C19 gene polymorphisms on the efficacy of PPIs and to propose personalized treatment strategies.

Objective: *Helicobacter pylori* infection is widespread worldwide and increases the risk of gastritis, peptic ulcer disease, and gastric cancer. The main reasons for failure of eradication therapy include antibiotic resistance and individual pharmacokinetic variability [1]. Proton pump inhibitors (PPIs) are an essential component of *H. pylori* eradication therapy, and their efficacy largely depends on metabolism mediated by the CYP2C19 enzyme. This systematic review aims to evaluate the impact of CYP2C19 gene polymorphisms on the efficacy of PPIs and to propose personalized treatment strategies [2].

The literature was selected from PubMed, Scopus, and Web of Science databases, including clinical studies published between 2000 and 2026. The results indicate that rapid metabolizers have lower eradication success rates due to reduced PPI exposure, whereas poor metabolizers demonstrate higher efficacy. In conclusion, CYP2C19 genotype is an important determinant of individual response to PPI therapy, and personalized approaches can improve eradication success rates [3].

Materials and methods: This study was designed as a systematic review in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines [4]. Literature searches were conducted in PubMed, Scopus, and Web of Science databases [5]. The following keywords were used: “CYP2C19”, “proton pump inhibitor” or “PPI”, “Helicobacter pylori” or “H. pylori”, “eradication”, and “polymorphism” [6].

Clinical studies published in English between 2000 and 2026 were included [7].

Results: Based on the systematic review, eradication success rates differed significantly according to CYP2C19 genotype:

- Rapid metabolizers: lower PPI plasma levels → lower eradication success (65–75%).
- Intermediate metabolizers: moderate efficacy (75–85%).
- Poor metabolizers: higher PPI exposure → higher eradication success (>90%) [8].

Additional findings:

1. Association with PPI type: Omeprazole and esomeprazole show reduced effectiveness in rapid metabolizers, whereas rabeprazole is less dependent on CYP2C19 metabolism and provides more consistent efficacy across genotypes.
2. Antibiotic combination: Clarithromycin resistance further reduces eradication success in rapid metabolizers [9].

Conclusion: CYP2C19 polymorphisms significantly influence the efficacy of PPI-based *H. pylori* eradication therapy. A personalized approach—adjusting PPI type and dosage according to the patient's genotype—can improve eradication success rates and help mitigate the impact of antibiotic resistance. This strategy has the potential to optimize future *H. pylori* eradication protocols and be incorporated into international clinical guidelines [10]..

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