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Relationship between *Helicobacter pylori* Infection and Parasitic Infection in Patients in Ilam

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Background: *Helicobacter pylori* is the most common cause of chronic infection in the human stomach. The infection has universe prevalence in all age groups. Probably, this bacterium is the cause of most common chronic bacterial infection in human beings and infects approximately half of the world population. *H. pylori* produces urease, an enzyme that degrades the urea in the stomach's mucous to ammonia resulting in biochemical reaction that leads to increase in pH of the stomach lumen. This allows pathogenic intestinal protozoa to take the opportunity to cross through stomach's increased pH and cause disease. The aim of this study was to evaluate the relationship between *H. pylori* infection and prevalence of parasitic infection in patients in Ilam.
Materials and Methods: Following stool samples collection during 2013 in patients with abdominal pain in Ilam, Iran. *H. pylori* infection was investigated based on stool antigen analysis (HPSA) by enzyme-linked immunosorbent assay (ELISA) method in patients who had recurrent abdominal pain. Stool specimens were examined using the direct examination and the spontaneous sedimentation method for detecting the trophozoite and cyst of parasites.
Results: In this study, we found 65 patients with *H. pylori* infection. Out of these 65 patients, the percentage of patients with positive results for *Giardia lamblia* was 30.7% and for *Entamoebahistolytica*/*dispar* was 12.3%.
Conclusion: The results of this study suggest that *H. pylori* infection may provide favorable conditions for giardiasis infection; however, this presumption needs further studies with larger sample size.

Keywords: *Helicobacter pylori*, parasitic infection, *Giardia lamblia*

1. Background

Helicobacter pylori causes one of the most common infections in humans. The infection is widespread all over the world and affects all age groups. It is estimated that the percentage of universe population that are affected by *H. pylori* is 50% (1). In developed countries such as United States, it is unusual to see infection in childhood and adults are usually affected by *H. pylori*. However, most of the children in developing countries are affected before the age of 10, and the percentage of people who are affected before 50 years old is 10% (1, 2). It has been reported that the prevalence of *H. pylori* in Iranian children is approximately 82-92% (3).

One of the particular characteristics of *H. pylori* is to have sufficient amount of urease enzyme (six percent of total proteins produced by *H. pylori*) that has intense activity. This enzyme degrades plasma urea that is secreted through the stomach wall to ammonium ion leading to protection of bacteria from the destructive effect of stomach acid by neutralization. There is a distinction between urease produced by *H. pylori* and other bacteria. Urease of *H. pylori* has two subunits with approximately 33 and 66kDa molecular weight in contrast to other bacteria that have three subunits. The *ure*A and *ure*B genes encode two subunits of urease made by *H. pylori* (1, 2). The pH increment of stomach's lumen makes it suitable for some protozoa to pass through stomach's acid environment easily (4). *Giardia* is a flagellated protozoan that is seen on the mucosa of duodenum, the first section of jejunum, ileum, rarely on stomach's wall, and colon (4). The prevalence of *Giardia* in the world and industrialized societies is 20-60% and 2-7%, respectively (5).On the other hand, studies have shown that under unsuitable situations, primarily when the acidity of stomach is reduced because of *H. pylori* infection, development of giardiasis related gastritis will be probable. Reduction of stomach's acidity due to the activity of *H. pylori* urease is the risk factor for infection by *Giardia* (6).

2. Objectives

The aim of this study was to evaluate the relationship between *H. pylori* infection and prevalence of parasitic infection in patients in Ilam, Iran.

3. Materials and Methods

This is a descriptive study. We followed all the patients that were referred to the laboratory with abdominal pain during 2013. Patients who were positive for *H. pylori* antigen in stool samples using enzyme-linked immunosorbent assay (ELISA) method enrolled in this study. The sensitivity and specificity of this method are 83% and 92%, respectively. Stool specimens were examined via light microscope with 40X magnification power as direct examination of parasite's trophozoites. Also in sedimentation method fifty grams of feces were mixed with approximately 100mL of tap water and sieved through 2mL mesh sieve. Afterwards, it was washed with 50mL water and then pressed with a spatula to recover the water as much as possible. After 40min, the supernatant was decanted and the remaining 50ml left in the beaker was refilled with tap water to the final volume of 200mL and then

the suspension was allowed to stand. After 40min, the supernatant was decanted to save 30mL, and 1mL was examined (in approximately 200µL aliquots) via light microscope with 100X magnification power to detect the presence of parasite's ova. Ziehl-Neelsen staining was performed to look for acid-fast protozoa (*Isospora belli, Cyclosporacayetanensis, and Cryptosporidium parvum*).

4. Results

A total of 130 patients with abdominal pain participated in this study, of which 65 patients were infected by *H. pylori* based on ELISA test. Patients without *H. pylori* infection were excluded from study. In the direct examination, trophozoite and cyst of *Giardia lamblia* were seen in 20 (30.7%) and 7 (10.7%) samples, respectively. However, we only evaluated patients who had excreted trophozoite of *Giardia lamblia*, because the presence of trophozoite is the sign of acute Giardiasis. Cysts of *Entamoeba histolytica / dispar* were seen in 8 out of 65 (12.3%) samples. In sedimentation method, ova of parasites were never seen. Finally, in Ziehl-Neelsen staining, acid-fast parasites were never seen in patients infected with *H. pylori*.

5. Discussion

H. pylori is the main cause of chronic stomach inflamemation, peptic ulcer, duodenal ulcer, non-ulcerous dyspepsia, gastric cancer, and gastric mucosa associated lymphoid tissue (MALT) lymphoma (7, 8). Urease of the bacterium can convert the urea of the stomach wall to ammonia. This results in the increment of stomach environment pH (1). Acidity of the stomach is an innate immune system barrier against pathogens, and diminished acidity acts as permission for pathogens to break this barrier and go across it. Giardiasis, a parasitic infection of the small intestine in most of the vertebrates and human that has global prevalence, is the result of contamination by a flagellated protozoan that is called *Giardia lamblia* (9, 10). *Giardia lamblia* can be transmitted from an affected person to others. Its transmission can occur through ingestion of contaminated water and food. It is the main cause of the diarrhea in children, passengers, and homosexuals (11). Also, many factors such as population density, weather situation, economic situation and hygiene level can provide a suitable condition for *Giardia lamblia* (12, 13). The prevalence of *Giardia* in the world and industrialized societies is 20-60% and 2-7%, respectively (5). Although the prevalence rate is variable in different countries and it depends on the hygiene level. On the one hand, according to a local epidemiological study about the prevalence of enteric parasites which was done in 2013, prevalence of *G. lamblia* in the children in Ilam city was 11.7% (14); on the other hand, our study demonstrated that prevalence of *G. lamblia* in *H. pylori* infected persons in Ilam was approximately 42% (trophozoite and cyst). Considering these two facts, it can be suggested that *H. pylori* infection has affect the rate of parasitic infection in *H. pylori* infected persons. The importance of polymicrobial infections has gained tremendous attention of researchers in recent years and some synergistic infections have been identified (15). In synergistic polymicrobial infections, one microbe creates a favorable environment for another one to more easily colonize a specific niche of their common host (15). *H. pylori* has been linked to co-infections earlier, e.g. the fluke *Schistosoma japonicum* is associated with an alteration in the antibody response to *H. pylori* during co-infections (16). Another interesting example is the co-infections of *H. pylori and Salmonella typhimurium* in mice (17).

Ankarklev and colleagues (2012) found a significant higher frequency of *Giardia* infection in cases where infected children also harbored the bacterial pathogen *H. pylori* (18).

Moreira and colleagues (2005) found an association between *H. pylori* infection and the presence *of G. lamblia* in feces (19). Isaeva and colleagues (2010) showed that 100% of *H. pylori*-infection combined with giardiasis (20). Abou El-Hoda and colleagues (2007) showed a significant increase in urease activity in the group having combined infection (Giardiasis and *H. pylori*) than the group infected with *G. lamblia* alone (21). The large number of co-infection in our study was possibly due to an elevated risk of *Giardia* colonization upon the presence of *H. pylori* in human patients or, alternatively, *H. pylori* colonization may be facilitated by a previous establishment of *Giardia*.

Abasian and colleagues have shown that by age classify-cation, the prevalence of *Giardia* in Iranian population is 15.1% among children younger than 10 years, 19.2% among adolescents and younger than 20 years and 6.7% among adults between 20-30 years old (22).

In this study parasitic infection was surveyed in persons infected with *H. pylori*. Rate of parasitic contamination in *H. pylori* infected persons was remarkable (active infection and carriers of *Giardia* approximately 42%). According to a simultaneous study, prevalence of *G. lamblia* is 12.3% in the western provinces near to the borders of Iraq and Turkey (22), and probably for this reason there was significant correlation between the *Giardia lamblia* and *H. pylori* co-infections.

6. Conclusion

Considering all these facts, it is well documented that the acidity of the stomach is an important protective factor. The pH increment would be concentrated as a risk factor for attraction of parasites, especially those that can transmit through the digestive tract such as *Giardia lamblia*. More studies are suggested to get authentic results for the validation of the relevance between *H. pylori* infection and with other parasites.

Conflict of Interests

The authors declare they have no conflict of interests.

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Authors' Contributions

Study concept and design: Hossein Kazemian; collection of data: Aref Shavalipour, Hamidreza Houri and Reza Mohebi; literature search: Jalil Kardan Yamchi; critical revision of the manuscript: Sobhan Ghafourian & Hamid Heidari; Supervision: Nourkhoda Sadeghifard

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