

## Original Article

# Association between Helicobacter Pylori Infection in the Gastric Mucosa and Severity of Gastric Inflammation in Children and Teenagers

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## Abstract

**Background and aim:** Helicobacter pylori (H. pylori) is a bacterial infection which is highly likely to be developed during childhood. The present study was conducted aiming to examine the degree of H. pylori colonization in gastric mucosa and its association with the severity of gastritis in children and adolescents.

**Method:** The present study examined 1006 biopsy samples of children and adolescents under the age of 18 who visited Hamedan Be'sat Hospital from 2011 to the end of 2018 while showing chronic gastrointestinal symptoms such as abdominal pain, nausea and vomiting as well as weak responses to medications regarding presence and severity of H. pylori, histological findings of gastritis severity, active and non-active gastritis types as well as atrophy and metaplasia.

**Results:** Out of 1006 biopsies, it was found that 766 samples (76.1%) had different degrees of H. pylori colonization. Moreover, it was revealed that the highest degree of H. pylori was moderate (49.9%) in the group with mean age of 8.94, and, moreover, the lowest degree of H. pylori belonged to the rare (1.9%) and severe (2.5%) categories in the mean age groups of 7 and 10.48, respectively. Also, it was found that the highest and lowest gastritis degrees were non-atrophic (46.7%) and atrophic (0.2%). Other gastritis types were respectively erosive gastritis (0.4%), lymphocytic (0.4%), ulcer (0.4%), hemorrhagic (0.4%) and reactive gastritis (1.7%). According to findings, as age increases, so does the prevalence of H. pylori colonization and active inflammation. A significant relationship was reported to be between severity of H. pylori and gastritis. It was, moreover, indicated that moderate and severe gastritis occurred more in moderate and severe colonization of H. pylori ( $p < 0.001$ ). The prevalence of atrophy and metaplasia were 0.2 and 0.1, respectively.

**Conclusion:** H. pylori colonization is followed by severity of gastritis, activity as well as chronic abdominal and intestinal complications. Given the high prevalence of this infection in the developing countries and high risks of its acquisition in childhood, it can impose a higher economic and medical burden on the society.

**Keywords:** Helicobacter Pylori, Gastritis, Children

## Introduction

Helicobacter pylori (H. pylori) is the most chronic bacterial infection among humans (1, 2). It is estimated that at least half of the world's population suffer from H. pylori infection (3), which is acquired, most of the

time, in the first five years of life (4). Fifty percent of children develop this infection in the first five years of their lives and more than 90 percent of them will grow up to adulthood with this infection (5). The prevalence of the infection varies depending on geographical regions, race, economic-

social conditions and age (3). However, various studies have shown that the infection has a more prevalence in the developing countries than in the developed ones (6, 7). Furthermore, it is indicated that *H. pylori* plays a crucial role in pathogenesis of gastritis and there is consensus that *H. pylori*, mostly acquired during childhood, can cause many complications in adulthood (8, 9), which is approved in recent years. Chronic atrophic gastritis and intestinal metaplasia are regarded as precursor cells of gastrointestinal cancer. Currently, most of the studies have been conducted with the aim of examining the role of *H. pylori* and stage of tissue treatability in preventing intestinal cancer (10-14). The need to study the effect of this disease on children in various populations is highly felt and it can contribute to improving diagnosis, preventive and treatment strategies (11). Accordingly, the study was carried out trying to investigate the relationship between *H. pylori* colonization and severity of gastritis in children and adolescents as well as to assess histopathological states of inflammation in gastric mucosa in helicobacter pylori infection.

## Methods

This is a descriptive-analytic study performed to examine abdominal biopsy samples of children and adolescents under the age of 18 who visited Hamedan Be'sat Hospital for *H. pylori* and chronic abdominal pain from 2011 till 2018. The subjects showed symptoms such as nausea, chronic vomiting and high weight loss and did not responded well to outpatient treatments.

Diagnosing presence and severity of *H. pylori* in gastric mucosa (normal, mild, moderate, severe) and other histological findings such as gastritis severity (mild, moderate, severe), its being active or inactive, type of gastritis (ulcer, erosive, eosinophilic, hemorrhagic, reactive and lymphocytic) as well as the presence of atrophy (mild, moderate and severe), metaplasia and its non-existence were all conducted through Giemsa and HE stain<sup>1</sup>. It should be noted that biopsy samples were analyzed on the basis of the Updated Sydney System: Classification and Grading of Gastritis as the Basis of Diagnosis and Treatment.

## Statistical Analyses

Quantitative variables were shown as mean and standard deviation (mean and SD), whereas qualitative ones in the form of frequency and percentage. Moreover, for qualitative and quantitative variables, respectively,  $\chi^2$  test (chi-squared test) and student's t-test as well as analysis of variance were employed. The statistical analyses were performed using the SPSS Software version 16.0 for Windows (SPSS Inc., Chicago, IL). *P*-values <0.05 were considered statistically significant.

## Ethical Considerations

Before the study was started, children's parents were asked to provide informed consent and, moreover, the study gained the approval of Ethics Committee of Hamedan University of Medical Sciences, Hamedan, Iran. It is noteworthy that involvement or non-involvement of subjects in the study had

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<sup>1</sup> Hematoxylin and eosin stain

no effect on the treatment and caring processes.

## Results

In the present study, a total of 1006 subjects, comprised of 460 boys (45.73%) and 546 (54.27%) girls, were examined. They mean age and SD were 8.87 and 3.48, respectively. With regard to severity of *H. pylori*, 23.9%, 1.9% and 4.4% were respectively normal, rare and minor. Moreover, mild, moderate and severe cases were respectively 49.9%, 17.5% and 2.5%. Also, mild, moderate and severe gastritis in patients were 51.6%, 15.6% and 1.1%, respectively, and, moreover, a total of 31.3% were normal in terms of gastritis. Additionally, frequency of metaplasia and atrophy in examined samples were respectively 0.1% and 0.2% (Table 1).

According to results of one-way variance analysis and Tukey's range test, mean age of patients with severe and moderate *H. pylori* was significantly higher than healthy individuals and those suffering from rare and mild *H. pylori* ( $P<0.01$ ). (Table 2) Moreover, based on the results of one-way variance analysis and Tukey's range test, mean age of patients having severe and moderate gastritis was significantly higher than that of healthy individuals and those with rare and mild gastritis ( $P<0.001$ ) (Table 3) Additionally, it was found that there is a direct correlation between severity of *H. pylori* colonization and severity of gastritis. Spearman correlation coefficient equaled 0.944, which is statistically significant at 0.50 level and in a sample size of 315 subjects ( $P<0.001$ ).

## Discussion

The present study was performed with the aim of investigating the degree of *H. pylori* colonization in gastric mucous and its association with gastritis severity in pathological samples of children and adolescents visiting Hamedan Be'sat Hospital.

The results revealed that out of 1006 children and adolescents, a total of 766 (76.1%) had varying degrees of *H. pylori* colonization, whose general prevalence was in line with that reported in studies by Fakher (6), Alborzi et al in Shiraz (11), Kato (12), Koh (14), Yolanda (10) and Bedoya (15). According to recent epidemiological studies, the prevalence of *H. pylori* colonization in Europe, South America, Asia and South Africa is 33-7%, 78-48%, 66-37% and 87%, respectively (17). As mentioned before, the prevalence of this infection in the present study was reported to be 76.1%, which is higher than studies conducted by Zamani (17) in Tehran and lower than researches by Alborzi et al in Shiraz (11). The difference is likely due to two reasons: the first is that warm weather conditions facilitate the growth of harmful germs such as *H. pylori* as Shiraz has a higher temperature than Tehran and Hamedan, and secondly Tehran enjoys a better place than Hamedan in terms of socioeconomic conditions, and medical-educational facilities.

With regard to prevalence of *H. pylori* on the basis of categories like rare (1.9%), weakly (4.4%), mild (49.9%), moderate (17.5%), and severe (2.5%), the results of the present study are in line with those of Koh (14) and Bahu et al (18) conducted in

Brazil. However, severity of colonization in severe category of the present study was lower than the number of severe cases in Bahu (18) which can be due to the fact that patients took antibiotics before endoscopy in current study. Findings of Yolanda et al (10) carried out in Mexico support those of this study.

The data gathered in the current study indicated that mean age of severe *H. Pylori* colonization patients was lower than mean age of patients with mild and moderate *H. pylori* colonization. There was not such a significant difference in Alborzi et al (11). Nonetheless, Yolanda (10), Yi (19), Bahu (18) and Zamani (17) approve the present study. The findings of the present study and those of other studies with the same results prove that *H. pylori* infection, which is acquired in the initial childhood years, will remain in abdomen and lead to other complications if it is not treated or removed from body.

In 2014, Yi et al (19) conducted a study in China and showed that prevalence of active inflammation in patients with *H. pylori* infection increases with age, a trend which was not reported in healthy patients. Likewise, in the present study we came to the conclusion that there is a significant relationship between severity of *H. pylori* infection and severity of gastritis. According to Yi study, patients infected by *H. pylori* had a higher significant neutrophil infiltration levels as a sign of active inflammation and lymphocyte levels as a sign of chronic inflammation, compared to non-infected patients. The findings of Koh in Japan (14), Bahu in Brazil (18), and

Bedoya (15) in Colombia support those of the current study.

Yolanda et al (10) showed in Mexico that there is no significant association between *H. pylori* colonization and gastritis, concluding that this lack of association and different finding may be because of the discrepancy in pathogenic factors of *H. pylori* in various areas of the world. In the study conducted by Engin et al (21) in 2001 entitled 'histopathological endoscopy findings of *H. pylori* in highly low-aged children', where children younger than two years old were involved, no significant relationship was reported between severity of *H. pylori* and gastritis severity. It was concluded that *H. pylori* colonization is related to various degrees of gastritis; a finding which can be possibly due to lack of maturation in highly low-aged children's immune response. Also, Yolanda (10) indicated that patients with an age lower than three, who suffer from *H. pylori*, had higher degrees of gastritis than healthy children. Meanwhile, the relationship between *H. pylori* infection with degrees of gastritis has not been significant due to insufficiency of gastric biopsy.

Moreover, the present study showed that the highest and lowest gastritis types were non-atrophic and atrophic with prevalence of 46.7% and 0.2%, respectively; a finding coinciding with that of Yolanda (10). Additionally, the present study showed low prevalence of gastritis types as erosive, lymphocytic, ulcer, etc. in children and adolescents. Results of Yi (19) and Yolanda (10) supported our findings. However, there

was no statistical difference between various types of gastritis in terms of mean age.

It should be noted that pursuing the examined patients until their adulthood can contribute to a more precise and better identification of this infection's complications.

In the present study, non-atrophic gastritis types were reported as mild (51.5%), moderate (15.6%) and severe (1.49%) which was nearly similar to Bahu (18) and Yolanda (10). In the study conducted by Yi in China (19) entitled the examination of the relationship between *H. pylori* infection and pathologic changes in gastric mucous of Chinese children in 2014, the number of moderate and severe gastritis cases were greater than those in the present study. It seems that low prevalence of moderate and severe gastritis in our study was due to two reasons: firstly, it is possible that patients might have taken antibiotics before undergoing endoscopy and secondly the age of patients might have played an effective role since *H. pylori* infection is acquired in initial years of life in the developing countries like Iran, the possible side effects would be far less than in adulthood and would expectedly appear at the later years of life.

Likewise, the results of the present study revealed that moderate and severe gastritis appear more in moderate and severe *H. pylori* colonization; a finding which is in line with that of Yi (19), Bedoya (15), Bahu (18) and Koh (14).

As of the association of *H. pylori* with atrophy and intestinal metaplasia, no

statistical comparison could be made as the number of atrophic and metaplasia cases were few.

Large sample size compared to most of other studies can be considered as a strong point of this study. Also, given that Be'sat Hospital is the only center where endoscopy and abdominal sampling of children and adolescents from Hamedan and some other western provinces can be conducted, the study has a relatively high strength for conclusion about the hypotheses.

## Conclusion

According to findings of the present study, increase in severity of *H. pylori* infection as well as in gastritis severity not only causes other possible complications for children and adolescents showing the symptoms and problems but also decreases life quality and imposes a greater economic and medical burden on the society.

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## Conflict of Interest

There isn't any conflict of interest to be declared regarding the manuscript.

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## Tables:

**Table 1.** Patients' Clinical, Pathological and Demographic Information

Variable		Frequency	Percentage
Gender	Boy	460	45.7
	Girl	546	54.3
Age (year) Mean (SD) <sup>2</sup>		8.87 (3.48)	
Helicobacter Pylori Severity	Normal	240	23.9
	Rare	19	1.9
	Mild	44	1.4
	Moderate	502	49.9
	Severe	25	2.5
Severity of Gastritis	Normal	315	31.3
	Mild	519	51.6
	Moderate	157	15.6
	Severe	15	1.1
Metaplasia	Yes	1	0.1
	No	1005	99.9
Atrophy	No	1004	99.8
	Mild-Moderate	2	0.2
Activity	Negative	960	95.5

<sup>2</sup> Standard Deviation

	Mild	19	1.9
	Moderate	25	2.5
	Severe	2	0.2
<b>Gastritis Type</b>	Negative	277	27.5
	Non-Atrophy	696	69.2
	Reactive	16	1.6
	Other	17	1.7

**Table 2.** Frequency of Colonization Severity of Helicobacter Pylori in terms of Patients' Age

<b>Severity of Helicobacter Pylori</b>	<b>Number</b>	<b>Mean</b>	<b>SD</b>	<b>Min.</b>	<b>Max.</b>	<b>P. value</b>
<b>Normal</b>	240	8.45	3.64	1	18	<0.001
<b>Rare</b>	19	7.0	4.29	1	18	<0.001
<b>Weakly</b>	44	7.73	3.34	1	16	<0.001
<b>Mild</b>	502	8.94	3.43	1	18	<0.001
<b>Moderate</b>	176	9.49	3.15	1	17	<0.001
<b>Severe</b>	25	10.48	3.24	4	18	<0.001
<b>Total</b>	1006	8.87	3.48	1	18	<0.001

**Table 3.** Frequency of Gastritis Severity in terms of Patients' Age

<b>Gastritis Severity</b>	<b>Number</b>	<b>Mean</b>	<b>SD</b>	<b>p. value</b>
<b>Normal</b>	308	8.26	3.67	<0.001
<b>Mild</b>	519	8.87	3.40	
<b>Moderate</b>	157	9.76	3.09	
<b>Severe</b>	22	11.05	3.14	
<b>Total</b>	1006	8.87	3.48	