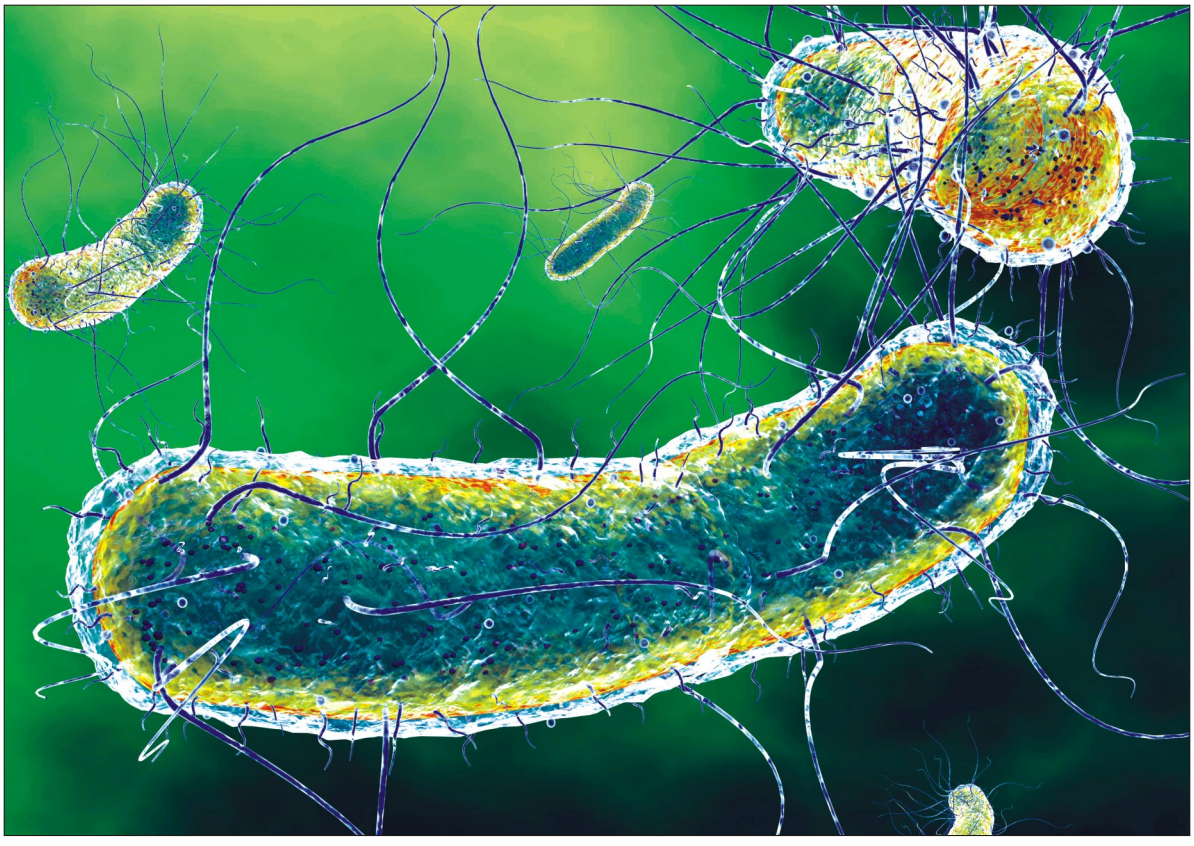

Current Research in Bacteriology

ISSN 1994-5426

science alert

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OPEN ACCESS Current Research in Bacteriology

ISSN 1994-5426
DOI: 10.3923/crb.2023.37.46

Research Article
Predominance of *Helicobacter pylori* Infection Among Dyspepsia Patients in Al-Hawban City-Taiz, Yemen

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Abstract

Background and Objective: *Helicobacter pylori* is the main cause of chronic gastritis and peptic ulcer, which is also a major risk factor for adenocarcinoma and gastric lymphoma. The objective of this cross-sectional study in Al-Hawban- Taiz, Yemen, was to ascertain the prevalence of *H. pylori* infection among dyspeptic patients. **Materials and Methods:** A cross-sectional, descriptive and experimental examination were carried out on a total of 325 dyspeptic individuals. As 149 stool samples and 176 blood samples were collected. Rapid diagnostic immune-chromatographic assays for antigen and antibody were used to quickly detect *H. pylori* in samples of feces and serum after samples of related variables were gathered using a structured questionnaire. **Results:** The findings showed that 42.2% of the patients tested positive for *H. pylori*, with an infection confirm in both males and females by stool (antigen) and serum (antibody) testing procedures. *Helicobacter pylori* infection was shown to be prevalent in serum. There was no statistically significant correlation between gender and infection in the two testing methods. According to the serum, cassette and ELISA serological results the positive rates for both procedures were 63.6% and 61.0%, respectively. **Conclusion:** The correlation coefficient between the three procedures is statistically significant and exhibits a strong link, particularly between the serological methods. The correlation coefficient, which has showed a strong relationship (0.946) between the two testing methodologies, showed that their performance was comparable.

Key words: *Helicobacter pylori*, gastric lymphoma, peptic ulcer, ELISA, Taiz-Yemen

Citation: Al-Hammadi, M.A. and H. Pyar, 2023. Predominance of *Helicobacter pylori* infection among dyspepsia patients in Al-Hawban City, Taiz, Yemen. Curr. Res. Bacteriol., 16: 37-46.

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Helicobacter pylori (*H. pylori*) is a Gram-negative bacterium that colonizes the microvillus of the epithelial cells of the stomach mucosa[1]. The spiral-shaped bacterium *H. pylori* measures 0.5-0.9 mm broad and 2-4 mm long. It needs carbon dioxide to grow, but it also has a tuft of sheathed unipolar flagella[2]. Culture of *H. pylori* with an optimum temperature of 37°C, growth occurs between 34 and 40°C. About gastritis, peptic ulcer disease, gastric adenocarcinoma, mucosa-associated lymphoid tissue (MALTS) lymphoma and perhaps cardiovascular disease, *H. pylori* play a substantial pathogenic role. Additionally, it has been postulated that frequent infantile vomiting could transmit *H. pylori* to gastric fluid[3,4]. Widespread *H. pylori* infection, while the region with the lowest economic development has the highest prevalence[5]. According to estimates, 50% of adults worldwide have *H. pylori* infections. In poor nations countries, the frequency of infection may reach levels of 80-90% by the age of 20 years. In contrast, less than 20% of people under the age of 25 have *H. pylori* infection in affluent countries[6]. There are numerous methods for detecting *H. pylori* infection, each one of them with varied sensitivity and specificity. These techniques can be divided into two categories: Invasive, such as the use of endoscopy to obtain gastric biopsies and non-invasive, such as the detection of antigens, antibodies, particular genetic loci and enzyme activities[7,8]. One of the most used diagnostic techniques is histological analysis, which enables the detection of the bacteria as well as the evaluation of the type and degree of inflammation in the gastric mucosa[9]. The subjective nature of evaluation and the related inter-observer variation, as well as differences in bacterial density and stomach location, are histology's limitations[10]. Through the use of *H. pylori* cultures, pathogenicity, molecular epidemiology and drug susceptibility testing (DST) variables and mechanisms can be identified[11]. However, factors including the number of bacteria present in the biopsy sample, the transportation environment and the usage of antibiotics can alter growth in culture[12]. Rapid detection of *H. pylori* and genotype determination are made possible by molecular techniques[13]. There is currently no diagnostic technique that can identify *H. pylori* infection with acceptable sensitivity and specificity on its own. Instead, it is advised to combine two or more diagnostic techniques to achieve diagnostic standards[14]. The WHO has categorized *H. pylori* as a Type-I carcinogen due to its link to stomach cancer. This study aims to ascertain the prevalence of *H. pylori* infection in dyspeptic patients in the major hospitals in Al-Hawban-Taiz, Yemen and identify the risk factors associated with *H. pylori* infection as there is no conclusive research on the topic.

MATERIALS AND METHODS

Study design: This research is cross-sectional, descriptive and experimental. The investigation was conducted between January and March, 2022.

Study area: The study has been carried out at the Al-Khaleg Hospital, the Dar Al-Seha Medical Lab and the Abn Sena Hospital in Al- Howban-Taiz City, Yemen.

Study population: Patients suspecte of having dyspeptic disorders of all ages who have arrived at different times at the Al- Howban-Taiz City's Al-Khaleg Hospital, Dar Al-Seha Medical Lab and Abn Sena Hospital are the study's target populations.

Inclusion standards: The dyspeptic patient whose parents or legal guardians approve of their participation in hospitals and medical research facilities.

Exclusion standards: Patients whose parents or guardians do not offer their approval for their involvement because they have another infection, dyspepsia or both.

Data collection and categorization: Each participant has been informed about the purpose of the study and the donation of his or her specimen. Forms are signed after being approved by each participant and their parents or legal guardians. Each patient's information has been gathered, noted and filled out on the questionnaire.

Sample size: The study has obtained 176 serums and 149 stool samples in total.

Ethical considerations: This study has been approved by the Ethical Committee of the Department of Medical Laboratory, at the University of Sciences and Technology, Yemen/Taiz Branch (MECA N0: 2022/1). The approval for this study was obtained from the ethical review committee in the Department of the Medical Laboratory at the University of Sciences and Technology/Taiz-Yemen.

Stool antigen cassette test method: The *H. pylori* antigen in stool was detected using an *H. pylori* antigen rapid test cassette (Feces), LUNGENE, China kit. The stool samples were examined using the manufacturer's recommended methodology. Before testing, allow the test, specimen, buffer and/or controls to reach room temperature. To collect approximately 50 mg of solid stool, randomly stab the specimen collection applicator into the fecal specimen at least three times. As you aspirate the feces with the dropper held vertically, deposit 2 drops (about 80 L) into the specimen collection tube containing the extraction buffer. Tighten the lid on the specimen collection tube, then shake it ferociously to combine the ingredients. Within an hour, take the test cassette out of the foil pouch and use it. After 10 min, invert the specimen collecting tube and transfer 2 drops of the extracted specimen to the test cassette's specimen wells. The results were then read and analyzed macroscopically. Two pink/red bands (control line and test line) indicated positive results, while only one pink/red band in the control window indicated a negative result. On the other hand, the material was centrifuged and 80 L of supernatant was collected if it did not migrate (there were particles present). Using an *H. pylori* antibody quick test cassette (Serum) ACON, USA Kit, the IgG anti-*H. pylori* antibody in serum was found. The steps were carried out according to the manufacturer's instructions. The specimen well of the test cassette has received 50 µL of serum plasma. After 10 min, the outcome was read and macroscopically analyzed. Two pink/red bands (control line and test line) indicated a positive result, while only one pink/red band in the control was indicative of a negative outcome. The presence of specific *H. pylori* immunoglobulin G (IgG) antibodies was examined in thawed sera using an Enzyme-Linked Immunosorbent Assay (ELISA) kit from AccuBind, USA. Briefly, diluted serum samples were added to the biotinylated conjugate-coated wells and left to sit for a brief period of time before being followed by the addition of a peroxidase-bound secondary IgG and a substrate that revealed the presence or absence of *H. pylori.*

Statistical analysis: The data were analyzed using the Statistical Package for Social Science (SPSS) version 21.0 software from SPSS Inc. in Chicago, Illinois, USA. A p-value of 0.05 or less was regarded as statistically significant.

RESULTS

Sample collection: The study samples (325 samples) were collected from hospitals. The distribution of the samples taken for diagnostic testing utilizing the stool (antigen) and serum (antibody) procedures was shown in Table 1. From the total sample, 149 samples were used in the stool method, with male and female percentages of 53.7 and 46.3%, respectively, while 176 samples were used in the serum method, with male and female percentages of 47.7 and 52.3%, respectively (Fig. 1). In Al-Hawban-Taiz City, samples were gathered from various private hospitals and laboratories.

Prevalence of *H. pylori* infection according to detection method

Serological/immunological (antigen-antibody) detection test: The distribution of the samples collected by the two methods-stool (antigen) and serum (antibody)-according to the patient's gender was displayed in Fig. 2. Males and females with a positive infection, which was diagnosed by stool (antigen), represented 36.9 and 46.6%, respectively (Table 2), by serum (antibody) method. Patients who have an infection are more likely to be treated with serum (antibody). The gender and infection of the two testing methods, serum (antibody) and stool (antigen) were not statistically significantly associated, according to the Chi-square test result of 0.969 ($p = 0.325$).

Serological (antibody) detection test: The distribution of the samples that were obtained for the serological detection techniques serum (antibody) cassette and serum (antibody) ELISA according to the patient's gender as shown in Table 3. The frequency of infection (positive or negative) varies depending on the gender (male or female) of the samples that

Table 1: Distribution of the collected samples according to the gender of patients

		Gender patients					
		Male		Female			
Type of sample	Total of sample	No	%	No	%	χ^2	p-value
Stool	149	80	53.7	69	46.3	1.148	0.284
Serum	176	84	47.7	92	52.3		
Total	325	164	50.5	161	49.5		

χ^2: Chi-square, p: Probability ($\chi^2 \geq 3.84$, $p<0.05$: Significant)

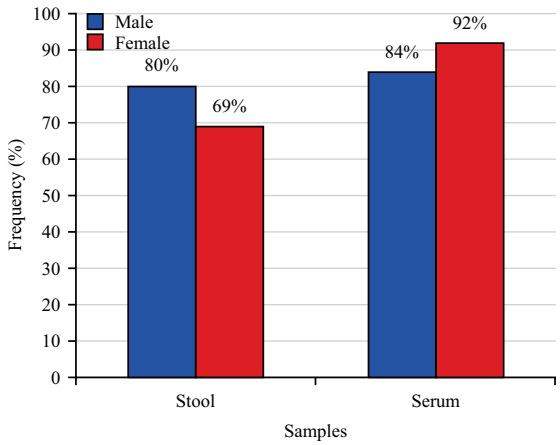

Fig. 1: Distribution of the patients according to the testing method

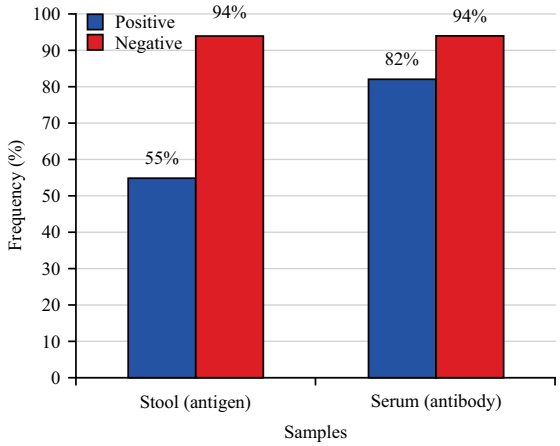

Fig. 2: Prevalence of *H. pylori* infection (positive and negative) based on gender according to the two methods test (serological/immunological)

Table 2: Prevalence of *H. pylori* (positive and negative) according to the gender of the patients using the two method tests (serological/immunological)

	Infection positive (+)		Infection negative (-)			
Sex	No	%	No	%	χ^2	p-value
Stool (antigen) n = 149						
Male n = 80	30	37.5	50	62.5	0.026	0.873
Female n = 69	25	36.2	44	63.8		
Total n = 149	55	36.9	94	63.1		
Serum (antibody) n= 176						
Male n = 84	37	44.0	47	56.0	0.418	0.518
Female n = 92	45	48.9	47	51.1		
Total n = 176	82	46.6	94	53.4		
Total n = 325	137	42.2	188	57.8		
χ^2	0.969		Significance			0.325

χ^2: Chi-square, p: Probability ($\chi^2 \geq 3.84$, $p<0.05$: Significant)

were collected and diagnosed using serum (antibody) cassettes and serum (antibody) ELISA. Additionally, they show that the positive and negative infections in tests using both methods are nearly comparable. In all procedures, males are more likely to get positively infected than females. The serum cassette and serum ELISA methods' Chi-Square test findings, which are 0.042 and 0.838 p-value, show that there is no significant correlation between a patient's gender and

Table 3: Prevalence of *H. pylori* infection according to the gender of patients by the serological detection test

	Serum (antibody) cassette						Serum (antibody) ELISA					
	Positive		Negative				Positive		Negative			
Sex	No	%	No	%	χ^2	p-value	No	%	No	%	χ^2	p-value
Male n = 43	27	62.8	16	37.2	0.03	0.862	26	60.5	17	39.5	0.013	0.908
Female n = 34	22	64.7	12	35.3			21	61.8	13	38.2		
Total n = 77	49	63.6	28	36.4			47	61.0	30	39.0		
χ^2				0.042			Significance					0.838

χ^2: Chi-square, p: Probability ($X^2 \geq 3.84$, $p<0.05$: Significant)

infection in either of the two methods, indicating that they are independent of one another. The results of the correlation analysis revealed a good correlation (0.946**) between the two testing techniques, serum (antibody) cassette and serum (antibody) ELISA, which were statistically significant (2-tailed) of 0.000005. The performance result for the two testing techniques was similar as a result of the high (substantial) and statistically significant link between them. Confirmatory tests were performed, showing how strongly the two variables were correlated.

Prevalence of *H. pylori* according to the three testing methods: The distribution of infections (positive and negative) for the three test techniques demonstrates that positive infections are more common than negative infections across all procedures as shown in Table 4. The correlation coefficient between the stool (antigen) cassette method and serum (antibody) ELISA infection cases is 0.78 with a p-value of 0.00 based on the data acquired. The correlation coefficient between serum (antibody) ELISA and serum (antibody) cassette techniques was 0.86 with a p-value of 0.00 and the correlation coefficient between infection of the stool (antigen) cassette and serum (antibody) cassette methods was 0.67 with a p-value of 0.00. This suggested that there is a correlation between the serum antibody (ELISA and cassette), but not the relationship between the infection diagnoses (positive and negative) in all three methods.

Comparison and evaluation of methods for diagnosis of *H. pylori* infection

Gold standard in all three test methods: The specificity and sensitivity of each test were calculated using the reference considered the gold standard to evaluate the stool antigen testing by cassette technique, serum antibodies testing by cassette and ELISA for *H. pylori* infection diagnosis currently in use. If three out of three tests were positive, the patient was deemed to have an *H. pylori* infection. Table 5 compared the diagnostic tests for stool antigen (cassette) and serum antibody (cassette and ELISA) for all 60 patients in terms of their sensitivity, specificity, positive predictive value, negative predictive value and accuracy. According to the established criteria, 27 (45%) of the patients had *H. pylori* infections and 33 (55%) did not. The specificities of the stool antigen testing (cassette) were 90.9% greater than the specificities of the serum antibody (cassette and ELISA) methods, which were 48.5 and 66.7%, respectively. The sensitivities of serum antibodies (cassette and ELISA) were 100% for each of them. The accuracy of the stool antigen cassette and serum antibody (cassette and ELISA) methods were 95, 72 and 82%, respectively. The stool antigen cassette has showed the best specificity and accuracy of the other serology (cassette and ELISA) methods.

Gold standard stool (antigen) cassette method: The evaluation analyses (sensitivity, specificity, positive predictive value, negative predictive value and accuracy). The results of stool antigen testing using the cassette technique were estimated for serum testing for anti-*H. pylori* antibodies by cassette and ELISA in clinical practice for current *H. pylori* infection diagnoses. Table 6 had displayed the serum antibody (cassette and ELISA) diagnostic assays' sensitivity, specificity, positive predictive value, negative predictive value and accuracy in comparison to the gold standard for all 60 patients. A total of 30 (50%) of the patients screened by the stool antigen cassette method matched the predetermined criteria. Two (6.7%) of the positive stool antigen testing results had negative antibody (cassette/or ELISA) assays. On the other hand, of the negative stool antigen testing results, 16 (53.3%) and 10 (33.3%) showed positive antibody test results (cassette and ELISA, respectively). Each of the serum antibody's sensitivities (ELISA and cassette) was 93.3%. The ELISA and cassette techniques for measuring blood antibodies had specificities of 46.7 and 66.7%, respectively. The serum antibody cassette method's accuracy, positive predictive value (PPV) and negative predictive value (NPV) were all 63.6%. whereas the accuracy, positive predictive value and negative predictive value of the serum antibody ELISA approach were 73.7, 90.9 and 80% correspondingly, respectively. More specifically and accurately than any other cassette approach, the ELISA demonstrated.

Table 4: Distribution of *H. pylori* according to the three testing method

	Stool (antigen) cassette				Serum (antibody) cassette				Serum (antibody) ELISA			
	Positive		Negative		Positive		Negative		Positive		Negative	
Gender	No	%	No	%	No	%	No	%	No	%	No	%
Male n = 34	19	55.9	15	44.1	24	70.6	10	29.4	22	64.7	12	35.3
Female n = 26	12	46.2	14	53.8	18	69.2	8	30.8	16	61.5	10	38.5
Total n = 60	31	51.7	29	48.3	42	70.0	18	30.0	38	63.3	22	36.7
χ^2	0.558				0.013						0.064	
Significance	0.445				0.909						0.801	
χ^2	0.422				Significance						0.516	

Table 5: Performance of antigen and antibody testing for the diagnosis of current *H. pylori* infection

	Gold standard all three test methods							
Test method	P*	N*	Total	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Stool (antigen) cassette								
Positive	27	3	30	100	90.9	90	100	95%
Negative	0	30	30					
Total	27	33	60					
Serum (antibody) cassette								
Positive	27	17	44	100	48.5	61.4	100	72%
Negative	0	16	16					
Total	27	33	60					
Serum (antibody) ELISA								
Positive	27	11	28	100	66.7	71.1	100	82%
Negative	0	22	22					
Total	27	33	60					

P*: Positive, N*: Negative, PPV: Positive predictive value and NPV: Negative predictive value

Table 6: Performance of antigen and antibody testing for the diagnosis of current *H. pylori* infection

	Gold standard stool (antigen) cassette method							
Test method	P*	N*	Total	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Serum (antibody) cassette								
Positive	28	16	44	93.3	46.7	63.6	87.5	70
Negative	2	14	16					
Total	30	30	60					
Serum (antibody) ELISA								
Positive	28	10	38	93.3	66.7	73.7	90.9	80
Negative	2	20	22					
Total	30	30	60					

P*: Positive, N*: Negative, PPV: Positive predictive value and NPV: Negative predictive value

DISCUSSION

In this study, a total of 325 samples from private hospitals were obtained and 137 (42.2%) of the total 137 samples tested positive for *H. pylori* infection in patients with dyspepsia. These samples were tested using two methods to extract the stool antigen and serum antibodies. In AL- Hawban-Taiz City, Yemen, dyspeptic patients had a high frequency of *H. pylori* infection, according to this study. The *H. pylori* infection was widespread overall, with sero and faecal prevalence rates of 46.6 and 36.9%, respectively. According to earlier publications, patients with dyspeptic conditions were most likely to have *H. pylori* infection in this investigation[15]. As shown in Table 2, the prevalence of *H. pylori* antibodies in serum was 82 (46.6%) in the current study, which is comparable to or slightly higher than earlier studies in Yemen[16]. Furthermore, the findings of this study agreed with those of a study conducted in Iran, where 43% of people had *H. pylori* infection[17]. On the other hand, another study by Ameri and Alkadasi[18] on 83 patient specimens revealed a prevalence of 53.0% for *H. pylori* in the Yemeni Province of Taiz. Around the world, *H. pylori* had become a widespread health issue. In both industrialized and developing nations, *H. pylori* infections represent a significant public health concern. The *H. pylori* is one of the most contentious bacteria in the world because it is present in about 50% of the world's population, mostly in

underdeveloped nations[19]. However, many people go on living asymptomatically. Numerous investigations have shown that *H. pylori* is the root cause of several conditions, particularly chronic gastritis and peptic ulcer disease, which can lead to stomach cancer[16]. Much research has looked at the prevalence of *H. pylori* infections globally. These study had found a significant correlation between risk factors for *H. pylori* infection and human *H. pylori* infection as well as the presence of these factors. On the other hand, there is little evidence available regarding the prevalence of *H. pylori* infection in Taiz, Yemen's Al-Hawban City. In 206 blood samples from Thamar General Hospital in Thamar City, Yemen, there have been 170 (82.52%) *H. pylori* antibodies present[20]. In Mukalla City, Hadhramout Governorate, Yemen, the prevalence of *H. pylori* infection among patients with dyspepsia using serum antibody detection technique was 18.5%[21]. Other nations having high seroprevalences of *H. pylori* included Nepal, Vietnam, Nigeria and Malaysia, with respective seroprevalences of 50.5, 48.8, 36.3 and 30.4%[22-24]. The results of this study, however, are less favorable than those of other investigations of anti-*H. pylori* seropositivity in close-by nations like Ethiopia, Iraq and Saudi Arabia (78, 80 and 98%, respectively)[18,25]. Infection with *H. pylori* was present in 25% of the population in Oman[26], 21.5% in Australia[27], 18.6% in China[22] and 3.1% in Japan[28].

The high incidence rate is ascribed to the low socioeconomic status of the populace in the poorest countries, poor hygiene, sanitation issues and the difficulty in getting clean sources of water supply. As shown in Table 2, the prevalence of *H. pylori* in dyspeptic patients in the current study was 55 (36.9%), which is consistent with a study conducted in Sana'a, Yemen, where it was 37.5%. Compared to a study done on dyspeptic patients in Hadhramout, Yemen (15.0%) and dyspeptic patients in Thamar, Yemen (15.0 and 18.5%, respectively), the faecal prevalence of *H. pylori* infection was greater[20,21]. Additionally, The findings of this study were consistent with investigations of *H. pylori* feco prevalence in other nations, including Brazil, Iran, Ethiopia, Uganda and Brazil, with concomitant rates of 35.7, 36.8, 37.8 and 38%[29,30]. The diagnostic method used, antibody detection from blood samples, which has a better sensitivity than the stool antigen detection approach and thus the inflated results, maybe the cause of the variability in the prevalence rate of *H. pylori* infection. Additionally, it is said that even in the absence of an infection, *H. pylori* antibodies can be found in blood months later[12]. The design of this study in which the researchers have screened, as well as differences in sample size, diagnostic techniques and individuals' level of sanitation practice, as well as low education levels, communities, living conditions or low levels of exposure to the risk factors other than those included in this study, could be the cause of this variation. The gender difference in this study (Male: 37.5% and Female: 36.2%) was not statistically significant. The results of this study were concurred with those of studies conducted in Ethiopia, Cameroon and Uganda[29,31,32]. Additionally, this outcome was consistent with that of Pakistan's Faisal *et al*.[33]. Using both the stool antigen and antibody test, it was found that males had a higher prevalence of *H. pylori* than females and the difference was statistically significant ($p<0.05$)[21]. The differences in the results could be attributed to differences in sample sizes, study settings including hospitals (the majority were hospitals and gastrointestinal referral units) and testing methodologies. However, other research revealed that females were substantially more likely than males to have *H. pylori* infection[24,34]. However, some researchers have found no association between gender and *H. pylori* infection in patients with dyspepsia[35-37]. Another study carried out in Egypt by Elshiekh *et al*.[38] revealed that the infection rate for males and females was 52 and 48%, respectively. Other researchers have observed no connection between gender and *H. pylori* infection ($p>0.05$)[39,40]. Treatment with proton pump inhibitors affects the accuracy of the stool antigen test because some patients get false negative results if they take Proton Pump Inhibitors or antibiotics for four days or more before storing stool samples[41,42]. Patients should stop using Proton Pump Inhibitors (PPIs), bismuth and antibiotics for at least four weeks to prevent false negative results. Although *H. pylori* leaves the stool fast after being eradicated, a positive *H. pylori* stool antigen test indicates the presence of an active infection that is still present[27,42]. When comparing the levels of *H. pylori* in the blood and stool, statistical analysis using the Chi-Square method revealed a difference that was statistically significant at the level of 0.05. The value of the Chi-Square was (0.969) with a level of significance ($p<0.05$). Comparing the stool antigen test to other gold-standard techniques like the breath test and biopsy bacterial culture, numerous studies had found that it was a valid diagnostic test for *H. pylori*. It was suggested as a helpful test for tiny labs without cutting-edge machinery[43]. The features of stool antigen testing include its reported high specificity (>95%) and sensitivity (>95%), popularity among patients and the fact that it is quick, easy and doesn't require specialized staff[44]. Based on those antigen testing results, this study has validated serum antibody testing for *H. pylori* current infection to stool antigen testing. The sensitivity and specificity of the serum antibody test were lower than those found in a Japanese investigation[45]. This might be explained by the disparity in infection prevalence rates between industrialized and poor nations.

The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of all three methods of stool antigen (cassette) and serum antibody (cassette and ELISA) diagnostic assays about the gold standard, the sensitivities of serum antibody (cassette and ELISA) were 100% each one of them and the specificity of the stool antigen testing (cassette) were 90.9% higher than specificities of the serum antibody (cassette and ELISA) methods were 48.5 and 66.7%, respectively. The accuracy of the stool antigen cassette and serum antibody (cassette and ELISA) methods were 95, 72 and 82%, respectively. The evaluation analyses (sensitivity, specificity, positive predictive value, negative predictive, value and accuracy) were calculated concerning stool antigen testing performed with the cassette technique where the sensitivities of serum antibodies (cassette and ELISA) were 93.3% each of them. The specificities of the serum antibody (cassette and ELISA) methods were 46.7 and 66.7%, respectively. The positive predictive value (PPV), negative predictive value (NPV) and accuracy of the serum antibody cassette method were 63.6, 87.5 and 70%, respectively, while the positive predictive value, negative predictive value and accuracy of the serum antibody ELISA method were 73.7, 90.9 and 80%, respectively.

This study has reaffirmed *Helicobacter pylori's* poor diagnostic utility in dyspepsia patients. Several clinical traits and demographic factors, including gender and age, have been identified as risk factors for dyspepsia patients. These factors may also have a significant impact on the occurrence of antibiotic resistance of *Helicobacter pylori*.

The stool antigen immune chromatographic test should be compared with a different gold standard technique, such as a breath test and biopsy.

CONCLUSION

The present study's findings have revealed that in AL-Hawban-Taiz City (Yemen), the prevalence of *H. pylori* antibody in blood and antigen in stool among humans appears to be virtually medium with 36.9 and 46.6%, respectively. This proportion could be attributed to socioeconomic position, family diet, unsanitary living conditions, or other risk factors that can raise the risk of infection. Infection and gender factors for all diagnostic testing methods have revealed that there is no statistically significant relationship between them and the correlation coefficient between all three methods is statistically significant with a substantial correlation, notably between the serological techniques.

SIGNIFICANCE STATEMENT

This study seeks to determine the incidence of *H. pylori* infection in dyspeptic patients at the major hospitals in Al- Hawban-Taiz, Yemen and identify the risk factors linked with *H. pylori* infection. The results showed that the prevalence of *H. pylori* antibodies in blood and antigen in stool have appeared to be nearly medium This percentage could be explained by a person's socioeconomic status, the diet of their family and other risk factors which increase the infection. The correlation coefficient between all three methods is statistically significant with a significant correlation, particularly between the serological techniques. The prevalence of *H. pylori* infection in dyspeptic patients in Al-Hawban-Taiz, Yemen establishes for the first time in this study.

ACKNOWLEDGMENTS

The authors appreciations to University of Sciences and Technology as well as Hadhramout University in Yemen for their valuable support. In addition, the authors are thankful to Selah Foundation for Development, Hadhramout, Yemen for their finical support.

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