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Comparison of home made and commercial rapid urease tests for detection of helicobacter pylori in patients with gastroduodenitis and peptic ulcer

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ABSTRACT

Introductions: *Helicobacter pylori* is one of the common and medically prominent infections worldwide and an established etiological factor for peptic ulcer disease. This study was conducted to compare the results of two types of Rapid Urease Tests (RUT) for *H. pylori* infection.

Methods: This study was conducted in patients with gastro duodenal diseases visiting Kantipur Hospital from June to August 2010. Antral biopsies were collected from sixty patients visiting endoscopy unit. The diagnosis was of *H. pylori* infection carried out using two types of rapid urease tests (commercial and homemade) as well as Histopathology.

Results: *H. pylori* infection was detected in 34 (56.67%) of 60 by histological test, 24 (40%) by homemade kit method and 28 (46.67%) by commercial RUT method. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) for RUT (commercial kit) considering histology as gold standard were 76.74%, 92.31%, 92.85% and 75% respectively. The sensitivity, specificity, PPV and NPV for RUT (homemade kit) were 58.82%, 84.62%, 83.3% and 61.11% respectively.

Conclusions: Homemade rapid urease test was sensitive and specific for detection of *H. pylori* infection than commercial test.

Keywords: helicobacter pylori, peptic ulcer, rapid urease test

Plain Language Summary

This study was conducted to compare between home made and commercial rapid urease test kit. Histopathological examination was taken as gold standard. This study concluded that homemade kits were not better than commercial kits.

INTRODUCTIONS

Helicobacter pylori (*H. pylori*) is a well-recognized etiologic agent for gastritis, duodenitis and peptic ulcer disease (PUD).¹ In Nepal, association of *H. pylori* has been found significantly higher in duodenal ulcer, gastric ulcer and gastritis by various studies.²

Urease produced by *H. pylori* is clinically important because it forms the basis for several invasive and noninvasive tests to diagnose infection.³ The presence of this infection can be diagnosed by non-invasive methods like urea breath test (UBT), serology using ELISA or stool antigen test.

The current study was performed with the objective to find out prevalence of *H. pylori* by comparing the two rapid urease tests, RUT homemade as well as commercial with histopathological test. The findings will be helpful in timely diagnosis and treatment of *H. pylori* infection.

METHODS

This was a cross sectional study conducted from June to August 2010 at Kantipur hospital, Kathmandu, Nepal. Sixty patients who underwent upper gastrointestinal endoscopy for dyspepsia or upper abdominal pain with burning sensation were included. Biopsy specimens were collected from antral and corpus in case of gastritis, duodenitis and duodenal ulcer. In the case of gastric ulcer, the biopsy specimens were taken from mucosa of adjacent margin of the ulcer. Four biopsies were taken. The first was directly inoculated into the homemade RUT tubes and the second was inoculated directly into the commercial RUT kits. The remaining two were taken to laboratory and placed into a sterile container containing 10% formalin for histopathology.

Homemade RUT reagent was prepared by adding one gram of urea in 9ml of sterile buffer solution (pH 6.8) where, one ml of this solution was filled in a sterile test tube and a drop of phenol red solution was added and stored at 2-8 °C. The original color of the solution was yellowish. The change in color to red or pink within 24 hours were regarded as RUT positive. The commercial RUT kit 'helikocek' was used. Histopathological examination was carried out at Kantipur Hospital by a single histopathologist.

In this study, homemade and commercial RUT were used for detection of *H. pylori* in the biopsy samples and compared with histopathology considered as "gold standard".

RESULTS

Out of the total 60 cases, 24 (40%) were found to be RUT positive by homemade method, 28 (46.67%) by commercial kit, whereas 34 (56.67%) by histopathological test. The age of patients ranged from 15 to 68 years. Among them highest number were from the age group 40 – 60 years. The prevalence of *H. pylori* infection was also found to be highest in this age group.

Out of 60 cases, 36 were male and 24 were female. Among the 34 histology positive cases, 23 were male and 11 were female, whereas the male and female patients the RUT (commercial kit) positive cases, 19 were male and 9 female; and in RUT (homemade test), 17 were male and 7 female. Male were affected more than females.

Table 1. Comparison of RUT (commercial kit) with reference to histology

R U T	Tests Results	Histology	
		Positive	Negative
	Positive	26	2
	Negative	8	24

The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) for RUT (commercial kit) considering histology as gold standard were 76.74%, 92.31%, 92.85% and 75% respectively.

Table 2. Comparison of RUT (homemade kit) with reference to histology

R U T	Tests Results	Histology	
		Positive	Negative
	Positive	20	4
	Negative	14	22

The sensitivity, specificity, PPV and NPV for RUT (homemade kit) were 58.82%, 84.62%, 83.3% and 61.11% respectively.

DISCUSSIONS

The *H. pylori* detection by histological examination is considered gold standard but a simple and inexpensive rapid urease test (RUT) enables quick and convenient diagnosis. A positive urease test is strong evidence of *H. pylori* infection. This is widely used as standard procedure for the detection of this bacterium.⁴ The false positive results may be explained by the presence of other urease producing bacteria in the gastric specimen. The false negative urease test may be due to the complete absence of *H. pylori* or the patchiness of organism.⁵

Out of total 60 patients, the *H. pylori* were detected in 34 (56.67%) by histology. In Nepal, *H. pylori* prevalence were found to be 56.8% by Kawasaki et al.⁶ using serology, 39.25% by Subedi et al.⁷ using histopathology and/or culture, 33.9% by Makaju et al.² using histopathology, 29.5% by Rai et al.⁸ using RUT, culture and PCR, 25.5% by Adhikari et al.⁹ using RUT and/or culture. In studies by Shah et al.¹⁰ the prevalence of *H. pylori* infection was 86.66% by CLO (urease test) and Larsson et al.¹¹ found the prevalence of 70-80% using ELISA test for IgG serum antibodies. In other studies it was 80% using RUT by Shakya et al.², and 36% using RUT, culture and histology by Dangol et al.¹², 67.50% by Marasini et al.¹³ and 46.56% using RUT and histology by Karki et al.¹⁴

The prevalence of *H. pylori* infection varies between regions of the same country or parts of the world. Many variations including studied population, bacterial strains, geographic locations, the efficacy of diagnostic methods, environmental and socio-economic factors may contribute, which makes it difficult to interpret data.¹⁵ Guzman et al.⁵ stated that false negative and false positive results in the different methods tested may be due to patchy distribution of *H. pylori* present in the gastric mucosa. Taking several pieces of tissues from different representative areas minimize this situation.²

If the patient uses PPIs, the sensitivity of the RUT may fall below 50%.¹⁶ Bleeding from peptic ulcer disease, presence of blood in the stomach from any source is considered to decrease the sensitivity of the RUT to 60-70%.¹⁷ Longstanding infection can lead to atrophic change especially in the gastric body. Subsequently, an increase in gastric pH in the body reduces the density of *H. pylori* below the detection level of RUT.¹⁸ On the other side the non acidic environment may harbor other bacteria with urease activity, giving false positive results.¹⁹ Chronic renal failure in which the prevalence of *H. pylori* infection is lower may also decrease the sensitivity of the RUT.¹⁷ After a failed eradication therapy, *H. pylori* may require over four weeks to reach the level detected by RUT.²⁰ It is claimed that the commercially available CLO (urease) test, which detects presence of urease is convenient and gives result within 24 hours with sensitivity and specificity of 98% and 97% respectively, but is relatively expensive. Homemade rapid urease test is cheap and can be prepared easily.¹⁴

A fundamental distinction among test for *H. pylori* is whether they provide direct evidence that infection is currently present (active test) or indirect evidence by detecting the presence of antibodies to *H. pylori* (passive test).²¹ Therefore, the available serological test at present in detection of antibody against *H. pylori* detects IgG only is not useful test for diagnosis of active

infection. Simple and non invasive active test such as urea breath test and stool antigen test are expensive and not easily available. The invasive technique such as culture takes long time and has low sensitivity than histology.²²

Histopathological examination of biopsy specimen detects active *H. pylori* infection, and has high sensitivity and specificity, is expensive and take days. Hence, RUT is considered to be a better choice for patients undergoing endoscopic examination because of the rapid result that can be obtained within few hours. The most rapid modern test gives positive results in minutes, enabling endoscopist to begin eradication therapy immediately after endoscopy.²³

Among the homemade and commercial kits available for rapid urease test, homemade RUT is considered to be advantageous in terms of low price, easy reagent preparation and result interpretation and if it has high sensitivity and specificity. However, histological examination should be performed where found essential to detect level of activity and any mitotic changes. The main disadvantage of the RUT is due to the low stability of the reagent. Usually the reagent may give false positive result after two weeks. This could be due to change in pH and contamination of the reagent by urease producing organism. This problem can be overcome by preparing the fresh reagent frequently in required amount. Further study is required for modification of reagent preparation to increase the stability.²

In this study, the sensitivity and specificity of RUT Kit either home-made or commercial was not found to be as expected but further studies regarding these tests should be performed for correct assessment. Other tests should be done to confirm diagnosis but RUT could be made more reliable after further study so that it can be used where histopathology is not possible.

CONCLUSIONS

H. pylori are commonest cause of gastroduodenitis. Histopathology is gold standard but takes several days and is expensive than home made rapid urease test. It is as sensitive and specific as commercials.

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