International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 7.101

Assessing The Prevalence and Treatment Success of Helicobacter Pylori Infection in Dyspeptic Patients: A Comparative Study

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Abstract: ***Helicobacter pylori (H. pylori) infection remains a significant global health issue, particularly in developing nations. This retrospective study evaluates the prevalence and eradication of H. pylori among dyspeptic patients at Preah Ang Duong Hospital, Cambodia. A total of 2, 113 patients were included, with a prevalence rate of 37.25%, showing a higher infection rate among women than men. Treatment regimens were assessed, with first - line therapies achieving a 66.5% success rate, while second - line therapies demonstrated a 73.08% success rate. The most effective regimens included LOAD, VLAD, and VCAM. Antibiotic resistance remains a challenge, highlighting the need for updated, region - specific treatment protocols***

Keywords: Helicobacter pylori, non - invasive test; endoscopy, eradication, antibiotics

1. Introduction

Helicobacter pylori (H. pylori) is a gram - negative, spiral - shaped, microaerophilic bacterium measuring approximately 2.5 to 5.0 µm in length and 0.5 to 1.0 µm in width. H. pylori has been found in the stomachs of humans in all parts of the world. The prevalence of H. pylori infection varies by country and region (ranging from 25 to 50% of the population in developed countries and from 70 to 90% of the population in developing countries). Long term carriage of H. pylori is strongly associated with chronic gastritis, peptic ulcer disease, and gastric cancer[1].

The result of a meta - analysis showed that the prevalence of H. pylori infection was greater in patients with dyspepsia than in controls, with an odds ratio of 2.3 (95% CI, 1.9 - 2.7) [2]. Besides, the H. pylori eradication provides a) significant improvement of symptoms in functional dyspepsia patients[3, 4,] b) histological resolution of chronic gastritis and peptic ulcers[5]; c) significant implication in preventing the development of gastric cancer[6, 7].

Even the prevalence has been decreasing in some parts of the world, but H. pylori infection is increasingly difficult to treat because of the antibiotic resistance, which has been increasing from day to day due to the overuse and inappropriate prescribing of antibiotics, especially in developing countries. However, the prevalence and eradication of H. pylori infection in Cambodia are out of date. Thus, this study is aiming to identify the current prevalence of H. pylori infection and to suggest the effective regimens using for treatment - naive and experienced patients in clinical practice in Cambodia.

This study is significant as it provides updated epidemiological data on H. pylori prevalence and eradication outcomes in Cambodia, guiding clinicians in selecting effective treatment regimens while addressing antibiotic resistance concerns.

The primary objective of this study is to assess the prevalence of H. pylori infection in dyspeptic patients and evaluate the effectiveness of different eradication regimens to optimize clinical treatment strategies in Cambodia.

Aims

To identify the current prevalence of H. pylori infection and to suggest effective treatment regimens for both treatment - naive and previously treated patients in Hepato - Gastroenterology Department at Preah Ang Duong Hospital. Phnom Penh, Cambodia.

Objectives

- To determine the prevalence of H. pylori infection among dyspeptic patients at Preah Ang Duong Hospital.
- To assess the efficacy of different first - line and second - line treatment regimens for H. pylori eradication.
- To analyze antibiotic resistance patterns affecting treatment outcomes.
- To provide clinical recommendations for optimized H. pylori management in Cambodia.

2. Materials and Methods

This was a retrospective, comparative, monocentric study analyzing 35, 559 patient records collected between June 1, 2019, and June 30, 2023, from the Gastrointestinal and Liver Department at Preah Ang Duong Hospital by a standardized questionnaire, and further processed on a computer for

statistical analysis via Excel 2016 (Version 2305 Build 16.0.16501.20074), using $\chi 2$ - test for qualitative variables, 95% confidence interval, and p value < 0.05 as significant.

This study was limited to a single center to ensure standardized diagnostic and treatment protocols, minimizing variability in patient management.

Inclusion criteria

- Patients must be Cambodian citizens or permanent residents of Cambodia, aged 16 - year - old or more of both genders;
- Patients must meet the Rome IV criteria for the diagnosis of functional dyspepsia.
- "Test for treat" and "test after treat" of H. pylori infection need to be confirmed by 13C urea breath test (13C - UBT), stool antigen test (SAT), histopathological examination (HPE) or rapid urease test (RUT);
- Uses of antisecretory drugs (H2 blockers, proton - pump inhibitors and/or potassium - competitive acid blockers) and/or antibiotics ought to be respectively suspended at least 2 and 4 weeks prior to examination date.

Exclusion criteria

- Patients aged younger than 16 - year - old or foreign travelers;
- Patients undergoing H. pylori serology test;
- Unclear or incomplete records or duplicated results.

3. Results

Baseline Characteristics Included Patients

Initially, out of 35, 559 patient's records, we selected 2, 231 patients who met Rome IV criteria for the diagnosis of functional dyspepsia and underwent the explorations for H. pylori infection. Then, we excluded 118 patients of which 2 were foreign travelers and 116 underwent serological test for anti - H. pylori IgM/IgG antibodies. So, at this moment, we had 2, 113 patients in which 1, 326 were H. pylori - negative and 787 were H. pylori - positive diagnosed by the 13C - UBT, SAT, HPE or RUT. However, after clinical improvement, 302 patients didn't show up and didn't receive the treatment for H. pylori infection. Besides, 7 patients gave up their treatment of H. pylori infection midway and denied the new regimens because of drug allergy (2 patients), drug intolerance (4 patients) and drug toxicity (only 1 patient). Furthermore, 81 patients didn't obtain the follow - up test after treatment. Finally, after exclusion, we got and analyzed 397 of 787 H. pylori - positive patients who received randomly different regimens as first line therapy for H. pylori infection. Then, 78 of 133 patients who failed to respond to the initial treatment regimens were treated by second line therapy (*Figure 1*).

Different Characteristics of Patients

There were 2, 113 dyspeptic patients enrolled in this study. The age of patients at the time of screening ranged from 16 to 89 - year - old, mean age was 44.52, median was 42 and mode was 38 - year - old.787 of 2, 113 dyspeptic patients had positive results of H. pylori infection diagnosed by 13C - UBT, SAT, HPE or RUT. Hence, the prevalence of H. pylori infection in dyspeptic patients was 37.25%, with a sex ratio of men to women as 1: 1.4 (higher in women than in men). However, the prevalence of H. pylori infection decreased with increased age (*Figure 2*): 42.95% in young adults (16 to 39 - year - old), 36.85% in middle - aged adults (40 to 59 - year - old), and 20.20% in old adults (≥ 60 - year - old).

In post - treatment group, 397 (50.44%) of 787 H. pylori - positive patients received randomly different regimens as first - line therapy for H. pylori infection and underwent follow - up tests (either 13C - UBT, SAT, HPE or RUT) at least one month after treatment. The results showed that the success rate of the first - line therapy for H. pylori eradication was 34.78%, 54.17%, 40.00%, 70.97%, 72.22%, 79.29%, 83.33% and 66.50% for CTT (as control group), ST, LAT, CQT, BQT, LEAD, LOAD and overall, respectively with p - value 0.7509, 0.6856, 0.0002, 0.0002, < 0.0001, 0.0026, < 0.0001, respectively (*Table 1*).

Then, 78 of 133 patients who failed to respond to the initial treatment regimens were treated by second - line therapy. Finally, the results from follow - up tests indicated that the success rate of the second line therapy for H. pylori eradication was 25.00%, 55.56%, 64.71%, 64.71%, 100%, 87.50%, 94.74% and 73.08% for LAT, CQT, BQT, LEAD, LOAD, VCAM, VLAD, and overall, respectively with p - value 0.3078, 0.1488, 0.1488, 0.0285, 0.0304, 0.0008, and 0.0393, respectively (*Table 1*).

4. Discussion

According to the latest study, the estimated prevalence of H. pylori infection in South Eastern Asia countries rated 20% in Malaysia, 22.1% in Indonesia, 21 - 54% in Thailand, 30 - 50% in Cambodia, 31% in Singapore, 34% in Philippine, 50 - 70% in Vietnam, 68.7% in Laos and 69% in Myanmar (Ratha Korn Vilaichone et al., 2020) [8]. In our study, the prevalence of H. pylori infection was 37.25% of dyspeptic patients from all the 25 provinces and capital/cities of Cambodia.

This rate was similar to the rate from above study as well as another one in Koh Kong province, in which the rate of H. pylori infection was 31.0% (Natsuda Aumpan et al., 2020) [9]. Our study also showed comparable results to a previous study in Koh Kong province, where female patients predominated in H. pylori infection cases (Natsuda Aumpan et al., 2020) [9]. This may be because of our patients were mostly women worker from the garment factory living in crowded conditions. Besides, our study indicated an alike result to a study in china (Shaohua Chen et al., 2013) [10], in which the prevalence of H. pylori infection decreased with increased age.

The first - line therapy in our study showed lower efficacy than in the studies in Thailand. The overall regimen efficacy was only 66.50%, compared to 92.61% (R. Shoosanglertwijit et al., 2020) [11] and 85.08% (P. Rattanachaisit et al., 2023) [12]. Comparing between the first - line therapy, ST and LAT showed an efficacy as low as CTT, while CQT, BQT, LEAD, and LOAD were significantly more effective than CTT. So far, in Cambodia, there have been several studies about the uses of antibiotics for H. pylori eradication revealed that the patients had a high rate of resistance to metronidazole, levofloxacin, and clarithromycin (Ratha Korn Vilaichone et al., 2020) [8], (Natsuda Aumpan et al., 2020) [9], (V. P. Tuan et al., 2019) [13], (Mak Sopheak 2014) [14].

So, based on our study and on the antibiotic susceptibility in the previous studies in Cambodia, we can conclude that CTT, ST, and LAT should be used with restriction. It means that CTT, ST, or LAT for 14 days in first - line therapy is only recommended in regions where H. pylori - metronidazole - resistance, H. pylori - levofloxacin - resistance or H. pylori - clarithromycin - resistance is known to be lower than 20% and in patients with no previous history of metronidazole or levofloxacin or macrolide exposure for any reason. However, CQT, BQT, LEAD, and LOAD should be recommended as treatments of choice in the first - line therapy for H. pylori eradication.

Anyway, in our study, the second - line therapy demonstrated greater efficacy than in the previous studies in Thailand. The overall regimen efficacy was 73.08%, compared to 68.42% (R. Shoosanglertwijit et al., 2020) [11] and 69.87% (P. Rattanachaisit et al., 2023) [12]. Comparing between the second - line therapy, LAT showed a very low efficacy (25%), while CQT, BQT, and LEAD were more effective than LAT, but were not statistically significant, whereas LOAD, VCAM, and VLAD were significantly more effective than LAT. Even the three regimens were used as second - line therapy, but they displayed a very high effectiveness in H. pylori eradication with success rate of 100%, 87.50%, and 94.74% for LOAD, VCAM, and VLAD, respectively. Thus, our study found and remarked that after failing to respond to any first - line therapy, using LAT for 14 days as second - line therapy of choice is still unacceptable in clinical practice and should not be recommended any more. Nonetheless, further studies with greater amount of sample size are required to prove if this this regimen is effective in real life. Therewithal, using CQT, BQT, and LEAD as second - line therapy remains acceptable in clinical practice. Yet, LOAD, VCAM, and VLAD are currently considered as the best treatment of choice in second - line therapy, which should be strongly recommended in clinical practice as a result of their high success rate for H. pylori eradication.

Anyhow, some limitations remain existing in this study. Firstly, even our patients came from all the 25 provinces and capital/cities of Cambodia, but this is a monocentric study, the prevalence of H. pylori infection in dyspeptic patients in our study is based on data collected from a single center. This might naturally refer to unwanted experimental mistakes that lead to an inaccurate representation of the research sample.

Secondly, this is a retrospective study in which all patients were recruited by convenience sampling and were thus not perfectly representative of the general population and prone to selection bias. Besides, this might lead to some other uncontrollable factors associated with treatment failure, such as unappropriated drug preservation, nonadherence to treatment, antibiotic resistance rate in the region, as well as the genetic factors. Thirdly, the small sample size in each arm remains inadequate to represent the general population.

5. Conclusion

This study highlights a Helicobacter pylori infection prevalence of 37.25% among dyspeptic patients in Cambodia, with higher rates among younger adults. The effectiveness of eradication regimens varies, with LOAD, VLAD, and VCAM demonstrating superior success. The increasing challenge of antibiotic resistance underscores the need for updated treatment protocols tailored to local resistance patterns. Future research should focus on genetic determinants of resistance and long - term treatment outcomes to refine therapeutic strategies.

6. Recommendation

- Optimized Treatment Protocols: Based on the study findings, clinicians should consider highly effective regimens such as LOAD, BQT, and LEAD for first - line therapy, while reserving second - line therapies like VLAD and VCAM for treatment failures.
- Public Awareness and Prevention: Community education programs should be implemented to reduce H. pylori transmission, emphasizing hygiene practices and safe food consumption.
- Further Research: Future studies should focus on genetic determinants of antibiotic resistance and the impact of different treatment durations to refine management strategies.

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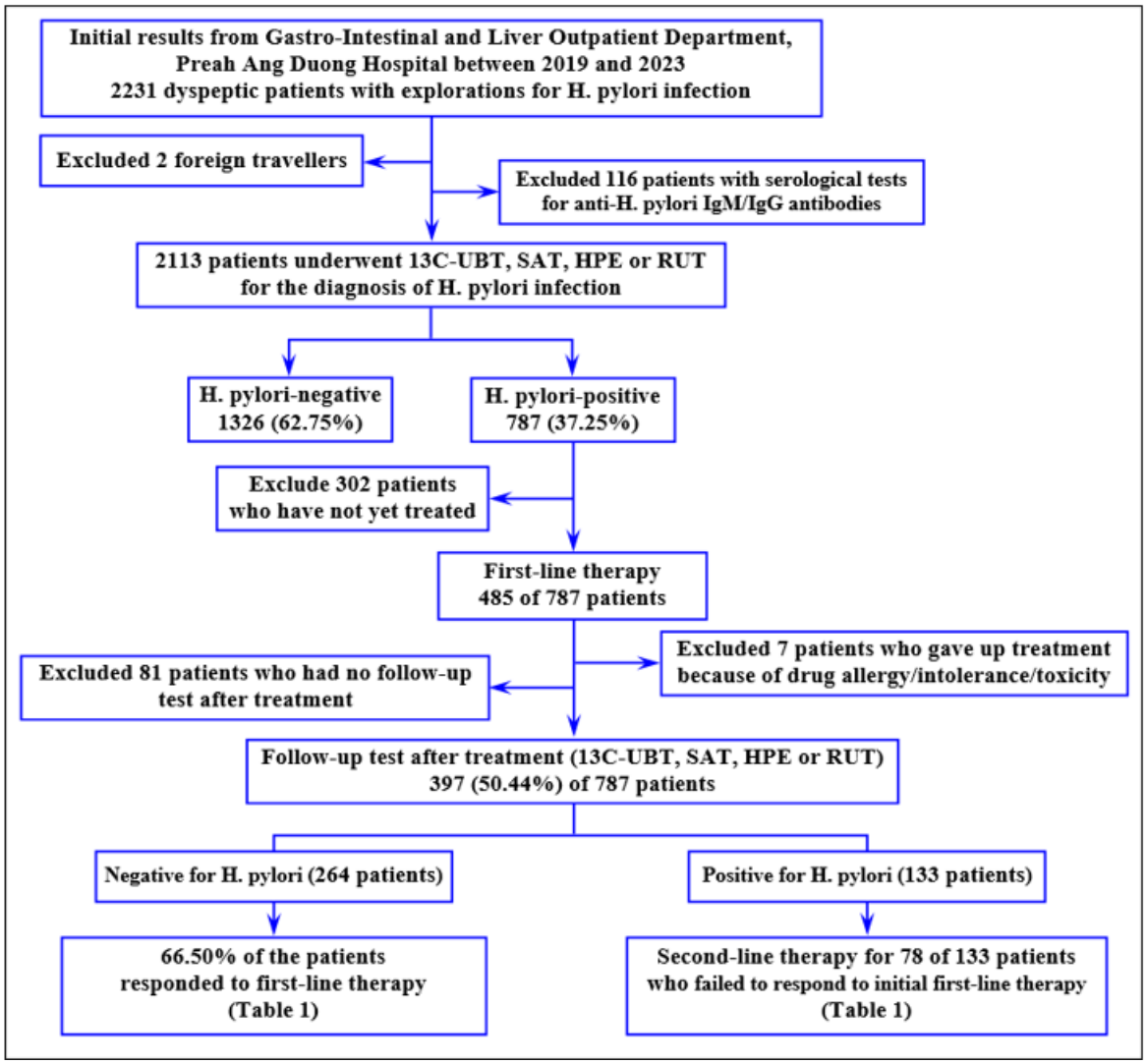

Figure 2: Prevalence of H. pylori infection decreased with increased age

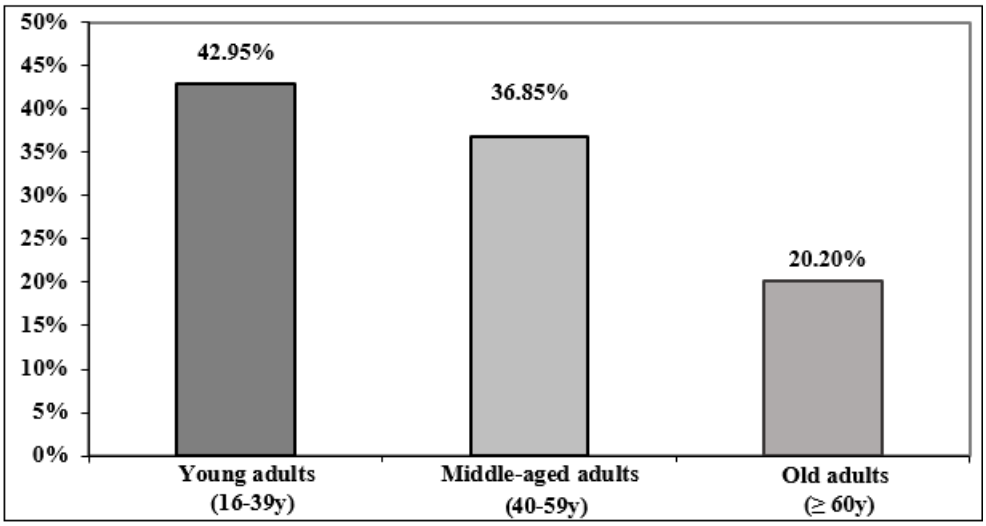

Table 1: Success rate of H. pylori eradication in different regimens

	Regimens	Duration (days)	Number of patients	Success rate	P-value
First-line therapy	**CTT (Classic/Standard triple therapy):** Esomeprazole 40mg BD, Clarithromycin 500mg BD, Amoxicillin 1g BD, or Esomeprazole 40mg BD, Nitroimidazole 500mg BD, Amoxicillin 1g BD, or Esomeprazole 40mg BD, Clarithromycin 500mg BD, Nitroimidazole 500mg BD	10-14	46	34.78%	
	ST (Sequential therapy): Esomeprazole 40mg BD and Amoxicillin 1g BD for first 5-7days, then follow by Esomeprazole 40mg BD, Clarithromycin 500mg BD, Nitroimidazole 500mg BD for the remaining 5-7days	10-14	34	54.17%	0.7509
	LAT (Levofloxacin-based triple therapy): Levofloxacin 500mg OD/Levofloxacin 250mg BD, Amoxicillin 1g BD, and Esomeprazole 40mg BD	10-14	20	40.00%	0.6856
	CQT (Concomitant quadruple therapy): Esomeprazole 40mg BD, Clarithromycin 500mg BD, Amoxicillin 1g BD, and Nitroimidazole 500mg BD	14	62	70.97%	0.0002
	BQT (Bismuth quadruple therapy): Esomeprazole 40mg BD, Bismuth subsalicylate 525mg QID, Nitroimidazole 250mg QID, and Tetracycline 500mg QID	14	54	72.22%	0.0002
	LEAD (Levofloxacin-based quadruple therapy): Levofloxacin 500mg OD/Levofloxacin 250mg BD, Esomeprazole 40mg BD, Amoxicillin 1g BD, and Doxycycline 100 mg BD	14	169	79.29%	< 0.0001
	LOAD (Nitazoxanide-containing quadruple therapy): Levofloxacin 500mg OD/Levofloxacin 250mg BD, Omeprazole 40mg BD, Alinia (nitazoxanide) 500mg BD, and Doxycycline 100 mg BD	10-14	12	83.33%	0.0026
	Overall	10-14	397	66.50%	< 0.0001
Second-line therapy	**LAT (Levofloxacin-based triple therapy):** Levofloxacin 500mg OD/Levofloxacin 250mg BD, Amoxicillin 1g BD, and Esomeprazole 40mg BD	14	4	25.00%	
	CQT (Concomitant quadruple therapy): Esomeprazole 40mg BD, Clarithromycin 500mg BD, Amoxicillin 1g BD, and Nitroimidazole 500mg BD	14	9	55.56%	0.3078
	BQT (Bismuth quadruple therapy): Esomeprazole 40mg BD, Bismuth subsalicylate 525mg QID, Nitroimidazole 250mg QID, and Tetracycline 500mg QID	14	17	64.71%	0.1488
	LEAD (Levofloxacin-based quadruple therapy): Levofloxacin 500mg OD/Levofloxacin 250mg BD, Esomeprazole 40mg BD, Amoxicillin 1g BD, and Doxycycline 100 mg BD	14	17	64.71%	0.1488
	LOAD (Nitazoxanide-containing quadruple therapy): Levofloxacin 500mg OD/Levofloxacin 250mg BD, Omeprazole 40mg BD, Alinia (nitazoxanide) 500mg BD, and Doxycycline 100 mg BD	14	4	100%	0.0285
	VCAM (Vonoprazan-based concomitant quadruple therapy): Vonoprazan 20mg BD, Clarithromycin 500mg BD, Amoxicillin 1g BD, and Nitroimidazole 500mg BD	14	8	87.50%	0.0304
	VLAD (Vonoprazan-levofloxacin-based quadruple therapy): Vonoprazan 20mg BD, Levofloxacin 500mg OD/Levofloxacin 250mg BD, Amoxicillin 1g BD, and Doxycycline 100mg BD	14	19	94.74%	0.0008
	Overall	14	78	73.08%	0.0393