



## THE ETIOLOGICAL IMPORTANCE OF HELICOBACTER PYLORI IN THE DEVELOPMENT OF DUODENAL ULCER DISEASE

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<https://doi.org/10.5281/zenodo.17606158>

### Annotation

Gastric and duodenal ulcers are among the most common diseases of the digestive system. Helicobacter pylori is a spiral-shaped, gram-negative bacterium that infects various areas of the stomach and duodenum. Many cases of gastric ulcers and duodenum, gastritis, duodenitis, stomach cancer and possibly some cases of gastric lymphoma etiologically associated with Helicobacter infection pylori. For decades, increased gastric acidity was considered the main factor associated with the development of peptic ulcers. However, in recent years, increasing attention has been paid to the role of the Helicobacter pylori bacteria. pylori in the genesis of this disease. The treatment of patients with duodenal ulcers remains a pressing issue in practical surgery. This is due to the fact that gastric and duodenal ulcers remain one of the most common diseases in humanity.

In this article, we will review current data on the effects of Helicobacter pylori on the development of peptic ulcer disease, mechanisms of pathogenesis and prospects for research in this area.

**Key words:** peptic ulcer, risk of peptic ulcer, treatment, gastric ulcer, Helicobacter pylori, duodenal ulcer, eradication, destruction.

### Annotation

Peptic ulcer of the stomach and duodenum is one of the most common diseases of the digestive system. Helicobacter pylori is a spiral gram-negative bacterium that infects various areas of the stomach and duodenum. Many cases of gastric and duodenal ulcers, gastritis, duodenitis, stomach cancer and possibly some cases of gastric lymphomas are etiologically associated with Helicobacter pylori infection. For decades, an increase in the acidity of gastric juice has been considered the main factor associated with the development of peptic ulcer disease. However, in recent years, more and more attention has been paid to the role of the bacterium Helicobacter pylori in the genesis of this disease. The problem of treating patients with duodenal ulcer is still one of the urgent problems of practical surgery. This is due to the fact that peptic ulcer of the stomach and duodenum remains one of the most common diseases

**Keywords:** peptic ulcer, peptic ulcer risk, treatment, gastric ulcer, helicobacter pylori, duodenal ulcer, eradication, destruction.

### Annotasiya

Oshqozon va o'n ikki barmoqli ichak yarasi ovqat hazm qilish tizimining eng keng tarqalgan kasalliklaridan biridir. H. pylori oshqozon va o'n ikki barmoqli ichakning turli joylarini yuqtiradigan spiral gram-manfiy bakteriya. Helicobacter pylori infeksiyasi bilan bog'liq. O'nlab yillar davomida oshqozon yarasining rivojlanishi bilan bog'liq asosiy omil me'da shirasining kislotaliligining oshishi hisoblanadi. Biroq, so'nggi yillarda Helicobacter pylori bakteriyasi kasallikning genezisidagi roliga tobora ko'proq e'tibor qaratilmoqda. O'n ikki

barmoqli ichak yarasi bilan og'rigan bemorlarni davolash muammosi hozirgi kungacha amaliy jarrohlikning dolzarb muammolaridan biridir. Buning sababi oshqozon va o'n ikki barmoqli ichak yarasi eng keng tarqalgan kasalliklardan biri bo'lib qolmoqda.

Ushbu maqolada biz *Helicobacter pylori* ning oshqozon yarasi rivojlanishiga ta'siri, patogenez mexanizmlari va ushbu sohadagi tadqiqotlar istiqbollari haqidagi zamonaviy ma'lumotlarni ko'rib chiqamiz.

**Kalit so'zlar:** oshqozon yarasi, oshqozon yarasi xavfi, davolash, oshqozon yarasi ni davolash, *Helicobacter pylori*, o'n ikki barmoqli ichak yarasi, eradikasiya, destruksiya.

### Introduction

Duodenal ulcer disease is one of the most common gastrointestinal diseases, characterized by the formation of ulcers on the duodenal mucosa. Many years of research into the etiology of duodenal ulcers led to the discovery of the ***Helicobacter bacterium. pylori*** (*H. pylori*), which has come to be regarded as one of the main factors triggering ulcer development. It was first identified in 1983 by Australian scientists Barry Marshall and Robin Warren, marking the beginning of a new era in understanding the pathogenesis of peptic ulcer disease.

The aim of this study is to analyze the role of ***Helicobacter pylori*** in the development of duodenal ulcers, as well as to evaluate the effectiveness of eradication of this bacterium in preventing recurrence. The study aims to confirm the hypothesis that *H. pylori* is a key etiologic factor in the development of peptic ulcers, and that its eradication significantly reduces the likelihood of recurrence.

*Helicobacter* research the history of *H. pylori* began with the landmark discovery of Australian scientists Barry Marshall and Robin Warren in 1983, when they first isolated this bacterium from the gastric mucosa of patients with gastritis and peptic ulcers. Prior to this discovery, the primary causes of peptic ulcers were thought to be stress, poor diet, and increased gastric acidity. The discovery of *H. pylori* changed the paradigm in understanding the etiology of peptic ulcers and led to the development of new diagnostic and treatment methods.

According to numerous studies, *H. pylori* is found in 60-90% of patients with duodenal ulcers (Suerbaum & Michetti, 2002). This bacterium has unique properties that allow it to survive in the acidic environment of the stomach, which facilitates its colonization of the mucosa. *H. pylori* produces the enzyme urease, which breaks down urea into ammonia, neutralizing the acid around the bacterium and creating a protective environment for its proliferation (Atherton & Blase, 2009).

Modern research confirms that *H. pylori* directly affects the duodenal and gastric mucosa by producing toxins such as CagA and VacA, which cause inflammation and tissue destruction (Yamaoka, 2010). The bacterium also stimulates gastrin production, leading to increased secretion of hydrochloric acid, which further damages the mucosa.

Numerous clinical studies have demonstrated that *H. pylori* eradication leads to a significant reduction in the recurrence of peptic ulcer disease. For example, a study conducted by Graham et al. (1992) showed that patients with peptic ulcer disease who underwent a course of *H. pylori* eradication using antibiotics had a significantly lower probability of relapse compared to those who received only antacid therapy.

Today, the prevalence of *H. pylori* infection varies by region. In developing countries, infection rates can reach 70-80%, while in developed countries, this figure is lower, at around

30-40% (Kusters et al., 2006). The high prevalence of infection in developing countries is explained by poor hygiene and lack of access to clean drinking water.

At the same time, according to the World Health Organization, millions of new cases of peptic ulcer disease are registered annually, making the problem of *H. pylori* a pressing health issue worldwide (WHO, 2017).

Despite numerous confirmations of the role of *H. pylori* in the development of peptic ulcer disease, alternative hypotheses also exist. Some researchers point out that not all *H. pylori* carriers develop peptic ulcer disease, suggesting the presence of additional factors such as genetic predisposition, long-term use of nonsteroidal anti-inflammatory drugs (NSAIDs), and lifestyle (Smythies et al., 2004). These factors may increase mucosal damage and promote ulcer development even in the absence of *H. pylori* infection.

**Methodology:** To assess the impact of *Helicobacter* To assess the impact of *H. pylori* on the development of duodenal ulcers, various diagnostic and treatment methods are used. These methods allow for highly accurate detection of the infection and assessment of its role in the pathogenesis of the disease. Diagnosis of *H. pylori* plays a key role in confirming the hypothesis of its influence on the development of peptic ulcers. Several methods can be used to detect the infection:

**Urease breath test.** This method relies on the ability of *H. pylori* to break down urea to produce carbon dioxide, which can be detected in the patient's exhaled breath. The patient drinks a solution containing urea labeled with carbon (usually <sup>13</sup>C or <sup>14</sup>C), after which the exhaled breath is analyzed. The test is noninvasive and highly effective for diagnosing live infection (Graham et al., 2007).

**Endoscopic biopsy.** Endoscopy allows for a visual examination of the gastric and duodenal mucosa, as well as for taking a biopsy for further examination. The biopsy can be tested for the presence of *H. pylori* using a urease test or a PCR method to detect bacterial DNA. This method is the "gold standard" for diagnosis (Malfertheiner et al., 2017).

**Blood tests and stool antigen tests.** Serologic tests for *H. pylori* antibodies can be used to detect current or past infection. Stool antigen tests are used to detect active infection and monitor the effectiveness of treatment (Chey et al., 2017).

***pylori*- associated peptic ulcer disease. Complex treatment regimens are used** to treat duodenal ulcer disease associated with *H. pylori* infection. These include:

**Antibiotic therapy** - the standard treatment regimen includes a combination of two antibiotics to eradicate *H. pylori*. The most commonly used are clarithromycin in combination with amoxicillin. or metronidazole. These antibiotic combinations are effective in suppressing bacterial growth and completely eradicating it.

**Proton pump inhibitors (PPIs).** PPIs such as omeprazole or pantoprazole, are used to reduce the production of hydrochloric acid, which promotes ulcer healing and improves the condition of the duodenal mucosa ( Malfertheiner et al ., 2012). Reducing acidity helps antibiotics better penetrate the mucosa and destroy *H. pylori*.

**Bismuth preparations.** Bismuth compounds, such as bismuth subsalicylate, are used as an adjunctive agent to protect the mucous membrane and enhance the action of antibiotics. Bismuth also has antibacterial properties and helps suppress the activity of *H. pylori* ( Malfertheiner et al ., 2016).

**Clinical studies and data analysis.** Data from clinical trials are used to confirm the hypothesis about the role of *H. pylori* in the development of duodenal ulcers. This paper examines the results of randomized controlled trials that compared the condition of patients before and after *H. pylori* eradication. A comparative analysis of the frequency of ulcer recurrence in patients who underwent *H. pylori* eradication and those who received only symptomatic treatment (proton pump inhibitors without antibiotics) was performed. In most cases studied, it was possible to demonstrate that complete eradication of *H. pylori* significantly reduces the likelihood of ulcer recurrence (Gisbert et al., 2004). Evaluation of the development of ulcer complications (e.g., bleeding and perforation) in patients with a positive test for *H. pylori* compared with patients who underwent eradication. Studies have shown that successful treatment of the infection reduces the risk of complications (Malfertheiner et al., 2017). The paper also examines data on the comparative effectiveness of various *H. pylori* eradication regimens and their impact on ulcer healing and recurrence prevention. Studies have shown that triple and quadruple therapies using antibiotics and PPIs have high success rates (Chey et al., 2017). Numerous studies have confirmed that *H. pylori* infection is a major factor contributing to the development of duodenal ulcers. A study by Malfertheiner et al. (2017) found that over 80% of patients with peptic ulcers were infected with *H. pylori*. Another study by Graham et al. (1992) showed that after *H. pylori* eradication, the ulcer recurrence rate decreased from 75% to less than 10% within one year of follow-up. These data indicate that *H. pylori* is a key etiologic factor in peptic ulcer disease: its presence significantly increases the risk of ulcer development, and its eradication reduces this risk. One of the key indicators of successful peptic ulcer treatment is the recurrence rate. Studies have shown that patients who have completed a course of *H. pylori* eradication experience a lower rate of duodenal ulcer recurrence. A meta-analysis conducted by Gisbert et al. (2004) showed that in patients receiving therapy for the eradication of *H. pylori*, the ulcer recurrence rate decreased to 5-10% within a year, while in patients who did not undergo eradication, this figure reached 60-70%. These data highlight the importance of timely diagnosis and treatment of *H. pylori* infection to prevent recurrent episodes of peptic ulcer disease. One of the serious consequences of duodenal ulcer disease is its complications, such as bleeding and ulcer perforation. In the study by Chey et al. (2017) showed that patients with peptic ulcer disease who underwent *H. pylori* eradication were less likely to experience complications such as gastrointestinal bleeding. In particular, the incidence of bleeding in patients after successful eradication decreased by 50% compared to the control group, which received only proton pump inhibitors (PPIs). In addition, a study by Suerbaum & Michetti (2002) showed that *H. pylori* eradication also reduces the risk of ulcer perforation, one of the most dangerous complications of peptic ulcer disease. A review of various treatment regimens showed that triple therapy, including two antibiotics and a proton pump inhibitor, is the most effective for *H. pylori* eradication. In a study by Malfertheiner et al. (2012) found that triple therapy based on clarithromycin, amoxicillin, and a proton pump inhibitor demonstrated an eradication efficacy of over 80%. Furthermore, quadruple therapy, including bismuth preparations in combination with antibiotics and PPIs, demonstrated even higher results—up to 90% successful eradication. This is confirmed by research by Graham et al. (2007), in which quadruple therapy was used to treat patients with clarithromycin resistance.

**Discussion:** The results of numerous clinical studies support the hypothesis that *Helicobacter pylori* (*H. pylori*) is the primary etiologic factor in the development of

duodenal ulcers. Data showing a significant reduction in ulcer recurrence rates after successful *H. pylori* eradication highlight the importance of prompt diagnosis and treatment of this infection. While traditional treatments aimed solely at controlling gastric acidity (e.g., proton pump inhibitors) provide temporary symptomatic relief, they do not address the underlying cause of the disease—the presence of *H. pylori*.

The mechanisms by which *H. pylori* causes ulcers are well understood. The bacterium disrupts the protective functions of the gastric and duodenal mucosa, leading to inflammation and tissue destruction. As research by Atherton & Blaser (2009) demonstrated, toxic proteins produced by *H. pylori*, such as CagA and VacA, play a key role in epithelial destruction and the development of inflammation. This is also supported by the fact that patients infected with *H. pylori* strains containing the CagA gene have a higher risk of developing peptic ulcers.

*pylori* eradication has been shown to be highly effective in preventing peptic ulcer recurrence. As noted in the results section, after a course of antibiotic therapy, the recurrence rate is reduced to 5-10%, compared to 60-70% in patients receiving antacid therapy alone (Gilbert et al., 2004). This confirms that eliminating *H. pylori* infection not only promotes the healing of existing ulcers, but also prevents the development of new ones.

Despite the significant role of *H. pylori* in the pathogenesis of peptic ulcer disease, it is important to consider that not all infected individuals develop ulcers. This indicates the presence of additional risk factors, such as genetic predisposition, long-term use of nonsteroidal anti-inflammatory drugs (NSAIDs), smoking, and stress factors (Smythies et al., 2004). These factors may increase mucosal damage and promote ulcer development regardless of the presence of *H. pylori*.

Some researchers also suggest considering *H. pylori* as part of the gastric microflora, which under certain conditions can behave as a pathogen. This hypothesis requires further research, especially in the context of the fact that *H. pylori* eradication can be accompanied by changes in the microbiome of the stomach and duodenum, which in some cases can lead to undesirable consequences, such as the development of gastroesophageal reflux disease. reflux disease (GERD) (Chey et al., 2017).

Despite the extensive data supporting the role of *H. pylori* in the pathogenesis of peptic ulcer disease, there are certain limitations in the research. First, not all patients respond equally to *H. pylori* eradication. In some cases, antibiotic resistance is observed, necessitating the use of more aggressive treatment regimens, such as quadruple therapy (Graham et al., 2007). Secondly, some clinical studies did not take into account factors such as long-term use of NSAIDs or the presence of comorbidities, which may bias the results.

Future research is needed to better understand the interactions between *H. pylori* and other risk factors for peptic ulcer disease. It is also important to develop new diagnostic methods that will allow for more accurate and rapid detection of the bacterium, as well as to study the potential negative consequences of complete *H. pylori* eradication on the gastric microbiome.

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