https://doi.org/10.31925/farmacia.2025.6.25 **ORIGINAL ARTICLE**

HELICOBACTER PYLORI: KNOWLEDGE, ATTITUDES AND EXPERIENCES AMONG PATIENTS

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Abstract

Helicobacter pylori is a Gram-negative bacterium that can cause chronic gastritis, gastro-duodenal ulcer, gastric cancer, or MALT lymphoma. Despite its declining prevalence, nearly half of the world's population is still infected. Seventy adult patients from Iași completed a questionnaire assessing their knowledge of *H. pylori*, attitudes toward testing and eradication and personal experience. A high proportion (65.71%) of respondents reported having heard of *H. pylori*. Basic knowledge varied significantly by place of origin ($p = 0.034$), consumption of preserved foods ($p = 0.001$), prior *H. pylori* testing ($p < 0.001$) and history of infection ($p < 0.001$) (Mann-Whitney U test). Most respondents (71.43%) had never been tested for *H. pylori*. Of those tested, 20.00% reported prior *H. pylori* infection, and 8.57% could not recall the test result. The study found low levels of knowledge about *H. pylori* among certain respondent groups, yet a high proportion of respondents supported preventive testing.

Rezumat

Helicobacter pylori este o bacterie Gram-negativă ce poate provoca gastrită cronică, ulcer gastro-duodenal, cancer gastric sau limfom MALT. În ciuda prevalenței aflată în scădere, aproape jumătate din populația lumii ar fi încă infectată. Studiul a inclus 70 de participanți adulți din Iași care au răspuns unui chestionar ce evalua cunoștințele despre *H. pylori*, atitudini cu privire la testare, eradicare și experiența personală. Un procent ridicat (65,71%) dintre respondenți au auzit despre *H. pylori*. Cunoștințele de bază despre *H. pylori* au variat semnificativ în funcție de locul de proveniență ($p = 0,034$), consumul de alimente conservate ($p = 0,001$), testarea anterioară pentru *H. pylori* ($p < 0,001$) și istoricul de infecție ($p < 0,001$), (testul U Mann-Whitney). Majoritatea respondenților (71,43%) nu au fost niciodată testați pentru *H. pylori*. Dintre cei testați, 20,00% au indicat infecția anterioară, în timp ce 8,57% nu și-au amintit rezultatul testului. Studiul a arătat niveluri scăzute ale cunoștințelor despre *H. pylori* în rândul anumitor categorii de respondenți, însă un procent ridicat dintre aceștia susțin testarea preventivă.

Keywords: *Helicobacter pylori*, level of knowledge, preventive testing, awareness

Introduction

Helicobacter pylori is a Gram-negative bacterium that colonises the gastric mucosa. It represents the leading cause of chronic gastritis, and it is associated with significant gastroduodenal pathologies, including peptic ulcer disease (PUD), gastric cancer and MALT lymphoma. The development of *H. pylori*-associated diseases is influenced by bacterial virulence, host genetics and environmental factors [19, 26].

Although prevalence has declined over the decades in most countries, nearly 50% of the global population is estimated to be infected with *H. pylori* [10]. Factors significantly affecting prevalence include age, ethnicity, comorbidities, geographic area, socioeconomic status and sanitation conditions [19]. In Europe, *H. pylori* appears more widespread in the South and East than in the Nordic countries [12]. Current *H. pylori* prevalence data in Romania primarily come from symptomatic patients in tertiary centres, with rates ranging from 25.3% to 71.9% [26].

H. pylori remains a significant cause of PUD, although ulcer aetiology is multifactorial, also involving other factors (*e.g.*, NSAID use, lifestyle, or genetic aspects) [20]. Moreover, *H. pylori* infection is associated with approximately 90% of gastric cancer cases, with regional variations in incidence and mortality, and notably higher rates in Asia and Eastern Europe. The impact of infection is also influenced by ethnicity and environmental factors, including socioeconomic status, dietary habits, tobacco use and salt consumption [19]. Person-to-person contact (oral-oral, gastro-oral, faecal-oral) is the primary route of transmission, especially during childhood and within families. Intermediate environmental reservoirs, including water, animals, or raw vegetables, have been suggested as alternative transmission routes [12, 23].

Most global studies have reported low levels of knowledge among the general population regarding *H. pylori* infection [7]. Understanding the general population's awareness and knowledge of *H. pylori*

is a key factor in the development of public health interventions, given its impact on preventing PUD and gastric cancer, as well as on healthcare costs. Education and awareness strategies can improve health outcomes, particularly in population groups with low health literacy and limited access to healthcare [2]. To the best of our knowledge, no studies have evaluated the general population's awareness, attitudes and experiences regarding *H. pylori* in Romania, and data on public health interventions targeting awareness, screening and eradication are insufficient.

The present study is a preliminary research that aims to evaluate patients' knowledge and attitudes in Iași, Romania, regarding *H. pylori* infection, testing, eradication and personal experience to identify current trends. A secondary objective and basis for future research is to analyse the possibility of involving pharmacists in increasing *H. pylori* awareness and prevention.

Materials and Methods

Study design and setting

This was a survey-based cross-sectional study conducted in a general practice (GP) in Iași, Romania, between April and July 2024. The medical practice is situated in an urban, easily accessible area and has operated for 25 years. Eligibility criteria included patients aged 18 years or older who visited the practice during the study period and agreed to participate. Exclusion criteria consisted of patients who declined participation, those under 18 years old, and individuals with mental illness, cognitive impairment, or inability to provide informed consent.

The sample comprised 70 participants selected *via* convenience sampling from a larger population. Before participation, each patient signed an informed consent form. Participation was voluntary and anonymous. The study was conducted with the approval of the Research Ethics Commission of the "Grigore T. Popa" University of Medicine and Pharmacy of Iași, Romania, (354/10.10.2023), and in compliance with current legislation.

Questionnaire content and structure

The base questionnaire was developed by Wu *et al*. [38], adapted by Vrebalov Cindro *et al*. [36], and used with permission from the latter. The questionnaire was translated into Romanian and adapted to the Romanian population, with several additional questions to increase the instrument's specificity. The questionnaire consisted of 40 items distributed across four sections: general information; basic understanding and awareness of *H. pylori*; attitudes towards testing and treatment; and personal experience with the infection. The questionnaire was administered by a healthcare provider, and completion took 15 - 25 minutes.

The first section – general information – had 8 items (multiple choice and dichotomous questions) that covered demographics (age, sex, education level, place of residence and employment status), lifestyle habits, whether they had ever heard of *H. pylori* and where they had obtained this information.

The second section comprised 8 closed-ended questions with Yes/No/Don't know response options assessing participants' basic knowledge of *H. pylori* (infectivity, transmission routes, gastric pathology involvement) and awareness of treatment availability, prevention and its impact.

The third section included 11 items: 8 items (closed and partially closed-ended questions with unordered choices) that covered attitudes towards *H. pylori* testing and treatment. Those who had not undergone testing received questions about their reasons for not being tested and their attitudes towards preventive testing. Patients who have ever been tested were asked about the means by which they would undertake testing, their attitude towards eradicating the infection and towards testing their family members; 2 items encompassed respondents' interest in receiving additional information about *H. pylori* and their perceived usefulness of disseminating information about the infection; one 5 points Likert scale item evaluated their trust in several medical and non-medical information sources.

The fourth section encompassed 13 items: 12 items (closed and partial closed-ended questions with unordered choices) addressed to participants who had undergone *H. pylori* testing – those who tested positive and did not undergo treatment were queried about their reasons for not doing so and those who received treatment were asked about the treatment regimen they followed, duration of treatment, adverse reactions, symptom outcomes, re-examination and reinfection after treatment. The last item was formulated as a 5-point Likert scale and concerned several symptoms associated with *H. pylori* infection, as well as several elements related to the patient's quality of life.

Questionnaire validation procedures

The questionnaire is undergoing validation in accordance with ISPOR guidelines. The content validity of the questionnaire was established *via* review by a panel of experts in the pharmaceutical field. These specialists drew on their expertise with the previously validated questionnaires to ensure the instrument's relevance and in-depth coverage of the subject matter [28, 29, 31]. Internal consistency reliability was assessed for the eight items designed to measure knowledge about *H. pylori* using overall reliability (Cronbach's alpha). Additionally, the scale was assessed using tests of EFA suitability (KMO and Bartlett's test), total variance explained and factor structure, as well as the pattern matrix and factor correlation matrix, which are discussed in the results section.

Statistical analysis

To classify the knowledge level regarding *H. pylori*, a composite score (0 - 8) was calculated from eight questions, with 1 point awarded for each correct answer. Knowledge levels were categorised as low (0 - 2),

medium (3 - 5) and high (6 - 8), as revealed by statistical analysis of the extended sample. Data were analysed using descriptive statistical methods, including mean, median, standard deviation and percentages. Associations between *H. pylori* knowledge scores and demographic or lifestyle variables were evaluated using Mann-Whitney U and Kruskal-Wallis tests. The Chi-square test (Cramer's V coefficient) was used to assess the association between various categorical variables. A p-value of less than 0.05 was considered statistically significant. Visual analyses, including graphs and tables, were created using Excel® Microsoft, and statistical analyses were performed with IBM Statistical Package for Social Sciences (SPSS), version 28.0 (IBM Corp., Armonk, NY, USA).

Results and Discussion

Demographic data and general information

The mean age of the patients included in the study was 62.31 ± 13.91 years, with the majority of patients in the 71 - 80 (37.14%) and 61 - 70 (32.86%) age groups (Figure 1).

Regarding occupational status, 71.43% of respondents were retired (Table I). Four (5.71%) respondents had medical education.

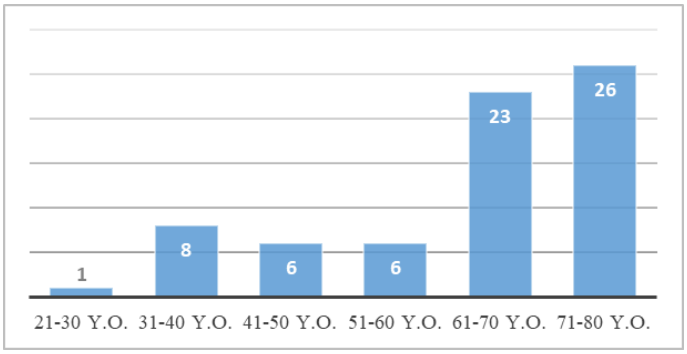

Figure 1.
Distribution by age groups

Table I
Demographic data and general characteristics of respondents

Characteristics		N	%
Age (years)	**21 - 30**	1	1.43%
	31 - 40	8	11.43%
	41 - 50	6	8.57%
	51 - 60	6	8.57%
	61 - 70	23	32.86%
	71 - 80	26	37.14%
Sex	**Female**	38	54.29%
	Male	32	45.71%
Education	**Primary school**	4	5.71%
	Trade school and high school	43	61.43%
	Bachelor's degree	19	27.14%
	Postgraduate studies	4	5.71%
Place of origin	**Rural**	21	30.00%
	Urban	49	70.00%
Occupation	**Retired**	50	71.43%
	Employed	20	28.57%
Heard of *H. pylori*	**Yes**	46	65.71%
	No	24	34.29%

Most respondents were women (54.29%), and the vast majority lived in urban areas (70.00%), a predictable finding given the medical practice's urban location. Regarding educational level, most of the patients had upper secondary education (61.43%), 27.40% had a university degree, and only 5.71% had postgraduate studies.

Regarding long-term dietary habits or lifestyle, 87.14% of patients reported drinking coffee, 47.14% reported eating sweets, 38.57% reported a high-fat diet and only 4.29% reported a history of seafood consumption. Eighteen (25.71%) respondents were long-term alcohol consumers.

Regarding *H. pylori* infection, 46 (65.71%) of the interviewed patients had ever heard about this bacterium (Table I).

Figure 2 presents the frequency of information sources for *H. pylori*, with most patients (42.86%) obtaining

information during a medical consultation. The second most commonly cited source was family or friends (35.71%). Thirteen (30.95%) of patients learned about *H. pylori* from television or radio, 14.29% obtained information from other sources (medical education or work in the medical field), and only 7.14% saw such information in newspapers or magazines. Regarding pharmacies, only 5 (11.90%) respondents reported receiving information about *H. pylori* from a pharmacy, comparable to those who learned on their own *via* the internet or social media.

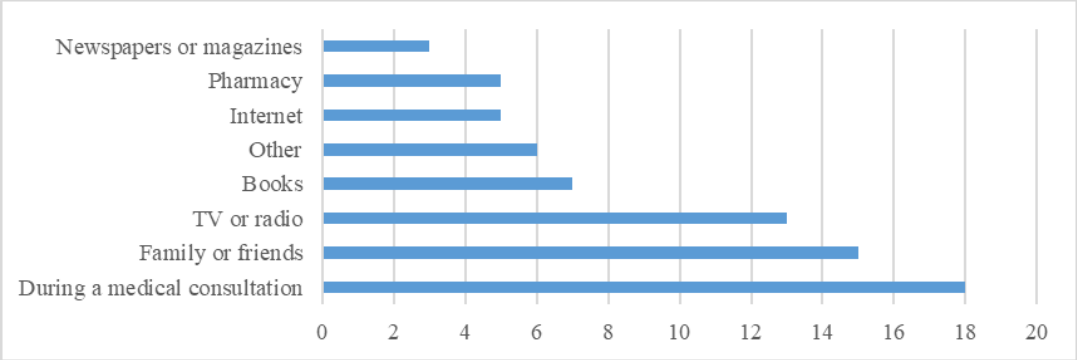

Figure 2.
Frequency of information sources regarding *H. pylori*

Questionnaire validation procedures

Overall reliability (Cronbach's Alpha). In SPSS, internal consistency reliability was assessed for the eight items designed to measure knowledge about *H. pylori*. The results showed that the scale demonstrated good internal consistency, with a Cronbach's alpha coefficient of ($\alpha = 0.853$) (Table II). This value exceeds the conventional cut-off of 0.70, indicating that the items reliably measure a single underlying construct.

In addition, an item-total analysis was conducted to determine the contribution of each item to the scale's overall reliability. The results indicated that all items contributed positively to the scale. The removal of any single item would not result in a higher overall Cronbach's alpha value than the current $\alpha = 0.853$. The highest potential alpha if an item were deleted was ($\alpha = 0.848$) (for item 3). These results indicate an extreme homogeneity among all eight items in the scale.

Table II

Analysis of scale reliability, indicating potential improvement in alpha if any items are deleted

Item	Cronbach's Alpha if Item Deleted
1	0.843
2	0.836
3	0.848
4	0.836
5	0.832
6	0.812
7	0.825
8	0.847

EFA suitability (KMO and Bartlett's Test). A preliminary analysis was conducted to assess whether the 8 items were appropriate for the exploratory factor analysis of the *H. pylori* knowledge scale. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy yielded a value of 0.762, which is regarded as good (values above 0.60 are generally acceptable).

In addition, Bartlett's test of sphericity was statistically significant (Chi-square (28) = 297.66, $p < 0.001$), confirming that the inter-item correlations are sufficiently significant to proceed with the exploratory factor analysis.

Total variance explained and factor structure. Principal Component Analysis (PCA) was used to extract components, with a Direct Oblimin rotation. Initial eigenvalues indicated that two components (factors) met the KMO criterion of having an eigenvalue greater than 1. These two factors collectively accounted for 66.53% of the total variance across the 8 items. The first factor accounted for the majority of the variance (51.95%), while the second factor accounted for an additional 14.58%.

Pattern matrix and factor correlation matrix. The rotated pattern matrix revealed a clean, two-component factor structure using a salient loading threshold of 0.40 (Table III).

The first factor, Knowledge of Clinical Impact and Treatment, was strongly defined by Items 2 ($\beta = 0.918$) and 3 ($\beta = 0.869$), with moderate contributions from Items 6 ($\beta = 0.656$), 7 ($\beta = 0.584$) and 8 ($\beta = 0.408$).

The second factor, Knowledge of Aetiology and Transmission, was defined by strong coefficients on Item 5 ($\beta = 0.899$), Item 4 ($\beta = 0.855$) and Item 1 ($\beta = 0.697$).

All items loaded primarily onto a single factor with minimal cross-loadings, confirming a distinct bi-factorial structure.

Furthermore, the component correlation matrix indicated a moderate, positive correlation between the two identified factors ($r = 0.449$; see Table IV), justifying the use of the oblique (Direct Oblimin) rotation method.

Table III

Rotated pattern matrix for the *H. pylori* knowledge scale. Rotation method: Oblimin with Kaiser normalisation. Extraction method: principal component analysis. Values represent primary factor loadings (beta)

Item	*Factor 1* Knowledge of treatment and public health impact	*Factor 2* Knowledge of aetiology and transmission
2	0.918	-0.064
3	0.869	-0.157
6	0.656	0.404
7	0.584	0.382
8	0.408	0.279
5	-0.057	0.899
4	-0.026	0.855
1	0.061	0.697

Table IV

Component correlation matrix. r = 0.449 indicates a moderate correlation between the two knowledge dimensions

Component	1	2
1	1.000	0.449
2	0.449	1.000

Knowledge about H. pylori

Study participants had a median of 3 correct answers (IQR: 0 - 6). Most respondents (31.43%) answered no questions correctly; 18.57% answered 6 questions correctly, while only 2.86% achieved the maximum score. The two questions concerning modes of transmission had the highest proportions of "don't know" or incorrect responses (82.86% and 80.00%, respectively).

A chi-square test of independence was performed to assess the relationship between biological sex and knowledge level groups, as follows (Table V, Figure 3).

Table V

Knowledge levels about *H. pylori* stratified by sex

Knowledge levels	Sex	
	Male	Female
Low	59.5%	33.9%
Moderate	20.8%	31.1%
High	19.6%	35.0%

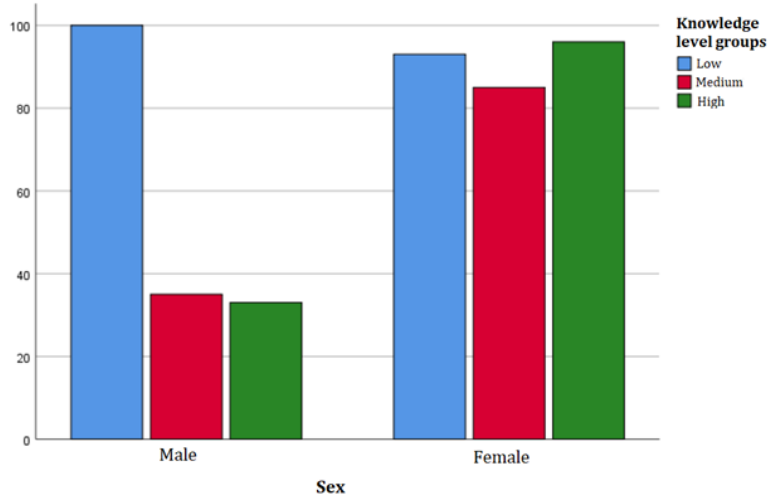

Figure 3.

Knowledge levels about *H. pylori* stratified by sex

The relationship between these variables is statistically significant ($p < 0.01$). Therefore, men are more likely to belong to the low-knowledge-level group. Cramer's V coefficient ($\varphi = 0.252$) was calculated to quantify the effect size; this value is statistically significant but moderate in magnitude.

Knowledge scores about *H. pylori* differed significantly by the place of residence ($p = 0.034$), preserved food consumption ($p = 0.001$), *H. pylori* testing ($p < 0.001$) and infection status history ($p < 0.001$), while other demographic and lifestyle factors showed no significant associations (Mann-Whitney U test). Statistically significant differences were also observed between respondents with medical education (5.71%, n = 4) and those without medical education (94.28%, n = 66; $p = 0.029$).

Furthermore, no statistically significant differences were observed in the knowledge scores about *H. pylori* across different age groups ($p = 0.505$) and educational levels ($p = 0.243$), as determined by the Kruskal-Wallis test.

Attitudes towards H. pylori testing and eradication

Most patients in the study sample (71.43%) had never been tested for *H. pylori*. Figure 4 illustrates the main reasons respondents stated for not undergoing testing, with the lack of symptoms being the most common (60%).

However, most untested patients (72%) support preventive testing for *H. pylori*, 24% are indifferent and only 4% consider it unnecessary (Figure 5).

Among patients previously tested for *H. pylori* (28.57%), 85% support preventive testing, 10% consider it not useful and 5% have no opinion (Figure 6).

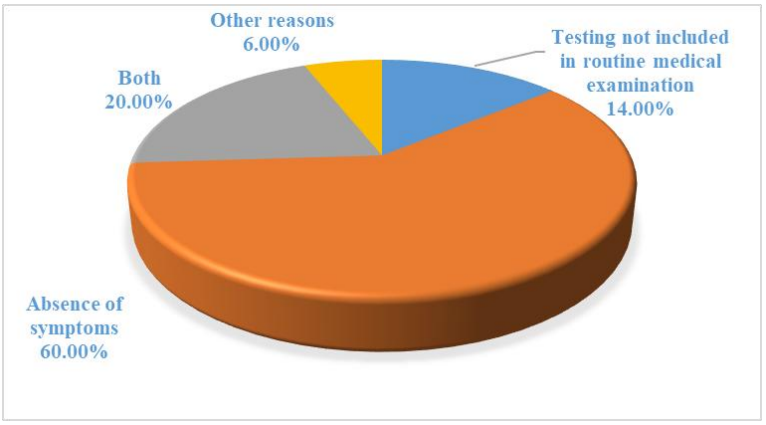

Figure 4.
Reasons reported for not undergoing *H. pylori* testing

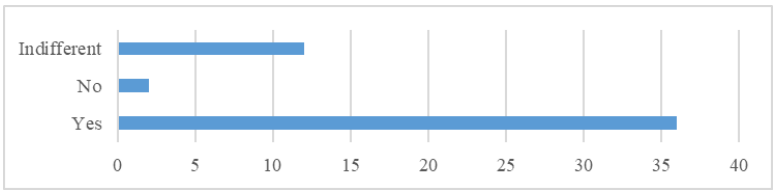

Figure 5.
Support for preventive testing or screening (Not-Tested Group)

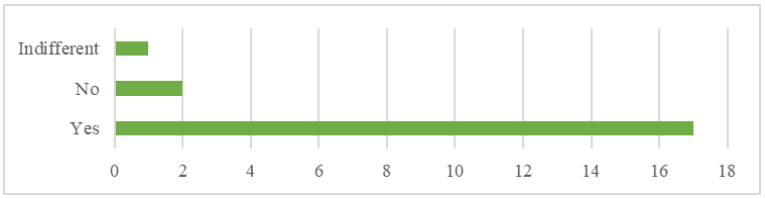

Figure 6.
Support for preventive testing or screening (Tested Group)

Eighty *per* cent of tested patients prefer testing or being recommended for testing as part of routine medical examinations; 5% prefer to be tested on their own and 10% would consider both options.

Most patients tested (80%) would prefer to detect *H. pylori* through routine medical examinations; 5% prefer self-testing; 10% consider both; and 5% choose "I don't know".

In response to the question "If you were infected with *H. pylori*, would you advise your family to get tested?", 85% of respondents from the Tested Group answered "Yes" (Figure 7). All patients (100%) in the Tested Group expressed support for eradication therapy, whether for their own case or that of a family member.

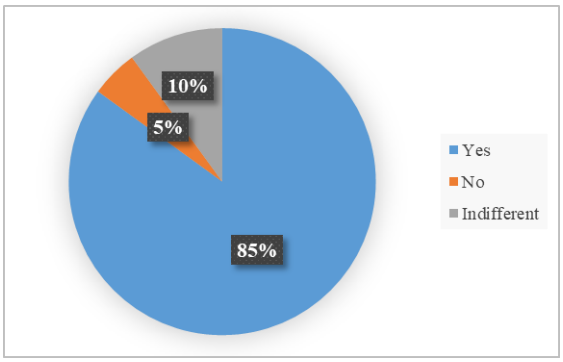

Figure 7.
Respondents' opinion on family testing recommendation in case of a personal *H. pylori* positive test (Tested Group)

The majority of the respondents (78.57%) answered *yes* to the question "Would you like to have more information about *H. pylori*?", while 15 (21.43%) answered *no* (Figure 8).

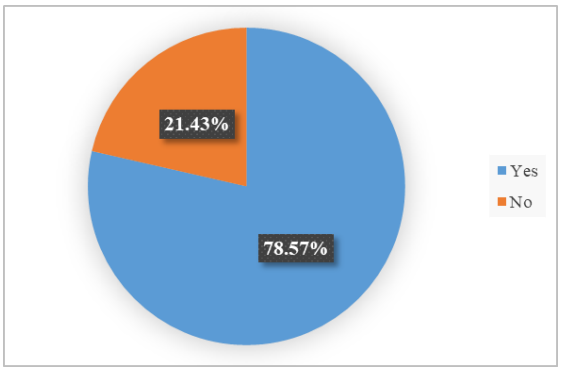

Figure 8.
Respondents' interest in learning more about *H. pylori*

We also sought respondents' views on the usefulness of distributing leaflets that provide comprehensible information about *H. pylori*, as well as the locations where such materials would be most trusted. All the interviewed patients found this way of informing to be helpful; most of them (38.54%) believed that leaflets would be trusted if distributed both in pharmacies and in medical practices; Second in frequency was distribution only in medical practices (12.17%), while 5.7% considered that information should be provided elsewhere or in another manner (*e.g.*, schools or at work, on the street, TV or online, in the mailbox, through oral or written communication from their physician). A small proportion (2.3%) of patients had no opinion on this subject.

Personal experience of H. pylori

Twenty *per* cent (n = 14) of the study participants reported a prior *H. pylori* infection, while 8.57% (n = 6) were unsure or did not recall. The association between various demographic factors (sex, place of origin, occupation and education) and categorical variables such as having heard of *H. pylori* infection, whether tested for *H. pylori*, and *H. pylori* infection status was analysed using the Chi-square test. A moderate association was observed only between respondents' occupation (retired or employed) and their *H. pylori* test results (Cramer's V = 0.316, p = 0.008).

Among previously infected patients, 13 underwent eradication treatment and one patient declined treatment by personal preference. Nine patients (69.23%) were retested after completing eradication therapy; only one (7.69%) was reinfected. More data on the type and duration of treatment are presented in Table VI.

Table VI
Experience with *H. pylori*

		N	%
***H. pylori* positive**	**Yes**	14	20.00%
	No	50	71.43%
	Don't know	6	8.57%
Treatment containing antibiotics	**Yes**	10	76.92%
	No	1	7.69%
	Don't know	2	15.38%
Triple or quadruple treatment	**Yes**	9	69.23%
	Don't know	4	30.77%
Duration of treatment	**Less than 7 days**	1	7.69%
	7 to 10 days	6	46.15%
	11 to 14 days	3	23.08%
	More than 14 days	2	15.38%
	Don't know	1	7.69%
Follow-up testing for *H. pylori*	**Yes**	9	69.23%
	No	4	30.77%
Recurrence after treatment	**Yes**	1	7.69%
	No	8	61.54%
	Don't know	4	30.77%

The age distribution in our sample (Figure 1) may be attributable to the higher probability that older adults visit their family physician due to chronic conditions that develop with advancing age. One third of respondents had higher education, an important aspect as the existing literature indicates that the educational level is an significant factor that impacts access and utilisation of healthcare, particularly among older adults; individuals with a lower level of education are more likely to encounter barriers to healthcare access, which may be attributed to factors such as reduced health literacy, limited awareness of available healthcare services and financial constraints, all associated with lower socioeconomic status [22]. Furthermore, numerous studies emphasise that a low socioeconomic level is a significant risk factor for acquiring *H. pylori* infection [32, 33, 39], and poor socioeconomic conditions remain associated with a high prevalence of *H. pylori* infection, despite a declining prevalence in developed countries [10].

In our sample, more than half of the respondents (65.71%) stated that they had heard of *H. pylori* before participating in the study, which is significantly more than the findings of a literature review of knowledge, attitude and practices studies, where between 22% and 35% of participants had heard of *H. pylori* [7]. Similar results were obtained in a predominantly young population in Jordan (64.3%) [2], in the urban population of the Kingdom of Saudi Arabia (59.16%) [21], and in the general population of China (68.9%) [37]. The studies from Bosnia and Herzegovina [5] or Croatia [36] showed higher percentages of respondents who had heard of *H. pylori* (79.34% and 83.1%, respectively).

We found that the most frequently cited source of information about *H. pylori* was medical consultation (42.86%), which contrasts with results reported in other studies, in which family and friends [3, 18] or the internet and social media [36] were the most frequently cited sources. Mass media (TV and radio) occupied the third place, being mentioned by one third (30.95%) of respondents, while the internet and social media were indicated by only 11.90%. This ratio is reversed in the literature, with social media reported much more regularly as an information source than mass media (31.4% *vs*. 3.9% [3], 14.90 *vs*. 8.30% [18], 13.7% *vs*. 4.3%, 31.1% *vs*. 4.4% [36]). Our results may indicate a tendency among patients in the sample toward traditional media, as they are likely less familiar with new devices and the internet in general. However, gathering medical information from media sources carries the risk of disseminating misleading or incomplete information, which can lead to misunderstandings of the concepts. On the other hand, Liu *et al*.'s structural equation modelling results showed that using social media platforms was strongly correlated with higher levels of *H. pylori*-related knowledge, more favourable attitudes toward the infection and improved preventive behaviours. These outcomes indicate that social media can significantly influence public awareness, attitudes and practices regarding *H. pylori*. In addition, the model revealed that increasing individuals' knowledge is associated with more positive attitudes toward *H. pylori* testing and treatment, as well as with more effective preventive practices. Together, these findings highlight the value of improving public understanding to enhance attitudes and behaviours related to *H. pylori* [16].

Only five respondents mentioned the pharmacy as a source of information. This emphasises the need to involve community pharmacists in awareness campaigns and counselling strategies for symptom recognition and testing, given their availability and direct patient access in pharmacies.

Furthermore, the pharmacists could identify patients who may require *H. pylori* testing by noting repeated prescriptions for antisecretory therapy [34]. This is also true for patients who visit the pharmacy regularly, based on specific symptoms or repeated self-medication requests for antisecretory drugs. Moreover, both treatment adherence and patient education represent important domains of pharmacist involvement [24, 30]. Thus, appropriate collaboration between pharmacists and other healthcare professionals is outlined to improve patient awareness, promote testing options, optimise eradication strategies and enhance clinical outcomes [34].

More than half of men (59.5%) and one-third of women (33.9%) in our sample had low levels of knowledge. A low level of knowledge was identified in a 2017 literature review [7] and in subsequent studies from several countries [18, 37, 38]. It's worth noting that the highest proportions of "don't know" or incorrect responses were received for questions regarding the main modes of transmission. Only 17.14% of the participants knew that *H. pylori* can be transmitted from person to person. Similar results were obtained in a study of university students in Nigeria, in which 23.4% of respondents were aware of the transmission of infection between individuals [9]. This contrasts with the results of a study conducted in Saudi Arabia, in which participants demonstrated strong familiarity with the hygiene and food-related risks of transmission, with over 80% of respondents identifying these risks [1]. This highlights the need for health education that focuses on these aspects and underscores the importance of hygiene, as understanding how the infection spreads is essential for prevention.

Patients who had previously tested positive for *H. pylori* or had a history of *H. pylori* infection had significantly more information about *H. pylori*. These results are also consistent with those of a similar study conducted among university students in Saudi Arabia, in which respondents' knowledge was significantly correlated with having heard of *H. pylori* infection and a history of *H. pylori* infection [8]. From these results, we can deduce that, in this study, people with greater knowledge about the bacterium are more likely to be tested/support testing.

The finding that respondents from urban areas demonstrated a higher knowledge than those from rural areas ($p = 0.034$) highlights the need for educational strategies targeted toward regions with low levels of awareness [3]. This is particularly important given that the most common risk factors for *H. pylori* infection involve living in rural areas, poor sanitation and low educational and socioeconomic status [12].

No statistically significant differences were observed in respondents' educational levels. However, as anticipated, respondents with medical education had significantly higher knowledge scores than those without medical education, consistent with prior findings in the literature [18, 37].

Only 28.57% of participants in our sample had ever been tested for *H. pylori*, a result consistent with other studies in countries such as Croatia (27.9%) [36], China

(21.7% [38], 27.3% [37]) or Bosnia and Herzegovina (36.18%) [5]. A related study in the US reported a 15.4% test positivity rate among patients tested, out of the total participants [4]. In the Untested Group, the main reason reported for not undergoing testing was the absence of symptoms. However, given the high proportion of patients with a low level of knowledge, we might question whether they can recognise the symptoms and discuss them with their physicians or whether they prefer to self-administer over-the-counter medications such as antacids or antisecretory agents. This requires further research and emphasises the importance of pharmacist involvement through appropriate patient counselling when patients request over-the-counter medications for digestive disorders.

Although more than two-thirds of respondents had never been tested, most (72%) support preventive testing, even though this proportion is lower than that of those in the previously Tested Group (85%). These findings, coupled with the significantly higher level of knowledge among tested compared with untested patients, suggest that the more informed individuals are, the more likely they are to support preventive testing or screening, as they likely better understand the importance of testing and the infection's associated risks. The favourable attitude of the tested patients is also reflected in the high percentage (85%) of supportive responses encouraging them to have their family members tested if they test positive. This is consistent with eradication, as all respondents (100%) expressed a positive attitude towards treatment and eradication. Moreover, many respondents (78.57%) expressed interest in learning more about the bacterium and its effects, suggesting a solid foundation for understanding how potential health education campaigns might be received. These findings are consistent with those reported in another study in Singapore, in which the majority of participants (85.3%) indicated that they wanted to learn more about *H. pylori*. This interest was significantly age-related, with individuals aged 41 - 60 years approximately four times more likely to seek additional information than those aged 21 - 40 years [35].

Comparably, in a study evaluating knowledge, attitude and practices of the patients in the gastroenterology department concerning chronic gastritis, these three constructs showed a consistent and positive inter-relationship [27]. This indicates that a greater understanding of chronic gastritis and *H. pylori* is associated with how individuals perceive and manage their condition. Knowledge demonstrated the most decisive influence on attitudes, and both domains contributed to healthier behaviours. However, despite generally positive attitudes and acceptable self-reported practices, knowledge remained the weakest component, particularly regarding the extra-gastric implications of *H. pylori* infection, diagnostic interpretation and its role in disease progression [27]. Strengthening patient education, particularly in gastroenterology settings, is therefore essential to improve attitudes and translate them into consistent, evidence-based health practices [27].

Twenty *per* cent of participants reported a history of *H. pylori* infection, a higher value than some results in the literature (13.8% [36], 11.9% [37], 11.7% [4]), but lower than others (36.18% [5], 49.16% [21]). This percentage is lower than the latest data on the prevalence of *H. pylori* infection in Romania, which were obtained from a study conducted on adults from communities with limited access to healthcare, finding an average *H. pylori* prevalence of 28.2% in Southern regions [26]. Another study conducted among the symptomatic patients has reported higher prevalence levels: a retrospective study (2014 - 2018) in North-West Romania on dyspeptic patients showed a serological prevalence of 40.8% [6]. In a large hospital-based series from the North-East, a stool antigen positivity rate of 39.9% [25] was found. Lower prevalence was observed in young, predominantly healthy medical students in Cluj-Napoca, Romania, with a C13-urea breath test-based study identifying an infection rate of 25.3% [17]. Overall, these findings suggest that *H. pylori* prevalence in Romania varies considerably and seems to depend on age, symptom profile and local community conditions. This variation highlights the need for population-representative epidemiologic data to describe national patterns more accurately [6, 17, 25, 26].

A moderate association was identified between the respondents' occupational status and a history of *H. pylori* infection, with a substantially higher proportion of retired patients infected with *H. pylori* than employed patients. Several studies [11, 15] have found higher *H. pylori* prevalence in the elderly. Some authors explain this phenomenon by noting that most *H. pylori* infections are acquired in childhood and persist throughout life, rather than by attributing a higher risk of infection to older age [19]. The most recent study assessing prevalence in Romania found no significant differences in *H. pylori* infection by patient age [26].

The study found that treatment duration (as reported by patients) varied considerably among patients (Table VI), which may be attributable to recall bias or evolving treatment strategies, given that patients were infected at different periods. One-third (30.77%) of patients were not retested after completing treatment, which demonstrates the need for adequate information and increased awareness of the risks of non-compliance with treatment and relapse/reinfection. An important pillar in this phase may be the pharmacist, who can provide rigorous counselling when dispensing eradication therapy and reinforce the physician's recommendations regarding the importance of post-therapy testing. However, our retesting rate of nearly 70% is significantly higher than that reported in extensive health-system evaluations: in a retrospective analysis of 27,185 patients treated for *H. pylori* within the U.S. Veterans Health

Administration between 1994 and 2018, only 23.9% underwent any form of post-treatment retesting. The authors concluded that retesting rates after *H. pylori* therapy were low, despite guideline recommendations for confirming eradication [14]. Because our sample is small and may not be representative of larger clinical settings, the relatively high retest rate should be interpreted with caution.

Limitations

The present study is a preliminary research from a larger set of studies, and the sample size was relatively small. Additionally, respondents are mainly urban and from a single GP practice, which may limit the generalisability of the results and may not reflect the diversity and characteristics of the general population. The research was a cross-sectional study that provided only an observational assessment of causality. Another important consideration is that the data were self-reported by participants, which may introduce recall bias. Another limitation of this study is that it relies on interviewer-administered data collection, which may have influenced participants' responses. The presence of an interviewer may introduce social desirability bias, encouraging respondents to provide answers they consider more acceptable rather than expressing their genuine opinions. As a result, the outcomes may overstate favourable attitudes [13].

Conclusions

The present study shows that approximately half of the sample population has low knowledge of *H. pylori* infection, but a high proportion of respondents have a positive attitude toward preventive testing and eradication. Although the level of support is high, testing has been low, possibly due to limited awareness of *H. pylori* and associated symptoms or risks.

Differences in results by patients' place of residence underline the need for information and awareness-raising campaigns tailored to specific populations. Given their expertise and availability, pharmacists can be actively involved in strategies to identify patients who could benefit from testing, provide counselling on treatment, and contribute to preventing infection and its associated conditions.

Conflict of interest

The authors declare no conflict of interest.

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