http://www.banglajol.info/index.php/JNINB

Original Article DOI: https://doi.org/10.3329/jninb.v7i2.58113

Journal of National Institute of Neurosciences Bangladesh, ISSN (Online) 2518-6612
July 2021, Vol. 7, No. 2, pp. 161-164 ISSN (Print) 2410-8030

Detection Capacity of *Helicobacter pylori* Infection by Stool Antigen Test Comparing with Rapid Urease Test among Peptic Ulcer Disease Patients

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[**Received on:** 22 April 2021; **Accepted on:** 12 May 2021; **Published:** 1 July 2021]

Abstract

Background: Rapid urease test and stool antigen test are both important diagnostic tools for the detection of *Helicobacter pylori* infection among peptic ulcer disease patients. **Objective:** The purpose of the present study was to compare the detection capacity of *Helicobacter pylori* infection with stool antigen test by comparing with rapid urease test among peptic ulcer disease patients. **Methodology:** This cross-sectional study was conducted in the Department of Clinical Pathology with the collaboration of Department of Gastroenterology at Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh from October 2011 to September 2012 for a period of one year. All the clinically suspected Helicobactor pylori infected peptic ulcer patients attending in the Department of Gastroenterology at Bangabandhu Sheikh Mujib Medical University (BSMMU) for upper GI endoscopy were selected as study population. Stool antigen test for *Helicobactor pylori* specific antigen from stool sample was done with "ABON-One Step *Helicobactor pylori* antigen test device". Endoscopy of upper GIT was performed in the Department of Gastroenterology. Biopsy taken during endoscopy for RUT. Rapid urease test (RUT) of endoscopic biopsy was performed. **Result:** A total 86 patients were recruited for this study. The mean (±SD) age was found 38.53(±10.40) years. Out of 86 patients 76 cases were SAT positive and 10 cases were negative. The sensitivity, specificity, positive predictive values and negative predictive values and accuracy of SAT with RUT are 85.53%, 90.0%, 98.48%, 45.0%, 86.05% respectively. The area under the curve was 0.283 with the lower and upper limits of 95% confidence interval of 0.133 and 0.432. This was statistically significant (p=0.003). **Conclusion:** In conclusion the stool antigen test is an effective method for the diagnosis of Helicobacter pylori infection. *[Journal of National Institute of Neurosciences Bangladesh, July 2021;7(2):161-164]*

Keywords: Detection capacity; Helicobacter pylori infection; stool antigen test; rapid urease test; peptic ulcer disease

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Conflict of interest: All authors had declared that there was no financial conflict of interest of this research work.

Funding agency: Any of the authors did not receive any external funding for this study.

Contribution to authors: Samad K, Chowdhury MNI were involved in the concept, study design and data collection. Samad K had prepared the manuscript. Begum KNA, Ahmed I, Rupom TU, Saheduzzaman M had involved in proof editing the manuscript.

How to cite this article: Samad K, Chowdhury MNI, Begum KNA, Ahmed I, Rupom TU, Saheduzzaman M. Detection Capacity of Helicobacter pylori Infection by Stool Antigen Test Comparing with Rapid Urease Test among Peptic Ulcer Disease Patients. J Natl Inst Neurosci Bangladesh, 2021;7(2): 161-164

Introduction

Helicobactor pylori infection is one of the most common bacterial infections worldwide[1]. Nearly 50% of the world's populations are affected[2]. The infected patients may develop gastritis caused by the bacterium as clinical outcome. *Helicobactor pylori* is typically acquired in childhood and has a long latent period[3]. In most patients *Helicobactor pylori* does not cause symptoms and the infection often persists without any clinically evident disease. However, only 10.0% to 20.0% of *Helicobactor*

pylori infected patients develop severe diseases during their lifetime including chronic gastritis, peptic ulcer disease, primary B-cell gastric lymphoma and adenocarcinoma of the stomach[4].

Helicobactor pylori is tropic for gastric epithelium and is found either attached to the surface epithelium or within the mucus coat. It elicits robust active inflammation and immune responses which continue throughout life or until the infection is cured[5]. The most important biochemical character of *Helicobactor pylori* is the abundant production of urease enzyme. This enzyme is one of the important factors for colonization. Urease is an important indirect marker for the presence of organism. It is the basis of rapid urease test (RUT) and urea breath test (UBT). Urease is also used as an antigen for serological detection[6].

The rapid urease test (RUT) can detect the presence of *Helicobactor pylori*, within short time with a satisfactory accuracy more than 90.0%[7]. According to Maastricht III consensus report, a positive rapid urease test is acceptable to initiate eradication therapy. However, endoscopy and gastric biopsies are required for this test[8].

The purpose of the present study was to compare the detection capacity of *Helicobacter pylori* infection with stool antigen test by comparing with rapid urease test among peptic ulcer disease patients.

Methodology

This cross sectional study was conducted in the Department of Clinical Pathology with the collaboration of Department of Gastroenterology at Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh from October 2011 to September 2012 for a period of one year. All the clinically suspected *Helicobactor pylori* infected peptic ulcer patients attending in the Department of Gastroenterology at Bangabandhu Sheikh Mujib Medical University (BSMMU) for upper GI endoscopy were selected as study population. Patients having upper abdominal pain, abdominal discomfort, anorexia, nausea, vomiting and belching and were enrolled for upper GI endoscopy. Among them who were found ulcer in the stomach or in duodenum were enrolled in this study to detect *Helicobacter pylori* by stool antigen test, rapid urease test and histopathology. Patient previously eradicated for Helicobacter pylori, diagnosed patient getting treatment for Helicobacter pylori infection, complicated peptic ulcer including active bleeding, perforation and pyloric stenosis, co-existing gastric carcinoma, patient who have taken PPI within two weeks or unwilling or unable to undergo or have contraindication for endoscopy were excluded from this study. Stool antigen test for *Helicobacter pylori* specific antigen from stool sample was done with "ABON-One step *Helicobacter pylori* antigen test device" lateral flow immunochromatographic test device in the Department of Clinical Pathology. Endoscopy of upper GIT was performed in the Department of Gastroenterology. Biopsy taken during endoscopy for RUT. Rapid urease test (RUT) of endoscopic biopsy was performed. Endoscopic biopsy was taken and inoculated in bottle containing urea agar base. Urease activity of *Helicobacter pylori* when the color changed into yellowish to pink within 1 to 24 hours in room temperature. Data were collected by predesigned questionnaire. Endoscopy report and biopsy was collected for RUT from clinically suspected *Helicobacter pylori* infected patient from endoscopy room at Department of Gastroenterology. The rapid urease test was done with endoscopic biopsy and result was recorded in data sheet. The stool antigen test result was compared with result of rapid urease test report. True positive, true negative and false positive, false negative results were recorded and sensitivity, specificity, positive and negative predictive values of stool antigen test was calculated by unpaired t-test, Chi-square test and validity test. Statistical analysis was computed by using SPSS -17.0. The test was considered significant when P value <0.05.

Results

A total 86 patients were recruited for this study after fulfilling the inclusion and exclusion criteria. The age distribution of the study patients was recorded. It was observed that majority were age belonged to 31 to 40 years which was 28(32.6%) cases. The mean (±SD) age was found 38.53(±10.40) years with range from 21 to above 60 years (Table 1).

Table 1: Age group distribution of the study population (n=86)

Age Group	Frequency	Percent
21 to 30 Years	25	29.1
31 to 40 Years	28	32.6
41 to 50 Years	23	26.7
51 to 60 Years	08	9.3
More Than 60 Years	02	2.3
Total	**86**	**100.0**
Mean±SD (Range)	38.53±10.40 (21 to 64)	

Out of 86 patients 76 cases were SAT positive and 10 cases were negative. RUT positive were in 66 cases

and negative were 20 cases. True positive were 65 cases, false positive were 01 case. True negative were 09 and false negative were 11 cases. These findings were statistically highly significant (p<0.001) (Table 2)

Table 2: Association between stool antigen test (SAT) with rapid urease test (RUT) findings (n=86)

Stool antigen test	Rapid Urease Test		Total	p value
	Positive	Negative		
Positive	65	11	76	
Negative	1	9	10	<0.001
Total	**66**	**20**	**86**	

*Chi square test was done to measure the level of significance.

The sensitivity, specificity, positive predictive values and negative predictive values and accuracy of SAT with RUT are 85.53%, 90.0%, 98.48%, 45.0%, 86.05% respectively (Table 3).

Table 3: Sensitivity, Specificity, Positive Predictive Values, Negative Predictive Values and Accuracy of SAT with Rapid Urease Test (RUT)

Validity	Values	95% CI
Sensitivity	85.53%	75.58% to 92.55%
Specificity	90.0%	55.50% to 99.75%
PPV	98.48%	90.99% to 99.76%
NPV	45.0%	31.33% to 59.47%
Accuracy	86.05%	76.89% to 92.58%

NPV=Negative Predictive Value; PPV=Positive Predictive Value

The area under the curve was 0.283 with the lower and upper limits of 95% confidence interval of 0.133 and 0.432. This was statistically significant (p=0.003) (Table 4).

Table 4: Area under the Curve of Test Result of SAT

Value of Area	Std. Error	P value	95% Confidence Interval	
			Lower Bound	Upper Bound
0.283	0.076	0.003	0.133	0.432

The test result variable(s): SAT has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.

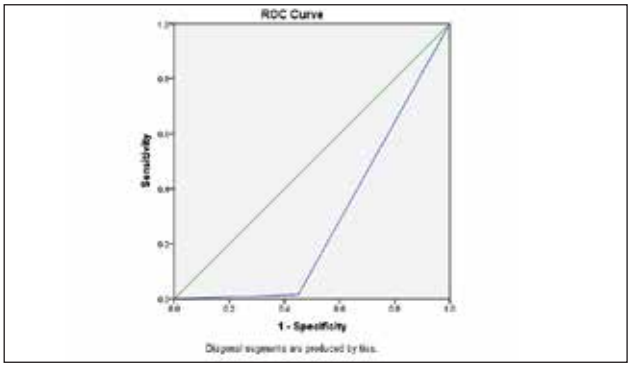

Figure I: ROC Curve of SAT

Discussion

Diagnostic tests for *Helicobacter pylori* can be divided into endoscopic and non-endoscopic tests[9]. All the methods currently available for the detection of *Helicobacter pylori* have their advantages and disadvantages regarding sensitivity, specificity, convenience, cost and immediacy[10]. Choosing among these tests depends upon the clinical circumstance, the pre-test probability of infection, the accuracy of the tests, the availability and the relative costs.

Helicobacter pylori infection can be diagnosed by identifying *Helicobacter pylori* specific antigens in the stool by enzyme immunoassay with the use of polyclonal or monoclonal anti- *Helicobacter pylori* antibodies[11]. The SAT is a reliable test to diagnose *Helicobacter pylori* infection as well as to confirm eradication after treatment and can be used interchangeably with the UBT. Both polyclonal and monoclonal tests have excellent sensitivity, specificity, positive and negative predictive values for diagnosis of infection before treatment. However, in the post treatment setting, only the monoclonal test appears to have sensitivity, specificity and predictive values of greater than 90%[12].

The polyclonal test appears to have less satisfactory sensitivity and positive predictive value. Therefore, in the post-treatment setting, the monoclonal SAT is more reliable than the polyclonal test. The SAT may be effective in confirming eradication as early as 14 days after treatment but, the general recommendation is to perform the test more than 4 weeks after treatment[13]. The SAT has its own disadvantages. Like the UBT, the SAT may produce a false negative result in patients who are taking PPIs, antibiotics or bismuth. To reduce false negative results, it is generally recommended to withhold bismuth, PPIs and antibiotics for at least 4 weeks[14].

This cross sectional study was carried in the Department of Clinical Pathology in collaboration with Department of Gastroenterology, BSMMU. It has been tested antigen in stool for the detection of Helicobacter pylori with ABON lateral flow immunochromatographic test device in 86 peptic ulcer disease patients. Through endoscopy in the Department of Gastroenterology those patients who were found ulcer in the stomach or duodenum were enrolled in the study.

In the study SAT result is compared with RUT of endoscopic biopsy. *Helicobacter pylori* status has been defined when both RUT is positive and the tests negative was considered as negative. There are many publications comparing SAT with different invasive and

noninvasive tests for detection of *Helicobacter pylori*. However, there is no known similar study done in comparing SAT with RUT in PUD patients in Bangladesh. In this study mean age was found 38.53±10.40 years with range from 21 to above 60 years and the highest incidence of PUD patients were belonged to 31 to 40 years. Islam et al[15] found that age between 16 to 70 years. Of the highest incidence were aged 21 to 30 and mean age was 37.98 years. These finding are near similar to this present study.

In this study we found the sensitivity, specificity, positive predictive and negative predictive values and the accuracy of SAT with RUT were 85.53%, 90.0%, 98.48%, 45.0% and 86.05% respectively. Qadeer et al[12] found the sensitivity, specificity, positive predictive value and negative predictive value of stool antigen test with rapid urease test was 89.1%, 92.6%, 91.1% and 90.9% respectively. Silva et al[16] found in their study the sensitivity, specificity, positive predictive and negative predictive values of SAT with Urea breath test were 88.0%, 87.5%, 88.0% and 87.5% respectively. Sony[17] found sensitivity and specificity of SAT with urea breath test 93.9% and 92.1% respectively. These results are consistent with this present study.

Rapid Urease tests depend on the activity of bacterial urease. Endoscopic biopsy specimens are placed into an agar gel or on a reaction strip containing urea, a buffering agent and PH sensitive dye. If Helicobactor pylori is present, its urease cleaves urea to liberate ammonia and bicarbonate, leading to an increase in the PH and change in the colour of the dye. CLO test, Hp Fast, HUT-test, Pyloritek and Pronto Dry are some of the commercially available RUT kits[11]. The overall performance of these tests are comparable. Although RUTs are rapid, inexpensive and easy to perform, their sensitivity is reduced under certain circumstances. The tests may produce a false negative result in patients with active or recent bleeding from the upper gastrointestinal tract when gastric contents are contaminated with blood[7]. Furthermore, these tests may give a false negative result in patients who have recently been taking proton pump inhibitors (PPIs), H_2-receptor antagonists (H_2RAs), antibiotics, or bismuth containing compounds. In these patients, the RUT is usually combined with other endoscopic or non-endoscopic tests to determine the presence or absence of the infection[9].

Conclusion

In conclusion the stool antigen test is an effective method for the diagnosis of *Helicobacter pylori* infection. The sensitivity is high by comparing with RUT. However, the specificity is high which gives a huge detection capacity of PUD negative cases. Furthermore, the accuracy is high which indicates the SAT is effective for the detection of positive cases of PUD. Large scale study should be conducted to get the real scenario.

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