



Total worker health[®] based *Helicobacter pylori* public health prevention strategy

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Purpose of review

This review aims to explore the public health approach for *Helicobacter pylori* Infection Prevention within the Total Worker Health (TWH) framework strategy.

Recent findings

The review identifies certain occupations considered high-risk groups for *H. pylori* infection. It underscores primary, secondary, and tertiary public health preventive measures align with the TWH approach. Within this framework, the role of raising awareness, emphasizing infection control, worker hygiene, risk assessment, and ensuring healthcare accessibility is emphasized. The importance of early detection, treatment, eradication, and a TWH approach emerges as a central theme. The TWH approach offers a holistic perspective, intertwining occupation-related health risks with overall health and well being.

Summary

Adopting the TWH approach, coupled with household-based infection control and eradication strategies, can significantly reduce *H. pylori* prevalence, fostering a healthier workforce and diminishing long-term healthcare costs. The review underscores the importance of recognizing *H. pylori* as an occupational disease. It calls for further research into the "one-health" perspective on *H. pylori* transmission dynamics.

Keywords

helicobacter pylori, occupational health promotion, public health prevention, total worker health

INTRODUCTION

Helicobacter pylori is a Gram-negative, spiral bacterium first cultured by Marshall and Warren in 1982 [1]. It selectively infects the human stomach, making it one of the most common bacterial infections affecting humans, leading to chronic gastritis and peptic ulcers [2]. Moreover, it has been linked to notable extra-gastric diseases, such as iron deficiency anemia and idiopathic thrombocytopenic purpura [3]. It is also the only bacterium classified as a Class I (definite) carcinogen by the WHO. It is the primary risk factor in the etiopathogenesis of gastric adenocarcinoma and mucosa-associated lymphoid tissue lymphoma (MALT lymphoma) [4]. Therefore, from a public health perspective, it is deemed a high-impact pathogen, accountable for significant morbidity and mortality [5^a,6^b].

H. pylori infection typically occurs during childhood and, if untreated, persists throughout life [7]. Factors such as low education, parents' low educational levels, poor dental hygiene, crowded living conditions during childhood, and several other indicators of low socioeconomic status are primary risk factors for *H. pylori* infection [8–10]. There is an

increased risk of gastric cancer associated with *H. pylori* infection. The likelihood of a causal association is further supported by a robust link between *H. pylori* and precancerous lesions, including chronic, and atrophic gastritis and dysplasia [11].

A recent systematic review and meta-analysis assessing global *H. pylori* infection rates from 1980 to 2022 revealed a decline, particularly between

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KEY POINTS

- The Total Worker Health approach to *H. pylori* prevention is both effective and feasible, its impact is amplified when coupled with household-based eradication efforts.
- Acknowledging *H. pylori* infection as a biological hazard at work, and as occupational disease will enhance health outcomes during occupational surveillance visits based on TWH recommendations.
- It is imperative to systematically screen certain high-risk occupations for *H. pylori* aligning with health surveillance protocols within the TWH framework.

2011 and 2022 [6[¶]]. The global prevalence dropped from 58.2% [95% confidence interval (95% CI) 50.7–65.8] during 1980–1990, to more recently 43.1% (40.3–45.9) in 2011–2022, with an overall prevalence of 48.9% (95% CI 46.7–51.2). According to the WHO region, the Eastern Mediterranean population had the highest prevalence at 59.1% (52.0–66.2), followed by Africa with 58.3% (48.0–68.6). In contrast, the European region, region of the Americas, and Western Pacific all reported rates below 50% [6[¶],12].

In the field of occupational medicine, *H. pylori* infection should be treated as a biological risk. The European Agency for Safety and Health at Work, in its publication titled “Exposure to carcinogens and work-related cancer: A review of assessment methods,” provides an overview on risk factors linked to work-related cancers. Notably, they emphasize the need for proper preventive measures for biological agents like *H. pylori*. Such measures would involve considering these agents when estimating exposure in specific job roles to highlight potential risks [13,14].

Collatuzzo *et al.* [15[¶]] suggest that occupational physicians can recommend *H. pylori* testing for workers, highlighting the significance of screening for gastric conditions and cancer. Implementing an *H. pylori* screening program offers numerous advantages including promoting overall well being at work, fostering a healthier workforce, enhancing job performance, and boosting employee loyalty and satisfaction. It also minimizes absences due to gastric issues, potentially extends screening benefits to employees’ families, decreases the workplace reservoir of *H. pylori*, targets the optimal age group for gastric cancer prevention, supports general practitioner patient management, and can integrate into broader existing health promotion programs [15[¶]].

The European Agency for Safety and Health at Work surveyed 25,000 workers from seven countries,

employing various agents, but *H. pylori* was omitted [16]. These agents are pivotal to the OccIDEAS system, and while additions are feasible, *H. pylori* remains absent from the list. Furthermore, *H. pylori* is not listed as a biological agent in the health surveillance protocols of Spain’s Interterritorial Council of the National Health System or in other regional entities [13]. Recognizing the significance of health promotion for workers, occupational health visits mandated in numerous countries present a valuable opportunity to screen and treat *H. pylori* infections based on best practices [17]. The substantial social and health system costs associated with *H. pylori* infection underscore the need for rigorous evaluation of public health strategies, ensuring access to optimal diagnostic methods and treatments.

Public health measures for preventing *H. pylori* infections encompass primary, secondary, and tertiary strategies, with household-based prevention proven to play a significant prevention role [18,19[¶],20[¶],21[¶],22]. Despite its benefits, discovering multiple *H. pylori* strains in individual households raises questions about its efficacy and indicates the need for broader interventions [18,23–25]. Current research needs to have an adequate focus on workplace-based *H. pylori* prevention. Given the proven efficacy of workplace screenings for diseases like influenza, there is a pressing need to explore similar preventive strategies for *H. pylori* to combat the transmission of this bacterium.

The Total Worker Health (TWH) approach [26] is an integrative strategy that intertwines policies, programs, and practices, aiming not only to protect workers from job-related health risks but also to promote overall well being proactively. It goes beyond traditional safety protocols, emphasizing the interconnectedness of individual health with various work-related elements, from tangible hazards to psychosocial stressors and organizational dynamics. By advocating for hazard control, fair compensation, and work-life balance, among others, TWH provides a holistic framework dedicated to enhancing workers’ quality of life [27].

The aim of this review is to describe the current role and development of public health strategies in preventing *H. pylori* Infection within the TWH framework. This review is conducted in November 2023. However, given the limited literature availability on this topic, we did not set specific date restrictions for the article search.

PUBLIC HEALTH PREVENTION PERSPECTIVE

Primary Prevention emphasizes proactive measures centered around the TWH. These include raising

awareness and promoting health about *H. pylori* infections. Concurrently, infection control practices within professional settings have been highlighted [28–32], as well as the crucial role of personal protective equipment and workplace health inspection for worker’s protection [30–32]. *H. pylori* infection risk assessment and reduction in the workplace was also highlighted, which recommends considering *H. pylori* as an occupational disease [15[■],29,31,33].

Transitioning to Secondary Prevention, the narrative shifts to highlight the importance of early detection and treatment. The ‘screen and treat’ and ‘test and treat’ strategy is emphasized [15[■], 28,30–32,34,35]. Tertiary Prevention is centered on eradication of the *H. pylori* infection to reduce the complications of the disease and long-term sequel such as gastric cancer [15[■],28,34,35] (Table 1).

FEASIBILITY OF HELICOBACTER PYLORI PREVENTION IN THE WORKPLACE

Several significant outcomes mark the effectiveness of *H. pylori* Prevention in the workplace. Occupational-based health screenings, tailored to diverse working schedules, have enabled higher participation rates, particularly among those with unconventional hours, such as shift workers [15[■],29,32,33]. This strategy has facilitated timely diagnoses and interventions for *H. pylori*, leading to a notable decrease in its prevalence among workers. Consequently, there is a direct improvement in health outcomes and a reduction in absenteeism, enhancing overall productivity [15[■],33].

The eradication of *H. pylori* offers relief from gastric complications like dyspepsia and curtails long-term complications such as gastric cancer, ensuring an overall healthier workforce [15[■], 33,34]. From an economic perspective, the ‘screen and treat’ approach for *H. pylori* has proven cost-effective. While initial expenses are tied to detection and treatment, the long-term financial benefits of avoiding advanced treatment costs and maintaining consistent workforce productivity outweigh these costs, making it a beneficial strategy for both employees and employers [15[■],34].

Implementing workplace prevention for *H. pylori* faces several challenges, including misconceptions about its significance and potential risks among employers and employees [15[■]]. Engaging larger firms and handling work disruptions due to treatment add to the logistical issues. The accessibility of surveillance is restricted for remote or traveling workers, and apprehensions about test results, treatments, endoscopy, and concerns related to stool handling deter participation [15[■],33]. Additionally, the intricate and prolonged nature of treatment regimens complicates adherence to therapy [15[■]].

For optimal *H. pylori* prevention in workplaces recommendations, it’s essential to recognize it as an occupational disease due to heightened risks in certain sector such as healthcare [15[■],29]. Embedding this within the TWH framework ensures comprehensive prevention. Key measures include standardized protocols for screening, testing, and eradication, and enhanced collaboration between occupational and community physicians [15[■],32–35]. Additionally, tailored infection prevention

Table 1. Public health prevention for *Helicobacter pylori* at work

Public health HP prevention at work	Components identified	References
Primary Prevention	Worker’s Health awareness and promotion	[29], [36], [30], [32].
	Workplace infection prevention and control measures	[29],[30], [31], [32], [28].
	Personal protective equipment	[30],[31],[32].
	Worker’s hygiene	[30]
	Health inspection at work environment	[30]
	Risk assessment and reduction	[15 [■]], [29], [31], [33].
	Worker’s health accessibility	[15 [■]], [28].
Secondary Prevention	Screen and treat	[15 [■]], [34], [30], [31], [32], [35], [28] .
	Test and treat	[15 [■]], [34], [35].
Tertiary Prevention	Eradication	[15 [■]], [34], [35], [28].

The table delineates a structured approach to public health interventions targeting HP prevention within the workplace. These interventions are systematically organized into three distinct levels of preventive measures: Primary, Secondary, and Tertiary.

guidelines for workers [15[■],32], promoting preventive behaviors [15[■],30], availability of personal protective equipment [30,31], and potential vaccine integration once developed [32], further enhance this approach (Table 2).

DISCUSSION

We discussed the multifaceted aspects of public health *H. pylori* prevention, spanning primary, secondary, and tertiary measures, from a TWH perspective. We categorized findings based on the three levels of prevention, each time emphasizing the relevance to the TWH framework [27], as summarized in Table 3.

This approach enabled a holistic understanding of how *H. pylori* prevention can be optimized by integrating occupational safety and health promotion, as emphasized by the TWH framework, allowing us to propose a new framework on preventive strategy. Therefore, we Proposed a framework for the TWH-based *H. pylori* public health prevention strategy (Fig. 1).

In our proposed TWH framework for *H. pylori* prevention, we emphasize the integration of work and household domains. Primary prevention focuses on both protecting and enhancing worker

health, highlighting the importance of raising awareness about *H. pylori* infection, its complications, and available healthcare resources. First and foremost is to recognize *H. pylori* infection as an occupational biological risk. Given the elevated infection risks in certain workplaces, rigorous infection control measures are essential. This measure includes providing tailored personal protective equipment based on specific job-related risks and promoting hygiene practices that counter oral-oral, fecal-oral, fomites, and iatrogenic transmission. A comprehensive risk assessment, coupled with targeted reduction strategies, further strengthens this approach. By facilitating easy access to healthcare, such as amongst migrant workers [37], we ensure workers are equipped for early disease detection, bridging the transition between primary and secondary prevention measures.

In the secondary prevention domain, targeting early detection and treatment within the TWH framework for *H. pylori*, we advocate for the proactive screening of workers in occupations with heightened risk of *H. pylori* infection [29,38]. Beyond occupational risk, testing should be readily available for symptomatic workers. Crucially, this domain’s reach extends beyond individual workers to encompass a familial or household perspective. Herein, family or

Table 2. The table presents the feasibility of the Public Health strategy for preventing *Helicobacter pylori* infections

Public health outcome of <i>Helicobacter pylori</i> prevention at work	Effectiveness	Increase worker’s participation in health screening	[15 [■] ,29,34,38]
		Contribute to the productivity of workers	[15 [■] ,38]
		Greater worker’s health benefit	[15 [■] ,31,38]
		Overall cost-effectiveness	[15 [■] ,31]
	Challenges	Misconception of employers and workers	[15 [■]]
		Screening logistic	[15 [■]]
		Affects short-term work performance during treatment	[15 [■]]
		Access to surveillance	[15 [■]]
		Low participation among employers and workers	[15 [■] ,38]
		Lack of compliance with therapy	[15 [■]]
	Recommendations	Recognize HP as an occupational disease	[15 [■] ,29]
		Standardize screening, testing, and eradication programs for workers	[15 [■] ,31,34,35]
		Role of occupational and community physicians	[15 [■] ,38]
		Infection Prevention and Control guidelines on <i>H. pylori</i> for workers	[15 [■] ,34,37]
		Preventive behaviors among workers	[15 [■] ,30]
		Availability of personal protective equipment (PPE)	[32,33,37]
		Consider vaccine once available	[34]

The feasibility is categorized into three main sections: Effectiveness, Challenges, and Recommendations.

Table 3. *Helicobacter pylori* infections at work and issue relevant to TWH perspective

HP infections at work, Issue relevant to TWH perspective	
Protecting Worker Safety and Health	Control of HP exposure
	Prevention of illness related to HP infection.
	Promoting a well tolerated & healthy workplace, free from HP
	HP workplace risk assessment & control
Promoting Worker Health & Well Being	Worker's Optimal well being
	Workers with higher health risk
Preserving Human Resources	Worker's healthcare accessibility on HP management
	Health & productivity at Work

household members of *H. pylori* positive workers warrant equal emphasis, meriting opportunities for screening and subsequent testing, ensuring a holistic approach to containment and care.

Lastly, In the domain of tertiary prevention, the cornerstone is ensuring complete *H. pylori* eradication to prevent complications, which requires post-treatment re-testing to verify the absence of the infection. This rigorous approach is pivotal, given the escalating concerns around antimicrobial resistance. Furthermore, our strategy underscores that eradication is holistic; it is deemed incomplete if a worker's family or household members remain infected. Addressing the entire household is

imperative to break the *H. pylori* transmission cycle completely.

The anticipated outcome of implementing this TWH-based strategy for *H. pylori* prevention is a marked reduction in *H. pylori* prevalence, both within occupational settings and the wider community. Consequently, workers will face fewer *H. pylori* associated conditions, such as dyspeptic symptoms [39]. Over the long run, this strategy will also lower the risk of *H. pylori* related gastric cancers [40], promoting a healthier workforce and community. Additionally, it will curtail long-term healthcare costs, as numerous studies have demonstrated its cost-effectiveness [34,41–44] compared to alternatives such as no screening, endoscopy, peptic ulcer treatment, non-treatment, and gastric cancer treatment.

The public health outcome of this strategy extends beyond immediate disease prevention, promising enhanced long-term worker productivity. By providing workers with improved access to healthcare services, including screening and early detection of *H. pylori* infections, and early treatment. This strategy also boosts health literacy, empowering workers with a deeper understanding of *H. pylori*, its potential repercussions, and preventive measures. Emphasizing the pivotal role of workers' families in breaking the *H. pylori* transmission cycle, this holistic approach addresses not just occupational health but also the overall physical, mental, and social well being of the workforce.

CONCLUSION

While the TWH approach to *H. pylori* prevention is both effective and feasible, its impact is amplified

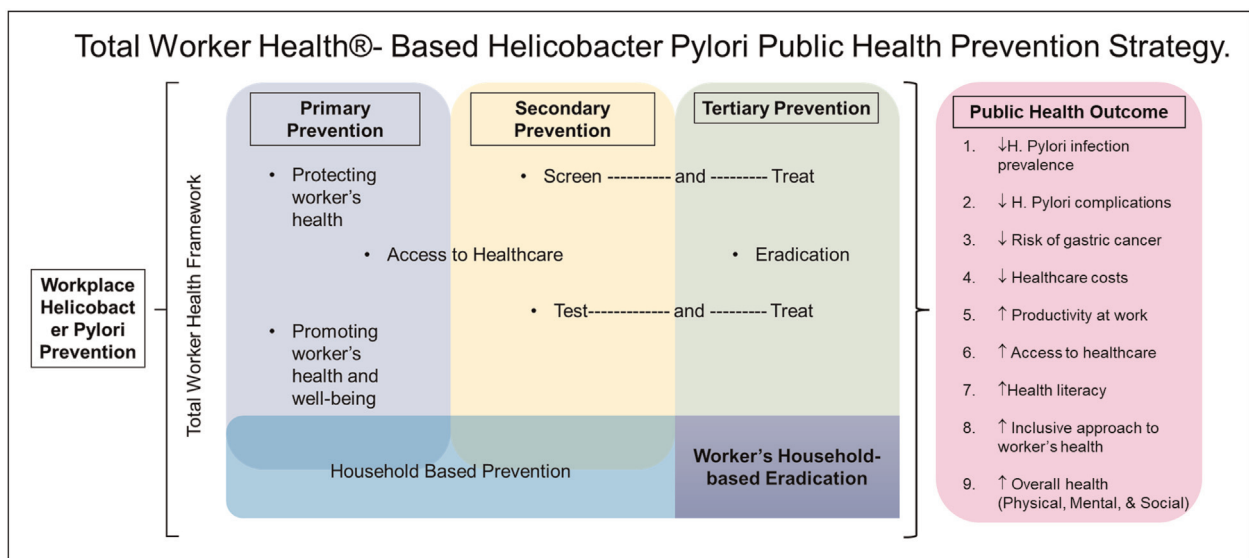


FIGURE 1. Proposed framework for the TWH-based *Helicobacter pylori* public health prevention strategy.

when coupled with household-based eradication efforts. Eradicating *H. pylori* not only fosters a more productive work environment, but also improve worker's overall health. This public health prevention strategy proves more cost-effective than no screening, as shown in multiple modelling studies.

It is imperative to systematically screen certain high-risk occupations for *H. pylori* aligning with health surveillance protocols within the TWH framework. Acknowledging *H. pylori* infection as a biological hazard at work, and as occupational disease will enhance health outcomes during occupational surveillance visits based on TWH recommendations.

Future research should broaden its scope to explore the "one-health" perspective on the *H. pylori* bacterium, investigating its reservoirs, behavior, and habitats in the environment, as well as its transmission dynamics among humans, animals, and the environment, is crucial for devising strategies to disrupt its transmission cycle effectively.

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Conflicts of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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