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Co-infection between intestinal parasites and *Helicobacter pylori*; A brief review

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Abstract

Co-infection between Intestinal parasites and *Helicobacter pylori (H. pylori)* in humans is a frequent health problem, particularly in developing countries. In addition to having similar risk factors, both pathogen groups are significant contributors to gastrointestinal disease in those with these co-infections and can influence the host's immune response. Intestinal parasitic infections are considered as a prevalent disease globally, affecting approximately 3.5 billion individuals, particularly in developing countries. These infections can result in anaemia, growth retardation in children and other mental and physical health problems. *H. pylori* is the most prevalent chronic bacterial infection in humans globally affecting about 4.4 billion individuals worldwide. *H. pylori* infection is associated with chronic gastritis, peptic ulcers and development of gastric malignant tumors. Due to their similar modes of infection and environmental conditions, intestinal parasites and *H. pylori* frequently co-infect each other. The objectives of this review were to study the association between different types of intestinal parasites and *H. pylori* infection. Data was collected scrutinizing PubMed using a mesh search. Initial word searches included *Helicobacter pylori*; Intestinal protozoa; *Entameba histolytica*; *Giardia lamblia*; intestinal helminthes.

Keywords: Intestinal parasites, *Helicobacter pylori*, Patients.

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1. Introduction

Individuals are co-infected with various microorganisms, including parasites and bacteria, in many developing countries, particularly in rural areas. Understanding disease becomes more challenging when co-infection occurs because different organisms can interact antagonistically or synergistically, influencing treatment outcomes, clinical outcomes, and susceptibility to other diseases [1]. Intestinal parasitic infections are considered as a prevalent disease globally, affecting approximately 3.5 billion individuals, particularly in developing countries. Since these infections can result in anaemia, growth retardation in children and other mental and physical health problems, they are regarded as a major public health concern [2]. The prevalence of parasitic infections can be influenced by a wide range of factors, including low income, poor general sanitation, poor water sources, and ecological and socioeconomic factors [3]. Different intestinal parasites are thought to commonly infect people through contaminated food and water [4]. Intestinal parasites are still regarded as a serious problem in Egypt, despite the increased efforts to enhance sanitation and hygiene [5]. With a high prevalence in developing countries, *H. pylori* is the most prevalent chronic bacterial infection in humans globally affecting approximately 4.4 billion individuals worldwide based on regional prevalence estimates [6]. It is a spiral gram-negative urease-producing bacteria that coats the stomach mucous or resides between the mucous layer and the stomach epithelium. Apart from inducing peptic ulcers and chronic gastritis, *H. pylori* is linked to the growth of malignant gastric tumors [7]. Intestinal parasites may find it easier to pass through the stomach due to *H. pylori's* production of the urease enzyme [8]. *H. pylori* induces changes in the stomach environment, including decreased gastric acid production, through the increased production of proinflammatory cytokines such as IL-2 and IFN-γ [9].

Stomach infection by other organisms becomes considerably easier as a result of this decreased acid production [10]. There are three main methods of *H. pylori* infection: feco-oral, gastro-oral, and oral-oral infections. Contaminated food, water, and infected animals can potentially spread infection [11]. Due to their similar modes of infection and environmental conditions, intestinal parasites and *Helicobacter pylori* frequently co-infect each other. Defecation in the soil, poor personal hygiene, and contaminated water sources are common risk factors [12]. People with *H. pylori* infection have gastrointestinal parasites more frequently than those without the infection [13]. This co-infection can have a variety of effects, including dehydration and malnutrition [14].

2. *H. pylori* and intestinal helminthes

Intestinal helminthes lead to polarization of Th2 cells. In a study involving stomach mucosal samples, individuals with this co-infection had a predominant Th2 response (increased level of IL-4) and decreased expression of pro-inflammatory cytokines [15]. Thus, co-infection of humans with *H. pylori* and intestinal helminthes is associated with improved regeneration processes and may provide protection against gastrointestinal tract inflammations [16]. Schistosomiasis and *H. pylori* infection are also related. Despite not being a member of the intestinal helminths group, *schistosoma* can have a major impact on the function of the digestive system. The mesenteric venules contain the mature worms of *Schistosoma*, where they lay their eggs [17]. There was no variation in the prevalence of *H. pylori* between individuals who were infected with *Schistosoma japonicum* (53%) and those who were not (49.3%). On the other hand, patients with coinfection had a considerably lower incidence and titers of anti-CagA IgG antibodies (52.3%, 9.5 U/ml) than patients without parasite infection (75.8%, 18 U/ml) [18]. In Colombia, another study found that intestinal parasites and *H. pylori* are present in children and adults residing in Pasto, a region in Colombia with a high incidence of gastric cancer, and Tumaco, an area with a low incidence of gastric cancer. The incidence of *H. pylori* did not differ between the two research groups. However, research indicates that the Tumaco region has a higher prevalence of parasitic infections (93%), compared to the Pasto (76%). Furthermore, the prevalence of helminthic infections is more than twice as high in Tumaco (54%) as it is in Pasto (25%) [19].

3. *H. pylori* and intestinal protozoa

Protozoa are unicellular microorganisms, characterized by their ability of rapid growth in the host leading to multiple complications as abdominal pain, fatigue, malnutrition and ulcerations of the digestive system [20]. *Giardia lamblia*, *Entamoeba histolytica*, *Cryptosporidium parvum*, *Blastocystis hominis* and *Isospora belli* are the most prevalent gastrointestinal protozoa [21]. In Egypt, a study found a high rate of prevalence of intestinal protozoa in *H. pylori* positive patients as 51.4% of patients were associated with co-infection with *Entameba histolytica* or *giardia lamblia* [22]. Another study in Egypt revealed that there was a significant association between intestinal protozoa and *H. pylori* infection in patients with gastrointestinal complaints. *Entameba histolytica* was the commonest parasite detected in *H. pylori* positive patients (55.5%) [23]. El-Badry et al., (2017) found that the rate of co-infection between *G. Lamblia* and *H. pylori* was 52.5% among 63 *G. lamblia* positive patients by both microscopy and PCR [24]. A significant association between *H. pylori* and diarrhea causing protozoa was detected by Ghallab and Morsy (2020) [25]. Another study was performed on Ugandian children and revealed that patients infected with *G. lamblia* had a three times greater chance of co-infection with *H. pylori* [26]. Seid et al., (2018) found a significant association between *G. lamblia* and *H. pylori* infection with *G. lamblia* accounted 22.3% of gastrointestinal symptomatic patients in Ethiopia [27]. Also, Intestinal parasites and *H. pylori* infection were reported to be significantly associated by Kibru et al., (2014) in Ethiopia [28]. In another study in Iran, Co- infections with *G. lamblia* and *E. histolytica/dispar* were found in 29.7% and 10.8% of cases, respectively, among positive *H. pylori* children with rercurrent abdominal pain [29]. The same researchers found that the rate of co-infection between *H. pylori* and *G. lamblia* and *E. histolytica/dispar* was 30.7% and 12.7% respectively, in a later study on a larger sample, which included adults and children in Ilham City in Iran [30]. In Italy, Grazioli et al., (2006) found that *G. lamblia* was detected in 9 out of 137 patients with Irritable-bowel syndrome and dyspepsia, 8 cases of them were *H. pylori* positive [31]. Another study in Portugal revealed that the co-infection rate between *G. lamblia* and *H. pylori* was 44.6% [32].

4. Conclusions

Human co-infection with *H. pylori* and many intestinal parasites is a common occurrence, especially in developing countries. Low socioeconomic status and contaminated water supplies are considered as risk factors for this co-infection. The co-infection of *H. pylori* and intestinal protozoa results in the recruitment of Th1 cells, which intensifies the harm to the stomach mucosa. However, recruitment of Th2 cells takes place during co-infection with helminth and *H. pylori* to guard against gastrointestinal tract inflammations. Therefore, improvement of environmental sanitation and providing safe water supplies is important for control of intestinal parasites and *H. pylori* co-infection.

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