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Prevalence of Helicobacter Pylori Infection among the Whole Spectrum of Age and the Performance of the Different Diagnostic Tests

By Awad Magbri, Eussera El-Magbri, Mariam El-Magbri & Fiona Stevens
George Washington University, United States

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Reliabilities of the diagnostic tests: The sensitivity, specificity, positive and negative predictive values for (i) Rapid urease test (RUT), (ii) ELISA, (iii) Histology and (iv) Culture. The rapid urease test was found to have a high sensitivity and specificity (89.5% and 96.8%), respectively. Although estimation of serum IgG H. pylori antibody by ELISA is relatively non-invasive procedure, unfortunately, it lacks sufficient sensitivity (63%) to be used as a sole diagnostic test for H. pylori infection. Histology on the other hand is widely available in most hospitals and has a relatively high sensitivity (77.4%) and specificity (75%).

Keywords: *helicobacter pylori, sensitivity, specificity, rapid urease test, gastric cancer, ELISA test, IgG to H. pylori.*

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Prevalence of H. pylori infection: The prevalence of H. pylori is assessed in the different age groups. There was a substantial increase in the prevalence of H. pylori infection with increasing age up to the age 61 years. In this study the highest prevalence of infection was found in the age group 31-60 years. The overall prevalence of H. pylori infection in patients with upper gastrointestinal symptoms as assessed by histology (73%), culture (53%), serum IgG ELISA (56%), and rapid urease test (65%).

Conclusion: The prevalent of Helicobacter pylori infection are worldwide and the infection rate is intimately related to age, ethnicity, and socio-economic factors. The sensitivity and specificity of the different methods used to detect H. pylori infection vary considerably and depends on the inherent characteristics of the test used. A test with high sensitivity and specificity is needed to capture the majority of patients with infection so they can be treated early and cured of the bacteria this will prevent the development of gastric and duodenal ulcer and the late consequences of gastric malignancy.

Author α: MD- Dialysis Access Center of Pittsburgh, PA.
e-mail: elmagbri@hotmail.com
Author σ: MD candidate, George Washington University, Washington DC.
Author ρ: BSc, American University, Washington DC.
Author ω: University College Hospital Galway, Ireland.

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I. Introduction

Studies from Western Europe, New Zealand, Australia, and United States have shown that the prevalence of H. pylori infection in symptomatic patients undergoing endoscopy is very high. The rate of H. pylori infection in patients with upper gastro-intestinal symptoms ranges from 40-60%. In benign gastric ulcer the organism is found in about 70% (1). No the other hand, the rate of infection in duodenal ulcer patients is 85-95% (2, 3). The rate of infection of H. pylori related to several factors, for example the rate of infection increases with age (1, 4-8). The prevalence in children was found to range between 20-68% (9-15). The rate of infection also correlate to underlying disease process; in duodenal ulcer and duodenitis the rate of H. pylori infection may be as high as 95%, and in gastritis the rate of infection ranged from 62-97% (16-30). The sensitivity and specificity of the various tests used to diagnose H. pylori infection have wide variation ranging from (63% to 89.5% for sensitivity) and (41.7% to 100% for specificity). The prevalence of H. pylori infection in different age groups was carried out in this study and was found to be highly variable in different age groups. The highest prevalence was found in the age group of 31-60 years.

II. Subjects and Methods

Three hundred and thirty eight patients were included in the study. They presented to the endoscopy suite at University College Hospital Galway, Ireland (UCHG) with upper gastrointestinal symptoms. The age range is 21-90 years with a median age of 52 years, 62% females, and 24% diabetics. They were divided into 3 groups 18-30 years, 31-60 years, and 61-90 years. The prevalence of H. pylori among the different spectrum of age is calculated using different methods of diagnosing H. pylori, table 3.2.

Formal written consent was obtained and the procedure was explained to each patient included in the study.

Blood was collected in a plain tube before endoscopy for estimation of serum IgG antibodies to H. pylori using ELISA test (Biometra, Germany).

Specimens were taken from antrum and duodenum from each patient enrolled in the study, for histological examination and culture. They were forwarded to the bacteriology laboratory in a separate containers containing a transport medium (Nutrient Broth Code: CMI oxide) for direct smear and culture on Colombia blood agar base (code: CM331) containing cefoperazone selective supplement (code: SR125) mixed together into sterile Petri dishes prepared according to the specifications of the supplier (Oxide, Ireland).

The specimens for the histological examination were labeled with reference numbers, and were formalin fixed and prepared according to the standard methods. Sections 5 μm thin and stained with haematoxylin and eosin (H&E) or modified Giemsa stain and read by an experienced pathologist (RS) without previous knowledge of clinical or microbiological information.

A biopsy specimen was examined by commercially available rapid urease test kindly provided by (Jatrox HP-Test, Rohm Pharma Waterston, Germany).

The performance of the different tests used to diagnose H. pylori was outlined in table 3.1.

III. Results

Reliabilities of the diagnostic tests: The sensitivity, specificity, positive and negative predictive values for (i) Rapid urease test, (ii) ELISA, (iii) Histology and (iv) Culture are shown in table 3.1.

The rapid urease test (RUT) was found to have a high sensitivity and specificity (89.5% and 96.8%) respectively. However, it needs an endoscopic procedure to obtain an antral biopsy for the assay which is not available in all hospitals. Endoscopy is an invasive and expensive procedure.

Although estimation of serum IgG H. pylori antibody by ELISA is relatively non-invasive procedure, unfortunately, it lacks sufficient sensitivity (63%) to be used as a sole diagnostic test for H. pylori infection, table – 3.1.

Histology on the other hand is widely available in most hospitals and has a relatively high sensitivity (77.4%) and specificity (75%), table 3.1. It is relatively quick, cheap and easy to perform but is requires endoscopic examination which is an invasive technique and needs a well trained histological expertise and therefore, it cannot be utilized as a screening test for H. pylori diagnosis.

Culture of H. pylori was found to be highly specific (100%) and sufficiently sensitive (86.2%), table – 3.1. However, it takes a few days for the results to come through and it cannot be used for quick diagnosis of H. pylori infection. Culture of H. pylori is, however, needed to determine the sensitivity of the bacterium to the anti-microbial agents, especially to metronidazole. Obtaining the biopsy for culture is an invasive procedure.

Prevalence of H. pylori infection: The prevalence of H. pylori is assessed in the different age groups, table – 3.2. There was a substantial increase in the prevalence of H. pylori infection with increasing age up to the age 61 years. This result agrees with the results of previous workers. However, in the age group 18-30 years the prevalence of H. pylori infection in patients with dyspepsia ranges from 45-53% depending on the mode used for diagnosis.

In this study the highest prevalence of infection was found in the age group 31-60 years, table-3.2. Usually the colonization of the bacteria is most prevalent in the elderly. The reason for this finding is not entirely clear. However, the frequent use of drugs like NSAIDS, and corticosteroids could contribute to the relatively low prevalence in this age group.

The overall prevalence of H. pylori infection in patients with upper gastrointestinal symptoms as assessed by histology (73%), culture (53%), serum IgG ELISA (56%), and rapid urease test (65%) table-3.2 agree with the previous studies from the developed countries (31-33).

IV. Discussion

Infection with H. pylori is rampant and worldwide. The rate of infection is influenced by age, race, geographical and socio-economic factors, as well as dietary practices (34-44). The rate of infection is found to be higher in China and India than in North America. On the other hand, the infection rate is similar in Mexico and the United States (37, 45). It has been revealed that the rate of infection of H. pylori in the United States is influenced by many factors like social-economic, ethnicity, age, and gender. These findings suggest that the rate of H. pylori infection is modified by geographical and host factors. The type and severity of gastritis associated with H. pylori colonization are also influenced the rate of infection.

The epidemiology of H. pylori infection has been extensively studied and was found to be closely correlated with superficial type-B gastritis. Infection with H. pylori is associated with active and chronic inflammation of gastric mucosa (32, 46). The density of the bacteria in the tissue is also correlated to the severity of inflammation and the local and systemic immune response mounted against the bacteria (32, 46-48).

H. pylori infection can be detected with various methods e. g histological examination and culture of the gastric biopsy specimens which takes several days, serology, rapid urease test etc. Serum IgG/IgA ELISA and Rapid Urease test were compared to the gold standard tests (histology and culture) and evaluated in this study. The organism was detected in 76 of 107 dyspeptic patients attending GI unit at UCHG. We found a relatively good correlation between serology and histological findings in the antral biopsies despite the

low sensitivity (63%) of our ELISA test compared to histology and culture, table-3.1. Our results of high sensitivity and specificity (89.5% and 96.8%) of rapid urease test agreed with Carvalho and others (15, 49-56), but disagreed with the results of Nichols and others (23, 57). The advantages of quick test e.g. RUT is that treatment can be given to the patients within one hour of their endoscopic procedures. In the Amsterdam study (15) the results of culture and histology were analogous to ours.

We found that, histological examination, culture, ELISA and RUT revealed an increased prevalence of H. pylori infection and the rate of infection are rising with increasing age up to the age of 61 years. This is in parallel with the findings that the prevalence of infection is related to the prevalence of gastritis (6, 31-33). However, the prevalence of H. pylori in the elderly age group is lower than the reported prevalence from Western countries, table-3.2. We noted that the prevalence of H. pylori infection in the age group 61-90 years was below that of 30-60 years. This agreed with the findings of Newell et al (57).

Previously, it has been suggested that the age discrepancy is due to progressive atrophic gastritis with hypochlorhydria in the body and fundus of the stomach of the elderly patients. This environment is hostile to the existence of the organism. Another possible explanation to the low infection rate in the elderly could be related to the increased use of the antibiotics in this age group which may clear the organism. The histological sections from the mucosa of the 25 patients from the group 61-90 years old were reviews, none were taken NSAIDs concurrently. We found 14(56%) of these patients had either normal or mild inflammation and of them 6(43%) were H. pylori positive. Moderate inflammation was present in 9(36%) all were H. pylori positive. Only 2(8%) had severe inflammation and both were H. pylori positive. Atrophy of specialized cells in the fundus and body of the stomach cannot be inferred from examination of antral biopsies. Thus in this study we have no evidence to support the notion that atrophic gastritis is associated with a decreased prevalence of H. pylori in the elderly. We concluded that the majority if the elderly (>61 years) had a prevalence of H. pylori ranging from (45-64%), table-3.2, depending on the mode used for detection of H. pylori infection. More than 50% of them had only mild inflammation; in these group H. pylori was isolated in 43%. However, moderate to severe degree of inflammation was present in 44% of them and H. pylori were always associated with gastritis.

V. Conclusion

The prevalent of Helicobacter pylori infection are worldwide and the infection rate is intimately related to age, ethnicity, and socio-economic factors. The sensitivity and specificity of the different methods used to detect H. pylori infection vary considerably and depends on the inherent characteristics of the test used. A test with high sensitivity and specificity is needed to capture the majority of patients with infection so they can be treated early and cured of the bacteria this will prevent the development of gastric and duodenal ulcer and the late consequences of gastric malignancy.

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Table – 3.1 : The reliabilities of the various diagnostic tests for H. pylori infection.

Test	Sensitivity	Specificity	PP value	NP value
Histology	77.4%	75%	83.7%	66.7%
Culture	86.2%	100%	100%	76.5%
Serum IgG	63%	97%	98%	51%
Local IgA	79.2%	41.7%	57.6%	66.7%
Urease test	89.5%	96.8%	98.6%	78.9%

Table 3.2 : The prevalence of H. pylori infection: age difference.

	18-30 years	31-60 years	61-90 years	Overall
Histology	52.9%	85.3%	56%	72.8%
Culture	47.1%	57.4%	45.5%	53%
ELISA	45.8%	61.2%	52.6%	55.8%
Rapid Urease test	47.06%	69.8%	64%	64.8%