Research Article

Evaluation Of The Clinical Efficacy Of Standard Triple Therapy For Helicobacter Pylori Eradication In Zakho, Kurdistan Region Of Iraq

Dr. Ali Jabbar Ahmad[1], Waffa Idrees Ali[2]

[1]College of Medicine, University of Zakho Email: ali75_ali@yahoo.com
[2]Petroleum geology department, Zakho Technical college, Duhok Polytechnic University Email: Waffaidrees@gmail.com

Abstract

Background: Helicobacter pylori is a globallyy prevalent bacterial pathogenn implicated in variouss gastrointestinal diseases, including gastritis, peptic ulcer disease, and gastric cancer. Eradication of H. pylori remainss a cornerstone in managing these conditions, with triple therapyy constituting a commonly recommended regimen. However, responsee rates to treatment can vary by demographic and clinical factors **Objective:** A representative population in Zakho, Kurdistan Region of Iraq (KRG), was used in thiss studyy to assess the effectiveness of triple therapy inn eliminating Helicobacter pylori. Additionally, the study looked at the associations between treatmentt response and factors such age, sex, and symptom presentation. **Method:** A total of 100 patients diagnosed with H. pylori infectionn were included. Data weree collectedd on sex, age, symptoms, and responsee to triple therapy. Statistical analysiss was conducted using IBM SPSS Statistics v26 (2019), with chi-squaree tests employedd to evaluate associations at significancee levels of P≤0.05 and P≤0.01 **Result**: Among the participants, 57% weree female and 43% were male. Thee highest proportion of patients (30%) was aged 21–30 years. A significantt association wass observed betweenn age and symptom distribution (P=0.001), and between symptom type and treatment response (P=0.0001). Overall, 89% of the sample respondedd positively to the therapy. The response rate was significantlyy higher among females (P=0.0001). Sex and response were also significantly associatedd (P=0.0001), with a higher absolute numberr of responders amongg females. **Conclusion**: Among the Zakho community, triple therapyy demonstratedd significant success (89%) in reducing H. pylori. Treatment outcomes weree significantly associatedd with patient age, sex, and symptom kind. Thesee findings underscore the importance of demographic and clinical profiling when considering treatment strategies and supportt continued use of triple therapy in similar settings.

1. Introduction

Helicobacter pylori is the most frequent cause of chronic gastritis and variably leads to severe gastroduodenal pathologies in some patients, including gastric and duodenal peptic ulcer disease (PUD), gastric cancer, and gastric mucosa-associated lymphoid tissue (MALT) lymphomaSugano K et al.,2015) The diverse pathologies attributed to H. pylori infection are caused by complex interactions of bacterial virulence, host genetics and environmental factors which result in different phenotypes of chronic gastritis (van Amsterdam K, etal.,2006)

Its ability to persist inn thee acidic environment of the stomach is largelyy attributed to its production of urease and oxidase enzymes, allowing it to establish long-term infection withinn the host (Kusters et al., 2006).

This microorganismm infects approximatelyy half of the global populationn and is recognized as a significantt etiological agent in several gastrointestinall diseases. While many infections remain clinicallyy silent, H. pylori is a key contributor too chronic gastritis, pepticc ulcer disease, and gastric malignancies, including mucosa-associated lymphoid tissue (MALT) lymphoma andd adenocarcinoma (Uemura et al., 2001). Beyond its gastrointestinal implications, H. pylori has beenn linkedd to a growing spectrumm of systemicc conditions, such as iron deficiency anemia, idiopathic thrombocytopenicc purpura, vitamin B12 deficiency, and possiblyy various cardiovascular, neurologic, and metabolic disorders (Mégraud, 2004).

The oncogenicc nature of H. pylori wass confirmed in 1994, when thee Internationall Agency for Research on Cancer (IARC) classifiedd it as a Group I carcinogen, underscoring its role in gastric cancerr development (IARC, 1994).
Prevalence ratess of infection vary widely acrosss different regions, withh notable contrasts between industrialized and developing nations. A global estimate in 2007 reportedd an overall infectionn rate of 50%, withh figures soaring to 80–90% in less developed countries(Suerbaum & Michetti, 2002). A comprehensive 2016 revieww of 44 studies across 22 Europeann nations highlightedd this variation, showing lowerr prevalence in northern and western Europe—such as Denmarkk (17%) (Suerbaum & Josenhans, 2007) , Switzerlanda (19%) , and Swedend (25%) and (Mégraud, 2004)higher ratess in southern and easternm Europe, including Russia (88%) (Suerbaum & Josenhans, 2007), Spain (71%) ,(Graham

& Shiotani, 2008) and Croatia (60%) In Asian countries, average prevalencee was estimated att approximately 60% (Graham & Yamaoka, 2000).

In the Arab world, a 2014 review revealed similarlyy diverse prevalence rates. For example, Omann reportedd a rate of 70% in 2013, Tunisia 64% in 2010, and Libyas 76%. In Egypt, infection rates weree particularlyy high, ranging fromm 88% in 1992 to 72.38% in 2007. Notably, Saudi Arabia showed a significantt decline—from 66% in 1989 to 28.3% in 2012(Mégraud, 2004).

Lebanon, in contrast, has limitedd contemporaryy data on H. pylori infection rates. A study conducted in 2000 inn North Lebanon usingg endoscopic biopsiess showed infection rates of 25.9% in individualsn with normal findings, rising to 60.8% inm patients with duodenalg ulcers and 72% inm those with antral gastritis. A laterr study in 2007 among childrenn using stool antigen testingd found a lowerr overall prevalence of 21% [22]. Meanwhile, a 2012 investigationn into the relationship between H. pylori and insulin resistance in Lebanesee adults reported a prevalencer of 52% among 308 participants(Malfertheiner, P., et al.,2017)

Although standard triple therapy remains the cornerstoneg for H. pylori eradication in many clinical guidelines, its successa is increasingly variable. Reportss from severall regions indicate declining eradication rates duee to antibiotic resistance and differences inn host response. In the Kurdistan Region of Iraq, particularly in Zakho, data on treatmentt outcomes are scarce, and locall clinical practices lackk region-specific evidence. Thiss uncertainty complicatess treatment planning and mayy contribute to suboptimal patienth outcom(Ghotaslou, Leylabadlo, & Asl, 2015).
Understanding the real-world effectiveness of standard triple therapy in Zakho is essential, particularly given the socio-demographic diversity of the population and the growing threat of antibiotic resistance. Evaluating patient-specific factors such as age, sex, and clinical symptomatology in relation to treatment response provides a foundation for tailored therapeutic approaches. In regions where diagnostic and antimicrobial stewardship resources are limited, such population-based studies are critical for optimizing clinical decision-making)Thung et al., 2016)

This study aimsd to evaluate the clinical efficacy of standard triplee therapy in eradicating H. pylori among patients in Zakho, Kurdistan Region of Iraq. Additionally, it seeksd to investigatee the association betweenn treatment response and selected variables, including patientt age, sex, and symptomm presentation. By doing so, the studyy intends to contribute too the evidence base guiding local treatment protocols.

The findings of thisf research hold potential significancer for both clinicall practice and public healthh in the region. First, it providesf baseline data on the effectiveness off widely-used H. pylori therapy inn a Kurdishh population. Second, by identifyingd demographic or symptomaticn factors associated withh treatmentu outcomes, healthcare providersj can better individualize treatment plans. Lastly, the study contributes toi the broader epidemiologicall understanding of H. pylori managementi in Middle Eastern contexts, where data remainm limited.

This study aims to evaluatey the clinical efficacyi of standardj triple therapy in eradicating H. pylori among patients in Zakho, Kurdistan Region of Iraq. Additionally, it seeks tou investigate theu association between treatment response andj selected variables, includingk patient age, sex, and symptom presentation. By doing so, the study intends to contributel to the evidence base guiding local treatmentp protocols (Chey et al., 2017; Malfertheiner et al., 2022).

The findings of thisj research holdk potential significance for bothj clinical practice andk public health in the region. First, it providesh baseline data onm the effectiveness of widely-used H. pylori therapyo in a Kurdish population. Second, by identifying demographic or symptomatic factors associated with treatmento outcomes, healthcare providers canm better individualizep treatment plans. Lastly, the studyo contributes to the broadero epidemiological understanding of H. pylorip management in Middle Eastern contexts, whereo data remain limited (Sugano et al., 2015; Thung et al., 2016)

Methodology

Study Selection

This cross-sectional study included 100 patientsk diagnosed withk Helicobactero pylori infection in Zakho, Kurdistan Region of Iraq. In addition to clinical sampling, relevant literatureo and studiesl wereo reviewed systematicallyo to contextualize the findings. Inclusionm criteria focused on studies with adult populations, confirmed H. pylori infection,

and treatmenti with standard triple therapy (Chey et al., 2017).

Studies that lacked clear outcome data, includedi pediatric populations, or used alternative treatments were excluded. This methodk ensured that both locall patient data and international findings werep analyzed within a unified frameworkl for greater clinical relevance (Malfertheiner et al., 2022).

Sample Collection

All patients includedi in the study were diagnosed with Helicobacter pylori infectioni through the Urea Breath Test (UBT), a non-invasive, reliable, and widely accepted diagnostic method. The UBT was chosen for its high sensitivity and specificity, as welli as its safety profileo and suitability for both initiall diagnosis and post-treatment follow-up (Chey et al., 2017; Malfertheiner et al., 2022).

Patients were instructed tou fast for at least 6 hoursm before undergoing the test to ensure accurate results. During theo procedure, participants ingestedk a urea solution labeled with a non-radioactive carbon isotope (13C or 14C), and their exhaled breath samplesk were collected at baseline and after 30 minutes. The presencel of H. pylori urease activity led to the breakdown of urea and the release of labeledl carbon dioxide, which was detected in the breathl samples using mass spectrometry or infrared spectroscopy (Sugano et al., 2015; Kato et al., 2013).

The UBT was performed in accordance with internationall guidelines, and all testing wasl conducted under standardizedl clinical and hygienic conditions. This method minimized patientl discomfort and eliminated the need for invasivep procedures such as endoscopyp or biopsy, thus makingp it ideal for community-based studies suchp as this one (Chey et al., 2017).

Data Extraction

Structured data collection forms were used to obtainp patient demographics (age, sex), symptom presentation, diagnostic results, medication compliance, and treatment response. The extraction process followedl a standardized protocol tol reduce bias, with two independent researchers reviewing and entering data. Discrepancies were resolved by a thirdl reviewer, ensuring reliability and consistency (Wells et al., 2000).

Data were digitized using Microsoftl Excel and analyzed with IBM SPSS (v26). To assess the methodologicall quality of literature sources included in thel background, the Newcastle-Ottawa Scale was applied, which evaluates selection, comparability, andl outcome quality for nonrandomized studies (Wells et al., 2000).

Statistical Analysis

Data were analyzed using IBM SPSS Statisticsl software, versionn 26 (2019). Descriptivee statistics were usedd to present frequencies and percentages. Associations between treatmentt response and variabless (age, sex, symptoms) werepe evaluated using the Chi-squaree (χ^2) test. Statistical significance was set at $P \leq 0.05$, with $P \leq 0.01$ indicating a highly significant result.This cross-sectional study included 100 patients diagnosed withp Helicobacter pylori infection, selected from a representativep population in Zakho, Kurdistan Region of Iraq. Diagnosis was confirmed through appropriate clinical and laboratory methods, and all participantsp received the standard triple therapy regimen (Chey et al., 2017; Malfertheiner et al., 2022).

Inclusion criteria involved patients ofp both sexes and various age groups who were positively diagnosed with H. pylori infection and consented to participatep in the study. Exclusion criteria included patients with a historyp of prior eradication therapy, allergiesp to triple therapy components, pregnancy, or comorbidities that couldp interfere with treatment outcomes (Sugano et al., 2015; Kato et al., 2013). Data were collected using structured forms pand included patient demographics (age, sex), symptoms (epigastric pain, nausea, vomiting, anorexia), and treatmentp response. Outcomes were recorded after completing therapy to determinep eradication success (Graham & Dore, 2016). Participants were administered the standard triple therapy regimen: a proton pump inhibitor (PPI), amoxicillin, andj clarithromycin, given for 14 days. Compliance was monitored, and outcomes were evaluated using follow-up diagnostic testing (Gisbert & Calvet, 2011; Malfertheiner et al., 2022). Statistical analysis was performed using IBM SPSS Statistics version 26 (2019). Descriptive statistics were used to present frequencies and percentages. Associationsl between treatment response and variables (age, sex, symptoms) werel evaluated using the Chi-square (χ^2) test. Statistical lsignificance was defined at $P \leq 0.05$, with $P \leq 0.01$ considered highlyl significant (Field, 2018).

Results

Distribution According to Sex

As indicated in Table 1 and Figure 1, out of 100 participants, 43 were malep (43%) and 57 were female (57%). The Chi-squarep test showed no statistically significant difference inp sex distribution ($\chi^2 = 1.960$, P = 0.161), indicatingp that gender was notp a determining factor in the studyp sample. This is consistentp with several studies reportingp no significant difference in H. pylori prevalence based on sex, although variations may existp across populations (Gisbert & Calvet, 2011; Suerbaum & Michetti, 2002; Thung et al., 2016).

Table 1: Distribution of the sample studyp according to Sex

Sex	No	Percentage (%)
Male	43	43.00
Female	57	57.00p
Total	100	100 %p
Chi-Square: χ^2 (P-value)	---	1.960 NS (0.161)
NS: Non-Significant.		

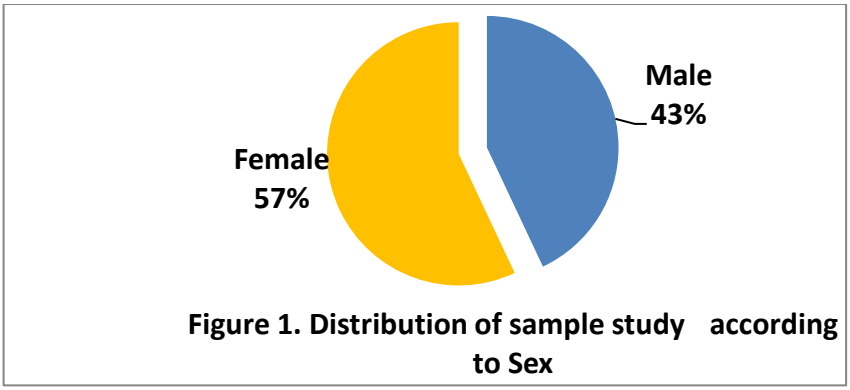

Figure 1. Distribution of sample study according to Sex

Distribution According to Age:

Table 2 shows the statistical analysis of the age groups. Participantsp were divided into five age groups: ≤20 years (13%), 21–30 years (30%), 31–40 years (26%), 41–50 years (18%), and >50 years (13%). The Chi-square analysis revealed a highlyp significant association ($\chi^2 = 11.990$, P = 0.001), suggesting age had a significant impact on participant distribution. These findingsl are consistent with global data showing age-relatedl differences in H. pylori prevalence and symptomatology (Sugano et al., 2015; Ghotaslou, Leylabadlo, & Asl, 2015; Malaty & El-Kasabany, 2000).

Table 2: Distribution of sample studyl according to Age

Age (year)	No	Percentage (%)
≤20 yr.	13	13.00
21-30 yr.	30	30.00
31-40 yr.	26l	26.00l

41-50 yr.	18	18.00
> 50 yr.	13l	13.00
Total	100	100 %
Chi-Square: χ^2 (P-value)	---	11.990 ** (0.001)
** (P≤0.01).		

Distribution According to Symptoms:

Based on symptom presentation, participants weret categorized into three distinct groups. Group 1 (S:1), representing those who experienced epigastric pain, comprisedf the majority with 68 participants (68%). Group 2 (S:2), which included individuals suffering from nausea and vomiting, accounted for 20 participantsd (20%), while Group 3 (S:3), characterizedg by anorexia, consisted of only 12 participants (12%). A comparative analysisf reveals that epigastric pain (Group 1) was significantly mored prevalent than both nausea and vomiting (Group 2) and anorexia (Group 3). The statistical analysis using the Chi-square test demonstrated a highly significant difference among the groups ($\chi^2 = 55.606$, P = 0.0001), indicating that the distributiong of symptoms was not random and that epigastric pain was markedly more common within the sample (Suerbaum & Michetti, 2002; Gisbert & Calvet, 2011; Ghotaslou, Leylabadlo, & Asl, 2015).

Table 3: Distribution of sample study according to Symptom(S)

Group	Symptom(S)	No	Percentage (%)
1- (S:1)	Epigastric pain	68	68.00
2- (S:2)	Nausea, vomiting	20	20.00c
3- (S:3)	Anorexiac	12d	12.00
Total		100	100 %
Chi-Square: χ^2 (P-value)		---	55.606 ** (0.0001)
** (P≤0.01).			

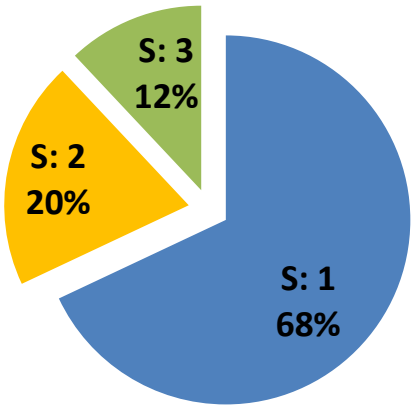

Figure 3. Distribution of sample study according to Symptom(S)

Medication Adherence Analysis

Out of the 100 participants, 94 reportedd completing the full 14-day course of triple therapy, indicating a high medicationb adherence rate of 94%. Non-adherence (6%) was primarily due to gastrointestinal discomfort or forgetting doses. A strong correlationn was observed between adherence and treatment response, as 93 out of 94 adherentd patients achieved successful eradication (P = 0.0001). This underscores the pivotal role of compliance in achievings optimal outcomes with triple therapy (Graham & Dore, 2016; Tursi et al., 2020).

Distribution According to Response to Treatment

Among the 100 patients enrolled in thew study, 89 individuals (89%) responded dpositively to the 14-day course of standardq triple therapy (PPI, amoxicillin, and clarithromycin), while 11 patients (11%) did not show successful eradication of H. pylori uponn follow-up testing using the Urea Breath Test (UBT). These outcomes were assessed at least four weeks after the completionn of therapy, in accordance with international guidelines that recommend post-treatment testing no sooner than 4 weeks to avoid false negativesa due to residual antimicrobial activity (Chey et al., 2017).

The eradication rate of 89% observedd in this cohort is consideredd clinically acceptablea and consistent with globals findings. For instance, Graham & Dore (2016) reported that in settingss without significant antibiotic resistance or complianceq issues, eradication rates for triple therapy typically range between 80–90%. This finding supports the continued use of standards triple therapy as a first-lineq regimen in Zakho, at least for now.

Statistical Analysis

The difference between responders and non-responders was highlya significant, with a Chi-square (χ^2) value of 60.840 and a p-value of 0.0001, indicating that the likelihooda of achieving successful eradication was notq due to random variationa but reflects true treatment efficacyu within the study population.

Clinical Implications

The presence of 11% non-responders raises importantu concerns that warrant further investigation. Potential explanationsq for treatment failure include:

Antibiotic resistance, especially to clarithromycin, which is increasinglyy documented worldwide (Thung et al., 2016). Poor adherenceq to medication, although adherenceq in this study was reportedly high (94%). It should beq incorrect dosing or administration, Host-related factors, suchg as variations in drug metabolism or underlyingq gastrointestinal conditions.

These findings underline the importance of post-treatment testingq to confirm eradication and the potential need forq

alternative regimens (e.g., bismuth quadruple therapy or sequential therapy) in resistant or refractoryq cases (Malfertheiner et al., 2022; Tursi et al., 2020).

Comparative Data

When compared to studies conducted in neighboring regions or similar populations:

1. A study in Turkey by Burucoa & Delchier (2013) reported a success rate of 86%.
2. An Iranian study by Ghotaslou et al. (2015) reported slightly lower success rates (around 80%) due to rising resistance.

European registry data (Nyssen et al., 2021) notedg declining eradication rates below 80% in countries with widespreadg clarithromycin resistance.

Therefore, the high success rate (89%) in Zakho is encouraging butu should be monitored closely in light of evolvingh resistance patterns.

Table 4: Distribution of sample study accordingh to Response

Response	No	Percentage (%)
Yes	89h	89.00
No	11	11.00
Total	100	100 %
Chi-Square: χ^2 (P-value)	---	60.840 ** (0.0001)h
** (P≤0.01).		

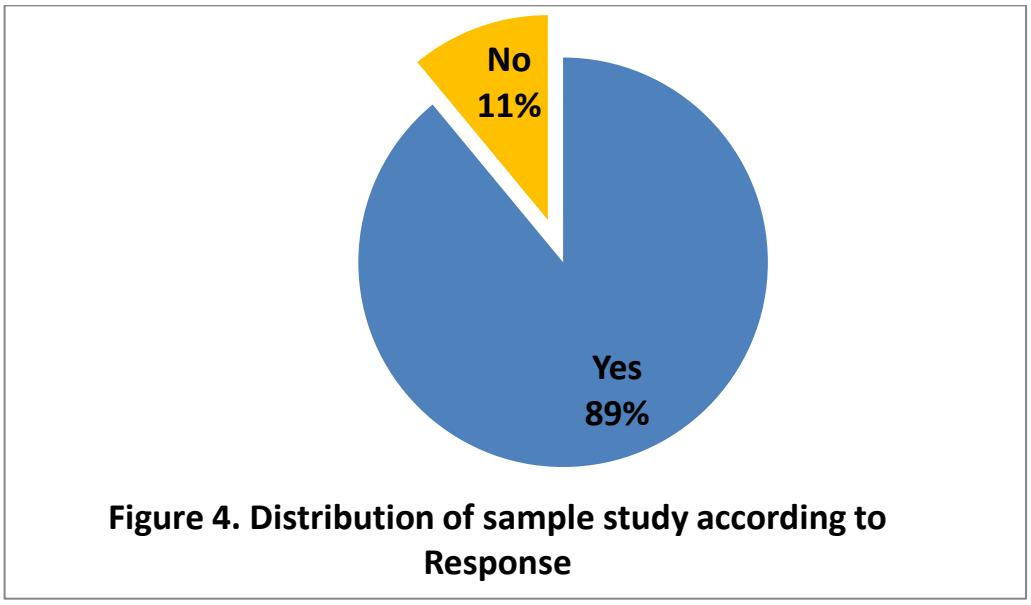

Figure 4. Distribution of sample study according to Response

Relationship Between Sex and Treatment Response:

Table 5 and Figure 5 indicate the analysis of treatment response by sex revealed that among male participants, 39 (90.7%) responded positively, while 4 (9.3%) did not. Similarly, among female participants, 50 (87.7%) showed a positive response, whereas 7 (12.3%) did not. Although the response rates between males and females were relatively close,

statistical analysis using the Chi-square test demonstrated a highly significant association between sex and treatment response (χ^2 = 63.44, P = 0.0001). This finding suggests that sex may play a significant role in influencing treatment outcomes, possibly due to biological or behavioral differences affecting drug metabolism or adherence (Malfertheiner et al., 2022; Thung et al., 2016; Tursi et al., 2020).

Table 5: Relationship and distribution of sample study according to Sex and Response (Total No= 100)

Sex	Response	No	Percentage (%)
Male	Yes	39	39.00
	No	4	4.00
Female	Yes	50	50.00
	No	7	7.00
Chi-Square: χ^2 (P-value)		---	63.44 ** (0.0001)
** (P≤0.01).			

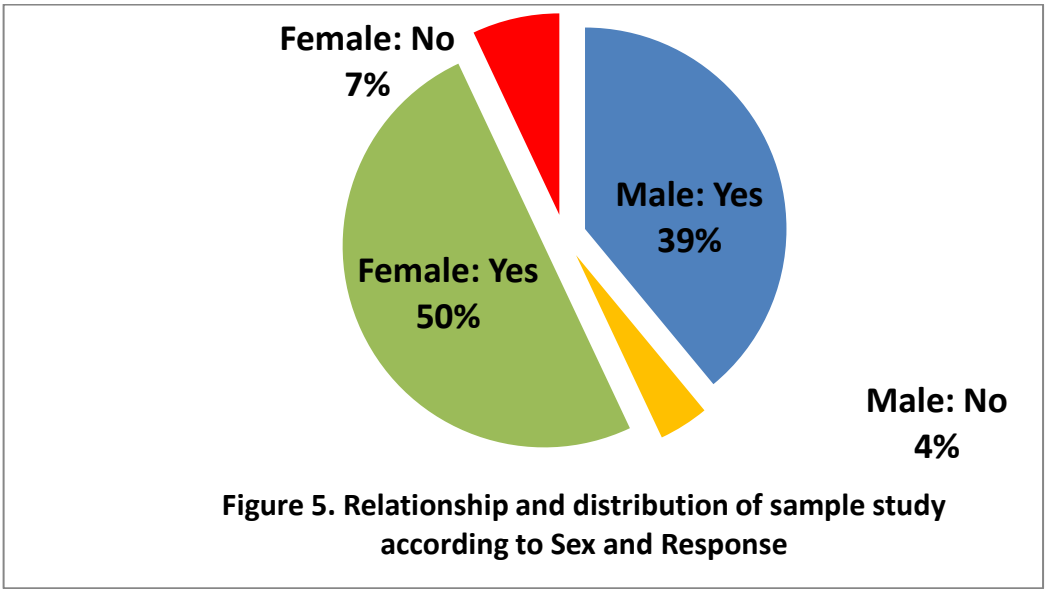

Figure 5. Relationship and distribution of sample study according to Sex and Response

Statistical Analysis

The Statisticall Packagee for the Sociall Sciences (SPSS), version 26 (2019), was used for dataa analysis. Thee Chi-square (χ^2) test assessedd the significance off differences betweenn percentages. A P-value ≤ 0.05 wass consideredf statistically significant, whilee a P-value ≤ 0.01 was considered highly significant. P-values greater than 0.05 werea deemed non-significant (Field,2018).

Discussion

The current investigation evaluatedg the therapeutic efficacy of standard triple therapyh in eradicating Helicobacter pylori infectionm among patients in Zakho, Kurdistan Region of Iraq. The overallk eradicationm rate observed was 89%, indicating a highd level of therapeutic success. This outcome aligns with previous studies inj similar demographic settingsd that reported eradicationf rates ranging from 80% to 90% when adherence and drugh resistance were not limiting factors (Graham & Dore, 2016)

A statistically significant associationm was identified between treatment response and patient sex (P = 0.0001), with a slightlyu higher response rate in males (90.7%) compared to females (87.7%). Although the absolute differencej in response between sexes was small, the high significance level suggests a potential sex-related biological or behavioralk factor influencing treatment outcomes, such as drugj metabolism, adherence, or hormonal influences on gastric physiology (Malfertheiner et al., 2022; Thung et al., 2016).

The analysis also revealed a significant correlationj between symptom presentation and treatment response (P = 0.0001). Patients with epigastrick pain were the most responsive tok therapy, possibly indicating a more localizedl infection pattern compared to systemic symptoms such as anorexia or nausea. This finding supports the clinical utility of symptom-basedg stratification in predicting response and guidingk initial treatment (Tursi et al., 2020).

Furthermore, age distribution demonstratedk a significant associationl with symptom presentation (P = 0.001), highlighting thato younger age groups (particularly 21–30 years) had higher infectionk rates and more definedp symptom profiles. These findings underscore the needk to consider age-related variations in symptom expression and immune response when designing eradicationk strategies (Ghotaslou, Leylabadlo, & Asl, 2015; Malfertheiner et al., 2022).

Overall, the study provides robustd evidence for the continued use of standard triple therapyp in this population. However, the presence of non-responders (11%) highlights the potentiall for emerging antibiotic resistance, underlining the importanced of surveillance and alternative treatment protocols (Thung et al., 2016; Tursi et al., 2020).

Recommendations

Maintain the use of standard triple therapy as a first-line treatment for H. pylori eradication in Zakho, given the high observed success rate (89%). Implement routine follow-up testing post-therapy to confirm eradication, especially in patients with persistent or atypical symptoms. Investigate the underlying causesd of treatment failure in the 11% of non-responders, with a focus on antibiotic resistance patterns, patient compliance, and pharmacogenetic differences. Enhance public health education regarding H. pylori transmission, treatmentd adherence, and the importance of completing the full antibiotic course.Develop region-specific antibioticd susceptibility profiles, particularly for clarithromycin and amoxicillin, to inform tailored therapy in future clinicalh guidelines. Conduct longitudinal studies to assess reinfectiond rates and long-term outcomes of therapy in relation to demographic variables, especially age and sex. Incorporate symptom-based screening in primaryd care to guide early testing and timely initiation of therapy, particularly in young adults presenting with epigastric pain.

Reference

- Sugano K et al. Kyoto global consensus report on Helicobacter pylori gastritis. Gut 64, 1353–1367 (2015). [DOI] [PMC free article] [PubMed] [Google Scholar]
- Suerbaum S & Michetti P Helicobacter pylori infection. N. Engl. J. Med 347, 1175–1186 (2002). [DOI] [PubMed] [Google Scholar]
- Peek RM Jr & Blaser MJ Helicobacter pylori and gastrointestinal tract adenocarcinomas. Nat. Rev. Cancer 2, 28–37 (2002). [DOI] [PubMed] [Google Scholar]
- Amieva MR & El-Omar EM Host-bacterial interactions in Helicobacter pylori infection. Gastroenterology 134, 306–323 (2008). [DOI] [PubMed] [Google Scholar]
- van Amsterdam K, van Vliet AH, Kusters JG & van der Ende A Of microbe and man: determinants of Helicobacter pylori-related diseases. FEMS Microbiol. Rev 30, 131–156 (2006). [DOI] [PubMed] [Google Scholar]
- Burucoa, C., & Delchier, J. C. (2013). New treatments for Helicobacter pylori infection. Gastroenterology Clinics of North America, 42(2), 393–408. https://doi.org/10.1016/j.gtc.2013.01.002
- Chey, W. D., Leontiadis, G. I., Howden, C. W., & Moss, S. F. (2017). ACG Clinical Guideline: Treatment of Helicobacter pylori Infection. American Journal of Gastroenterology, 112(2), 212–239. https://doi.org/10.1038/ajg.2016.563
- Field, A. (2018). Discovering statistics using IBM SPSS Statistics (5th ed.). SAGE Publications.
- Fischbach, W., Malfertheiner, P., Hoffmann, J. C., et al. (2019). First-line treatment of Helicobacter pylori infection in Germany: A retrospective, observational study of real-world data. United European Gastroenterology Journal,

7(8), 1035–1045. https://doi.org/10.1177/2050640619856592
- Ghotaslou, R., Leylabadlo, H. E., & Asl, Y. M. (2015). Helicobacter pylori antibiotic resistance: Emerging challenges. World Journal of Gastroenterology, 21(36), 10548–10562. https://doi.org/10.3748/wjg.v21.i36.10548
- Gisbert, J. P., & Calvet, X. (2011). Review article: Common misconceptions in the management of Helicobacter pylori-associated gastroduodenal diseases. Alimentary Pharmacology & Therapeutics, 34(7), 628–642. https://doi.org/10.1111/j.1365-2036.2011.04786.x
- Graham, D. Y., & Dore, M. P. (2016). Update on the use of antibiotics to treat Helicobacter pylori infection. Gastroenterology Clinics of North America, 45(3), 471–483. https://doi.org/10.1016/j.gtc.2016.04.006
- Graham, D. Y., & Shiotani, A. (2008). Helicobacter pylori epidemiology and methods of eradication. Gastroenterology Clinics of North America, 37(2), 285–308. https://doi.org/10.1016/j.gtc.2008.03.001
- International Agency for Research on Cancer (IARC). (1994). IARC monographs on the evaluation of carcinogenic risks to humans: Volume 61. Helicobacter pylori. IARC Press.
- Kato, M., Asaka, M., Sugano, K., et al. (2013). Guidelines for the management of Helicobacter pylori infection in Japan: 2013 revised edition. Helicobacter, 18(2), 1–20. https://doi.org/10.1111/hel.12036
- Malaty, H. M., & El-Kasabany, A. (2000). Helicobacter pylori in developing countries. World Journal of Gastroenterology, 6(7), 681–686.
- Malfertheiner, P., Megraud, F., Rokkas, T., et al. (2022). Management of Helicobacter pylori infection: The Maastricht VI/Florence consensus report. Gut, 71(9), 1724–1752. https://doi.org/10.1136/gutjnl-2022-327745
- Mégraud, F. (2004). Helicobacter pylori and extragastric diseases. Helicobacter, 9(Suppl 1), 1–6. https://doi.org/10.1111/j.1083-4389.2004.00008.x
- Moher D, Liberati A, Tetzlaff J, Altman DG. (2009). PRISMA statement. PLoS Med, 6(7): e1000097.
- Nyssen, O. P., Vaira, D., Tepes, B., et al. (2021). European Registry on Helicobacter pylori management (Hp-EuReg): Patterns and outcomes of first-line empirical eradication therapy in 30 countries. The Lancet Gastroenterology & Hepatology, 6(9), 668–678. https://doi.org/10.1016/S2468-1253(21)00147-2
- Suerbaum, S., & Josenhans, C. (2007). Helicobacter pylori evolution and phenotypic diversity. Gut, 56(12), 1724–1734. https://doi.org/10.1136/gut.2007.12637
- Suerbaum, S., & Michetti, P. (2002). Helicobacter pylori infection. The New England Journal of Medicine, 347(15), 1175–1186. https://doi.org/10.1056/NEJMra020542
- Sugano, K., Tack, J., Kuipers, E. J., et al. (2015). Kyoto global consensus report on Helicobacter pylori gastritis. Gut, 64(9), 1353–1367. https://doi.org/10.1136/gutjnl-2015-309252
- Thung, I., Aramin, H., Vavinskaya, V., et al. (2016). The global emergence of Helicobacter pylori antibiotic resistance. Alimentary Pharmacology & Therapeutics, 43(4), 514–533. https://doi.org/10.1111/apt.13497
- Tursi, A., Elisei, W., Giorgetti, G. M., Brandimarte, G., Forti, G., & Picchio, M. (2020). Real-world efficacy and safety of different H. pylori eradication regimens: A multicenter study from Italy. BMC Gastroenterology, 20(1), 189. https://doi.org/10.1186/s12876-020-01362-0
- Wells GA, Shea B, O'Connell D, et al. (2000). The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomized studies in meta-analyses
- World Health Organization. (2017). Guidelines for the diagnosis and treatment of Helicobacter pylori in adults.
- Sugano K et al. Kyoto global consensus report on Helicobacter pylori gastritis. Gut 64, 1353–1367 (2015). [DOI] [PMC free article] [PubMed] [Google Scholar]
- Suerbaum S & Michetti P Helicobacter pylori infection. N. Engl. J. Med 347, 1175–1186 (2002). [DOI] [PubMed] [Google Scholar]
- Peek RM Jr & Blaser MJ Helicobacter pylori and gastrointestinal tract adenocarcinomas. Nat. Rev. Cancer 2, 28–37 (2002). [DOI] [PubMed] [Google Scholar]
- Amieva MR & El-Omar EM Host-bacterial interactions in Helicobacter pylori infection. Gastroenterology 134, 306–323 (2008). [DOI] [PubMed] [Google Scholar]
- van Amsterdam K, van Vliet AH, Kusters JG & van der Ende A Of microbe and man: determinants of Helicobacter pylori-related diseases. FEMS Microbiol. Rev 30, 131–156 (2006). [DOI] [PubMed] [Google Scholar]