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PREVALENCE OF *HELICOBACTER PYLORI* INFECTION AMONG CLINICAL COHORTS IN UKRAINE: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Abstract – *Objective:* *Helicobacter pylori (H. pylori)* infection drives major gastroduodenal pathologies. Although isolated clinical studies exist in Ukraine, a comprehensive synthesis is lacking. This systematic review and meta-analysis aimed to estimate the pooled proportion of *H. pylori*-positive individuals in Ukrainian clinical cohorts and to explore inter-study heterogeneity.

Materials and Methods: Following PRISMA guidelines, PubMed, Scopus, Web of Science, and domestic databases were searched for observational studies reporting *H. pylori* prevalence in Ukraine. Pooled prevalence and 95% confidence intervals (CIs) were calculated using a random-effects model with logit transformation (PLOGIT). We evaluated heterogeneity using the I^2 statistic. Subgroup analyses, meta-regression, and sensitivity analyses (leave-one-out, trim-and-fill) were conducted.

Results: Twenty-seven studies met the inclusion criteria. Among 21 studies involving 6,492 patients with gastrointestinal pathologies, the pooled *H. pylori* prevalence was 76.5% (95% CI: 68.5-82.9%). A separate analysis of six studies (n = 458) on extragastric conditions yielded a prevalence of 69.1% (95% CI: 52.4-81.9%). Inter-study heterogeneity was consistently high across both groups (I^2 = 92.2% and 87.8%, respectively; $p < 0.001$). Subgroup analysis and meta-regression showed that diagnostic method (active *vs.* serological/combined) was not a statistically significant moderator of prevalence ($p = 0.171$). Sensitivity analyses confirmed the stability of the pooled estimates without dominant mathematical impact from individual studies. Egger's test ($p = 0.777$) suggested no significant publication bias, though selection bias remains prominent.

Conclusions: *H. pylori* detection rates are exceptionally high among Ukrainian clinical cohorts, underscoring the need for accessible, validated diagnostics in indicated patient groups. However, substantial heterogeneity and pronounced selection bias prevent extrapolation of these descriptive estimates to the general population. Determining the true national burden necessitates purposefully designed population screening.

Keywords: *Helicobacter pylori*, Prevalence, Systematic review, Meta-analysis, Ukraine, Gastrointestinal diseases, Clinical cohorts, Selection bias.

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INTRODUCTION

Helicobacter pylori (*H. pylori*) infection is a global public health issue, as it plays a key role in the development of a wide spectrum of gastroenterological diseases, including chronic gastritis, peptic ulcer, gastric mucosal atrophy, and gastric cancer[1]. This Gram-negative bacterium possesses unique adaptive mechanisms that allow it not only to survive but also to actively colonize the mucous membrane[2]. The prolonged presence of *H. pylori* in the body often causes chronic inflammation of the gastric mucosa, which can, over time, lead to severe pathological changes such as mucosal atrophy and intestinal metaplasia. Studies indicate that *H. pylori* is associated with pathologies that substantially increase mortality risk[3,4]. The prevalence of *H. pylori* varies significantly across countries and regions and depends on socioeconomic conditions, sanitary and hygienic factors, population age, healthcare accessibility, and the diagnostic methods applied[5]. In Ukraine, such population-based data are lacking; only isolated studies among various clinical patient cohorts exist, which precludes accurate extrapolation to the national level. The aim of our study was to conduct a systematic review and meta-analysis of studies conducted in Ukraine and published in available scientific sources to determine the proportion of *H. pylori*-positive individuals among patients with gastroenterological and extragastric pathologies and to evaluate inter-study heterogeneity.

MATERIALS AND METHODS

The systematic review was conducted in accordance with the international PRISMA guidelines[6]. The primary information sources were international databases such as PubMed, Scopus, and Web of Science, as well as Ukrainian resources, notably the electronic libraries of the National Academy of Sciences of Ukraine, the electronic archive of scientific papers “Scientific Periodicals of Ukraine”, data from the Ukrainian Medical Journal portal, and literary sources from the V. Otamanovskyi Vinnytsia Regional Universal Scientific Library.

Literature Search

The search was conducted without language restrictions. A search of grey literature was searched exclusively to identify additional sources; however, only peer-reviewed articles and published dissertations or dissertation abstracts were included in the quantitative review. Duplicate removal was performed both automatically and manually. The search period covered papers published from 1999 to April 18, 2026. In international databases, the following standardized search query was used: for the PubMed database (using MeSH terms and title/abstract search): (“*Helicobacter pylori*”[MeSH Terms] OR “*Helicobacter pylori*”[Title/Abstract] OR “*H. pylori*”[Title/Abstract]) AND (“Ukraine”[MeSH Terms] OR “Ukraine”[Title/Abstract] OR “Ukrainian”[Title/Abstract]) AND (“prevalence”[Title/Abstract] OR “incidence”[Title/Abstract] OR “epidemiology”[Title/Abstract]). For Scopus and Web of Science databases, the search was conducted across title, abstract, and keyword fields (TITLE-ABS-KEY and TS, respectively) using a similar logical structure. For domestic databases, combinations of the following keywords were applied: “*Helicobacter pylori*”, “*H. pylori* infection in Ukraine”, “gastritis”, “peptic ulcer”, “dyspepsia”. The final search was conducted on April 18, 2026. The study protocol was not registered in advance.

Eligibility Criteria

The review included only peer-reviewed articles and published dissertations or dissertation abstracts that met the predefined criteria. The main inclusion criteria were:

- observational studies (cross-sectional, cohort, case series analysis) in which patient recruitment was conducted within the territory of Ukraine;
- the presence of clearly specified and valid *H. pylori* diagnostic methods, such as the urea breath test, serological tests, biopsy-based methods, or DNA analysis *via* PCR;
- the availability of precise quantitative data regarding the total sample size (n) and the number of *H. pylori*-positive individuals.

Exclusion Criteria

- studies conducted outside Ukraine, even if they contained information about *H. pylori*;
- publications lacking a description of diagnostic methods;
- review articles that did not provide new primary data;
- studies in which the results were presented unclearly or did not allow for comparison between samples.

Study Selection and Data Extraction

Literature selection was conducted in several stages. Initially, all publications matching the search criteria were identified, and then they were screened by title and abstract. Publications meeting the inclusion criteria underwent full-text analysis. To reduce bias, two researchers independently performed each selection stage. The unit of synthesis in this meta-analysis was the clinical cohort. All selected publications were carefully checked for overlapping cohorts or duplicate patient data. In case of discrepancies, a third researcher was involved to reach consensus. A formal Risk of Bias assessment using standardized tools, such as the JBI Critical Appraisal Checklist for prevalence studies, was not conducted due to the retrospective lack of detailed design descriptions in early Ukrainian publications. This constitutes a significant methodological limitation of our study. Therefore, quality assurance was ensured at the screening stage through the application of strict *a priori* inclusion criteria, particularly the mandatory requirement for clearly verified diagnostic methods and valid quantitative data.

Statistical Analysis

Statistical analyses were conducted in the RStudio environment (version 2026.04.0+526, Posit Software, PBC) using the R programming language (version 4.6.0) and the meta package. For individual studies, confidence intervals for proportions were calculated using the Clopper-Pearson exact binomial method. The pooled estimate and its 95% CI were obtained on the logit scale within a random-effects model, then back-transformed using the standard logistic function. The pooled prevalence of *H. pylori* infection was evaluated using a proportional meta-analysis with a random-effects model. To stabilize variance, we used the logit transformation of proportions (PLOGIT). Inter-study variance (τ^2) was estimated using the Maximum Likelihood (ML) method. Statistical heterogeneity across studies was assessed using Cochran's Q statistic and the I^2 index. An I^2 value > 75% was interpreted as high heterogeneity. To identify sources of heterogeneity, an *a priori* subgroup analysis was conducted based on:

- the type of diagnostic method applied (tests for active infection *vs*. serological tests);
- the presence of gastroduodenal pathology;
- geographic region.

The effect of publication year was examined using univariate meta-regression. The robustness of the results was tested through sensitivity analysis using the sequential exclusion of individual studies (leave-one-out analysis). Publication bias was assessed visually with a funnel plot and statistically with Egger's regression test. Given anticipated high inter-study heterogeneity, the trim-and-fill method was also applied as a sensitivity analysis to evaluate the robustness of the pooled prevalence estimate to potential publication bias. Results were considered statistically significant at $p < 0.05$.

RESULTS

Characteristics of Included Publications

Within the framework of the systematic review, 784 scientific publications meeting the search criteria were identified. After removing duplicates, 397 unique articles remained. After screening titles and abstracts, 72 articles were selected for full-text review. After full-text analysis and assessment against the inclusion criteria, 27 studies were included in the final analysis (Figure 1).

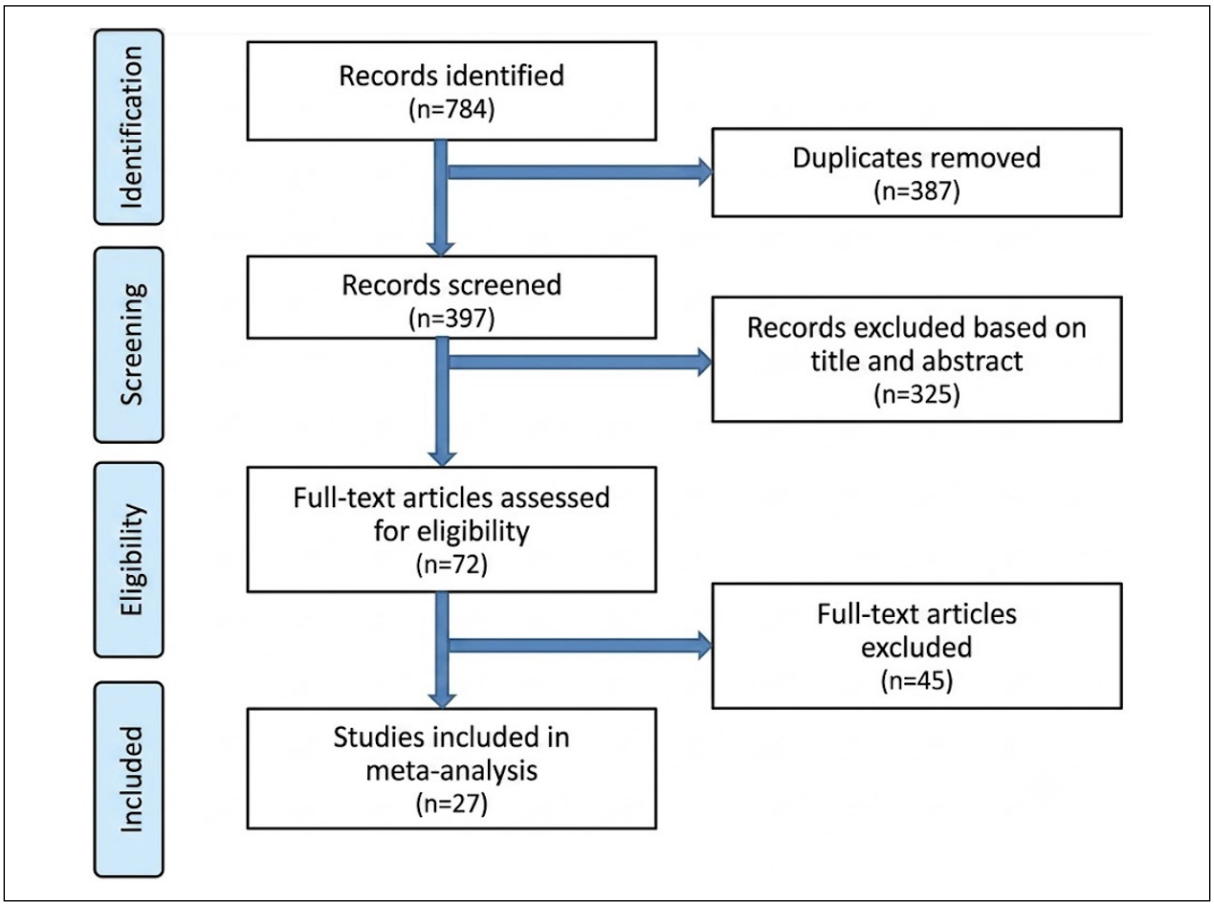

Figure 1. PRISMA flowchart of studies considered in our meta-analysis.

Of the included publications, 21 addressed *H. pylori* prevalence in patients with gastrointestinal pathology, and 6 assessed prevalence in patients with extragastric pathology.

Prevalence of *H. pylori* Infection Among Patients with Gastrointestinal Diseases

Twenty-one publications meeting the search criteria were included in the analysis, and their characteristics are presented in Table 1.

Based on a meta-analysis of 21 studies involving 6,492 participants, the pooled prevalence of *H. pylori* infection was 76.5% (95% CI: 68.5-82.9%) using the random-effects model (Figure 2).

Visual assessment of the funnel plot revealed no pronounced asymmetry (Figure 3). Egger's regression test also showed no statistically significant evidence of a small-study effect or publication bias (t = -0.29; p = 0.777). The trim-and-fill method suggested that two studies might be missing from the left side of the funnel plot. After their hypothetical addition, the pooled prevalence of *H. pylori* infection decreased only marginally, from 76.5% (95% CI: 68.5-82.9%) to 74.0% (95% CI: 68.5-78.9%). However, given the high inter-study heterogeneity (I^2 = 92.2%), the results of the trim-and-fill analysis should be interpreted with caution.

To assess the robustness of the results, we also conducted a sensitivity analysis using the leave-one-out method, sequentially excluding each of the 21 studies. The pooled *H. pylori* prevalence estimate did not change significantly, ranging from 75.17% (excluding Chopei et al[12]) to 77.58% (excluding Zakharchuk et al[10] or Bychkov et al[20]) (95% CI: 68.5-82.9%). The level of inter-study heterogeneity also remained consistently high (I^2 = 91.3-92.6%). These results indicate that no single study exerted a disproportionate influence on the overall meta-analysis outcome, demonstrating the absence of a dominant mathematical impact from individual studies on the pooled estimate; however, this does not exclude the presence of systematic bias across the entire dataset.

TABLE 1. LIST AND CHARACTERISTICS OF STUDIES INVESTIGATING THE PREVALENCE OF *H. PYLORI* INFECTION AMONG PATIENTS WITH GI DISEASES.

First author	Year of publication	Study region	Number of patients	Patient diseases	Gastroduodenal pathology (yes/no)	*H. pylori* detection method	Diagnostic type	*H. pylori* infection rate (%)
Klymanska et al[7]	1999	Northern	130	Patients with duodenal peptic ulcer (PU)	Yes	Histological	Active	84.6%
Hulevskyi et al[8]	1999	Central	162	Patients with duodenal PU	Yes	Bacterioscopic, rapid urease test	Active	89.0%
Tkach et al[9]	2000	Northern	3,562	Patients with dyspeptic complaints (PU, chronic gastritis, non-ulcer dyspepsia)	Yes	13C-UBT	Active	78.1%
Zakharchuk et al[10]	2000	Western	104	Gastric and duodenal peptic ulcer	Yes	Rapid urease test, histological	Active	50.0%
Hospodarskyi et al[11]	2000	Western	288	Duodenal PU	Yes	Gastric mucosal biopsy with microscopy	Active	78.0%
Chopei et al[12]	2004	Western	100	Patients with duodenal PU and chronic superficial gastritis	Yes	Histological, rapid urease test, serological (IgG)	Combined	94.0%
Sarapuk et al[13]	2004	Western	148	Patients with reduced acid-producing gastric function	Yes	Rapid urease test, histological	Active	71.6%
Sirchak et al[14]	2004	Western	32	Patients with liver cirrhosis	No	Serological (total Ig) and 13C-UBT	Combined	87.5%
Kolesnyk et al[15]	2008	Western	534	Patients with dyspeptic complaints	Yes	Serological (IgG)	Serological	84.0%
Chubenko et al[16]	2009	Eastern	60	Patients with chronic atrophic gastritis, Chernobyl Nuclear Power Plant (ChNPP) accident liquidators	Yes	Fecal antigen detection	Active	93.3%
Arkhiy et al[17]	2009	Western	137	Hepatogenic erosive and ulcerative gastric lesions	Yes	Fecal antigen detection	Active	87.6%
Maslova et al[18]	2010	Eastern	30	Patients with chronic antral gastritis and duodenal PU	Yes	PCR of gastric biopsies	Active	53.3%
Pelishenko et al[19]	2010	Western	28	Patients with chronic atrophic gastritis and gastric/duodenal PU	Yes	Rapid urease test, histological, “Helic” test, serological (IgG)	Combined	75.0%
Bychkov et al[20]	2011	Western	12	Patients with diseases of the upper digestive tract	Yes	Fecal antigen detection and 13C-UBT	Active	33.3%
Dorofeyev et al[21]	2014	Eastern	168	Functional dyspepsia	Yes	13C-UBT and rapid urease test	Active	58.0%
Novytskyy et al[22]	2015	Central	126	Erosive and non-erosive gastro-duodenitis, peptic ulcer	Yes	Rapid urease test, histological, cultural	Active	67.6%
Radetska et al[23]	2016	Central	182	University students with gastro-enterological complaints	Yes	Serological (IgA)	Serological	62.5%
Bobro et al[24]	2018	Eastern	108	NSAID-gastropathies	Yes	Rapid urease test	Active	60.2%
Sukhan et al[25]	2018	Central	325	Non-atrophic and atrophic chronic gastritis	Yes	Rapid urease test, histological	Active	61.5%
Filip et al[26]	2024	Western	226	Patients with esophagogastroduodenal zone lesions and lumbar osteochondrosis	Yes	Rapid urease test, fecal antigen detection, 13C-UBT	Active	88.9%
Kolosovych et al[27]	2025	Northern	30	Patients with stage IV pancreatic head cancer	No	Fecal antigen detection	Active	86.7%

Peptic ulcer (PU), Nonsteroidal anti-inflammatory drug (NSAID), 13C-urea breath test (13C-UBT), Polymerase chain reaction (PCR).

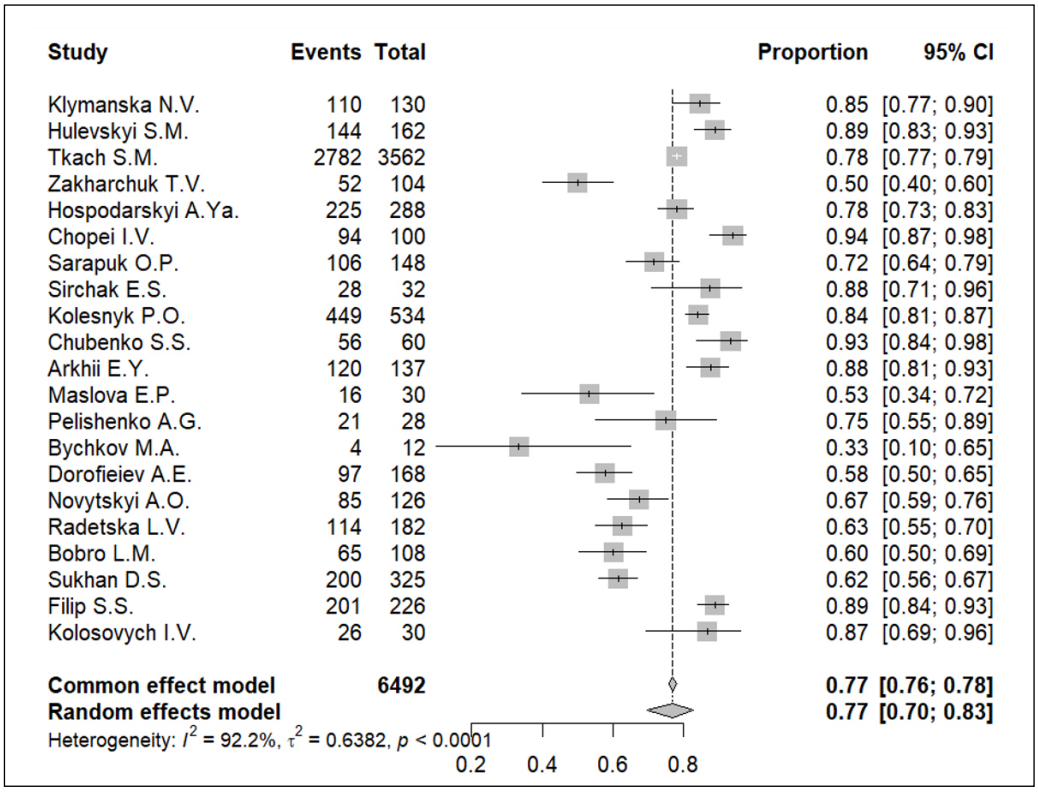

Figure 2. Meta-analysis of *H. pylori* infection prevalence among adult patients with GI-related pathologies.

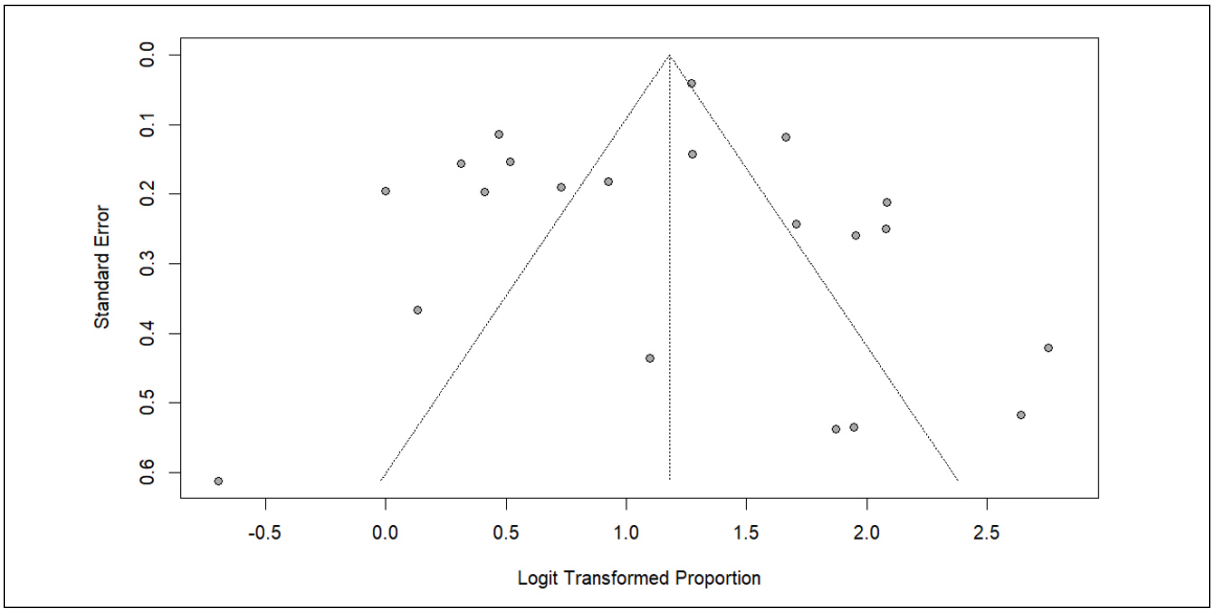

Figure 3. Funnel plot for assessing publication bias in the meta-analysis.

Publication Years and Prevalence

Meta-regression analysis found no statistically significant association between publication year and *H. pylori* prevalence (β = -0.019; 95% CI from -0.066 to 0.027; p = 0.415).

Study Region and Prevalence

Under the random-effects model, the prevalence of *H. pylori* was 78.4% (95% CI: 77.1-79.7%) in the Northern region, 71.7% (95% CI: 57.5-82.6%) in the Central region, 79.4% (95% CI: 68.6-87.1%) in the Western region, and 69.5% (95% CI: 47.2-85.3%) in the Eastern region (Figure 4).

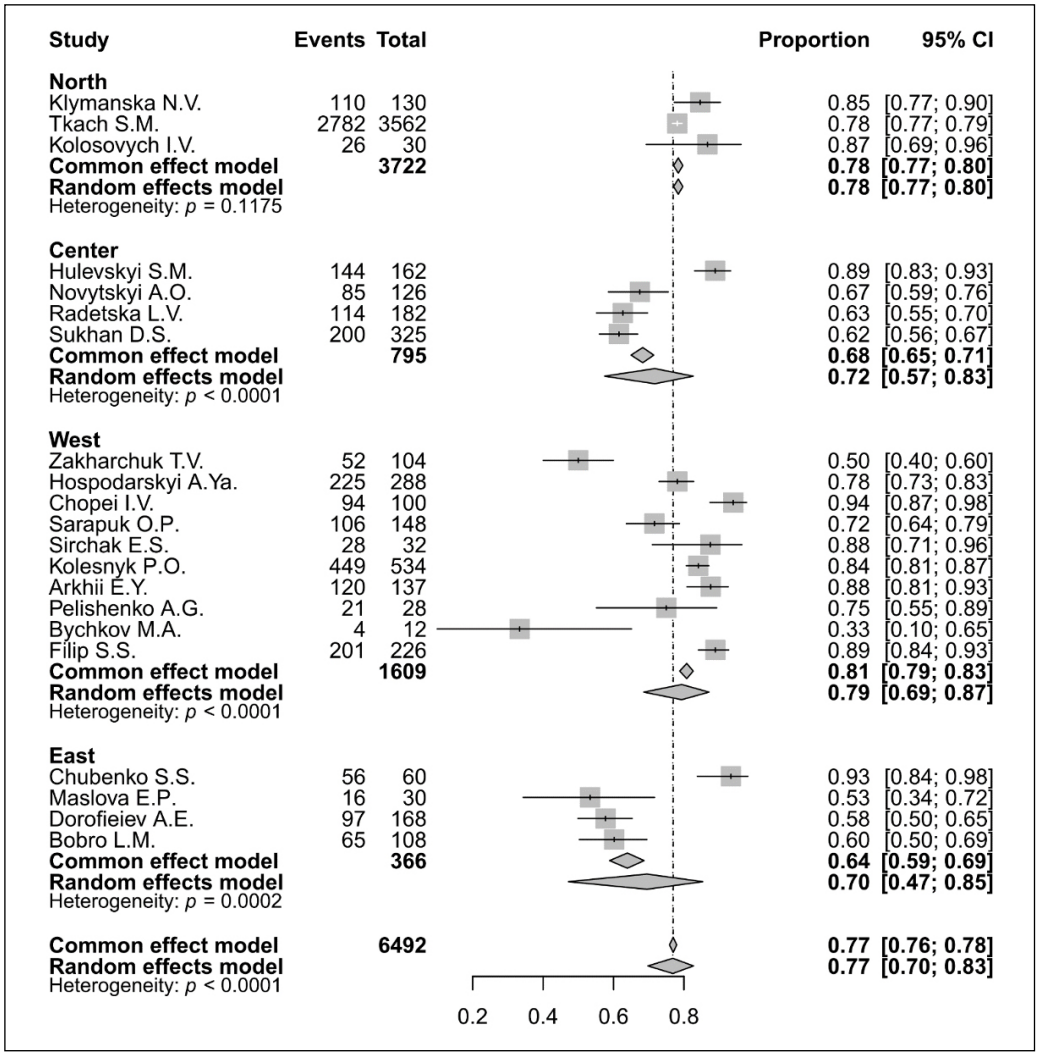

Figure 4. Subgroup analysis of *H. pylori* infection prevalence by regions of Ukraine (forest plot).

The Western and Northern regions had numerically higher prevalence rates, while the Eastern region had lower rates; however, these differences were not statistically significant. Heterogeneity remained high in most regional subgroups: I^2 = 53.3% in the Northern region, 91.6% in the Central region, 91.1% in the Western region, and 84.6% in the Eastern region. Despite numerical differences between regions, subgroup comparison using a random-effects model found no statistically significant regional differences (χ^2 = 2.19; df = 3; p = 0.533).

Gastroduodenal Pathology and Prevalence

We compared subgroups based on whether the clinical cohorts had gastroduodenal pathology or diseases of other gastrointestinal tract segments. In the 19 studies that included patients with gastroduodenal pathology, the pooled prevalence of *H. pylori* was 75.7% (95% CI: 68.0-82.1%), with significant heterogeneity among the studies (I^2 = 92.9%). In the two studies assessing prevalence

among patients with other GI diseases, the infection prevalence was 87.1% (95% CI: 76.3-93.4%). Subgroup comparison *via* the random-effects model revealed no statistically significant differences between studies based on the presence of gastroduodenal pathology (Q = 3.29; df = 1; $p = 0.070$). However, the latter subgroup included only two studies, which limits the statistical power of the analysis and requires cautious interpretation of the estimates.

Diagnostic Method and Prevalence

Given the use of combined diagnostic strategies in most primary studies, we grouped all studies into three categories: those using serological methods for *H. pylori* diagnosis, those using active detection methods (rapid urease test, histological method, fecal *H. pylori* antigen determination, 13C-UBT), and those combining serological and active methods. In studies using combined methods, a patient was considered *H. pylori*-positive if at least one test was positive (unless the authors of the primary study specified a different rule). Subgroup analysis by *H. pylori* diagnostic method found no statistically significant differences in infection prevalence across groups (Q = 2.63; df = 2; $p = 0.268$). The pooled prevalence was 74.4% (95% CI: 68.0-79.8%) with active methods, 87.4% (95% CI: 71.7-95.0%) with combined serological and active methods, and 74.9% (95% CI: 49.3-90.2%) with serological methods. Meta-regression analysis showed that the *H. pylori* diagnostic method was not a statistically significant moderator of infection prevalence (QM = 3.53; df = 2; $p = 0.171$). The diagnostic method did not explain the inter-study heterogeneity ($R^2 = 0\%$). Although combined methods showed a trend toward higher infection prevalence than active methods, this difference did not reach statistical significance ($\beta = 0.872$; $p = 0.061$).

Prevalence of *H. pylori* Infection Among Patients with Extragastric Pathologies

Of the processed and selected publications, six examined *H. pylori* prevalence among patients with extragastric pathologies. The characteristics of these studies are shown in Table 2.

Thus, in the studies included in the meta-analysis, the total number of patients was 458, of whom *314 had H. pylori* infection. Using a random-effects model, the pooled prevalence of *H. pylori* was 69.1% (95% CI: 52.4-81.9%). Significant heterogeneity was observed among the studies ($I^2 = 87.8\%$; $p < 0.001$) (Figure 5).

Sensitivity analysis using the leave-one-out method demonstrated the stability of the results. Sequentially excluding each study did not substantially shift the pooled *H. pylori* prevalence, which ranged from 64.0% to 72.3%. Heterogeneity remained high after excluding any study ($I^2 = 83.8$-90.1%), indicating that no single study had a dominant effect on the overall meta-analysis result. Meta-regression analysis revealed no statistically significant effect of publication year on *H. pylori* prevalence among patients with extragastric diseases ($\beta = -0.011$; 95% CI from -0.139 to 0.118; $p = 0.832$). Regional subgroup analysis showed statistically significant differences in *H. pylori* prevalence across the regions of Ukraine (Q = 10.91; $p = 0.004$). The highest prevalence was observed in the Western region – 77.8% (95% CI: 50.1-92.5%), whereas in the Central and Eastern regions, it was 62.2% (95% CI: 1.6-99.4%) and 51.2% (95% CI: 40.5-61.8%), respectively. These results should be interpreted with caution due to the limited number of available studies in some regions, especially in the Eastern region, where the analysis was based on a single study; therefore, these findings should be regarded exclusively as hypothesis-generating.

DISCUSSION

This systematic review and meta-analysis included 21 studies with a total of 6,492 participants and found a pooled prevalence of *H. pylori* infection among Ukrainian clinical cohorts of 76.5% (95% CI: 68.5-82.9%).

The obtained value indicates a high prevalence of infection among patients seeking gastroenterological care. Similar results were reported by Estonian researchers, who studied the prevalence of *H. pylori* infection among patients with dyspepsia referred for upper gastrointestinal endoscopy[34]. Slightly lower values were observed in a multicenter study conducted in Italy. According to its findings, among 589 dyspepsia patients undergoing gastroscopy with biopsy, *H. pylori* infection was detected in 51.5% of patients with visible lesions on upper endoscopy and in 50.1% of patients without visible lesions[35].

TABLE 2. NONSTEROIDAL ANTI-INFLAMMATORY DRUG (NSAID).

First author	Year of publication	Study region	Number of patients	Patient diseases	*H. pylori* detection method	Diagnostic type	*H. pylori* infection rate (%)
Tyvonchuk et al[28]	2007	Central	43	Patients with morbid obesity	Rapid urease test, cytological	Active	74.4%
Kozyrieva et al[29]	2016	Eastern	82	Patients with IHD and type 2 diabetes mellitus	Serological (IgG)	Serological	51.2%
Shved et al[30]	2018	Western	103	Patients witha acute coronary syndrome on the background of essential arterial hypertension	Serological (total Ig)	Serological	80.6%
Sirchak et al[31]	2018	Western	48	Patients with type 2 diabetes mellitus	Rapid urease test, bacterioscopic, 13C-UBT	Active	62.5%
Khukhlina et al[32]	2024	Western	100	Patients with B12-deficiency anemia	Fecal antigen detection, rapid urease test	Active	85.0%
Paliy et al[33]	2025	Central	82	Patients taking ASA due to cardiovascular system diseases	Serological (total Ig)	Serological	51.2%

Ischemic heart disease (IHD), Acetylsalicylic acid (ASA), 13C-urea breath test (13C-UBT).

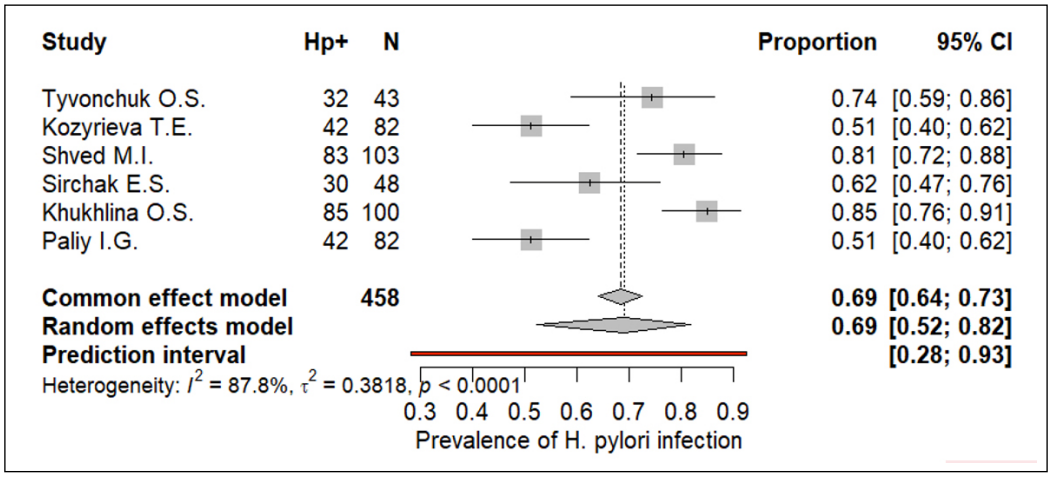

Figure 5. Meta-analysis of *H. pylori* infection prevalence among patients with extragastric pathologies.

A separate analysis of studies conducted among patients with extragastric diseases revealed a high *H. pylori* prevalence (69.1%), although this rate was slightly lower than that observed among gastroenterological patients. These results align with modern understanding regarding the possible connection between *H. pylori* and a number of extragastric conditions, specifically iron-deficiency anemia, immune thrombocytopenia, and vitamin B12 deficiency, for which eradication therapy is recommended by international guidelines, justifying the inclusion and independent analysis of these clinical cohorts.

However, the pooled estimate for this subgroup is primarily statistical rather than pathophysiological, as the included nosologies differ drastically in the mechanisms of their potential association with the infection. Thus, this figure (69.1%) is exclusively hypothesis-generating and cannot be interpreted as a universal prevalence of extragastric manifestations.

To our knowledge, this is the first systematic review and meta-analysis summarising data on *H. pylori* prevalence among clinical cohorts in Ukraine. Unlike previous studies focused on specific nosologies or regions, our work integrates findings from diverse clinical populations, enabling a more comprehensive assessment of infection burden among patients with a gastroenterological profile.

However, the figure we obtained cannot be extrapolated to the general population of Ukraine, as the meta-analysis predominantly included clinical studies of patients with gastroenterological and other diseases that may increase the likelihood of *H. pylori* infection.

Consequently, the derived estimate reflects the infection prevalence strictly among clinical cohorts and does not characterize the infection rate in the healthy population. This distinction is fundamental, as estimating *H. pylori* prevalence in the general population *vs.* clinical groups serves different epidemiological and clinical objectives. For instance, a recent systematic review and meta-analysis of nearly 400,000 participants from the general population reported a pooled *H. pylori* infection prevalence of 43%, almost half of our study's finding[36]. Such a discrepancy is expected and primarily reflects the diverse composition of the studied cohorts rather than a real surge in infection prevalence in Ukraine.

The high inter-study heterogeneity (I^2 = 92.2%) warrants attention, suggesting that the pooled figure is a descriptive aggregate estimate and should be interpreted cautiously. High heterogeneity (I^2 > 90%) is typical for *H. pylori* prevalence meta-analyses. For example, an analysis published in 2023 of 224 studies from 71 countries encompassing nearly 3 million people reported a global heterogeneity index I^2 of 99.9%[37]. The authors attribute this to variations in diagnostic methods, age groups, socioeconomic status of the study populations, geographical locations, and the timeframes over which the studies were conducted.

The aforementioned 2026 meta-analysis also revealed profound heterogeneity (I^2 = 99.9%)[36]. Nevertheless, our subgroup analysis found no statistically significant differences between studies based on the diagnostic method used (p = 0.268), a finding corroborated by meta-regression results (p = 0.171; R^2 = 0%). Within this set of studies, no statistically significant differences across

method categories were detected; however, given the small number of serological and combined studies and the clinical non-equivalence of the methods, this result does not establish diagnostic or epidemiological equivalence.

At the same time, the clinical interpretation of these data demands caution. Serological methods detect antibodies against *H. pylori*, which can persist long after eradication, preventing reliable differentiation between active infection and past infection.

The lack of statistically significant differences likely reflects the small number of studies using serological or combined methods, which limits the analysis's statistical power. Furthermore, statistical equivalence does not imply clinical diagnostic equivalence: merging tests for active and past infections into a single dataset could systematically skew the estimates.

Despite the high heterogeneity, the publication-bias analysis showed no substantial evidence of systematic error. No statistical evidence of funnel plot asymmetry was found; however, given the high heterogeneity and the methodological limitations of proportional meta-analyses, the lack of a statistically significant Egger's test result ($p = 0.777$) does not rule out publication bias. The trim-and-fill method suggested the presence of two potentially missing studies, and the adjusted pooled prevalence fell marginally from 76.5% to 74.0%.

The high heterogeneity likely reflects the complex interplay of other factors that the meta-analysis could not fully account for. Foremost among these is the clinical diversity of the included cohorts, as the studies included patients with different gastroenterological diseases, each with a different risk profile for *H. pylori* infection. In addition, temporal differences between studies, variations in sampling strategies, inclusion and exclusion criteria, and differences in laboratory protocols may have influenced the results.

The acquired results bear significant clinical and practical value. A high proportion of positive results within the included clinical cohorts emphasizes the crucial need for accessible, validated *H. pylori* diagnostics and may support the implementation of test-and-treat approaches recommended by clinical guidelines in specific, indicated patient groups[38,39]. The timely detection and eradication of *H. pylori* can help decrease the risk of developing peptic ulcer disease, atrophic gastritis, and gastric cancer.

The findings could also serve as an epidemiological foundation for refining national paradigms for *H. pylori* diagnosis and treatment, as well as for designing future population-based studies in Ukraine.

Study Limitations

A major limitation of this study is selection bias. Ukraine currently lacks large-scale population studies that evaluate *H. pylori* prevalence among healthy individuals using modern, highly accurate diagnostic methods. Consequently, most available data come from patients already seeking medical attention, which likely yields higher prevalence estimates than in the general population.

Another limitation is the regional imbalance among the available studies. For certain regions of Ukraine, the number of studies was insufficient, resulting in exceptionally wide confidence intervals.

Some included studies used diagnostic techniques that now fall short of modern guidelines for identifying active infections, and thresholds for serological positivity or breath test protocols were not always standardized, all of which could have affected the findings. The absence of a statistically significant association with publication year does not exclude true temporal trends in infection epidemiology, because 21 studies are insufficient to draw complex moderator inferences, and the article publication year often misaligns with the actual time of clinical data collection, substantially diminishing the validity of the meta-regression analysis.

A further important limitation is the absence of a formal Risk of Bias assessment *via* standardized scales. Accordingly, we could not perform a sensitivity analysis excluding low-quality studies, which limits our ability to appraise the overall certainty of evidence and leaves the risk that undisclosed methodological flaws in primary studies may have influenced the pooled estimate.

Finally, the systematic review protocol was not prospectively registered in the international PROSPERO registry. The absence of prospective registration precludes independent comparison of prespecified eligibility criteria, outcomes, and planned analytical methods with the final study protocol. Nevertheless, the manuscript described the literature search strategy, study selection process, data extraction, and statistical analyses in detail to ensure transparency and reproducibility.

CONCLUSIONS

Thus, the pooled estimate of the proportion of *H. pylori*-positive results among the included Ukrainian clinical cohorts is high (76.5% for gastroenterological and 69.1% for extragastric pathology *via* the random-effects model), underscoring the critical need for accessible, validated diagnostics for the indicated patient groups. However, the extraordinarily high heterogeneity and pronounced selection bias preclude extrapolation of this descriptive estimate to the broader population. Determining the true epidemiological landscape in Ukraine requires a purposefully designed national population screening program.

Funding

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Ethics Approval and Informed Consent

Ethics approval and informed consent were not applicable to this study because it was a systematic review and meta-analysis based exclusively on data from previously published studies. No new data were collected, and no identifiable individual-level data were accessed or analyzed.

Authors' Contributions

Iryna Paliy: conceptualization, methodology, supervision, writing – review & editing.
Oleh Ksenchyn: investigation, writing – original draft, formal analysis, software, visualization.
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Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

All data supporting the findings of this study are included within the article and/or its supplementary materials.

AI Disclosure

Generative AI, specifically Gemini (Google), was used to prepare this manuscript for English-language translation, academic editing, refinement of scientific wording, and assistance with formatting selected sections. AI was not used to generate data, perform statistical analyses (conducted using RStudio and the meta package), or draw scientific conclusions about the interpretation of the results. The authors thoroughly reviewed, verified, and critically evaluated all AI-assisted content and assume full and final responsibility for the integrity, accuracy, and originality of the manuscript.

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