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PREVALENCE OF *HELICOBACTER PYLORI* REINFECTION AND SOME ASSOCIATED FACTORS: AN OVERVIEW

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ABSTRACT

Objective: To summarize evidence and provide an overview of the prevalence of *H. pylori* reinfection and describe some associated factors.

Subject and method: This scoping review was conducted by systematically searching PubMed, Cochrane Library, and Google Scholar for relevant studies published up to May 2024. Additional records were identified through manual reference checks. Studies were screened based on inclusion and exclusion criteria, and key data were extracted and synthesized narratively.

Results: A total of 40 studies were included, reporting annual reinfection rates of *H. pylori* that ranged from 0.8% to 29.8%, with higher rates observed in developing regions. Factors associated with reinfection included young age, low socioeconomic status, crowded living conditions, household exposure to infected individuals, poor hygiene practices, specific treatment regimens, and comorbidities. Preventive interventions reported in the literature encompassed hygiene education, community-based screening, and adjustments to eradication regimens.

Conclusion: *H. pylori* reinfection remains a significant public health concern, particularly in low-resource settings. Effective and context-specific preventive strategies are crucial to improving long-term eradication outcomes.

Keywords: *Helicobacter pylori*, reinfection, risk factors, preventive interventions, scoping review.

1. INTRODUCTION

Helicobacter pylori (H. pylori) infection is an essential cause of gastroduodenal diseases, including chronic gastritis, peptic ulcer, and gastric cancer, which can seriously affect the patient's quality of life [1]. Since 1994, *H. pylori* has been classified as a primary carcinogen by the World Health Organization, and *H. pylori* eradication treatment is identified as one of the primary measures to prevent gastric cancer [2]. Although *H. pylori* is a common bacterium and can be easily transmitted, *H. pylori* vaccine is not available. People infected with H. pylori and who have been successfully eradicated can still be reinfected with this bacterium. Reinfection is understood as the re-occurence of *H. pylori*, which can be a new strain or a reinfection with a previously infected strain. The period for determining reinfection is not yet agreed upon; it is commonly performed between 6 and 24 months to assess reinfection, with the C13/C14 Urease Breath Test serving as the gold standard for detecting *H. pylori*.

Several studies have been conducted in different regions and populations on *H. pylori* reinfection, including a survey by Gisbert et al. in 2005, which reported an average annual rate of *H. pylori* reinfection worldwide of 4.5% [3]. A study by Yaron Niv et al. on reinfection, with follow-up in patients who had successfully undergone *H. pylori* eradication treatment, reported that the reinfection rate was more common in developing countries, with an annual reinfection rate of 13%, compared

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with a yearly reinfection rate of approximately 2.7% in developed countries [4]. Several factors associated with *H. pylori* reinfection have been reported from studies, mainly showing socioeconomic status, poor sanitation, and lack of clean water [5]. Despite successful eradication efforts, reinfection of *H. pylori* remains a significant concern, especially in areas with high prevalence of infection, crowded population and having poor sanitation. Therefore, strategies to prevent *H. pylori* reinfection are urgently needed to reduce the disease burden caused by *H. pylori* in the community.

To develop and implement more effective prevention strategies that eliminate the risks of *H. pylori* reinfection, it is essential to identify and thoroughly understand the factors that influence transmission and reinfection, particularly in countries and regions with high residential density and inadequate sanitation. Therefore, this scoping review was conducted with the following objective: To summarize the evidence and provide an overview of the prevalence of *H. pylori* reinfection and describe some associated factors to the reinfection status.

2. STUDY PARTICIPANTS AND METHODS

2.1. Study design: A scoping review, following PRISMA-ScR guidelines [6].

2.2. Place and time: from May 2024 to February 2025 in Vietnam.

2.3. Study population:

- *Inclusion criteria:* Original studies on *H. pylori* reinfection and associated factors, accessible in full text and published in prestigious journals. Grey literature (e.g., policy reports, dissertations) was also considered, depending on the scope and objective of the review. Studies published worldwide as of May 2024, in both Vietnamese and English.

- *Exclusion criteria:* Studies that had been retracted from the journals.

2.4. Sample size and Sampling methods: Studies were identified using a set of keywords and purposively selected from the databases, then subjected to a screening process to ensure alignment with predefined inclusion and exclusion criteria.

2.5. Variables: Prevalence of *H. pylori* reinfection rates, associated factors: socio-demographic characteristics (geographic location, age, sex, income, socioeconomic status, treatment regimen, high population density, prevalence of *H. pylori* in the region, living habits like hand washing, eating and drinking, lack of clean water, living with *H. pylori* infected family member, knowledge about *H. pylori,* comorbidities,...)

2.6. Data collection:

Searching sources: Studies that had been published and had full-text access from online databases (Google Scholar, PubMed/MEDLINE, Cochrane Library, ScienceDirect, and other relevant databases).

Search strategy: search keywords are built and combined with the "AND" and "OR" algorithms to optimize search results, presented in Table 1 below:

Table 1. Search keywords

	AND			
OR	*Helicobacter pylori*	recurrence	epidemiology	associated factors
	H. pylori	reinfection	global prevalence	related factors
	H. p	recrudenscence		determinants

2.7. Data processing and analysis: This review applied PRISMA-ScR guidelines to describe the flow of searching and screening. Search results from online databases were downloaded and exported to Zotero version 6.0. Duplicates were automatically detected and removed by the software. All studies that met the inclusion criteria were then downloaded in full text. Two independent reviewers conducted the review.

2.8. Ethical consideration: As this review used secondary data from publicly available literature, it did not require ethical consideration.

3. RESULTS

A total of 215 records were identified through electronic databases. After removing 17 duplicates, 198 articles remained for screening. An additional six articles were obtained from reference lists. Of the 122 records, 70 were excluded due to language limitations, unclear methodology, lack of full-text access, or irrelevant outcomes. Fifty-two full-text articles were assessed for eligibility, and 40 studies were included in the final analysis. The selection process is illustrated in Figure 1.

3.1. Prevalence of Helicobacter pylori reinfection rates

Across the included studies, reinfection was operationalized using two definitions: recrudescence, defined as recurrence of infection within 12 months post-eradication, presumed to involve the same bacterial strain, and reinfection, defined as recurrence after 12 months, presumed to involve a different strain [7]. Due to the limited availability of strain-typing data, most studies adopted a pragmatic approach using the 12-month cutoff. Diagnostic confirmation was primarily conducted via urea breath tests, stool antigen tests, histopathology, or a combination of modalities.

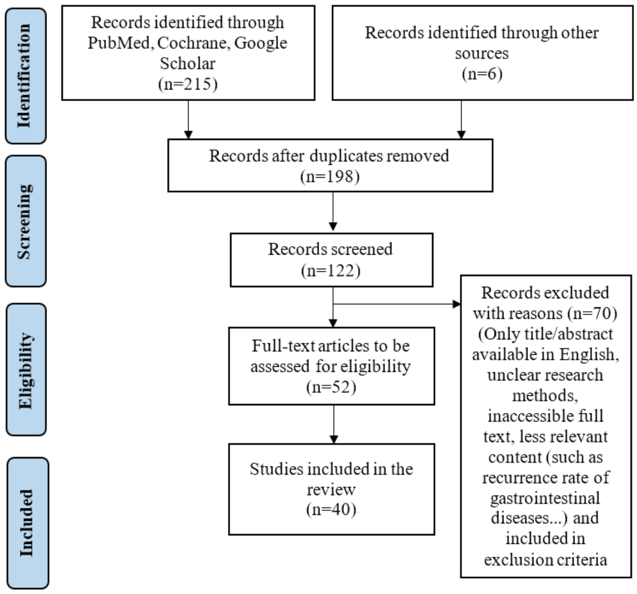

Figure 1. PRISMA-ScR Flow Diagram for search results

Table 2. Prevalence of *Helicobacter pylori* reinfection rates in some countries

Author, year	Country	Reinfection rates	Methods for determining reinfection	Sample size	Study design
Bassiony et al., 2020 [13]	Egypt	19%	Urease Breath Test and Stool Antigen Test	157	Prospective cohort study, 1-year follow-up
Bruce et al., 2015 [14]	US	14.5%, 22.1%, and 12.0% among urban, rural, and non-urban Native Americans, respectively	Urease Breath Test	229	Prospective cohort study, 2-year follow-up
Laimas Jonaitis et al., 2016 [15]	Republic of Lithuania	29.8% cumulative reinfection, 3.36% annual reinfection	Urease Breath Test, Histopathology Test, Blood Test	117	Cohort study, 9-year follow-up
Benajah et al., 2013 [16]	Morocco	0.8%	Urease Breath Test	256	Prospective cohort study, 1-year follow-up
FM Silva et al., 2010 [17]	Brazil	1.8% reinfection per year	Urease Breath Test	147	Prospective cohort study, 5-year follow-up

Author, year	Country	Reinfection rates	Methods for determining reinfection	Sample size	Study design
JH Nam et al., 2019 [18]	Korea	3.25%; annual reinfection rate 0.91%	Histopathology, Urease Breath Test	647	Retrospective cohort study
Y Xue et al., 2019 [19]	China	1.75% reinfection after 1 year, 4.61% reinfection after 3 years	Urease Breath Test, Histopathology Test	1050	Prospective cohort study, 3-year follow-up
Y Xie et al., 2020 [11]	China	1.5% reinfection per year	Urease Breath Test, Histopathology Test, Stool antigen test	5193	Prospective cohort study (6-to-84-month follow-up)
Vilaichone et al., 2017 [20]	Thailand	5.7%; 5.1% reinfection after 1 year and 3.8% reinfection after 2 years	C13 Urease Breath Test	105	Cross-sectional study
Wheeldon et al., 2005 [21]	Vietnam	23.5%	Urease Breath Test	226	Prospective cohort study
Zhou et al., 2020 [22]	China	4.75%	C14 Urease Breath Test	400	Cross-sectional study
Zhang et al., 2024 [23]	China	3.5%	Urease Breath Test	734	Cross-sectional study
Lim et al., 2023 [24]	Korea	5.9% for the first 2 years, and 2.0%-2.4% thereafter	C13 Urease Breath Test	996	Cross-sectional, retrospective study

In the United States, the overall *reinfection rate with Helicobacter pylori in the general population is relatively low*, at approximately 5%. However, significantly higher rates have been observed among three distinct population groups in Alaska. The results indicated cumulative *H. pylori* reinfection rates at the two-year mark of 14.5% among American Indian/Alaska Native individuals, 22.1% among residents of rural areas, and 12% among urban residents. The annual *Helicobacter pylori* reinfection rate in the developing country of Brazil was reported to be relatively low at 1.8% [12]. Similarly, Morocco, another developing nation, demonstrated a very low reinfection rate. Among 256 patients who achieved successful *H. pylori* eradication, only two experienced reinfection within one year, corresponding to a reinfection rate of 0.8% [11].

In Asia, developed countries such as South Korea and Japan also report low annual rates of reinfection. In South Korea, studies have documented reinfection rates ranging from 0.91% to 9.1% [13,20,21]. Although Japan has a high prevalence of *H. pylori*, reinfection rates remain low. In contrast, developing countries tend to report higher rates of reinfection. Najafi et al. investigated *H. pylori* reinfection in Iranian patients following successful eradication. Among 98 participants, 20.4% had a positive urea breath test after a three-year follow-up [22].

In China, a densely populated country, a study of 743 patients diagnosed and treated for *H. pylori* between April 2013 and January 2014 reported a reinfection rate of 1.75% one year after treatment, and 4.61% at three years, as confirmed by urea breath test or endoscopic biopsy [14]. A more recent retrospective cohort study in China showed that reinfection rate was 1.5% per person-year. Reinfection was significantly associated with the following factors: minority ethnic group, low educational attainment, family history of cancer, residence in Western China, and Central China ($p < 0.05$ for all) [7].

In Thailand, a cohort study evaluated the reinfection rate following successful eradication of *H. pylori* in patients with chronic gastritis over a 1-to 2-year period. Reinfection was assessed using the 13C-urea breath test, conducted after discontinuation of PPIs and antibiotics for at least four weeks. Among 105 patients, the overall reinfection rate was 5.7%. Specifically, reinfection rates at 1 and 2 years post-treatment were 5.1% and 6.1%, respectively [15].

In Vietnam, studies on *H. pylori* reinfection remain limited and are often based on small sample sizes. A 2005 study by Wheeldon, involving 226 Vietnamese patients, reported a high reinfection rate of 23.5% one year after successful treatment of *H. pylori*-associated peptic ulcer disease. Of these, 58.8% were reinfected with the same strain and 41.2% with a different strain compared to the pre-treatment isolate [16]. A study conducted at Hoang Long General Clinic found a relatively high *H. pylori* reinfection rate, with a two-year cumulative incidence of 64.6 cases per 1000 persons. The estimated annual reinfection incidence was approximately 40 per 100 individuals, meaning that for every 100 patients returning for evaluation one year after successful eradication, 36.4 reported reinfection [23].

3.2. Some associated factors with the prevalence of *Helicobacter pylori* reinfection

H. pylori reinfection primarily occurs due to repeated exposure to the bacterium through direct person-to-person transmission, often facilitated by poor hygiene practices. Indirect transmission can also occur via contaminated environments, including food, drinking water, and water sources, categorized into the following groups, as shown in Table 3..

Table 3. Some associated factors with the prevalence of *Helicobacter pylori* reinfection

No.	Associated factors	Studies	Review and meta-analysis	Cross-sectional studies	Longitudinal studies	Total
1	Geographic location	[24–28]	8	0	2	10
2	Sex	[15,20,23,29]	0	2	2	4
3	Age	[13,15,27,30]	4	3	1	7
4	Socio-economics status	[5,31,32]	3	1	1	5
5	Eradication regimens	[20,23,33,34]	0	2	2	4
6	Residential density	[24,35,36]	1	2	2	5

No.	Associated factors	Studies	Review and meta-analysis	Cross-sectional studies	Longitudinal studies	Total
7	Prevalence and Incidence of *H. pylori* in the area	[5,25,37]	1	1	1	3
8	Life habits (handwashing, sharing utensils, lack of clean water,...)	[5,25,38–40]	0	2	3	5
9	Living with *H. pylori*-infected members	[35,41–46]	8	3	4	15
10	Knowledge of *H. pylori*	[41,43]	0	0	2	2
11	Comorbidities	[47,48]	1	2	3	6

Reinfection with *Helicobacter pylori* was consistently associated with a wide range of individual, household, and other contextual determinants. Geographical variation played a significant role, with higher reinfection rates observed in developing regions compared to developed countries. Specifically, the mean annual reinfection rate was 5.6% in Asia and 7.7% in Latin America, contrasting with 2.7% in Europe. Age was another prominent factor; children and adolescents were more susceptible to reinfection than adults. Xu et al. (2024) reported an annual reinfection rate of 17% among Asian children, significantly higher than the 6% observed in their European counterparts.

Regarding socioeconomic status, as measured by the Human Development Index (HDI), there was an inverse relationship with the risk of reinfection. According to Yan et al. (2013), countries with very high HDI reported a mean annual reinfection rate of 1.68%, whereas nations with low HDI experienced rates as high as 9.63%. Poor living conditions, particularly overcrowded housing, were associated with an increased risk. Household exposure also significantly influenced the likelihood of reinfection.

Behavioral and hygienic practices were similarly associated with the risk of reinfection. Individuals with inadequate sanitation habits, such as poor hand hygiene, the use of untreated water, and frequent consumption of meals outside the home, were at a greater risk of reinfection. In a recent cohort study in China, Zhang et al. (2024) identified frequent eating out as a strong independent predictor of reinfection (OR = 2.291-14.556; $p < 0.001$). The type of treatment regimen also influenced reinfection rates. In South Korea, patients treated with a quadruple regimen (EBMT) exhibited a lower annual reinfection rate (4.45%) compared to those receiving the MEA regimen (6.46%) over a 5- to 8-year follow-up period in the Kim et al. study. Lastly, comorbid conditions such as diabetes and peptic ulcer disease were found to be positively associated with reinfection. For example, patients with gastric ulcers had nearly a fourfold increased risk of reinfection compared to those with non-ulcer dyspepsia.

4. DISCUSSION

Numerous studies have been published on the rates of *H. pylori* reinfection, yielding diverse results due to variations in factors such as region, country, population group, sample size, socioeconomic status, follow-up duration, and study design. In general, reinfection rates tend to be higher in developing countries compared to developed ones. A 2024 study reported an overall *H. pylori* reinfection rate of 19%, with an annual reinfection rate of 13%. In a stratified analysis, the annual recurrence rate of *H. pylori* among Asian children was higher than that in European children (17% vs. 6%), and similarly, higher in developing countries compared to developed ones (18% vs. 5%) [27]. A study by Bassiony et al. in Egypt involving 157 patients who successfully underwent *H. pylori* eradication therapy and were followed for one year also reported a reinfection rate of up to 19%, as determined by both the urea breath test and stool antigen test. In this study, educational level and alcohol consumption were identified as factors associated with reinfection [8]. A meta-analysis by Yan et al. (2013), which included 77 studies encompassing 43,525 person-years of follow-up after successful *Helicobacter pylori* eradication, reported an average annual recurrence rate of 2.82 ± 1.16% per person-year.

H. pylori reinfection may occur due to various factors, with one primary cause being the patient's non-adherence to the initial eradication regimen [49]. To date, there is still limited research on the mechanisms of innate immunity against *H. pylori*. Some evidence suggests that when children are first exposed to *H. pylori*, the immune system is activated to eliminate the bacteria. However, in many cases, the immune response is insufficient to eradicate the pathogen completely, allowing it to persist and establish a chronic infection. This pattern of recurrent disease is generally not observed in individuals who have successfully undergone eradication therapy with appropriate antibiotic regimens.

In developed countries, reinfection with *H. pylori* in adults is uncommon, and recurrence typically reflects a failure of the initial eradication regimen rather than a new infection. Consequently, reinfection is more frequently observed in cases where treatment regimens have low efficacy or when patient adherence to the prescribed therapy is suboptimal. However, reinfection may still occur in certain instances, as acquired immunity can vary slightly across populations. Therefore, reinfection remains a possibility, particularly in regions with a high prevalence of *H. pylori* infection [50].

A review by Yaron Niv (2008) reported that the 12-month reinfection rate across studies varied widely, ranging from 0% to 41.5%. Reinfection rates following successful *H. pylori* eradication were generally low in developed countries but occurred more frequently in developing nations [51]. Another meta-analysis including 10 studies conducted in developed countries (3,014 patients with follow-up durations of 24-60 months) and seven studies conducted in developing countries (2,071 patients with follow-up periods of 12-60 months), assessed reinfection rates using the C13 urea breath test after confirmed eradication of *H. pylori*, showed annual reinfection rates of 2.67% in developed countries and 13.0% in developing countries. For follow-up periods exceeding one year, the reinfection rates were 1.45% (RR = 0.54) and 12.00% (RR = 0.92), respectively [52]. These findings suggest that in developed countries, most reinfections tend to occur within the first year post-treatment, whereas in developing countries, reinfection rates remain relatively consistent over time.

A study by Pellicano conducted in Turin, Italy, reported no cases of *H. pylori* reinfection during a 24-month follow-up period. The study enrolled patients with *H. pylori*-induced peptic ulcer disease who had achieved successful eradication, and follow-up evaluations were conducted at 6, 12, and 24 months [53]. Similarly, a study by Laimas (2016) yielded comparable findings. Patients with *H. pylori*-associated peptic ulcer disease who had undergone successful eradication were followed for nine years. While the cumulative reinfection rate over the entire period was 29.8%, the annual reinfection rate remained low at 3.36% [10].

Developing countries tend to exhibit higher reinfection rates compared to developed nations. The average annual *H. pylori* reinfection rates reported in Africa, Asia, Europe, North America, South America, and Oceania are 1.5%, 5.6%, 2.7%, 6.2%, 7.7% and 2.0%, respectively [31]. However, statistical data and reports on reinfection rates for many African countries remain limited and fragmented.

Regarding some associated factors with the prevalence of *H. pylori* reinfection, age is another risk factor positively correlated with *H. pylori* reinfection rates [13,15]. Children are more likely to engage in behaviors that elevate the risk of exposure to *H. pylori*, such as improper handwashing or failing to wash hands before and after contact with contaminated sources. In developing countries or regions with high transmission rates, children often live in environments with poor sanitation and limited access to clean water, which increases their vulnerability to reinfection [28]. A cohort study by Ji Hyung Nam et al. followed 647 patients who had achieved successful eradication of *H. pylori*, with annual follow-up using rapid urease testing during endoscopy. The average age in the reinfection group (55.9 years) was significantly higher than that of the non-reinfection group (50.7 years) ($p = 0.006$).

Adjusted ORs for reinfection were 0.20% and 0.25 %for age groups 50-59 and under 50, respectively, when compared to patients over 60 years old [13].

The influence of gender on *H. pylori* reinfection rates remains inconclusive. In a longitudinal study conducted in Korea, Kim et al. found that male gender was significantly associated with a higher risk of reinfection (p = 0.037) [20]. Conversely, research by Nguyen Thi Viet Ha indicated that female gender in Vietnamese children was linked to an increased risk of reinfection, with an adjusted hazard ratio (aHR) of 2.5 for girls compared to boys [29]. Similarly, a study by Dao Viet Hang et al. conducted at Hoang Long General Clinic also reported higher reinfection rates in females compared to males (37.5% vs. 20%), with a reinfection rate of 53.3% in girls versus 15.4% in boys [23]. However, a study from Thailand evaluating reinfection rates 1 to 2 years after successful eradication found no significant association between gender and *H. pylori* reinfection [15].

A study by Xu et al. reported on the reinfection rates of *H. pylori* in children, highlighting notable differences based on geographic and socioeconomic factors. Stratified analysis revealed that the annual recurrence rate of *H. pylori* in Asian children was higher than in their European counterparts (17% vs. 6%), and similarly, higher in developing countries compared to developed ones (18% vs. 5%). Importantly, *H. pylori* reinfection rates were found to be inversely correlated with socioeconomic status [27].

Helicobacter pylori reinfection tends to occur in an inverse relationship with socioeconomic development, as measured by the Human Development Index (HDI). Countries with high and very high HDI levels exhibit significantly lower reinfection rates compared to those with low or medium HDI. The average annual reinfection rate was highest - at 10.9% (95% CI: 6-18%) - among countries with medium or low HDI, whereas countries with high or very high HDI reported a considerably lower rate of 6.2% (95% CI: 4-8%) [31]. Similarly, the study by Yan et al. reported a decreasing trend in annual *H. pylori* reinfection rates across countries with higher HDI levels. Based on 75 studies categorized into four HDI groups, the yearly reinfection rates were 1.68 ± 0.87% in countries with very high HDI, 6.05 ± 2.55% in high-HDI countries, 7.04 ± 4.21% in medium-HDI countries, and 9.63 ± 13.13% in low-HDI countries [32]. These findings are consistent with those of Gisbert et al. and Niv et al., who also reported an inverse relationship between *H. pylori* reinfection rates and HDI levels [3,51].

Regarding the association of treatment regimen to the reinfection rates, a study by Kim et al. (2013) evaluated 648 patients who experienced initial treatment failure with the standard triple therapy for *H. pylori* infection, indicating that those treated with the MEA regimen were followed for five years, yielding a higher annual reinfection rate of 6.46% [20]. In contrast, despite a high prevalence of clarithromycin resistance in Pakistan, the recurrence rate of *H. pylori* following eradication therapy was relatively low, among 102 patients monitored for one year, only six tested positive on the C14 urea breath test, corresponding to a recurrence rate of 6% [33]. In Vietnam, a study reported that, after a two-year follow-up, reinfection rates varied by treatment regimen. The highest reinfection rates were observed in patients receiving clarithromycin-based regimens (11.1%) and levofloxacin-based regimens (11.8%), while the lowest rate was recorded in the tetracycline-based regimen group (4.9%). Reinfection rates also differed over time. After one and two years, the reinfection rates for clarithromycin-based regimens were 8.9% and 2.4%, respectively, while those for tetracycline-based regimens were 2.7% and 2.3%, respectively [23].

High population density is also recognized as a risk factor for increased *Helicobacter pylori* reinfection. Studies have reported that *H. pylori* reinfection rates are generally higher in urban settings than in rural ones. Specifically, the reinfection rate in urban areas has been estimated at 8% compared to 5% in rural regions [24]. Bruce et al. further demonstrated that overcrowded living conditions, defined as more than one person per room, were associated with a 2.3-fold increased risk of *H. pylori* reinfection [47]. However, exceptions exist. For example, China, a country with high population density and a substantial *H. pylori* prevalence of 44.2% [26], has reported relatively low annual reinfection rates.

Certain lifestyle behaviors are associated with an increased risk of *H. pylori* reinfection such as infrequent handwashing, frequent dining at restaurants or street food vendors, consumption of untreated or unboiled water, and the intake of pickled or fermented foods. A study by Zhang et al. (2024) which followed 734 patients for one year after successful eradication of *H. pylori*, reported a reinfection rate of 3.5%. Several independent risk factors for reinfection were identified, including contact with individuals infected with *H. pylori*, poor hygiene at food establishments, consumption of unclean water, frequent dining out, and irregular eating habits [39]. These findings are consistent with another study by Lili Zhang et al. which pointed out frequent consumption of restaurant food, high intake of salty and fatty foods, consumption of smoked foods, and a family history of *H. pylori* infection as associated factors [40]. Dining out is a high-risk behavior associated with an increased risk of *H. pylori* reinfection. A 2020 study by Zhou et al. involving 400 patients reported a reinfection rate of 0.63% among those who rarely ate outside, 2.92% among occasional diners, and 13.46% among those who frequently dined out (p = 0.001). Alcohol consumption and dining out were identified as independent risk factors for reinfection [34].

Cross-infection between family members is a significant route of transmission, particularly from mothers to children and among siblings living together. Several studies support the link between household infection and the risk of reinfection. In Alaska, reinfection rates were 7.0% for individuals with no infected household members, 9.3% for those with a few infected members, and 27.3% when all household members were infected [9]. In China, close contact with infected individuals increased reinfection risk [48]. In a Vietnamese study by Dao Viet Hang et al., the reinfection rate among patients living with infected family members was 82.6% [23].

Regarding comorbidities, Candelli et al. conducted a three-year cohort study involving 75 patients with type 1 diabetes and 99 control participants. The study found that both the prevalence and reinfection rates of *Helicobacter pylori* were higher in diabetic patients compared to age, sex, and socioeconomically matched controls with upper gastrointestinal symptoms [54]. A history or current diagnosis of peptic ulcer disease, as identified via endoscopy, was also associated with increased reinfection risk [47,48]. Similarly, Zhou et al. followed 743 patients for one year and reported that those with gastric ulcers had nearly four times the risk of reinfection compared to patients with non-ulcer dyspepsia [55]. Findings from Bruce et al. also supported this association. In a two-year study of 229 patients, individuals with peptic ulcer disease had a 2.4-fold increased risk of reinfection compared to controls [47].

5. CONCLUSIONS

This scoping review highlights that *Helicobacter pylori* reinfection remains a persistent challenge following eradication therapy, particularly in communities with high transmission rates, high incidence of *H. pylori*, and limited access to sanitation and health education. Reinfection rates vary considerably across regions, with developing countries bearing a disproportionately higher burden. Some factors associated with reinfection include being in younger ages, having a low socioeconomic status, living in overcrowded conditions, exposure to infected family members, inadequate hygiene practices, and specific treatment regimens.

In response, a range of preventive strategies has been proposed and implemented, including health promotion interventions, improved sanitation, community-based screening, and optimization of treatment protocols. However, most existing studies are concentrated in specific geographic contexts, and standardized prevention frameworks are lacking. Future efforts should focus on developing and evaluating context-adapted, multi-level interventions to mitigate the risk of reinfection and enhance the long-term effectiveness of eradication strategies.

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