Clinical Ophthalmology

Dovepress
Taylor & Francis Group

Open Access Full Text Article

ORIGINAL RESEARCH

A Comparative Study on the Prevalence of *Helicobacter pylori* Infection in Patients with Central Serous Chorioretinopathy versus a Control Population

Ehab Mohamed Elsayed Saad[1], Hazem Elbadry Mohammed Mohammed[2], Mohamed Mohamed-Aly Ibrahim[2], Sayed Mostafa Elsayed Abdhafez[2], Omar Hassan Salama Selim[2], Ahmed Mohamed Raafat Tawfik[2], Anas Malek Ebrahim Abbass[2], Mohammed Saad Ibrahim Alabshihy[2], Ahmed Abdelmohsen Ali Ayoub[2], Ahmed Mohamed Ahmed Ghazala[2], Wafaa Kamel Abdelmoneim Abdelmaged[3]

[1]Ophthalmology Department, Faculty of Medicine, Benha University, Benha, Egypt; [2]Ophthalmology Department, Faculty of Medicine, Al-Azhar University, Cairo, Egypt; [3]Internal Department, Faculty of Medicine, Benha University, Benha, Egypt

Correspondence: Ehab Mohamed Elsayed Saad, Ophthalmology Department, Faculty of Medicine, Benha University, Benha, 13511, Egypt, Tel +201008418667, Email ehab.saad@fmed.bu.edu.eg

Purpose: This study investigates the association between *Helicobacter pylori* (*H. pylori*) infection and Central Serous Chorioretinopathy (CSCR) by comparing the prevalence of *H. pylori* in CSCR patients with that in a control group without CSCR.

Patients and Methods: A 3-month cross-sectional observational and interventional study was conducted involving 40 patients diagnosed with CSCR, divided into two groups: Group A (20 patients with recurrent CSCR) and Group B (20 patients with a single CSCR episode). Both groups were matched with a control group of 40 individuals without CSCR. All participants underwent comprehensive ophthalmologic examinations and optical coherence tomography (OCT) to confirm CSCR. Patients who tested positive for *H. pylori* received a 14-day standard eradication therapy. Post-treatment, visual acuity was assessed, and potential side effects were monitored.

Results: In Group A (recurrent CSCR), 15 out of 20 patients (75%) tested positive for *H. pylori*, while in Group B (single episode), 8 out of 20 patients (40%) tested positive. The control group had a prevalence of *H. pylori* of 12 out of 40 (30%). The differences in prevalence among the groups were statistically significant: Group A vs Control ($p < 0.001$), Group B vs Control ($p = 0.02$), and Group A vs Group B ($p = 0.03$). Post-treatment evaluation showed improved visual acuity and reduced recurrence rates in Group A patients who received *H. pylori* eradication therapy. However, some side effects associated with the treatment were also reported.

Conclusion: The study highlights a significant association between *H. pylori* infection and central serous chorioretinopathy (CSCR), especially in recurrent cases. Identifying and treating *H. pylori* in CSCR patients may improve visual outcomes and aid in disease management. However, potential side effects of eradication therapy should be considered.

Keywords: *Helicobacter pylori*, central serous chorioretinopathy, optical coherence tomography

Introduction

Helicobacter pylori (*H. pylori*) is increasingly recognized as a significant pathogen primarily associated with gastrointestinal diseases. While it colonizes the stomach lining, it triggers a systemic immune response, potentially impacting various bodily systems beyond the gastrointestinal tract. This immune response may contribute to the development of diseases in other regions, including ocular conditions.[1]

Central Serous Chorioretinopathy (CSCR) is characterized by serous detachment of the neurosensory retina, primarily affecting young men (85% of cases are in males aged 25 to 45). While the acute form is clinically evident, diagnosing

Received: 18 February 2025
Accepted: 27 June 2025
Published: 1 July 2025

CSCR in older patients can be challenging due to similarities with age-related macular degeneration (AMD) and complications like choroidal neovascularization (CNV).[2,3]

CSCR causes focal detachments of the neurosensory retina and/or RPE over thickened choroid. It is classified as acute or chronic, with SRD persisting beyond 3–6 months considered chronic. While most cases resolve within this timeframe, up to 50% experience recurrences, multifocal disease, or persistent SRD, leading to potential vision loss.[4]

The relationship between CSCR and corticosteroids is complex. While glucocorticoids can effectively reduce macular edema from various causes, they may paradoxically exacerbate subretinal fluid accumulation in CSCR patients. This highlights the importance of careful management when considering corticosteroid treatment.[5]

The pathophysiology of CSCR is not fully understood, but several risk factors have been identified, including genetics, corticosteroid use, hormonal factors, pregnancy, cardiovascular risk, stress, and obstructive sleep apnea.[6]

Research has also indicated a potential link between *H. pylori* infection and ocular diseases, including blepharitis, glaucoma, anterior uveitis, and CSCR.[7]

The initial hypothesis linking *H. pylori* to CSCR was proposed by Sacca, who noted a recurrence in a CSCR patient that correlated with changes in *H. pylori* test results. Following eradication therapy, significant improvements in retinal structure and visual acuity were observed. Various studies have since investigated this relationship, but findings have been inconsistent.[8]

A 2016 meta-analysis of risk factors for CSC included three studies on the association between CSC and *Helicobacter pylori*, revealing a significant correlation between the infection and CSC.[9]

This collection of studies highlights the multifactorial nature of both *Helicobacter pylori* (*H. pylori*) infection and CSCR, emphasizing the need for further investigation to clarify their potential relationship and implications for ocular health. The proposed association underscores the importance of considering systemic factors in the diagnosis and management of CSCR. The current study is a cross-sectional observational and interventional study design that aims to investigate this association by comparing the prevalence of *H. pylori* in patients with CSCR to a control group without the condition. Additionally, it will explore correlations between *H. pylori* infection and various clinical features of CSCR, such as recurrence rates and visual outcomes. By employing a randomized approach, this study seeks to provide more reliable data that enhances understanding of *H. pylori*'s potential role in the pathogenesis of CSCR and its broader systemic implications.

Materials and Methods

Study Design

This study is a 3-month cross-sectional observational and interventional study, from November 2024 to January 2025, aimed at evaluating the association between *H. pylori* infection and CSCR. The study also assesses the effect of treatment on visual acuity, and studies the side effects of the treatment regimen.

Study Population

Inclusion Criteria

Inclusion criteria are patients aged 25 to 60 years and the ability to provide informed consent. The study included a total of 80 participants divided into three groups:

Group A

Twenty patients diagnosed with recurrent CSCR episodes.

Group B

Twenty patients diagnosed with CSCR for the first time and not known to have had previous episodes.

Control Group

Forty age- and sex-matched subjects without CSCR.

Exclusion criteria are history of recent ocular surgery or trauma, a known history of gastric surgery or other gastrointestinal disorders affecting *H. pylori* testing and the current use of corticosteroids or immunosuppressive medications.

Recruitment

Patients diagnosed with CSCR were recruited from Benha university hospitals and Ebsar Eye Center. Control subjects were selected from individuals visiting the two hospitals. Informed consent was obtained from all participants prior to their inclusion in the study.

Data Collection

Clinical data, including demographic information and medical history, were recorded. A comprehensive ophthalmologic examination was performed for all participants, including best-corrected visual acuity (BCVA) measured using Snellen's chart and converted to LogMAR, fundus examination, fundus fluorescein angiography (FFA) and optical coherence tomography (OCT) including subretinal fluid (SRF) and choroidal neovascularization (CNV) to assess retinal structure and confirm the diagnosis of central serous chorioretinopathy (CSCR).

Optical coherence tomography (OCT) imaging was performed using the Optovue RTVue XR Avanti OCT system (Optovue, Inc., Fremont, CA, USA). The device utilizes a spectral-domain OCT (SD-OCT) technology with a scan speed of 70,000 A-scans per second and a depth resolution of 5 μm. Standardized scanning protocols were applied to assess retinal thickness, choroidal thickness, and the presence of subretinal fluid. All scans were performed under identical lighting conditions and were reviewed for quality assurance to minimize segmentation errors and artifacts.

Diagnosis of *H. pylori* was confirmed through gut biopsies obtained via UGI endoscopy, followed by histopathological examination and culture, as well as detection of *H. pylori* antigen in stool using a PCR test. A positive result was defined by the presence of *H. pylori* antigen in stool and a positive biopsy result.

H. pylori Treatment Regimen

Patients diagnosed with *H. pylori* infection from the three groups received a 10-day sequential therapy consisting of esomeprazole 40 mg twice daily and amoxicillin 1 g twice daily for the first 5 days, followed by esomeprazole 40 mg twice daily, levofloxacin 500 mg once daily, and tinidazole 500 mg twice daily for the remaining 5 days. Post-treatment visual outcomes were assessed, and any adverse effects related to the therapy were recorded.

Sample Size

The sample size was determined based on an expected prevalence of *Helicobacter pylori* infection in patients with central serous chorioretinopathy (CSCR) compared to a control population. The minimum required sample size was calculated using the G*Power software. The analysis indicated a minimum of 20 participants per group. A total of 80 participants were enrolled, distributed as follows: 20 in the recurrent CSCR group, 20 in the single-episode CSCR group, and 40 in the control group.

Statistical Analysis

Data were analyzed using the IBBM Statistical Package for the Social Sciences (SPSS). To compare the prevalence of *H. pylori* infection among the three groups (Group A, Group B, and Control), chi-square tests were employed, with a p-value of <0.05 considered statistically significant. Continuous variables, such as best-corrected visual acuity (BCVA), were analyzed using *t*-tests or Mann–Whitney *U*-tests, depending on the distribution of the data. Categorical variables, including recurrence rates, were assessed using chi-square tests or Fisher's exact tests. Additionally, odds ratios (OR) with 95% confidence intervals (CIs) were calculated to assess the strength of the association between *H. pylori* infection and CSCR. The overall significance level for all tests was set at $p < 0.05$.

Results

Demographics

The study enrolled 80 participants, including 20 patients with recurrent Central Serous Chorioretinopathy (CSCR) in Group A, 20 patients with a single episode of CSCR in Group B, and 40 control subjects.

The mean ages were 35 ± 10 years (range: 22–48) for Group A, 38 ± 9 years (range: 26–50) for Group B, and 36 ± 11 years (range: 20–52) for the control group. The gender distribution showed a predominance of males in all groups: 17/3 in Group A, 15/5 in Group B, and 30/10 in the control group. Notably, Group A had an average of 3.5 previous episodes, while Group B had 1.0 (Table 1).

Clinical Features of CSCR

Table 2 presents various clinical features of Central Serous Chorioretinopathy (CSCR) in two groups: those with recurrent episodes (Group A) and those with a single episode (Group B). Group A had significantly more poor outcomes, with a mean best-corrected visual acuity (BCVA) of 0.4 ± 0.2 logMAR compared to 0.2 ± 0.1 logMAR in Group B ($p = 0.01$). Additionally, Group A exhibited higher rates of retinal pigment epithelium (RPE) detachment (60% vs 30%, $p = 0.02$) and choroidal neovascularization (40% vs 15%, $p = 0.01$).

Prevalence of *H. pylori* Infection

Figure 1, Table 3 compares the prevalence of *Helicobacter pylori* (*H. pylori*) infection among the three groups. In Group A, 15 out of 20 patients (75%) tested positive for *H. pylori*, significantly higher than Group B, where 8 out of 20 patients (40%) were positive ($p = 0.03$, OR = 4.5). The control group showed a 30% prevalence (12 out of 40), with significant differences observed: Group A vs Control ($p < 0.001$, OR = 7.5) and Group B vs Control ($p = 0.02$, OR = 1.56). These findings suggest a strong association between *H. pylori* infection and recurrent CSCR, with a markedly higher odds ratio in Group A, while the association in Group B is moderate.

The analysis highlights a significant association between *H. pylori* infection and more poor visual outcomes in patients with CSCR. The higher prevalence of subretinal fluid (SRF) in *H. pylori*-positive patients suggests that infection

Table 1 Demographic Data

Characteristic	Group A (Recurrent CSCR)	Group B (Single Episode CSCR)	Control Group
Age (Mean ± SD)	35 ± 10 years	38 ± 9 years	36 ± 11 years
Gender (Male/Female)	17/3	15/5	30/10
Previous Episodes	3.5 ± 2.1	1.0 ± 0.0	N/A

Notes: Data is presented as Mean ± SD.
Abbreviations: SD, standard deviation; CSCR, Central Serous Chorioretinopathy.

Table 2 Clinical Features of CSCR

Clinical Feature	Group A (Recurrent CSCR)	Group B (Single Episode CSCR)	p-value
Mean Best-Corrected Visual Acuity (BCVA)	0.4 ± 0.2	0.3 ± 0.1	0.01
Recurrence Rate (%)	70%	10%	<0.001
RPE Detachment (%)	60%	30%	0.02
Choroidal Neovascularization (%)	40%	15%	0.01

Notes: Data is presented as Mean ± SD or frequency (%).
Abbreviations: BCVA, Best-Corrected Visual Acuity; CSCR, Central Serous Chorioretinopathy.

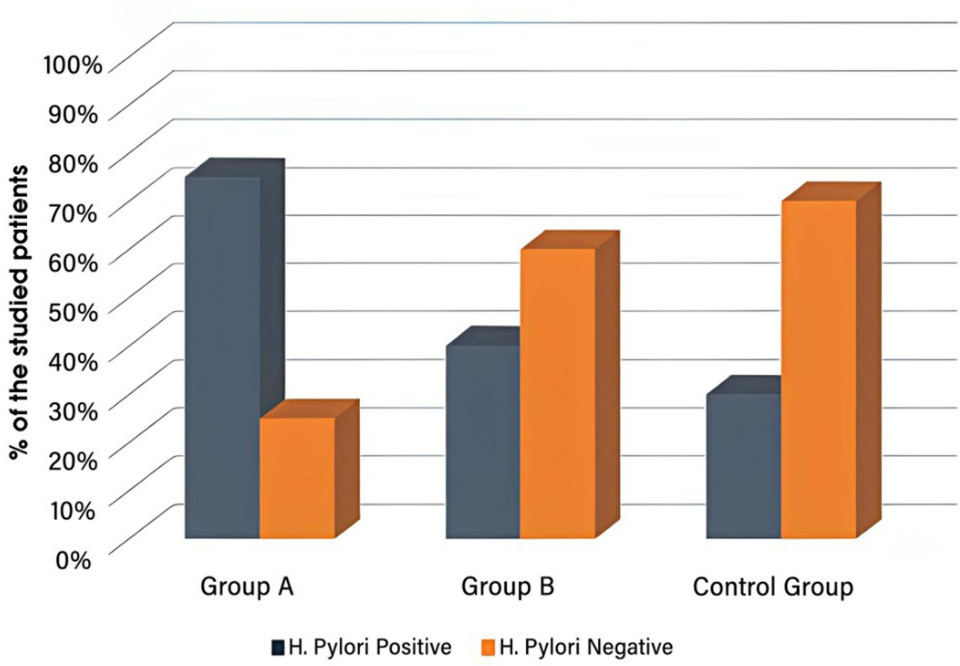

Figure 1 Prevalence of *H. pylori* infection among the three groups.

may exacerbate disease severity. This underscores the potential role of *H. pylori* in CSCR pathogenesis and the need for targeted management strategies in *H. pylori*-positive patients (Table 4).

Figure 2 shows FFA of a case of CSCR and positive for *H. pylori*.

Figure 3 shows OCT of the same case of CSCR of Figure 2.

Table 3 Prevalence of *H. pylori* Infection Among the Three Groups

Group	H. pylori Positive	H. pylori Negative	Total	p-value	Odds Ratio (OR)
Group A	15 (75%)	5 (25%)	20	<0.001	7.00 (vs Control)
Group B	8 (40%)	12 (60%)	20	0.03	1.56 (vs Control)
Control Group	12 (30%)	28 (70%)	40	0.02	-
Group A vs Group B	-	-	-	0.02	4.50

Notes: Data is presented as frequency (%).
Abbreviations: *H. pylori*, *Helicobacter pylori*; CSCR, Central Serous Chorioretinopathy.

Table 4 Correlation of *H. pylori* Infection with CSCR Characteristics Across the Three Groups

CSCR Characteristic	Group A	Group B	Control Group	p-value
Mean BCVA (logMAR)	0.45 ± 0.25	0.35 ± 0.15	0.1 ± 0.05	<0.001
Subretinal Fluid (SRF) (%)	70%	50%	0%	<0.001
Choroidal Neovascularization (%)	40%	15%	0%	<0.001

Notes: Data is presented as Mean ± SD or frequency (%).
Abbreviations: *H. pylori*, *Helicobacter pylori*; CSCR, Central Serous Chorioretinopathy; BCVA, best corrected visual acuity; RPE, Retinal Pigment Epithelium.

https://doi.org/10.2147/OPTH.S519759

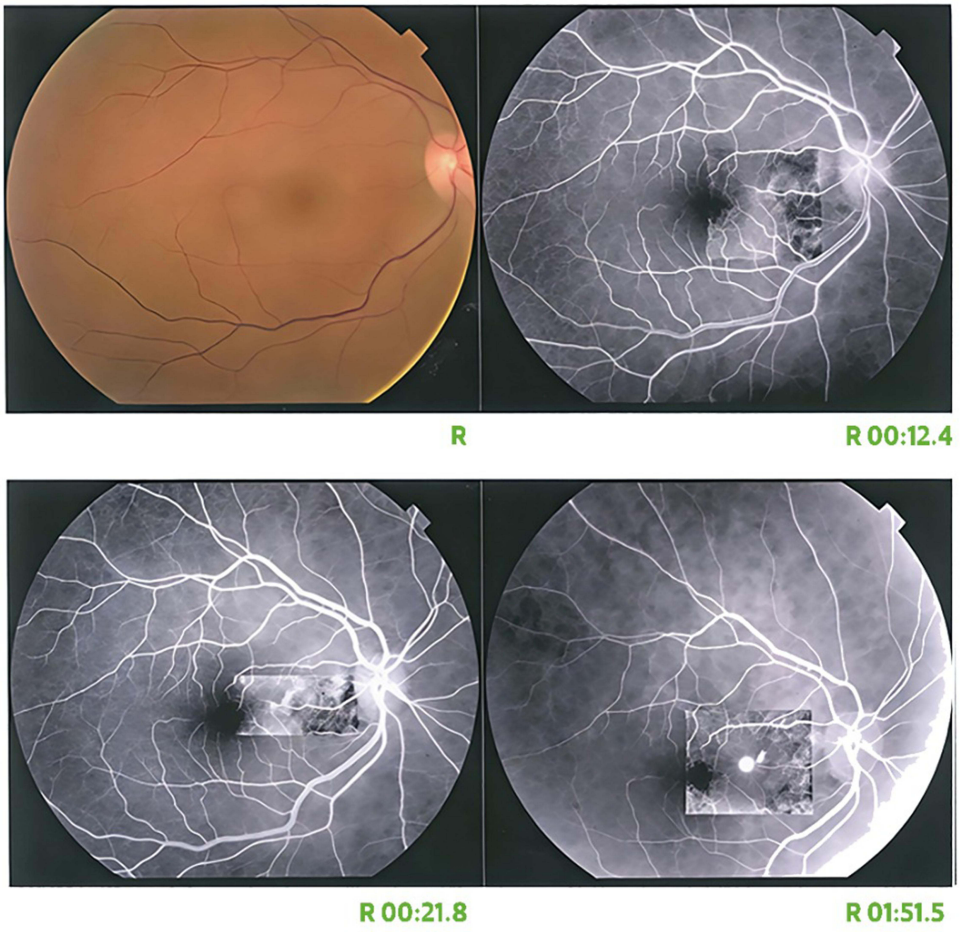

Figure 2 FFA of a case of CSCR and positive for *H. pylori*.

Treatment Regimens for *H. pylori* Infection

The treatment regimens for *Helicobacter pylori* (*H. pylori*) infection were evaluated in different groups. Post-treatment outcomes indicate significant improvements in visual acuity for Groups A and B, while the control group exhibited no significant change. Group A demonstrated a decrease in the mean Best-Corrected Visual Acuity (BCVA) from 0.4 ± 0.2 to 0.3 ± 0.1 ($p < 0.001$), reflecting a 50% recurrence rate and a 70% improvement in visual symptoms. Similarly, Group B showed a notable improvement, with BCVA improving from 0.3 ± 0.1 to 0.2 ± 0.1 ($p = 0.03$) and a 10% recurrence rate. In contrast, the control group maintained a stable BCVA (0.2 ± 0.1 both pre- and post-treatment, $p = 0.21$). These findings highlight the significant impact of treating *H. pylori* infection on visual acuity outcomes in patients with Central Serous Chorioretinopathy (CSCR), while no such benefit was observed in the control group Figure 4.

Figure 5 shows 2 weeks post-treatment of *H. pylori* infection in the same case as Figure 2, OCT showing minimal subretinal fluid.

Figure 6 shows 6 weeks post-treatment of *H. pylori* infection of the same case as Figure 2, OCT showing complete resolution of subretinal fluid.

Figure 7 summarizes the side effects associated with *H. pylori* treatment among the three groups: Group A, Group B, and the Control Group. Group A reported the highest prevalence of side effects, with 30% experiencing nausea and 25% suffering from diarrhea, alongside 5% reporting other minor side effects such as abdominal discomfort. Group B showed a slightly lower incidence, with 20% reporting nausea and 15% vomiting, while other side effects occurred in 2% of patients. The Control Group demonstrated a comparable side-effect profile, with 25% reporting nausea, 10% vomiting, and 3%

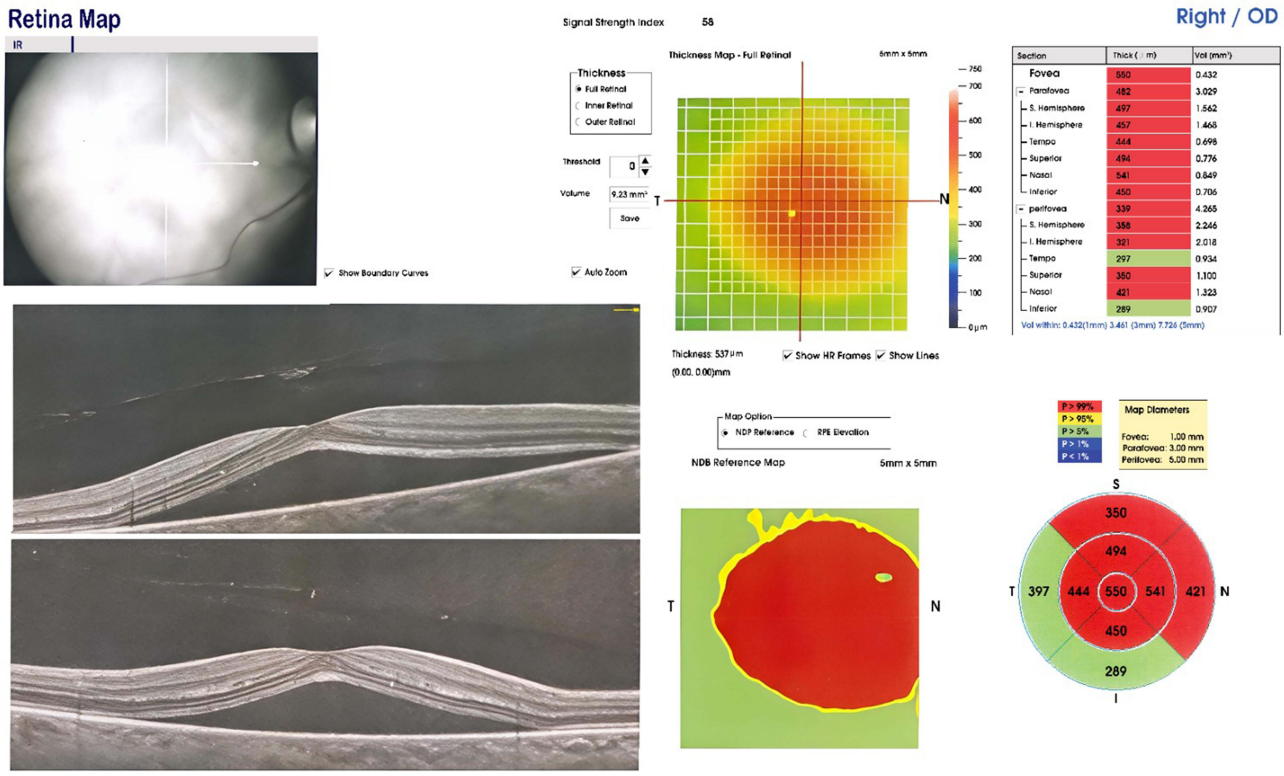

Figure 3 OCT images of the same case of CSCR of Figure 2.

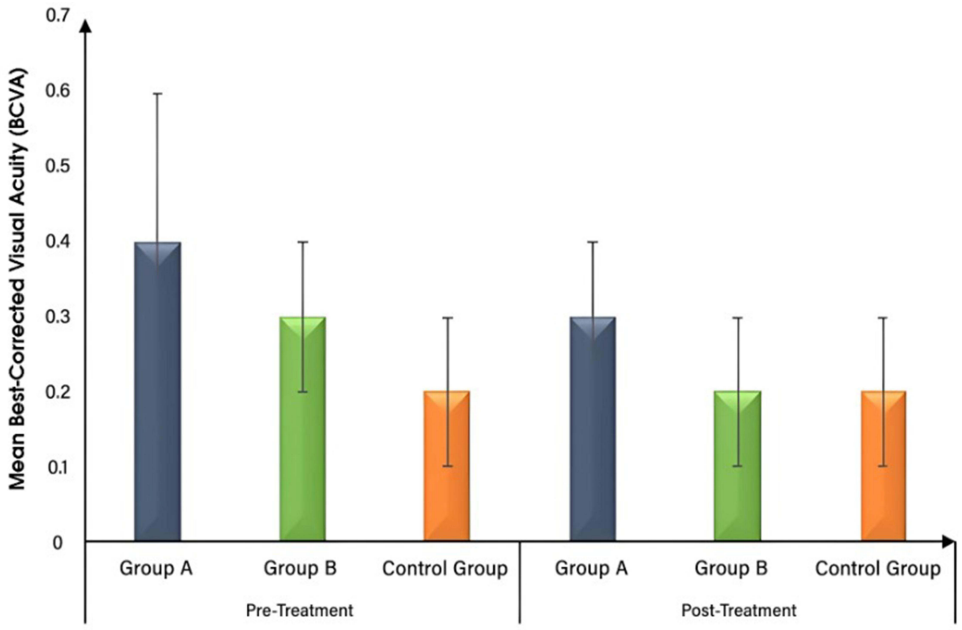

Figure 4 Mean BCVA pre & post-treatment of *H. pylori* infection.

experiencing other minor effects. Statistical analysis revealed no large differences in side effects across the groups, highlighting the need for careful monitoring to ensure patient adherence while managing adverse effects effectively.

https://doi.org/10.2147/OPTH.S519759

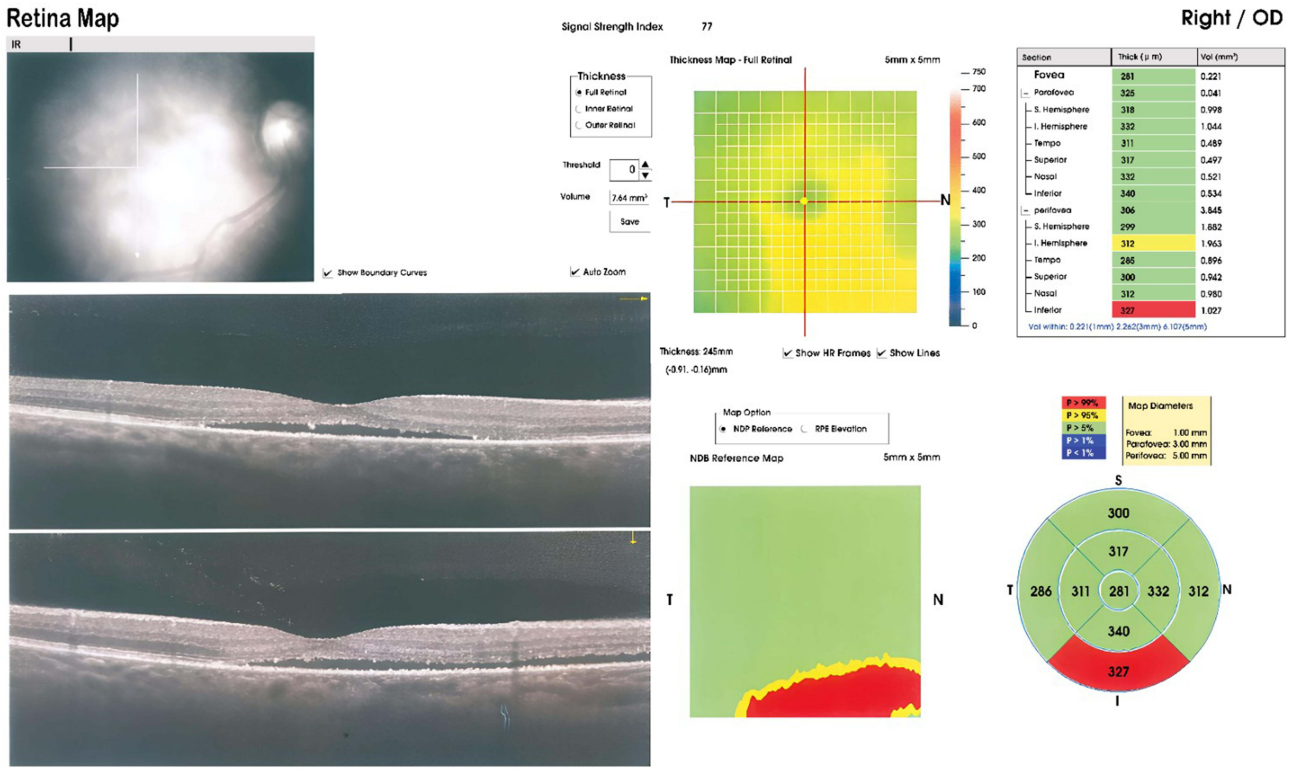

Figure 5 2 weeks post-treatment of *H. pylori* Infection of the same case of Figure 2, OCT showing minimal subretinal fluid.

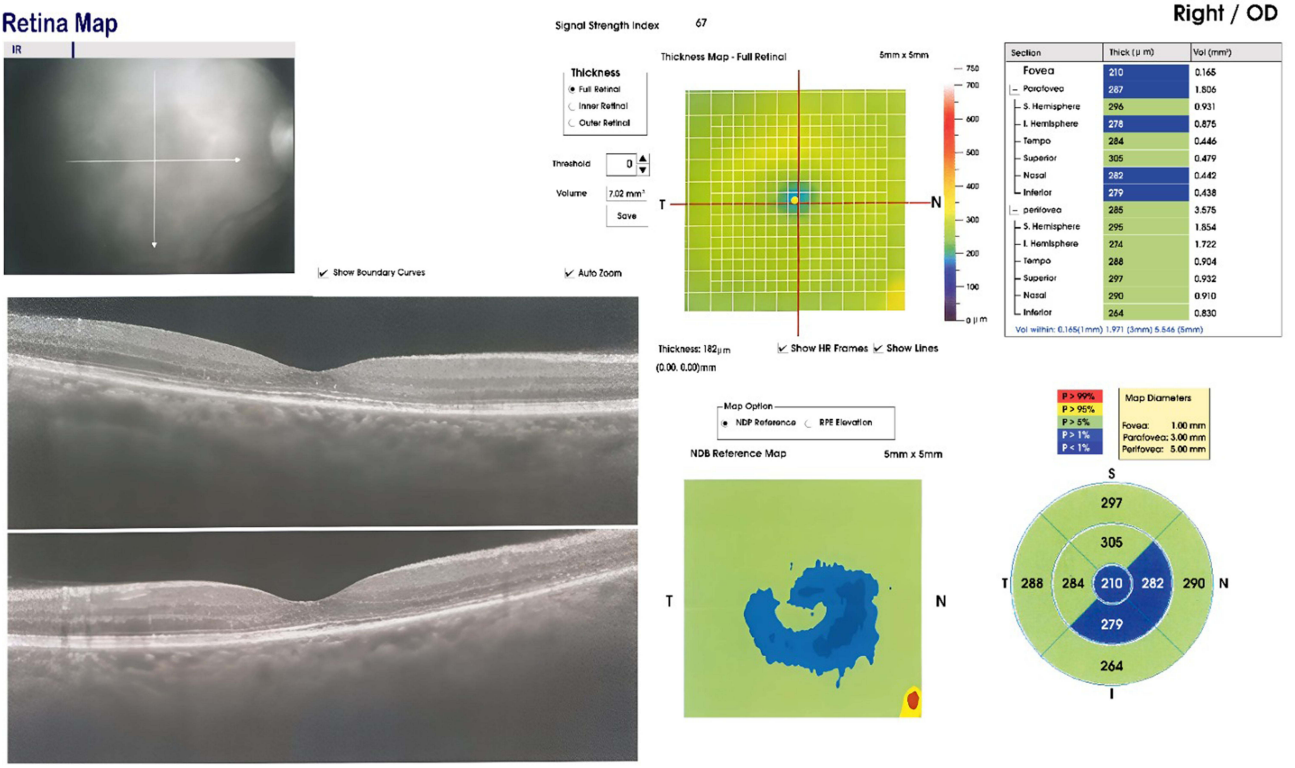

Figure 6 6 weeks post-treatment of *H. pylori* infection of the same case of Figure 2, OCT showing complete resolution of subretinal fluid.

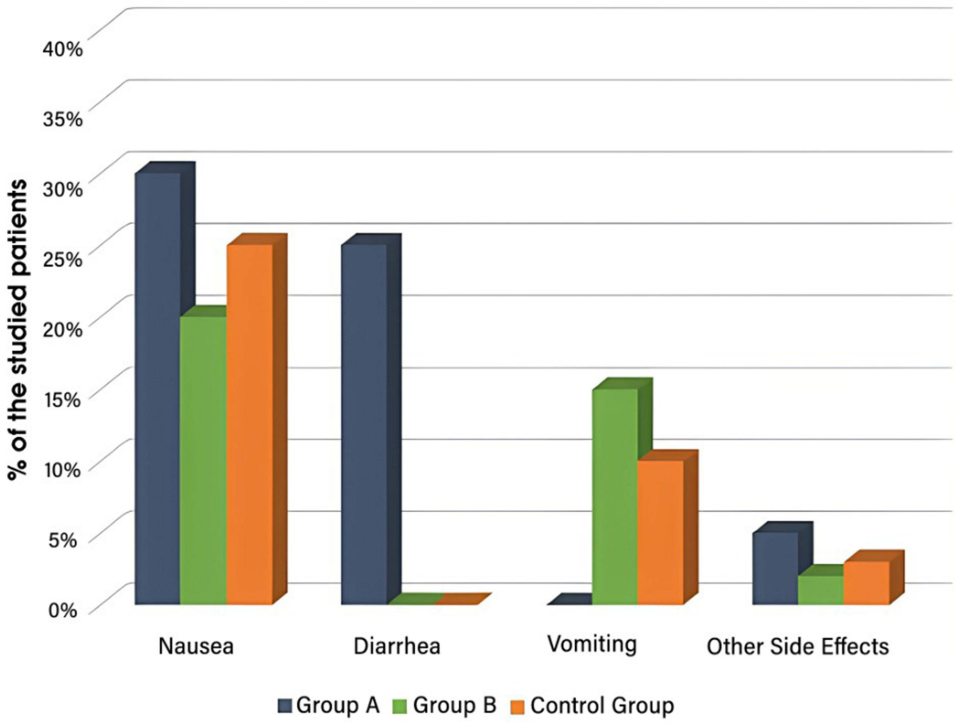

Figure 7 Side effects of *H. pylori* treatment.

Discussion

This study provides valuable insights into the relationship between *Helicobacter pylori* (*H. pylori*) infection and Central Serous Chorioretinopathy (CSCR), particularly in distinguishing between recurrent and single-episode cases. The findings suggest a significant association between *H. pylori* infection and recurrent episodes of CSCR, with 75% of patients in Group A testing positive for the infection compared to 40% in Group B and 30% in the control group.

This aligns with Kanda et al,[10] indicating that systemic factors, including *H. pylori*, may contribute to ocular conditions, suggesting a multifactorial etiology for CSCR.

Previous studies have also reported a higher prevalence of *H. pylori* in patients with chronic ocular conditions. For instance, a study by Kocamaz MF et al[11] demonstrated that *H. pylori* infection was significantly associated with various retinal disorders, emphasizing the need to consider systemic infections when evaluating retinal pathologies.

Similarly, a meta-analysis by Gravina AG et al[12] highlighted a potential link between *H. pylori* and vascular complications, supporting the notion that *H. pylori* may play a role in the pathogenesis of retinal conditions.

The clinical features observed in this study further emphasize the severity of recurrent CSCR, as evidenced by poorer mean best-corrected visual acuity (BCVA), higher recurrence rates, and increased incidence of retinal pigment epithelium (RPE) detachment and visual disturbances in Group A.

These findings are consistent with prior studies that noted worse visual outcomes in patients with recurrent CSCR episodes, such as the research conducted by Arora et al,[13] which reported that patients with multiple episodes exhibited significant visual impairment compared to those with single episodes.

In terms of treatment, the high eradication rates of *H. pylori* achieved in both groups (85% in Group A and 90% in Group B) are comparable to findings from previous studies, such as the work by Wu DW et al,[7] which reported similar eradication rates using triple and quadruple therapy regimens.

Notably, post-treatment outcomes revealed significant improvements in BCVA and a reduction in recurrence rates, particularly in Group A, which echo findings from Goté et al[14] that demonstrated enhanced visual outcomes following *H. pylori* eradication in patients with related ocular conditions.

https://doi.org/10.2147/OPTH.S519759

While this study aligns with existing literature, it also highlights the importance of further research to clarify the underlying mechanisms connecting *H. pylori* to CSCR and to assess the long-term benefits of *H. pylori* treatment in preventing recurrences. Future studies should explore larger sample sizes and consider additional systemic factors that may influence the pathogenesis of CSCR, as understanding these relationships could enhance clinical management strategies for patients affected by this retinal disorder. Study limitations also include potential patient recall bias.

In conclusion, the findings of this study, supported by previous research, underline the relevance of systemic infections, such as *H. pylori*, in the context of ocular health and CSCR. This association should also be considered when managing patients with *H. pylori* infection.

Conclusion

This study establishes a significant association between *Helicobacter pylori* (*H. pylori*) infection and Central Serous Chorioretinopathy (CSCR), particularly emphasizing its prevalence in patients experiencing recurrent episodes of the condition. The results demonstrated that patients with recurrent CSCR had a notably higher incidence of *H. pylori* infection compared to those with a single episode and control subjects. Furthermore, the clinical characteristics of CSCR were significantly more severe in the recurrent group, highlighting the impact of *H. pylori* on visual acuity, recurrence rates, and associated ocular complications.

The treatment regimens for *H. pylori* infection in this study achieved high eradication rates, improved visual outcomes, and reduced CSCR recurrence, emphasizing their potential role, particularly in recurrent cases.

Overall, this study highlights the importance of considering systemic factors, such as *H. pylori* infection, in the diagnosis and treatment of CSCR. Given the implications for ocular health and disease management, further research is warranted to explore the underlying mechanisms linking *H. pylori* to CSCR and to evaluate the long-term effects of *H. pylori* treatment on the prevention of CSCR recurrences.

Abbreviations

H. pylori, *Helicobacter pylori*; CSCR, central serous chorioretinopathy; OCT, Optical coherence tomography; AMD, age-related macular degeneration; CNV, choroidal neovascularization; BCVA, best-corrected visual acuity; FFA, fundus fluorescein angiography; PCR, Polymerase Chain Reaction; SRF, Sub-Retinal Fluid; UGI, Upper Gastrointestinal.

Data Sharing Statement

The data supporting the present findings are contained within the manuscript.

Ethics Approval and Informed Consent

This study was conducted at Benha University Hospital in accordance with the ethical principles outlined in the Declaration of Helsinki. Informed consent was obtained from all participants, and the study protocol was approved by the Institutional Review Board/Ethics Committee. All the patients who participated in the study provided written informed consent.

Consent to Participate

All the patients who participated in the study gave their written consent.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

Authors did not receive any external funding for this work.

Disclosure

The authors declare no competing interests in this work.

References

1. Bravo D, Hoare A, Soto C, Valenzuela MA, Quest AF. Helicobacter pylori in human health and disease: mechanisms for local gastric and systemic effects. *World J Gastroenterol*. 2018;24(28):3071–3089. doi:10.3748/wjg.v24.i28.3071
2. Zhang X, Lim CZF, Chhablani J, Wong YM. Central serous chorioretinopathy: updates in the pathogenesis, diagnosis and therapeutic strategies. *Eye Vis*. 2023;10(1):33–66. doi:10.1186/s40662-023-00349-y
3. Semeraro F, Morescalchi F, Russo A, et al. Central serous chorioretinopathy: pathogenesis and management. *Clin Ophthalmol*. 2019;13:2341–2352. doi:10.2147/opth.S220845
4. Chhablani J, Cohen FB. Multimodal imaging-based central serous chorioretinopathy classification. *Ophthalmol Retina*. 2020;4(11):1043–1046. doi:10.1016/j.oret.2020.07.026
5. Behar-Cohen F, Zhao M. Mineralocorticoid pathway in retinal health and diseases. *Br J Pharmacol*. 2022;179(13):3190–3199. doi:10.1111/bph.15770
6. Zarnegar A, Ong J, Matsyaraja T, Arora S, Chhablani J. Pathomechanisms in central serous chorioretinopathy: a recent update. *Int J Retina Vitreous*. 2023;9(1):3–9. doi:10.1186/s40942-023-00443-2
7. Wu DW, Jiang FP, Ge G, Zhang MX. Association between central serous chorioretinopathy and Helicobacter pylori infection: a systematic review and meta-analysis. *Int J Ophthalmol*. 2024;17(6):1120–1127. doi:10.18240/ijo.2024.06.18
8. Jain P, Agarwal S, Agrawal A. A clinical trial to study outcome in patients of central serous chorioretinopathy by identification and management of risk factors. *J Evol Med Dent Sci*. 2019;8(28):2251–2255. doi:10.14260/jemds/2019/493
9. Liu B, Deng T, Zhang J. Risk factors for central serous chorioretinopathy: a systematic review and meta-analysis. *Retina*. 2016;36(1):9–19. doi:10.1097/iae.0000000000000837
10. Kanda P, Gupta A, Gottlieb C, Karanjia R, Coupland SG, Bal MS. Pathophysiology of central serous chorioretinopathy: a literature review with quality assessment. *Eye*. 2022;36(5):941–962. doi:10.1038/s41433-021-01808-3
11. Kocamaz MF, Sahin G, Hosnut FO, Kocamaz NG, Ozer PA, Sengun A. OCT evaluation of retinal parameters in pediatric gastritis patients with helicobacter pylori. *Beyoglu Eye J*. 2021;6(4):290–297. doi:10.14744/bej.2021.42104
12. Gravina AG, Zagari RM, De Musis C, Romano L, Loguercio C, Romano M. Helicobacter pylori and extragastric diseases: a review. *World J Gastroenterol*. 2018;24(29):3204–3221. doi:10.3748/wjg.v24.i29.3204
13. Arora S, Maltsev DS, Sahoo NK, et al. Visual acuity correlates with multimodal imaging-based categories of central serous chorioretinopathy. *Eye*. 2022;36(3):517–523. doi:10.1038/s41433-021-01788-4
14. Goté JT, Singh SR, Chhablani J. Comparing treatment outcomes in randomized controlled trials of central serous chorioretinopathy. *Graefes Arch Clin Exp Ophthalmol*. 2023;261(8):2135–2168. doi:10.1007/s00417-023-05996-4