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Rapid Urease Test vs Histopathological Examination: A Prospective Study to Compare the Accuracy of Both Tests in the Diagnosis of *Helicobacter pylori*

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Background: *Helicobacter pylori* is a gram-negative bacterium that causes chronic gastritis and plays important role in peptic ulcer disease, gastric carcinoma, and gastric lymphoma. The main aim and objective of the study were to study the incidence of *H. pylori*. To find the efficacy of rapid urease test (RUT) and histopathological examination of gastric biopsy in diagnosing *H. pylori* organism.
Methods: This study was conducted at saveetha medical college and hospitals for 6 months. A comparative study between rapid urease test and histopathological examination to diagnose *H. pylori* infection. Some 100 patient with gastritis was taken for this study.
Result: A total No of patients 100 (100%) were taken for this study in which 64 patients were detected positive for *H. pylori* by RUT method and 63 patients were detected positive for *H. pylori* by HPE method.The total no of cases positive for both RUT and HPE is 60.An association between

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RUT and HPE finding in the study group with the sensitivity being 95.24%, specificity being 89.19%, positive predictive value 93.75%, negative predictive valve 91.67% and accuracy 93.00%.
Conclusion: Our study shows when comparing rapid urease test and histopathological examination. RUT and HPE show the same level of accuracy in the diagnosis of *H. pylori* infection. Since the rapid urease test is a rapid technique to perform so it is a good alternative for histological examination in a resource-poor environment.

Keywords: Rapid urease test; H. pylori; HPE.

1. INTRODUCTION

Helicobacter pylori is a gram-negative rod-shaped bacterium that causes chronic gastritis and plays important role in peptic ulcer disease, gastric carcinoma, and gastric lymphoma [1]. Indeveloping countries, 70 to 90% of the population carries *H. pylori*. In developed countries, the prevalence of infection is 40 to 50% [2]. Transmission is by, fecal-oral, and oral-oral routes.

The main pathogenesis of *H. pylori* is it produces an enzyme called urease which converts urea (present in the stomach) into CO_2 and ammonia. Ammonia will alkalise the gastric acid for *H. pylori* to survive in a low PH environment. It also produces certain exotoxins like CagA and VacA. CagA will disrupt cellular integrity and structure and also stimulate the production of cytokines like IL - 8 which in turn causes inflammation. VacA causes apoptosis of gastric cells. All these things will disrupt the mucosal barrier of the stomach and causes gastric ulcers [3,4].

Currently, the first-line treatment for *H. pylori* is triple combination therapy, including proton-pump inhibitor (PPI), clarithromycin, and amoxicillin. In the case of drug-resistance strains of *H. pylori* sequential therapy, high-dose dual therapy, and concomitant therapy can be given [5-6]. Most of the cases of *H. pylori* are asymptomatic with no clinical signs and symptoms. *H. pylori* causes chronic gastritis, gastroduodenal ulcers, and even gastric carcinomas [7].

H. pylori infection can be diagnosed by many detection methods. These tests include non-invasive and invasive methods. The non-invasive method includes urea breath test, stool antigen test, and serology. The invasive methods include culture, histological examination, and rapid urease test, which requires the use of endoscopy to collect biopsy specimens [8-10] Invasive test is more accurate than non-invasive test for *H. pylori* infection [11-13]. Regarding the histological examination, hematoxylin and eosin (H&E) staining, Genta stain, immunohistochemical (IHC) stain and Giemsa stain were developed. In addition, the rapid urease test, Campylobacter-like organism test (CLO test), is another routine examination with easy diagnosis and high accuracy [10].

In most hospitals, the fastest diagnostic methods for *H. pylori* detection are the invasive tests including the RUT test and Giemsa stain that are most commonly used [10]. In this study, we compared accuracy between histopathological examination and rapid urease test in diagnosing *H. pylori*.

2. METHODS

A comparative study between rapid urease test and histopathological examination to diagnose *H. pylori* infection was conducted at saveetha medical college and hospitals for 6 months. Some 100 patient with gastric symptoms was taken for this study.

In our study, 100 patients with complaints of dyspepsia and epigastric pain for more than 6 months were taken for endoscopic biopsy. The patient was asked to stop all medications like NSAIDS and PPI at least two weeks before endoscopy. Complete blood profiles were taken to rule out anaemia and any bleeding disorders.

2.1 Patient Preparation

Patients were asked to be in a fasting state for at least 4 - 6 hrs before the procedure. We asked them to stop the blood-thinning medication.

2.2 Pre Endoscopic Preparation

IV cannula was inserted for giving IV fluids and emergency injectable antispasmodics.

Premedication - local oral anaesthesia by lignocaine topical aerosol (LOX 10%) oral spray was given.

During the procedure - after 10 % LOX oral sprayed on both tonsillar pillars and posterior pharyngeal wall patient was kept in left lateral position with head on a small pillow flexed forward and mouth tilting downwards to facilitate drainage of saliva and pulse oximetry was attached to patient and endoscopy was introduced after placing a mouth gag. Gentle air pressure was fed into the oesophagus to inflate the stomach.

The scope was passed through the oropharynx then due to voluntary swallowing movement of the patient the scope moves further through the oesophagus then on reaching the stomach 4 biopsies were taken from the antrum of the stomach. 2 of the biopsy sample were taken for the RUT and the rest for the histopathological examination. The scope was removed after deflating the stomach.

2.3 Rapid Urease Test

RUT is also known as the CLO test (campylobacter like organism test). It is a rapid diagnostic test for the diagnosis of *H. pylori* [14].

principle of RUT - When a biopsy of the mucosa is taken from the antrum of the stomach and placed on the medium containing urea and an indicator phenol red. the urease producing *H. pylori* convert urea to ammonia which will raise the pH of the medium and change the colour of the strip from yellow [negative] to pink[positive].

2.4 Histopathological Examination

Two biopsies were sent in a plain bulb containing 1:10 of formalin and a water mixture. Specimens were fixed on a glass slide and then Giemsa staining was done on examination under a microscope, purple coloured spiral-shaped bacteria are visualised.

3. RESULT

To compare the accuracy between the rapid urease test and histopathological examination, gastric biopsies of 100 patients with gastritis were taken to perform these tests to indicate *H. pylori*.

Table 1, shows age distribution in *H. pylori* positive patients. Incidence of *H. pylori* wasmore commonly seen among(50 - 59) age groups 16 (25%).

Table 2, showing the total no of patients 100 (100%) in which 64 (64%) were RUT positive and 36(36%) were RUT negative.

Table 3 show the result of a histopathological examination. 63(63%) were positive for *H. pylori* and 37(37%) were *H. pylori* negative.

Table 1. Age distribution in H. *pylori* positive patient

AGE	*H. pylori positive*
10 - 19	8 (12.5%)
20 -29	10 (15.62%)
30 - 39	12 (18.75%)
40 - 49	14 (21.87)
50 - 59	16 (25%)
60 - 69	3 (4.6%)
More than 70	1 (1.5%)
Total	64 (100%)

Table 2. Rapid urease test result

Rapid Urease Test	No of cases	Percentage
Positive	64	64%
Negative	36	36%
Total	100	100%

Table 3. Histopathological examination result

Histopathological Examination	No of cases	Percentage
Positive	63	63%
Negative	37	37%
Total	100	100%

Table 4. Association between RUT and HPE finding in study group

	Histopathological Examination		
Rapid Urease Test	**Positive**	**Negative**	**Total**
Positive	60	4	64
Negative	3	33	36
Total	63	37	100

Table 5. Agreement between Rapid grease test and Histology for detection of *H. pylori* infection

	values
Chi square	72.115
P value	<0.00001
Sensitivity	95.24%
Specificity	89.19%
Positive predictive value	93.75%
Negative predictive value	91.67%
Accuracy	93.00%

Table 4 shows the association between the rapid urease test and histopathological examination. The total no of cases positive for both RUT and HPE is 60, RUT positive and HPE negative is 4 (false positive), HPE positive and RUT negative is 3 (false negative) and both negative is 37.

Table 5, showsagreement between the Rapid grease test and Histology for detection of *H. pylori* infection (chi-square = 72.115), P< 0.0001. The sensitivity and specificity of the rapid urease test is 95.24% and 89.19% and the Positive predictive value = 93.75%, the Negative predictive value = 91.67% and the Accuracy of the rapid urease test is 93.00%.

4. DISCUSSION

*H. pylori*is a gram-negative bacteria that is the most common cause of gastric ulcer and gastric carcinoma. For the identification of *H. pylori* two tests are done in which histopathological examination take time to give the results where on the other hand rapid urease test are less time-consuming. In our study, we compare both test accuracy in diagnosing *H. pylori*.

It is recommended to take at least two biopsies to identify *H. pylori*; the best option is two biopsies from the antrum and one from the corpus. Biopsy from the corpus is especially valuable for yielding positive results if the patient has been taking PPI for a long time when *H. pylori*are translocated fromthe antrum to the corpus. However, in the current study, 4 biopsies from antrum were included, no specimens were taken from the corpus. Medication we're stopped two weeks before the endoscope.

In the current study, Giemsa staining was used because Giemsa staining has become the most used method worldwide for the detection of *H. pylori* due to its low cost, ease of use, sensitivity, and reproducibility.

In our study, 64 were positive in RUT out of 100 patients. This is compared to that of Athavale VS et al. [15] and jemilohun et al. [16] where they found that RUT is accurate for the diagnosis of *H. pylori* infection. So it can be well used as a rapid diagnosing tool and also in a resource-poor setup.

In our study 63 were positive in the histopathological examination out of 100 patients. This is compared with the study conducted by MDU Islam, SHZ Rahman et al. [17] where 62 out of 81 dyspepsia patients (76.54%) showed *H. pylori* infection histopathological examination is with high sensitivity and specificity to diagnose *H. pylori*.

The sensitivity of the histology test ranges from 50% to 95% and depends on the quality, location, size and frequency of the biopsy and the applied staining varieties [18].

In the present study, 60% were both RUT and histology positive cases. In Jemilohun et al study [15], diagnosis of *H. pylori* was made in 55(64%) patients. This is because the Nigerian population have a high incidence of *H. pylori*.

Association between RUT and histopathological examination findings in our study group. The sensitivity and specificity were 95.24% and 89.19% respectively. The sensitivity was comparable but the specificity was higher than that of the study conducted by Athavale et al. [15] (96.38%, 81.25%) and Jemilohun et al. [16] (93.33%, 75.6%).

In our study, the positive predictive value and negative predictive values are 93.79% and 91.67%. This was compared with the study conducted by Jemilohun et al. [16] found the positive predictive value and negative predictive values are 80.76% and 91.17%.

According to Bordin et al. [18], the urea breath test is a "gold standard" in the diagnosis of *H. pylori* infection. The sensitivity and specificity of RUT were 85–95% and 95–100% respectively when compared to the urea breath test. The sensitivity and specificity of the Histopathological test were 91–93% and 100% respectively. In the present study, we used the histopathological test as the goldstandard and we compare RUT with the histopathological test.

In our study accuracy was 93%. This was compared with Athavale et al. [15] found accuracy was 98.85%.

The presence of other urease-producing bacteria such as *staphylococcus capitis* subspecies. ureolyticus, *Streptococcus salivarius*, and *Proteus mirabilis* in the stomach RUT may lead to false-positive test results. The sensitivity of RUT was reduced by up to 70% in patients with bleeding peptic ulcers. False-negative test results are more common than false-positive test results, so a negative result cannot be used to exclude a diagnosis of *H. pylori*. Thus, a positive RUT result indicates the presence of *H. pylori* and makes it possible to prescribe treatment, but a negative result does not allow excluding *H. pylori* [18].

In our study result shows that the rapid urease test is accurate for the diagnosis of *H. pylori* and also highly specific and sensitive like histopathological examination. On comparing with Athavle et al. [15] and Jemilohun et al. [16] studies also shows rapid urease test are more accurate in diagnosing *H. pylori* infection.

5. CONCLUSION

Our study shows that the rapid urease test is more accurate in diagnosing *H. pylori* infection and also as sensitive as histopathological examination. RUT can only be used as an initial diagnosis whereas Histopathological tests can be used as an initial diagnosis, follow-up after eradication. The main disadvantage of this procedure is that it is an invasive procedure. Both rapid urease test and histopathological examination are highly sensitive and specific in diagnosing H. *pylori* infection. On comparing both tests rapid urease tests are quicker in diagnosing H. *pylori* than histopathological examination. So rapid urease test can be a good alternative to histopathology in diagnosing H. *pylori* and also can be used in resource-poor regions.

CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline participant consent and ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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