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Original Research Article

# Evaluate Similarities and Differences between Endoscopic Findings, the Rapid Urease Test, and Conventional Histopathology in the Process of Diagnosing an Infection with Helicobacter Pylori

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**Abstract**

The gastritis caused by Helicobacter pylori (H. pylori) is a serious public health problem in countries that are still building their healthcare systems. There is a significant incidence of morbidity and death, with symptoms ranging from chronic gastritis to cancers of the stomach. There is a large amount of variation in the prevalence of H. pylori infection from one nation to the next, and even within a country, from one area to the next. The purpose of this study was to evaluate the commonly available diagnostic methods, such as the Rapid Urease Test (RUT), and conventional histopathology in the diagnosis of H. pylori gastritis, as well as to investigate the association between H. Pylori and the development of gastrointestinal complications.

**Settings and Design:** A retrospective cross-sectional study was carried out between May 2018 and September 2020, with data collection beginning in May 2012. The components and the procedure: The research was conducted in a tertiary medical college hospital in India for the purpose of this study. Endoscopy was performed on patients who presented with dyspeptic symptoms, and histological examination and RUT were used to determine whether or not H. pylori infection was present in the biopsy specimens. The presence of H. pylori was determined to be the case if either of the diagnostic tests produced positive findings.

**Results:** A diagnosis of H. pylori was established in 330 out of 550 individuals. There was a substantial statistical association between H. pylori infection and the occurrence of endoscopic abnormalities and major gastrointestinal complications (peptic ulcer and dysplasia/cancer). When it came to the diagnosis of H. pylori infection, RUT exhibited predictive values that were on par with those of histology.

**Conclusion:** It has been suggested that H. pylori is responsible for a large amount of morbidity and death that is caused by related gastrointestinal problems. It is crucial for the avoidance of major problems to conduct early and precise detection using many cost-effective approaches, maintain strong patient compliance, and initiate treatment as soon as possible.

**Keywords:** Infection with H. pylori, Histopathological examination, Rapid urease test, and Gastrointestinal problems



## Introduction

Chronic gastritis and gastric ulceration are quite common in a significant number of people in every region of the world [1]. H. pylori gastritis is the most common cause of chronic active gastritis and is linked with serious consequences such as stomach adenocarcinoma and mucosa associated lymphoid tissue lymphoma (MALT lymphoma) [2]. Bacillus pylori is a Gram-negative, flagellated microorganism that, in most cases, colonizes the gastric pits just below the mucus layer and in close proximity to the stomach epithelial cells. It is estimated that around fifty percent of the normal population across the world is infected with H. pylori; however, only ten to twenty percent of those people develop symptoms [3, 4]. The yearly incidence rate of H. pylori infection is 4-5% in underdeveloped nations compared to that of 0.5% in wealthy and industrialized countries [5]. There is a link between H. pylori infection and the hygiene related circumstances, lifestyle, and economics.

Chronic gastritis can be caused by a wide variety of other etiological variables, including cigarette smoking, the use of nonsteroidal anti-inflammatory medicines (NSAIDS), and reflux of gastric juice (chemical gastritis), among many others. Even while H. pylori is considered to be the major cause of gastritis, it is possible for it to behave as a synergist when combined with other etiological variables [6].

When it comes to diagnosing H. pylori, there is a broad variety of tests that may be performed in the laboratory. The tests may be divided into two categories: those that are non-invasive and those that are invasive. The urea breath test (UBT), serological IgG and IgM detection, saliva and urine antibody testing, and stool antigen testing are all examples of non-invasive diagnostic procedures [7]. The invasive tests are endoscopy-based, and they include histological inspection, RUT, and polymerase chain reaction. These tests are performed through a small incision (PCR). In contrast to invasive tests, which have a high sensitivity and specificity of over 90% [8,] non-invasive diagnostics like as serology have a limited use in regions with a high incidence because they are unable to differentiate between a prior infection and an active one. Infections with H. pylori, like other major chronic infectious illnesses (such as syphilis and TB), are linked with a long latent period before showing clinically. This is the case even if H. pylori infections are not contagious. As a result, a great number of illnesses will be found during this dormant time. Several treatments for H. pylori infection have been developed, and they may be broadly classified as either "invasive," which denotes that they require stomach tissue or mucus, or "non-invasive," which denotes that they require simply blood, breath, or stool or analysis as their primary ingredients. In this article, we will cover the rapid urease test, often known as the RUT. This test is considered invasive since it needs a sample to be taken from the gastrointestinal mucosa. The test gives circumstantial evidence of the infection by determining whether or not the stomach mucosa contains the non-mammalian enzyme urease. In order to determine the predictive qualities of RUT and histopathology in the diagnosis of H. pylori infection, this study's primary focus was on conducting the research. It was also determined whether or not there was an association between endoscopy-related alterations and gastrointestinal issues caused by H. pylori infection.

## Methods

Methodology consisted of a retrospective cross-sectional research that was carried out between the months of May 2018 and September 2020. The patients were recruited for the study based on their primary complaints of dyspepsia, and the ages of the patients varied from 14 to 86 years. Patients who had recently received treatment with a proton pump inhibitor (PPI) or any other type of antibacterial medication were ruled ineligible for the study. Patients' ages ranged anywhere from 14 to 86 years old during this study's participation. Size of the Study: A total of 550 patients, including both outpatients and inpatients, participated in the research. Data analysis: The statistical software for the social sciences, version 23.0, was used to do the analysis of the data (SPSS 23). The Chi square test was used to make comparisons between categorical variables. a p value of less than 0.05 was considered to indicate statistical significance.

The "Pentax" forward looking oesophago gastro duodenoscope was utilized in the course of the endoscopy procedure. The mucosa was observed to be pink in color, smooth, and shiny throughout the endoscopy, which led to the conclusion that the procedure was normal. Each patient's antrum provided two pieces for the endoscopic biopsy, and they were taken from each patient. A portion of the biopsy was placed in a formalin container before being submitted to the histology department. Two portions with a thickness of four microns were cut from each block, and one of those sections was mounted on each of the four slides. The slides were stained with the Giemsa stain in addition to the standard Haematoxylin and Eosin (H and E) stain. A pathologist performed a histopathological examination of the gastric mucosa, and grades were assigned for mononuclear cell infiltration, neutrophilic infiltration, atrophy, intestinal metaplasia, and density of H. pylori using the visual analogue of updated Sydney grading system [9] for reporting gastric biopsies. The labomed microscope vision 2000, India was utilized in order to do the microscopic examination of the slides. On the luminal surface of mucosal cells, H. pylori appeared as light-bluish rods in H and E stained slides in positive cases. These rods ranged in size from 3-6 microns and were of varying lengths. H. pylori appeared a dark blue against a lighter background when stained with the Giemsa method. Another portion of the biopsy was transferred to the microbiology section for RUT testing. The RUT was carried out using the following method: Two grams of urea were dissolved in twenty milliliters of double-distilled water. The solution received 20 drops of phenol red, and its pH was adjusted to fall somewhere between 6.8 and 6.9 by adding a drop of N/10 HCl or N/10 NaOH, depending on whether the pH was higher or lower than 6.8. At this stage, the solution had a very faint yellow tint. This was then transferred into sterile vials, each of which contained 2 milliliters of the substance. The temperature was maintained between 35 and 37 degrees Celsius while biopsy material was added. If the color changed within the first half an hour of the test, it was considered positive; if the change occurred after two hours, it was considered positive for the week.

The institution's scientific research committee gave the study their blessing before it could proceed. The study consisted of an analysis of the data collected during a routine procedure that was performed in the institution, and prior to the procedure, informed consent was obtained from each patient. It was considered a true positive if the sample passed one or more of the following tests: histopathology using either of the stains (H&E or Giemsa) or RUT. The sensitivity, specificity, positive predictive value, and negative predictive value of each method was computed and compared.

## Results

The information from 550 patients was analyzed, with 330 males and 220 females making up the patient population. The age range ranged from 14 to 60 years old, with the mean age being 41.22 years and the standard deviation being 9.55 years.

Histopathological examination revealed a positive result for H. pylori in 330 of the patients, and the fast urease test revealed a positive result for H. pylori in 310 of the cases. Infection with H. pylori was determined to be present if either one or both of the tests came out positive. After integrating the findings of both tests, it was determined that 329 of the patients had a positive H. pylori result. When compared with the presence of H. pylori, endoscopic abnormalities produced significant findings, with 294 out of 329 H. pylori positive patients displaying any of the abnormalities, and a p value of less than 0.001 indicating this (Table 1). Gastritis was found to be the most prevalent endoscopic abnormality, accounting for 69% of cases. This was followed by duodenitis (17%), oesophagitis (12%), duodenogastric reflux (7%), hiatal hernia (6%), gastric ulcer (GU) (2%), duodenal ulcer (DU) (2%) and Barrett's oesophagus (2%). Only 42 individuals, or 7.9%, were found to have serious gastrointestinal disease, which was defined as GU, DU, or cancer. Patients displayed a wide range of clinical symptoms, including abdominal pain (61%), gastric fullness (17%), vomiting (12%), fatty food intolerance (9%), bloating (7%), belching (6%), melena (5%), early satiety (5%) and weight loss (4%). Patients also showed a variety of other symptoms, such as fatty food intolerance (9%), bloating (7%), and vomiting (12%).

**Table 1: Correlation of endoscopic abnormalities with H. pylori infection:**

| | | Endoscopic abnormalities | | |
|---|---|---|---|---|
| | | **Present** | **Absent** | **Total** |
| H. pylori | Positive | 300 | 30 | 330 |
| | Negative | 150 | 70 | 220 |

**Table 2: Types of histopathological reporting:**

| Types of pathological reporting | % Total biopsy cases examined |
|---|---|
| H. Pylori gastritis | (330/550) |
| Reactive gastritis | (60/550) |
| Non-specific gastritis | (65/550) |
| Ulcer (Gastric, Duodenal) | (20/550) |
| Dysplasia/carcinoma | (20/550) |
| Normal gastric mucosa | (50/550) |

**Table 3: Categorisation of cases based on results of diagnostic tests**

| Cases No | Histopathology | RUT | Final result |
|---|---|---|---|
| 300 | P | P | P |
| 30 | P | N | P |
| 20 | N | P | P |
| 200 | N | N | N |

**Table 4: Predictive value of different diagnostic tests**

| Diagnostic methods | Sensitivity | Specificity | PPV | NPV | YI |
|---|---|---|---|---|---|
| Histopathology | 94.22 | 100 | 100 | 91.1 | 94.2 |
| RUT | 91.2 | 100 | 100 | 90.1 | 93.2 |

RUT-Rapid urease test, PPV-Positive Predictive value, NPV-Negative predictive value, YI-Youden’s index.

When it came to the histopathological characteristics, it was determined that 56 out of 550 patients, or 10.5%, had reactive gastritis (Table 2). The presence of H. pylori was found in 292 out of 443 individuals who were diagnosed with

gastritis. 45 out of 550 instances had what seemed to be normal stomach mucosa. In patients diagnosed with gastritis, histological characteristics such as intestinal metaplasia and glandular atrophy were observed in 8.1% and 18.7% of cases, respectively. On the other hand, patients diagnosed with dysplasia or cancer exhibited these histological characteristics in 57.1% and 71.4% of cases, respectively. The correlation between gastritis and H. pylori infection was statistically not significant, with a p value of 0.092, whereas the correlation between gastrointestinal complications and H. pylori infection was statistically highly significant, with a p value of 0.001. These complications include peptic ulcer disease and dysplasia or cancer.

## Discussion

During a regular gastroendoscopy procedure, the RUT is the test that is carried out the most commonly. Because it provides a positive result for H. pylori infection before the patient leaves the endoscopic suite, it is of tremendous use. The histological diagnosis of H. pylori infection is often reserved for patients who have had a negative biopsy urease test or for patients who required histology for another reason, such as ruling out the possibility of cancer. In a previous investigation into the rapid urease test, said *et al* [10] found that its sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy were all 99%, respectively. These figures were for the positive predictive value, negative predictive value, positive predictive value, and positive predictive value.

There are a number of variables that can lead to gastritis, gastric ulceration, and gastric cancer; however, an infection with H. pylori is the most common cause of these conditions. The risk of becoming infected with H. pylori varies widely depending on a variety of factors, including age, gender, socioeconomic standing, dietary habits, genetics, and the immune system. In the current study, the most prevalent identified lesion during endoscopy was gastritis, which made up 69% of the total cases. Endoscopic alterations are a sensitive predictor of H. pylori infection, as shown by the link between endoscopic abnormalities and H. pylori infection, which was statistically highly significant with a p value of less than 0.001, according to the findings of the study. In contrast to the findings that Jemilohun *et al*. [11] presented, in which they found that the association was not statistically significant, our findings show that the opposite is true. This might be attributable to the fact that their study analyzed a much smaller number of instances (86) in comparison to the cases we evaluated in our study.

Only 42 out of 550 patients, or 7.2%, had major gastrointestinal issues according to the pathological reports. These complications included peptic ulcers (both GU and DU) as well as dysplasia and cancer. It was revealed that there was a statistically significant connection between these lesions and H. pylori infection in 18 of 21 (85.7% of) patients who had peptic ulcers and 19 of 21 (90.5% of) patients who had dysplasia/carcinoma. According to the research conducted by Cotran *et al*. [12], the global relationship of H pylori with stomach ulcers is greater than 70 percent.

In the current investigation, researchers found that 10.5% of patients had reactive gastritis. Due to increased duodenogastric reflux associated with changing lifestyles of the population, injudicious and rampant use of drugs like NSAID which are easily available and are frequently prescribed for musculoskeletal ailments, there is a rising incidence of reactive gastritis in rural and suburban populations of developing nations like India. This is caused by increased incidence of reactive gastritis in developed nations.

According to the findings of this study, dysplasia and cancer only develop in a small percentage of instances when predisposing conditions are present. These variables include intestinal metaplasia and glandular atrophy. High H. pylori

prevalence in cases having dysplasia and carcinoma in this study, which was 90.5%, indicates that the majority of gastric adenocarcinomas can be prevented with early stage detection of H. pylori and H. pylori eradication therapy. In this study, there were 19 cases with dysplasia and carcinoma, and 19 of those cases had H. pylori. This is in accordance with the findings that were published by the International organization for research on cancer, which said that the absence of a H. pylori infection can prevent at least sixty percent of all cases of stomach cancer that occur across the world [13].

As was said up above, the RUT is a test that determines whether or not the urease enzyme is present. However, the real results will depend on the condition that is affecting the stomach, as well as the chance of atrophic alterations or external factors that lower the bacterial load and generate false negative results. It is possible to obtain a false positive result if additional organisms that contain urease are present in sufficient amount or if the specimen and the medium are allowed to come into prolonged contact with one another for an extended length of time, often for more than 24 hours. In order to obtain a positive result from the biopsy sample, there must be around 105 bacteria present [14].

Intestinal metaplasia and recent use of proton pump inhibitors are the two factors that contribute to a false negative diagnosis more frequently than any other two factors combined. It is quite rare that a false negative RUT will also be accompanied by histologically normal stomach mucosa that is uninflamed. After stopping treatment with a proton pump inhibitor (PPI), it is recommended to get a noninvasive test, such as a urea breath test or a stool antigen test, if there is any uncertainty about the outcome.

False-positive results are uncommon, but when they do occur, they may be caused by the presence of other organisms that contain urease, such as Proteus mirabilis, Citrobactor freundii, Klebsiella pneumonia, Enterobactor cloacae, and Staphylococcus aureus [15]. False-positive results are rare, but when they do occur, they may be caused by the presence of other urease-containing organism.

However, unless the patient has achlorhydria or hypochlorhydria, it is highly unlikely that non-H. pylori organisms will be present in sufficient concentration to produce a positive test. This is the case unless the RUT substrate does not contain an inhibitor to bacterial growth, in which case non-H. pylori organisms may possibly overgrow during the observation period of 24 hours.

Upper endoscopy is a costly test that is associated with a little but definite risk, unless there are particular contraindications, biopsy for study of the mucosal histology is often recommended. In general, upper endoscopy is associated with a tiny but definite risk. Testing for RUT can also be performed, and it is particularly beneficial in challenging diagnostic cases in which the physician would prefer to begin therapy as soon as possible. The tissue sample that is contained in the agar of an RUT test can be utilized for molecular testing in order to determine whether or not H. pylori is present, as well as whether or not there is resistance to clarithromycin.

## Conclusion

In conclusion, there is a significant incidence of the H. pylori infection in the population of both rural and suburban areas in India. The incidence of H. pylori gastritis and the abdominal symptoms that are associated with it is substantial, although only a small percentage of people go on to develop major gastrointestinal issues. Early detection using conventional and cost-effective diagnostic methods and empirical treatment with anti-H. pylori therapy can provide absolute prevention of these complications and relief from the distressing abdominal symptoms. Early detection also provides the opportunity for more effective treatment.

When there is a discrepancy between the RUT and the histology, especially when the RUT is positive but the histology is negative, there should be a fast evaluation of the histopathology. RUT should be utilized as an informal assessment of the accuracy of the pathology laboratory. The findings of the positive tests should be linked with those of the endoscopy, and a histological examination of the stomach mucosa should be performed whenever it is possible to do so in order to collect more information on the architecture.

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