

H pylori infection: rapid urease test and helicobacter pylori serology

¹Dr. Aabid Hussain Wani, MD General Medicine

²Dr. Nisar Ahmad Shah, Professor, DM Gastroenterology, GMC Srinagar.

³Dr. Mudasir Ahmad Sofi, MD General Medicine

⁴Dr. Ruby Reshi, Professor, Department of Pathology

⁵Dr. Bilal Ahmad Khan, Consultant, Gastroenterology, GMC Srinagar.

⁶Dr. Rakib Ahmad Wani, MD, Radio Diagnosis & Imaging, GMC Srinagar.

Corresponding Author: Dr. Rakib Ahmad Wani, MD, Radio Diagnosis & Imaging, GMC Srinagar.

How to citation this article: Dr. Aabid Hussain Wani, Dr. Nisar Ahmad Shah, Dr. Mudasir Ahmad Sofi, Dr. Ruby Reshi, Dr. Bilal Ahmad Khan, Dr. Rakib Ahmad Wani, “H pylori infection: rapid urease test and helicobacter pylori serology”, IJMACR- September – October - 2022, Vol – 5, Issue - 5, P. No. 30 – 38.

Copyright: © 2022, Dr. Rakib Ahmad Wani, et al. This is an open access journal and article distributed under the terms of the creative commons attribution noncommercial License 4.0. Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

H. pylori is one of the most common human specific pathogen which exclusively inhabits gastric mucosa. H. The diagnosis of H. pylori can usually be established during endoscopy. This cross-sectional study was done in the Post graduate Department of Medicine, Govt. Medical College Srinagar over a period of 18 months with the aim to comparatively evaluate invasive (rapid urease test and Histopathology) and non- invasive tests in diagnosis of infection with Helicobacter. Pylori, measure the prevalence and to observe the impact of Proton pump inhibitors, antibiotics, H₂ blockers and NSAIDS on the sensitivity and specificity of the diagnostic modalities. Total 172 patients were included. Among them majority (52.9%) of the patients were male and 47.1% were female patients. The mean age of the

participants was 41 years. Gastritis was most common EGD finding seen in 95 (55.2%) patients. Sensitivity of RUT in patients with history of PPI intake was 96.67% whereas 100% sensitivity was observed in patients without history of PPI intake. Specificity of RUT in patients with history of PPI intake was 100% whereas in patients without PPI intake sensitivity was 93.7%. The concluded that RUT is more sensitive as well as specific investigation than serology in detecting H. pylori infection. RUT can be recommended as the first-choice investigation in endo scoped patients as results are obtained in short period of time besides being very accurate test.

Keywords: H. Pylori, Endoscopy, RUT, Serology, Diagnostic test, Sensitivity & specificity, Gastritis.

Introduction

H. pylori is one of the most common human specific pathogen which exclusively inhabits gastric mucosa.^{1,2}

H. pylori is the most common chronic bacterial infection in humans affecting up to 50% of the world's population. The majority of children are infected before the age of 10, the prevalence in adults peaks at more than 80% before age 50 in developing countries and in developed countries, infection in children is unusual but becomes more common during adulthood with a prevalence around 30%.

The route of H. Pylori infection is in clear. Person to person transmission of H. pylori through either fecal/oral or oral/oral exposure seems most likely.³ It is associated with >80% of duodenal ulcers and >60% of gastric ulcers. H. pylori is also known to cause atrophic gastritis, gastric adenocarcinoma and MALTomas (GI B-Cell lymphoma).^{4,5}

There are various diagnostic methods, invasive or non-invasive techniques with varying levels of sensitivity and specificity to diagnose the H. pylori infection.⁶ The diagnosis of H. pylori can usually be established during endoscopy by one of the three methods: 1) Biopsy urease test 2) Histology and much less commonly by 3) Bacterial culture. Gastric biopsies can diagnose H. pylori infection and associated lesions (e.g., atrophic gastritis, intestinal metaplasia, dysplasia, and MALT lymphoma).

Non-invasive tests to diagnose the H. Pylori infection are urea breath test and fecal antigen tests. Serological methods to detect immunoglobulin G antibodies to H. pylori shows high accuracy as other non-invasive and invasive biopsies, but do not differentiate between current or past H. pylori infections. Polymerase chain reaction (PCR) is an emerging option that can be categorized as invasive and non-invasive tests. PCR

method is beneficial to detect H. pylori from gastric biopsies without the need for the cultures.⁶

Aims and Objectives

- To comparatively evaluate invasive (rapid urease test and Histopathology) and non-invasive (Immuno chromatic anti body detection) tests in diagnosis of infection with Helicobacter. Pylori.
- To observe the impact of Proton pump inhibitors, antibiotics, H2 blockers and NSAIDs on the sensitivity and specificity of the diagnostic modalities.
- To observe the prevalence of H pylori in endo scoped patients and its relation with different types of endoscopic findings.

Material and methods

This cross-sectional study was done in the Postgraduate Department of Medicine, Govt. Medical College Srinagar over a period of 18 months from December 2018 to February 2020 after obtaining the ethical clearance from the institution.

A total of 172 patients presented in the gastro enterology department and recommended for endoscopy were included in the study after taking informed consent.

Inclusion Criteria

- All endo scoped patients who consent for the study.
- Patients above the age of eighteen years.

Exclusion criteria

- Patients below 18 years of age.
- Those recently treated with Anti-H. pylori treatment.
- Those diagnosed to have malignancy on Endoscopy.
- Those who don't consent for the study.
- Those who have undergone gastrectomy.

The detailed history including clinical presentation and drug history (PPI, H2Blocker, Antibiotics, NSAIDs) was taken and diagnostic tests were done for all patients.

The data was analyzed using EpiInfo. Sensitivity and specificity was reported as percentages. Comparison of two percentages was done using Mc Nemar test. $P < 0.05$ considered statistically significant. Graphically the data was presented by Bar and pie diagrams and tabulation form.

Observations and result

In this cross-sectional study, total 172 patients were included. Among them majority (52.9%) of the patients were male and 47.1% were female patients. The mean age of the participants was 41 years.

Table 1: Clinical indications of the study patients

Indications	Frequency	Percentage
Anemia	8	4.7
C.L. D	1	.6
Dyspepsia	145	84.3
Liver Mass	1	.6
Recurrent Vomiting	13	7.6
U.G.I Bleed	4	2.3

Table 1 depicted that dyspepsia was the most common clinical indication (84.3%), followed by recurrent vomiting 13(7.6%), anemia 8(4.3%), UGIBleed 4(2.3%), CLD and liver mass 1 case (0.6%) each.

Table 2: EGD findings of the study patients

Indications	Frequency	Percentage
Antral Gastritis	95	55.2
Chronic Gastritis	4	2.3
Esophageal Varices	2	1.2
Fundic and corpus Gastritis	6	3.5
Gastric Polyp	4	2.3
GERD	5	2.9
Normal	16	9.3
Pangastritis	24	14.0
PUD	16	9.3

Table 2, showed that gastritis was most common EGD finding seen in 95(55.2%) patients. pangastritis was observed in 24(14%) patients followed by PUD in 16(9.3%) patients. EGD revealed normal study in 16 (9.3%) patients. Other findings include Fundic and Corpus gastritis 6 (3.5%), GERD 5(2.9%), Chronic Gastritis 4(2.3%), Gastric polyp 4(2.3%) and esophageal varices 2(1.2%).

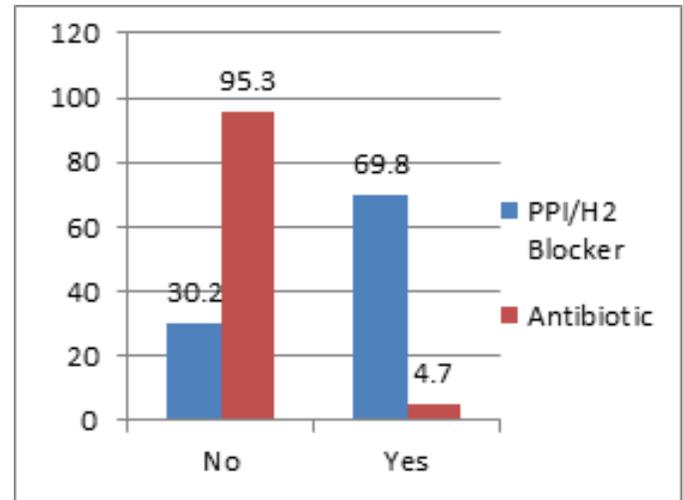


Figure 1: PPI/H₂ Blocker and Antibiotics taken by the study patients.

Figure 1, represented that the 69.8% patients had history of PPI/H₂ Blocker intake within one month before endoscopy was done and antibiotics were taken by 4.7%.

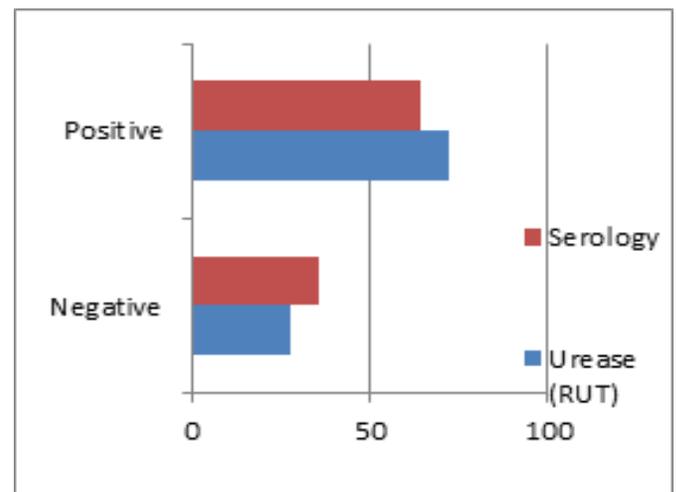


Figure 2: Urease (RUT) and Serology (Antibodies) results of the study patients

Figure 2, showed that RUT was positive in 124 (72.1%) and negative in 48 (27.9%) patients and Serology was positive in 110 (64%) and negative in 62 (36%) patients.

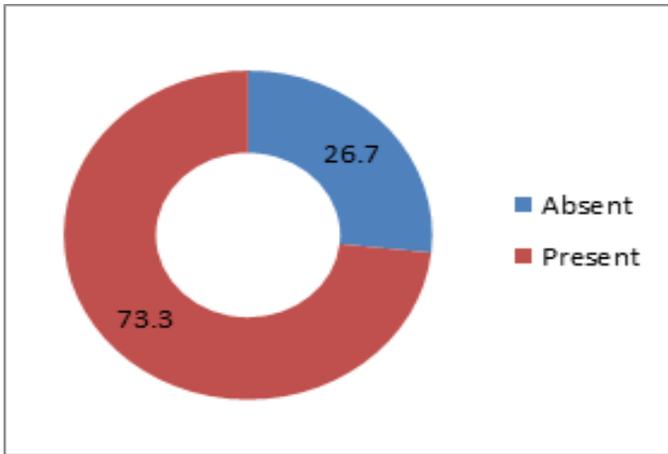


Figure 3: HPE results

Figure 3, represented that HPE was positive in 126 (73.3%) patients and negative in 46 (26.7%) patients.

Table 3: Urease (RUT) and Serology (antibodies) results with respect to HPE results

		HPE			
		Absent		Present	
		Frequency	%Age	Frequency	%Age
Urease	Negative	45	97.8	3	2.4
	Positive	1	2.2	123	97.6
Serology	Negative	38	82.6	24	19
	Positive	8	17.4	102	81

Table 4: Urease (RUT) and Serology (antibodies) results

		Frequency	%Age
Urease	FN	3	1.7
	FP	1	0.6
	TN	45	26.2
	TP	123	71.5
Serology	FN	24	14
	FP	8	4.7
	TN	38	22.1
	TP	102	59.3

Table 3,4 depicted that Among 124 RUT Positive patients True Positive were 123 whereas only 1 was False Positive. Among 48 RUT Negative Patients True Negative were 45 and 3 patients were False Negative. Out of 110 serology Positive cases 102 were True Positive and 8 patients were false positive. Out of 62 serology negative patients True Negative were 38 whereas, 24 patients were false Negative.

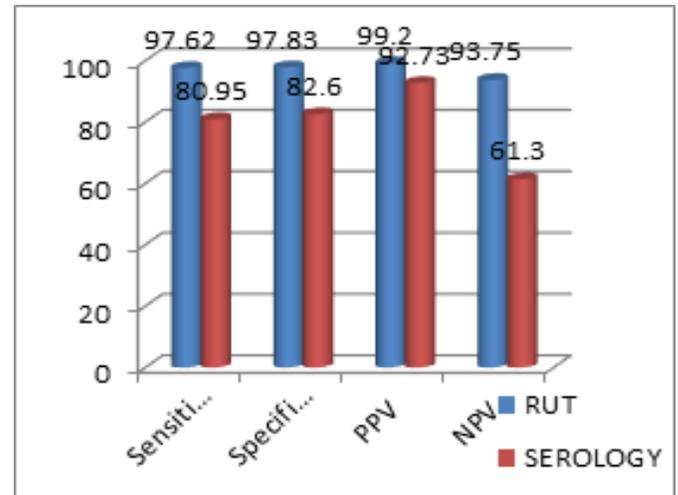


Figure 4: RUT & Serology results

Figure 4, revealed the sensitivity, specificity, PPV and NPV of RUT as 97.62%, 97.83%, 99.2% and 93.75% respectively. Whereas, Serology has sensitivity, specificity, PPV and NPV as 80.95%, 82.60%, 92.73% and 61.30% respectively.

Table 5: Clinical manifestation results with respect to HPE results

Clinical manifestations	HPE			
	Absent		Present	
	Frequency	%Age	Frequency	%Age
Anemia	4	8.7	4	3.2
C.L. D	0	0	1	0.8
Dyspepsia	35	76.1	110	87.3
Liver Mass	1	2.2	0	0
Recurrent Vomiting	5	10.9	8	6.3
U.G.I Bleed	1	2.2	3	2.4

Table 5 showed that the dyspepsia was seen in 110 H. pylori Positive patients. Dyspepsia was followed by recurrent vomiting seen in 8 H. pylori Positive patients. Other clinical manifestations observed in H. pylori Positive patients were: Anemia 4 cases, U.G.I bleed 3 cases and C.L.D 1 case.

Table 6: EGD findings with respect to HPE results

EGD findings	HPE			
	Absent		Present	
	Frequency	%Age	Frequency	%Age
Antral Gastritis	23	50	72	57.1
Chronic Gastritis	2	4.3	2	1.6
Esophageal Varices	0	0	2	1.6
Fundic and corpus Gastritis	2	4.3	4	3.2
Gastric Polyp	2	4.3	2	1.6
GERD	2	4.3	3	2.4
Normal	6	13	10	7.9
Pangastritis	5	10.9	19	15.1
PUD	4	8.7	12	9.5

Table 6, stated that Antral Gastritis as the most common EGD finding associated with H. pylori infection observed in 72 patients (57%). Second most common EGD finding associated with H. pylori infection was pangastritis seen in 19 patients (15%). PUD was seen in 12 H. pylori positive patients whereas 10 H. pylori positive patients had normal EGD findings.

Table 7: Impact of PPI on RUT and Serology results

		PPI				P- value
		Off PPI		On PPI		
		Frequency	%Age	Frequency	%Age	
Urease	Negative	15	28.8	33	27.5	0.033
	Positive	37	71.2	87	72.5	
Serology	Negative	22	42.3	40	33.3	0.260
	Positive	30	57.7	80	66.7	

Table 8: Impact of PPI on RUT results

		PPI				P- value
		Off PPI		On PPI		
		Frequency	%Age	Frequency	%Age	
RUT	FN	0	0.0	3	1.7	0.260
	FP	1	0.6	0	0.0	
	TN	15	8.7	30	17.4	
	TP	36	20.9	87	50.6	

Table 9: Impact of PPI on Serology results

		PPI				P- value
		Off PPI		On PPI		
		Frequency	%Age	Frequency	%Age	
Serology	FN	8	4.7	16	14	0.712
	FP	2	1.2	6	4.7	
	TN	14	8.1	24	22.1	
	TP	28	16.3	74	59.3	

Table 10: Sensitivity and Specificity of RUT results with PPI & without PPI intake

Group	No. of patients	Sensitivity	Specificity
		%Age	%Age
Without PPI intake	52	100	93.75
With PPI intake	120	96.67	100

Table 10, depicted that sensitivity of RUT in patients with history of PPI intake was 96.67% whereas 100% sensitivity was observed in patients without history of PPI intake. Specificity of RUT in patients with history of PPI intake was 100% whereas in patients without PPI intake sensitivity was 93.7%. P- value of 0.026 was

calculated with respect to impact of PPI on RUT results i, e. significant correlation.

Table 11: Sensitivity and Specificity of Serology results with PPI &without PPI intake

Group	No. of patients	Sensitivity	Specificity
		%Age	%Age
Without PPI intake	52	77.78	93.75
With PPI intake	120	82.23	100

Table 11, showed Sensitivity of serology with and without intake of PPI was 77.8% and 82.23% respectively. Specificity of serology with and without PPI intake was 93.7% and 100% respectively. P-value = 0.72 i.e., insignificant correlation.

Table 12: Correlation of RUT & Serology results with or without antibiotics intake

		Antibiotic				P- value
		Without		With		
		Frequency	%Age	Frequency	%Age	
RUT	FN	3	1.8	0	0	0.25
	FP	1	0.6	0	0	
	TN	44	26.8	1	12.5	
	TP	116	70.7	7	87.5	
Serology	FN	24	14.6	0	0	0.38
	FP	8	4.9	0	0	
	TN	37	22.6	1	12.5	
	TP	95	57.9	7	87.5	

Table 13: Sensitivity and Specificity of RUT results with &without antibiotic intake

Group	No. of patients	Sensitivity	Specificity
		%Age	%Age
Without anti biotic in take	164	97.48	97.78
With anti-biotic intake	8	100	100

Table 14: Sensitivity and Specificity of Serology results with &without antibiotic intake

Group	No. of patients	Sensitivity	Specificity
		%Age	%Age
Without anti biotic in take	164	97.48	82.22
With anti-biotic in take	8	100	100

Discussion

In this comparative study sensitivity and specificity of RUT and Serology for diagnosis of H. pylori infection in endo scoped patients was compared.

Total 172 patients were included in the present study. Among them majority (52.9%) of the patients were male and 47.1% were female patients. The mean age of the participants was 41 years. This is similar to observation laid by Adlekh et al⁷ and Tarkhashvi et al⁸: but in some studies, like Shokrzadeh et al⁹ and Kaore et al¹⁰, they have reported increase in H. pylori prevalence in younger age groups (20-40) than the older age groups and majority of the patients were male.

Prevalence of H. pylori infected patients in our study was 73.5%. High prevalence of H. pylori infected patients could be due to the fact that almost only symptomatic patients were included in our study. Puneet et al May¹¹ also observed similar prevalence (74%) of H. pylori in North India in a similar study where 100 patients were included in the study to analyse the prevalence for H. pylori infection in endo scoped patients.

Dyspepsia was most common clinical manifestations accounting 145 (84.3%) patients in our study. Other common clinical manifestations of the individuals included in our study were Recurrent Vomiting (7.6%), anemia (4.7%) and upper G.I Bleed (2.3%). These

results are comparable with other studies e.g., Neri G Picardo et al¹² also reported that dyspepsia was the most common indication for endoscopy accounting 61.1% in their study. Various other studies including Adlekha et al⁷ and Puneet et al¹¹ also support the same observation.

In our study Antral Gastritis was the most common endoscopic finding associated with *H. pylori* infection found in 72 (57.1%) patients out of 126 positive patients. There is a strong correlation between Antral Gastritis and *H. pylori* infection with p-value of 0.05. Pangastritis was the second most common endoscopy finding associated with *H. pylori* infection found in 19 (15.1%) patients. Pangastritis has very strong correlation with *H. pylori* infection with p-value of 0.01. PUD was observed in total of 12 (9.5%) *H. pylori* infected patients. Significant correlation is observed between PUD and *H. pylori* infection with p-value of 0.05. 10(7.9%) patients with *H. pylori* infection had normal endoscopic findings with p-value of 0.01 suggesting strong correlation. Fundic and Corpus Gastritis was seen in 4(3.2%) *H. pylori* infected patients (p-value=0.04) and GERD was observed in 3(2.4%) patients with p-value of 0.23 indicating insignificant correlation between GERD and *H. pylori* infection. Insignificant correlation could be due to small sample size. Chronic Gastritis, Gastric Polyp and Esophageal varices was seen in total 6 positive patients (each 1.6%). Gastric polyp and chronic gastritis also have insignificant correlation with p-values of 0.21 and 0.12 respectively. The reason for insignificant results can be explained by small sample size with these Endoscopic findings. Our results are comparable with the study done by Amrendra Mandal et al¹³ in Nepal. In their study antral gastritis was the most common endoscopic finding

observed in 40.7% *H. pylori* positive patients. It was followed by erosive gastritis (30.1%), PUD (11.5%), pangastritis (8.8%) and GERD (8.8%) in positive patients. Our study is also comparable with the study done by Segni et al¹⁴ in their study 65% were detected to have *H. pylori* infection. Though Gastritis and PUD was significantly associated with *H. pylori* ($p < 0.001$), however, no association was found between GERD and Gastric cancer with *H. pylori* infection ($p > 0.05$).

In present study, sensitivity, specificity, PPV and NPV for RUT were 97.62%, 97.83%, 99.2% and 93.75% respectively. Serology has sensitivity, specificity, PPV and NPV as 80.95%, 82.60%, 92.73% and 61.30% respectively. Therefore, on comparing RUT with Serology it is revealed that RUT has better sensitivity, specificity, PPV and NPV. Our study is comparable with Chey and Wong et al¹⁵ with sensitivity, specificity, PPV and NPV of RUT higher than serology. Sensitivity of serology ranges between 76% - 84% and specificity between 79%-90%; whereas, RUT showed sensitivity more than 90% and specificities more than 95%. Though Serology has lower sensitivity, specificity and detection rate than RUT, it has still decent sensitivity and specificity (>80%). Serology being noninvasive, widely available and cheap make it a desirable test for screening population in epidemiological studies. Serology results are not affected by PPI and antibiotic use. Therefore, patients need not stop PPI/Antibiotics use prior to undergoing serology.

There was significant correlation between RUT results and PPI/H2 Blocker consumption with p-value 0.026 (<0.05). There is decline in sensitivity of RUT from 100% sensitivity in patients without PPI/H2 Blocker consumption to 96.67% in patients with consumption of PPI/H2 Blockers. Decline in sensitivity could be due to

increase in false negative results of RUT as PPI/H2 Blockers are known to have negative effects on growth and urease activity of *H. Pylori* leading to false negative results. However, there is no significant correlation between PPI/H2 Blockers and serology results; p-value 0.712. Results are consistent with the study done by Farideh et al¹⁶. In their study there is a similar decrement in sensitivity of RUT in patients with history of PPI/H2 Blocker intake. Sensitivity of RUT dropped from 92.2% without PPI/H2 Blocker to 74.4% with PPI/H2 Blocker in their study. W Dickey et al¹⁷ studied the effect of proton pump inhibitors on the detection of *Helicobacter pylori* in gastric biopsies, demonstrated that the treatment with a proton pump inhibitor before endoscopy reduces the sensitivity of antral and corpus biopsies for *H. pylori* detection, both by urease testing and histological examination.

Conclusion

This comparative study concluded that RUT is more sensitive as well as specific investigation than serology in detecting *H. pylori* infection. RUT can be recommended as the first-choice investigation in endoscoped patients as results are obtained in short period of time besides being very accurate test. Serology being noninvasive, cheap and widely available investigation, is recommended for situations when endoscopy is not necessary. Serology can also be recommended for screening.

References

1. Kabir S. Detection of *Helicobacter pylori* in faeces by culture, PCR and enzyme immunoassay. *J Med Microbiol.* 2001;50:1021–1029.
2. Dunn BE, Cohen H, Blaser MJ. *Helicobacter pylori*. *Clin Microbiol Rev.* 1997;10:720–741.
3. Allaker RP, Young KA, Hardie JM, Domizio P,

- Meadows NJ. Prevalence of *Helicobacter pylori* at oral and gastrointestinal sites in children: evidence for possible oral-to-oral transmission. *J Med Microbiol.* 2002;51:312–317.
4. A. Kandulski, M. Selgrad, and P. Malfertheiner, “*Helicobacter pylori* infection: a clinical overview,” *Digestive and Liver Disease*, 2008; 40(8): 619–626.
5. P. Correa and J. Houghton, “Carcinogenesis of *Helicobacter pylori*,” *Gastroenterology*, 2007; 133(2): 659–672.
6. Sabbagh, P., Mohammadnia-Afrouzi, M., Javanian, M. et al. Diagnostic methods for *Helicobacter pylori* infection: ideals, options, and limitations. *Eur J Clin Microbiol Infect Dis* **38**, 55–66 (2019).
7. S Adlekha, T Chadha, P Krishnan, B Sumangala. Prevalence of *H. pylori* infection among patients undergoing EGD in a medical college hospital in Kerala, India 2013.
8. NATO Tarkhashvi li, Rusu dan, Garner. *H. pylori* infection in patients undergoing egd, Republic of Georgia; 2015.
9. Leila Shokrzadeh, Kaveh Baghaei, Yoshio Yamaoka, Seiji Shiota. Prevalence of *H. pylori* infection in dyspeptic patients in Iran; 2012.
10. Kaore NM, Nag deo NV, Thom bare VR. Comparative evaluation of investigations for *H. pylori*; India 2012.
11. Puneet Kumar Agarwal, Mayank Badkur, Richa Agarwal, Seema Patel. Prevalence of *H. pylori* infection in upper G.I disorders; India 2012.
12. Neri G Picardo, Nnennaya A Ajayi. Correlation of UGI endoscopic findings with *H. pylori* infection at the University of Nigeria Teaching Hospital Enugu; 2015.
13. Amrendra Kumar Mandal, Pan tosh Kafle, Pradeep puri, Baikuntha Chaulagai, Jasdeep S. Sidhu, Vijay Gay

am 1 An association of Helicobacter pylori infection with endoscopic and histological findings in the Nepalese population. J Family Med Prim Care March 2019.

14.Segni M Ayana, Birgitta Swai, Gibson. Upper gastrointestinal endoscopic findings and prevalence of Helicobacter pylori infection among adult patients with dyspepsia in northern Tanzania; 2010.

15.William D. Chey, C. Y. Wong, guidelines of the American College of Gastroenterology Am J Gastroenerol 2007.

16.Farideh, Parast oo sanie, Saman, Khaleel Evaluation of methods for H. pylori detection in PPI consumption using culture, rapid urease test and smear examination 2015.

17.Dickey W, Kenny BD, McConnell JB.” Effect of proton pump inhibitors on the detection of Helicobacter pylori in gastric biopsies; June 1996.