

# Effectiveness of Rapid Urease Diagnostic Test in Diagnosing *Helicobacter Pylori* Infection in Patients with Dyspepsia in Gastrointestinal Endoscopy Centre

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## ABSTRACT

**Background:** Diagnosis of *H. pylori* infection is important in patient with dyspepsia. There are several methods in the diagnosis of *H. pylori* infection. Histopathology is still the gold standard, but it requires more time and higher cost. Rapid diagnosis from biopsy sample using urease test has been developed to provide rapid on-site diagnosis. This study aims to obtain accuracy of rapid urease test in diagnosis of *H. pylori*.

**Method:** Patients with dyspepsia in Cipto Mangunkusumo National General Hospital who underwent esofagogastroduodenoscopy was included in this study. Biopsy sample was taken for rapid urease test using Helicotec and histopathology examination.

**Results:** Prevalence of *H. pylori* infection based on histopathology examination was 7.2%. From seven positive results in histopathology examination, four samples were Helicotec positive. The sensitivity and specificity of rapid urease test using Helicotec was 57.1% and 98.9%. The positive predictive value and negative predictive value were 80% and 96.7%.

**Conclusion:** Rapid urease examination using Helicotec for *H.pylori* infection has a good accuracy, faster and cheaper. Interpretation of rapid urease test also need to consider clinical condition of patients who are tested.

**Keywords:** *Helicobacter pylori*, dyspepsia, rapid urease test

## ABSTRAK

**Latar belakang:** Diagnosis infeksi *H. pylori* penting dilakukan pada pasien dengan dyspepsia. Terdapat berbagai metode diagnosis untuk infeksi *H.pylori*. Pemeriksaan histopatologi merupakan pemeriksaan gold standard namun memerlukan waktu lebih lama dan biaya yang lebih tinggi. Pemeriksaan yang lebih cepat dan murah telah dikembangkan dengan menggunakan rapid urease test. Penelitian ini bertujuan untuk menilai akurasi pemeriksaan rapid urease test (helicotec).

**Metode:** Penelitian ini dilakukan pada pasien dengan keluhan dyspepsia yang menjalani Tindakan esofagogastroduodenoskopi di Rumah Sakit Umum Pusat Nasional Cipto Mangunkusumo. Sampel biopsi diambil untuk pemeriksaan rapid ureae test (helicotec) dan histopatologi sebagai gold standard.

**Hasil:** Prevalensi infeksi *H.pylori* berdasarkan pemeriksaan histopatologi pada penelitian ini adalah 7.2%. Sensitivitas dan spesifisitas pemeriksaan rapid urease test dengan helicotec adalah 51.7% dan 98.9%. Positive predictive value dan negative predictive value adalah 80% dan 96.7%.

**Simpulan:** Pemeriksaan rapid urease test dengan helicotec memiliki akurasi yang cukup baik untuk diagnosis infeksi *H.pylori*. Interpretasi hasil pemeriksaan rapid urease test tetap memerlukan kesesuaian dengan klinis atau gambaran endoskopi.

**Kata kunci:** *Helicobacter pylori*, disepsia, rapid urease test

## INTRODUCTION

*Helicobacter pylori* is one of the most important infectious agents in the world. These bacteria infect 50% of the world population. Gastritis due to *H. pylori* has been associated with the incidence of peptic ulcer, B cell primary lymphoma in the stomach, and gastric carcinoma. In dyspepsia, eradication of *H. pylori* helps symptoms improvement and treatment cost efficiency.<sup>1</sup>

Prevalence of *H. pylori* is quite high in less developed Asian countries, such as India, Bangladesh, Pakistan, and Thailand. A study in Jakarta found that the prevalence of *H. pylori* infection decreases from 12.8% in 1998 to 2.9% in 2005. Several risk factors which have been associated with *H. pylori* infection include age, social economy class, geographical area (more *H. pylori* infected individuals in rural areas compared to urban areas), and several dietary factors.<sup>2,3</sup> Among those factors, social economy class is an independent risk factor.

To date, the gold standard test to diagnose *H. pylori* infection is histopathology and culture examinations. However, considering its significant amount of preparation time, this method is not ideal for implementation in daily practice. Upon further development, other supporting examinations have been developed. One of those tests is through detection of urease enzyme from tissue biopsy. This method is faster in diagnosing *H. pylori* infection. Several urease tests which are commercially available in Indonesia include Helicotec and Pronto Dry.

Dyspepsia is defined as chronic or recurrent pain or discomfort sensation, centred around the upper region of the abdomen and if accompanied with predominant or often (more than once a week); heartburn or acid regurgitation need to be considered as gastroesophageal reflux disease (GERD) until proven otherwise.<sup>4</sup> In dyspeptic patients, it was stated by McColl et al that patients with dyspepsia who are positively infected by *H. pylori* has the possibility of duodenal ulcer as much as 40% and gastric ulcer 13%, while dyspepsia patients with negative *H. pylori* only has the possibility of duodenal ulcer of 2% and gastric ulcer of 3%.<sup>5</sup>

This study aimed to evaluate urease test in diagnosing *H. pylori* infection in dyspepsia patients. It is expected that we could obtain a scientific evidence

which can become the basis of routine use of urease examination in diagnosing *H. pylori* infection.

## METHOD

This study used diagnostic study design. This study was performed in adult dyspepsia patients who underwent endoscopy examination in Gastrointestinal Endoscopy Centre Cipto Mangunkusumo General Hospital in January – November 2018.

The inclusion criteria were dyspepsia patients, aged more than 18 years, and indicated to undergo upper gastrointestinal tract endoscopy. Exclusion criteria include patients who were pregnant or breastfeeding, refused endoscopy examination, had contraindication to undergo endoscopy, had endoscopic results of gastric malignancy, or consumed antibiotics, nonsteroidal anti-inflammatory drugs (NSAIDs), proton pump inhibitors in the previous 2 weeks.

Patients who fulfilled the inclusion criteria underwent endoscopic examination and biopsy samples were obtained from two points in the antrum and one point in the corpus. One biopsy sample was intended for rapid urease test using Helicotec which was performed according to the standard procedure and was interpreted 2 hours later. Biopsy for histopathological examination was preserved in formalin solution and sent to Histopathology Department for analysis and identification of *H. pylori* bacteria. Interpretation of histopathological examination of gastric biopsy sample was performed using Updated Sydney System Classification.

Statistical analysis was performed to obtain sensitivity, specificity, positive predictive value (NPV), negative predictive value (NPV), and likelihood ratio (LR). A p value <0.05 is considered as significant.

## RESULTS

There were 97 patients participated in this study, comprising of 40 (41,2%) male and 57 (58,8%) female patients. Patients' age ranged from 20 – 85 years with an average of 50,12 ± 15,30. Other patients' characteristics were presented in table 1. Endoscopic results were shown in Table 2.

**Table 1. Patients' characteristics**

Characteristics	n (%)
Sex	
Male	40 (41.2)
Female	57 (58.8)
Marital status	
Married	79 (81.4)
Unmarried	18 (18.6)
Religion	
Buddhism	4 (4.1)
Moslem	64 (66)
Catholic	2 (2.1)
Konghucu	1 (1)
Christian	26 (26.8)
Domiciled in	
Jabodetabek	89 (91.8)
Outside Jabodetabek	8 (8.2)
Ethnicity	
Acehnese	1 (1)
Ambonese	3 (3.1)
Arabian	1 (1)
Batakese	26 (26.8)
Betawinese	2 (2.1)
Javanese	27 (27.8)
Lomboknese	1 (1)
Manadonese	1 (1)
Minangnese	10 (10.3)
Palembangnese	2 (2.1)
Sundanese	14 (14.4)
Ternatenese	2 (2.1)
Chinese	7 (7.2)
Occupation	
Labour	1 (1)
Housewife	39 (40.2)
Student	2 (2.1)
Priest	1 (1)
Retired	9 (9.3)
Civil worker	8 (8.2)
Artist	2 (2.1)
Private	15 (15.5)
Jobless	7 (7.2)
Entrepreneur	11 (11.3)
Economy (Rupiah)	
<2,500,000	38 (39.2)
2,500,000 – 5,000,000	50 (51.5)
>5,000,000	9 (9.3)
Toilet	
Private	96 (99)
Public	1 (1)
Source of drinking water	
Mineral water	80 (82.5)
Boiled water	17 (17.5)
Soymilk consumption	
Yes	0 (0)
No	100 (100)
History of endoscopy	
Yes	30 (30.9)
No	67 (69.1)

Jabodetabek: Jakarta, Bogor, Depok, Tangerang, Bekasi

**Table 2. Results of endoscopic and histopathology examination**

Characteristics	n (%)
Results of oesophagus endoscopy	
Normal	41 (42.3)
Grade A oesophagitis	39 (40.2)
Grade B oesophagitis	8 (8.2)
Grade C oesophagitis	7 (7.2)
Grade D oesophagitis	0 (0)
Others	2 (2)
Results of gastric endoscopy	
Normal	3 (3.1)
Atrophy gastritis	0 (0)
Gastritis with gastric lesion	2 (2.1)
Gastritis with gastric ulcer	4 (4.1)
Gastric lesion with gastric ulcer	1 (1)
Gastric ulcer	1 (1)
Results of duodenal endoscopy	
Normal	73 (75.3)
Duodenitis	15 (15.4)
Duodenitis with duodenal erosion	2 (2.1)
Duodenitis with duodenal ulcer	2 (2.1)
Duodenal erosion with duodenal ulcer	1 (1)
Duodenal ulcer	3 (3.1)
Duodenal mass	1 (1)

Location <i>H. pylori</i> was found	n (%)
Antrum	3 (3.1)
Fundus	3 (3.1)
Antrum and fundus	1 (1)
Degree of antrum inflammation	
No data	4 (4.1)
Mild	70 (72.2)
Moderate	21 (21.6)
Severe	2 (2.1)
Degree of antrum atrophy	
No data	4 (4.1)
Non-Atrophy	55 (56.7)
Mild	29 (29.9)
Moderate	9 (9.3)
Hard	0 (0)
Degree of corpus inflammation	
No data	11 (11.3)
Mild	68 (70.1)
Mild-moderate	1 (1)
Moderate	16 (16.5)
Hard	1 (1)
Degree of corpus atrophy	
No data	11 (11.3)
Non-atrophy	77 (79.4)
Mild	8 (8.2)
Moderate	0 (0)
Hard	1 (1)

Prevalence of *H. pylori* infection based on histopathology examination was 7.2%. From seven positive results in histopathology examination, four samples were Helocotec positive. The sensitivity and specificity of Helicotec was 57.1% and 98.9%. The positive predictive value and negative predictive value were 80% and 96.7%.

**Table 3. Sensitivity, specificity, positive predictive (PPV), negative predictive values (NPV), and likelihood ratio (LR)**

Sensitivity	Specificity	PPV	NPV	LR +	LR -
57.1%	98.9%	80%	96.7%	51.9	0.43

## DISCUSSION

*H.pylori* colonising in gastric mucosa produce urease enzyme in a significant amount. This becomes the basis of various diagnostic test to detect *H.pylori*. Rapid urease test is an indirect *H. pylori* test detection using detection of urease concentration in gastric mucosa. Rapid urease test has a superiority which relates to its ability to detect active *H. pylori* infection compared to serologic examination. Additionally, rapid urease test can be performed quickly and efficiently compared to histopathology examination. Results of this study showed that the prevalence of *H. pylori* infection was 7.2%. This number was slightly lower compared to the study performed in Jakarta in 2006, which was 8%.<sup>6</sup>

The sensitivity, specificity, positive predictive value, and negative predictive value were 57.1%, 98.9%, 80%, and 96.7%. The sensitivity of this Helicotec test was different to the results of rapid urease test using Pronto Dry in Jakarta which were 95.7%.<sup>6</sup> Nonetheless, the sensitivity rate of Helicotec test was not so different with the results of the study using Pronto Dry in Indonesia which were 69.6%, with

better positive predictive value compared to Pronto Dry which were 66.1%.<sup>6</sup>

Results of rapid urea test can be influenced by atrophic gastric mucosa which causes the number of microorganisms to be low, thus giving out false negative results. False negative results may also be found when patients consume PPI prior to the examination and have intestinal metaplasia. False positive results might be acquired if there was other microorganism producing urease in adequate amount, usually caused by specimen was left for too long (> 24 hours). The sensitivity and specificity of rapid urease test might be increased using bigger biopsy forceps (jumbo forceps).<sup>7</sup>

Interpretation of rapid urease test also need to consider pre-test probability value of each case.<sup>8</sup> For example, in a case with duodenal ulcer, negative result in rapid urease test is better confirmed with histopathological examination. Additionally, rapid urease test should not be used as a single test in evaluating results of *H. pylori* eradication because its sensitivity is not 100%.<sup>9,10</sup>

Rapid urease test using Helicotec has a good specificity, although the sensitivity was low. This test may give result in relatively short time with lower cost.

## CONCLUSION

Rapid urease examination using Helicotec is one of *H. pylori* diagnostic tools that is good enough to diagnose faster and cheaper. Interpretation of rapid urease test also need to consider clinical condition of patients who are tested.

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