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Original article

The Prevalence and Risk Factors of *Helicobacter pylori* Infection among Children with Dyspeptic Patients

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A B S T R A C T

Helicobacter pylori (*H. pylori*) infection in children is common in developing countries. There is no data available regarding *H. pylori* infection in dyspeptic children and associated risk factors in Libya. The objectives were to determine the prevalence of *H. pylori* among the dyspeptic children and to correlate risk factors associated with *H. pylori* infection. A gastric biopsy was collected from (120) dyspeptic children attending the gastroenterology units of Tripoli Children Hospital, and a questionnaire covering socio-demographic variables was completed by interview. The prevalence of *H. pylori* infection was 84%. Age (6 to 10 years), place of residence (rural areas), and family members (5 to 7 members) were the most significant risk factors associated with *H. pylori*. These findings highlighted the importance of screening children with dyspepsia in urban and rural Libyan regions.

Introduction

Helicobacter pylori (*H. pylori*) is the most common human bacterial Infection. More than half of the world's population is infected with *H. pylori*, especially in the developing countries, where it is acquired almost always within the first 5 years of life (30%–50%) and increases up to 90% in the elderly, which is mainly due to poor living conditions, cleanliness, and overcrowding. In contrast, infection is uncommon in young children in developed countries and can reach up to 60% at older ages [1].

H. pylori infection is acquired in childhood and often remains for life, and most of those infected (80%–90%) are asymptomatic patients. In other words, *H. pylori* is defined as a commensal and not a pathogen, making it difficult to determine who should be treated to avoid the complications [2]. The discovery that this bacterium is the cause of most peptic ulcer-related diseases in human life (with infection being present in 60%– 80% of gastric and 95% of duodenal ulcers) has been arguably the most important advance in gastroenterology in recent decades [1]. Infection with *H. pylori* pathogen causes chronic mucosal inflammation (Gastritis) in the stomach and duodenum, which, one at a time, might lead to abnormalities in gastroduodenal motility, sensitivity, and endocrine and acid-secretory abnormalities that could drive the symptoms of functional dyspepsia [3]. Histopathology has historically been considered as being the gold standard diagnostic tool for *H. pylori* detection in suspicious patients with upper gastrointestinal symptoms or in highly prevalent areas [4].

The detection of *H. pylori* infection in biopsy tissue samples that are taken by upper endoscopy or Oesophago-Gastro-Duodenoscopy (OEGD) has been based on histology (Invasive method). The organism can be easily detected by its position on the epithelial cell surface within the gastric pits or in the mucus overlying the cell surface, and by its S-shaped morphology [5]. Although Libya is considered one of the largest countries, over the past decades, there have been many changes in the lifestyle. Nevertheless, there is a shortage of information about the epidemiology and the prevalence of *H. pylori* infection in dyspeptic children. Therefore, this study will be important for the health authorities to develop plans and strategies for the prevention of or at least to reduce the cases of gastroduodenal diseases related to *H. pylori* infection.

Methods

Study Population

A cross-sectional study was conducted to find out the prevalence of *H. pylori* among 120 pediatric patients (49 males and 71 females) aged (<1-14 years) attending the gastroenterology unit in Tripoli Children's Hospital

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with recurrent abdominal pain, unexplained weight loss, vomiting, and dyspeptic complaints and in whom endoscopy was indicated. The appropriate permission was obtained from the concerned authorities for sample collection, parents were informed about the purpose of this research study, and a verbal agreement was given to them before any sample collection. A standard questionnaire was filled out by interviewing one of the parents to obtain socioeconomic data regarding each patient (gender, age, place of residence, blood group, number of family members, source of drinking water, family history of gastric ulcer or gastric cancer).

Exclusion Criteria

To rule out possible false-negative results, patients who have used antibiotics in the last month, proton-pump inhibitors (PPIs) in the last 14 days, H2 receptor antagonists or antacids in the last 24 hours, and those with chronic gastrointestinal diseases were excluded.

Sample Collection

Over the study period, three Biopsies were obtained (gastric, antrum, and corpus biopsies) from the patients in whom esophagogastroduodenoscopy was performed following at least eight hours of fasting. The biopsies were placed in an Eppendorf tube containing 1 mL of 10% neutral formalin solution and transferred to the pathology laboratory. Gastric biopsies were submitted for histology, placed in slides, stained with hematoxylin and eosin stain (Abbey Color, Philadelphia, PA, USA), and assessed by a pathologist. The pathologist organized a report about the findings. He looked for the presence of gastritis and *H. pylori* according to the updated Sydney classification [6].

Statistical Analysis

Descriptive statistics were used to describe the demographic data. For categorical variables, frequencies and percentages were reported. Comparisons of categorical variables were carried out using Pearson's chi-square test. An a priori two-tailed level of significance was set at 0.05. Statistical analyses were conducted using Statistical Package for the Social Sciences version 24 (SPSS Inc., Chicago, IL, USA).

Results

At Tripoli Children's Hospital, a total of 120 biopsies were collected, of which 50 other biopsies were excluded as the biopsy results were indicative of other chronic diseases. The overall prevalence of *H. pylori* among dyspeptic children patients using the histopathology technique (invasive method) was 84% (101/120)(Figure 1).

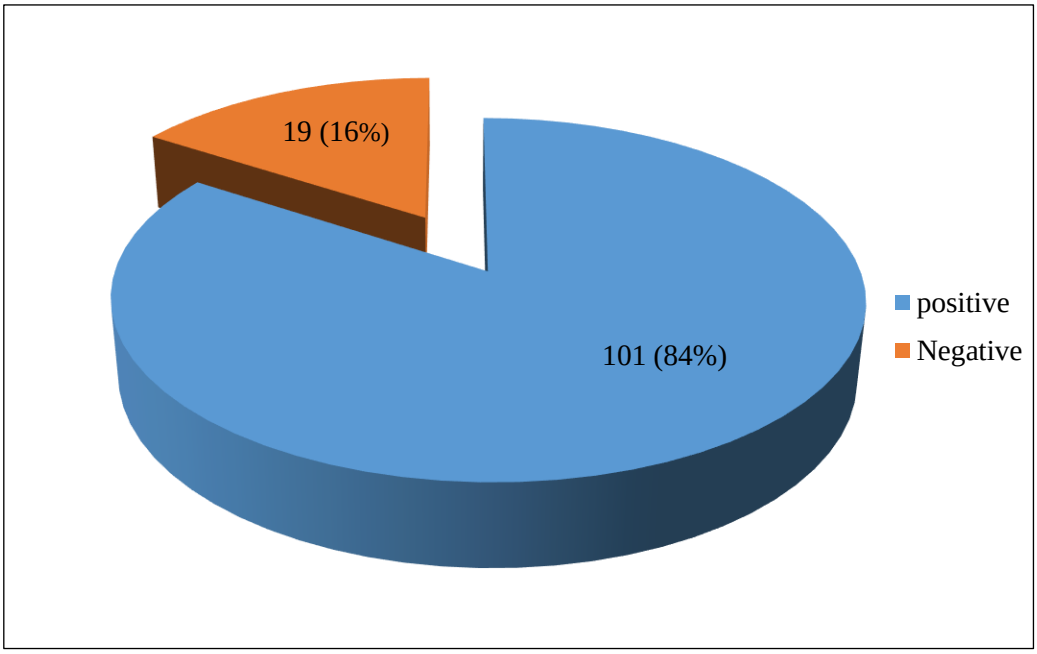

Figure 1. Prevalence of Helicobacter pylori among Children with Dyspeptic Symptoms.

Prevalence of H. pylori According to Gender

The prevalence of *H. pylori* was higher in females (61%) than in males (39%). There was no significant difference in correlation to age (Table 1).

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Table 1. Prevalence of Helicobacter pylori in Relation to Gender

Gender	Positive	Percentage	Negative	Percentage	Total	X^2	DF	*P*- value
Male	39	39%	10	53%	49	1.301	1	0.254
Female	62	61%	9	47%	71			
Total	101	100%	19	100%	120			

Prevalence of H. pylori According to age

There was a significant difference in *H. pylori*-positive results with age (*P*= 0.02). The infection rate of *H. pylori* increased with the increase in age of the participants, from 27% among 1 to 5 years old to 48% among 6 to 10 years (Table2).

Table 2. Prevalence of Helicobacter pylori in Relation to Age.

Age	Positive	Percentage	Negative	Total	X^2	DF	*P*- value
1-5 years	27	27%	13	40	1.301	1	0.02
6-10 years	48	48%	5	53			
11-15 years	26	25%	1	27			
Total	101	100%	19	120			

Prevalence of H. pylori According to Place of Residence

Referring to (Figure 2), the frequency of infection of *H. pylori* among children residing in Tripoli was (47%) while it was (53%) in children living in the suburbs. There was a statistical significance between the place of residence and the positive results of the bacteria (*P*= 0.003).

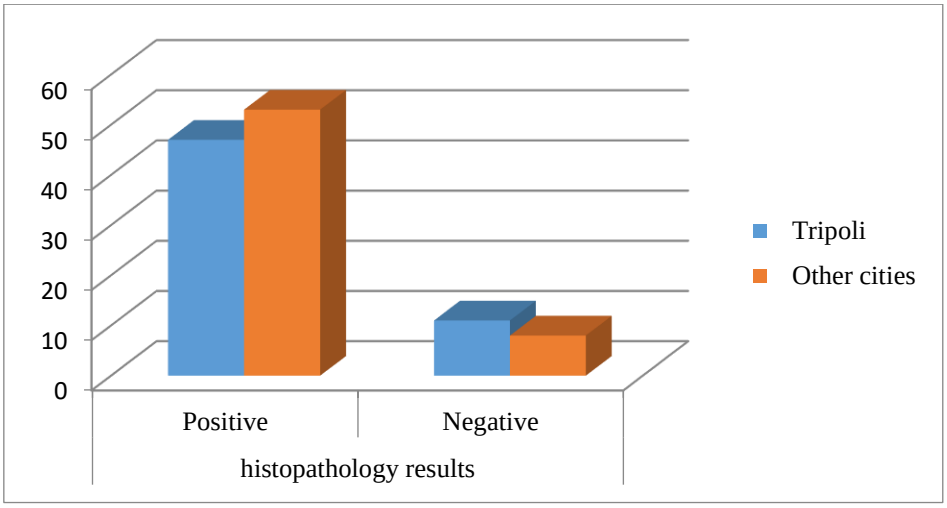

Figure 2. Prevalence of Helicobacter pylori in Relation to the Place of Residence.

Prevalence of H. pylori According to the Blood Group

According to (Table 3), the frequency of the ABO blood groups among the positive patients was (A = 43.0%, B = 10%, AB = 4%, O = 44%, and Rh+ (87%), 86% of the positive cases were carriers of A and O blood groups but without significant difference concerning blood group.

Table 3. Prevalence of H. pylori According to the Blood Group

Blood Group	Positive	Negative	Total	X^2	DF	*P*- value
A	43	4	47	1.015	3	0.798
B	10	3	13			
AB	4	0	4			
O	44	12	56			
Total	101	19	120			

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Prevalence of H. pylori According to the Family Members

The participants were divided into three groups according to the number of family members (Table 4). Most of the positive cases (68%) were among families carrying 5-7 members with a statistically significant difference in relation to family clustering (p=0.00).

Table 4. Prevalence of Helicobacter pylori in Relation to Family Members

Family Members	Positive	Negative	Total	X^2	DF	*P-* value
2 to 4	16	13	29	21.885	2	0.00
5 to 7	69	5	74			
8 to 10	16	1	17			
Total	101	19	120			

Prevalence of H. pylori According to the Source of Drinking Water

The high positivity of *H. pylori* infections (97%) was detected in cases who use filtered water (commercial supply) compared to those who use tap water (3%). There is no statistical significance of the association between the *H. pylori* infection and the source of water (p= 0.609).

Prevalence of H. pylori According to the Family History of Gastric Diseases (Hereditary Factor)

Of the 120 patients studied, only 34 (30.8%) had a family history of peptic ulcer disease (PUD), of which 30 (29.7%) were related to positive *H. pylori* patients and 4 (21%) were related to negative *H. pylori* patients (p = 0.443).

Discussion

This study revealed a high prevalence of infection with *H. pylori* (84%) among dyspeptic children aged (<1-14 years) who attended the gastroenterology unit in Tripoli Children Hospital (TCH). Other previous studies worldwide came in support of this study, including a 52% prevalence of *H. pylori* infection was recorded in Brazilian dyspeptic children who subjected to upper gastrointestinal endoscopy and biopsy [7], and a relatively higher percentage (63%) was obtained from Romanian children infected with *H. pylori* who attended pediatric gastroenterology unit of St. Mary children's hospital, Jassy, Romania [8]. Other studies in the middle east supported our results, including a Jordanian study, which revealed that the prevalence of *H. pylori* in children who underwent Esophago-gastro-duodenoscopy at Jordan university hospital in Jordan was 54% [9], and a Saudi study showed high prevalence of *H. pylori* gastritis in Saudi Arab children (92%) [10]. Another Egyptian study pointed out a prevalence of *H. pylori* infection in children attending the Gastroenterology Unit of the Paediatric Hospital, Cairo University of 64.6% [11].

In this study, there was no statistically significant correlation between gender and *H. pylori* infection. This suggests that gender may not be a significant risk factor in the acquisition of H. pylori infection in children. This is similar to the results of other studies conducted in Egypt [11] and in Uganda [12]. However, a study in Sudan revealed that boys are more likely to be infected with *H. pylori* than girls [13], while a study in Ghana reported a significant association between *H. pylori* infection and female gender [14].

Regarding age as a risk factor, the results of this study indicate that the age of the patients was found to be statistically significantly associated with *H. pylori* (P= 0.02), as the infection rate of the bacteria increases with increasing the age of the participants, from 27% in children aged 1to 5 years, to 48% in children aged 6 to 10 years. Similar findings of increasing prevalence with age have been reported in a Nigerian study [15], and an Iranian study [16]. Another Ugandan study revealed that the infection rate of *H. pylori* increased with an increase in age of the participants, from 16.2% among 1- to 5-year-olds to 27.2% among 6 to 10-year-olds [12]. The reason why the infection was higher among school-age children may be that school-age children spend a long period in school close to each other and they carry out a lot of activities and are exposed to various causes of infection. If the school environment is not hygienic, they can easily acquire organisms like *H. pylori*. Consequently, there should be awareness campaigns school-age children on good hygiene practices. Different findings regarding age were found in an Ethiopian and a Nigerian studies, in which older age was associated with increased positive *H. pylori* cases, with the 10–14 age group when compared to the 5–9 age group [17], [18].

Living in suburbs and rural areas has a significant impact on the acquisition of bacteria as reported in this study's results. Children from rural areas had a significantly higher infection rate than those from urban areas (53% vs.47%, P < 0.003). These results may be contributing to low hygienic standards as compared with city residents, representing a potential risk for the development of gastro-duodenal diseases.

Considering the ABO system, the results in this study agree with a Chinese study that found no association between *H. pylori* infection and ABO blood groups [19], while conflicting with a Brazilian study which showed

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that the positivity of *H. pylori* was greater among the children with the O blood type, thus suggesting that these children have a greater genetic susceptibility to infection by *H. pylori* [20].
The other major risk factors for *H. pylori* infection in developing countries are overcrowded families. The infection odds ratio rises with the number of siblings in the family, pointing to a higher risk of *H. pylori* infection in the familial group, because that creates closer contact between parents and children and between siblings that might spread the infection to each other. In this study, most of the positive cases (68%), were among families carrying 5-7 members compared to 15.8% having family members of 2 to 4, with a statistically significant association with *H. pylori* infection (P = 0.001). This goes in accordance with a study conducted in Romania by Rosu et al and in Egypt by Galal et al, they reported that living in overcrowded houses with no basic sanitary comfort has a great effect on acquisition the bacteria [8], [11].
Water is an important source of *H. pylori* spread and Awuku *et al.* 's study that conducted in Ghana has confirmed it [14]. The lack of a source of pure water supply is a significant environmental risk factor that has been connected to the expansion of *H. pylori*. Nevertheless, in this study, most of the positive cases (97%) are using commercial water compared to (3%) using the well-tape water supply as a source of drinking water (p= 0.609), this may be because the filtered water from commercial places is possibly contaminated with the bacteria since a proper sewage network does not exist. furthermore, the multiple uses and refilling of the water bottles make them vulnerable to bacterial contamination.
There was no significant statistical correlation between *H. pylori* infection and family history of PUD (p = 0.443). these findings are similar to the results and rosu *et al* and Aitila *et al* study, where they conclude that there was no statistical relationship between the family history of PUD in children and *H. pylori* infection [8,12], while in contrast, an American study showed a statistically Significant associations were found between positive and symptomatic cases and a family history of gastric complaints [21].

CONCLUSION

The present study showed that *H. pylori* infection in children is a serious health problem. The prevalence of *H. pylori* infection among 120 dyspeptic children patients undergoing Gastrointestinal endoscopy was 84%. Most of the infected patients were school-age children, 6-10 years old. The most significant risk factors for *H. pylori* infection were (age, place of residence, family members), while (Gender, blood group, source of drinking water, and history of gastric diseases) could not be considered as a major basic risk factors for *H. pylori* infection as demonstrated by the results of this study.

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Competing interests
Authors have declared that no competing interests exist.

Ethical approvals
The appropriate permission was obtained from the concerned authorities for sample collection, parents were informed about the purpose of this research study and a written consent agreement was given to them before sample collection.

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