Prevalence of Helicobacter Pylori Infection Among Females in Hodeidah City, Yemen

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ABSTRACT

Background: Helicobacter pylori infection is the most prevalent bacterial infection globally and affecting approximately 50%-75% of worlds of population. It is recognized as a significant high-risk factor for chronic gastritis, peptic ulcer, gastric adenocarcinoma, gastroesophageal reflux disease, and functional dyspepsia. **Aim of this study**: This study aimed to determine the prevalence of helicobacter pylori infection among females in Hodeidah City, Yemen. **Subjects and methods: Study design:** A cross-sectional study design was used. **Setting:** This study conducted in Al-Mina districts in Hodiedah City, Yemen. **Subjects**: 202 females participated in this study from February 2024 to February 2025. **Tools of data collection:** Data was collected by three tools: Tool I: demographic characteristics. Tool II: clinical signs and symptoms of the participants and Tool III: laboratory tests for H. pylori antigen and antibody were used to detect the H. pylori infection. **Result**: The study results indicate that the infection rate was 19% as H. pylori antigen and 29.8% H. pylori antibodies among females. The highest rate of infection by H. pylori-Ag was recorded in Al-Hali district (22.4%), whereas H. pylori-Ab was recorded in Al-Hawak district (35.8%). **Conclusion:** There was a significant association between the prevalence of H. pylori infection and the consumption of raw vegetables for H. pylori antigen. Also, there was a significant association between the prevalence of H. pylori infection and previously infected and clinical symptoms for H. pylori antibody. **Recommendations:** This study recommended that avoiding consuming of unwashed raw vegetables and fruits, wash hands frequently after defecation, and before meals to reduce spreading of H. pyloric infection among females. Regular treatment of H. pylori infection to avoid transmission of this type of infection particularly between females.

Keywords: Helicobacter pylori, Hodiedah city, Infection, Prevalence, Yemen.

Introduction

Helicobacter pylori (H. pylori) is the most prevalent bacterium worldwide, and over 80% of individuals infected with this bacterium are asymptomatic **(Edrees, 2022).** H. pylori is a gram negative, microaerophilic **(She et al., 2023).** The genus helicobacter is a member of the family heliobacteria and currently includes more than 30 helicobacter species. In general, the genus helicobacter is classified into two groups, gastric species and non-gastric species. Both groups demonstrate a high level of organ specificity, such that gastric helicobacter is unable to colonize the intestine or liver, and vice versa.

Gastric helicobacter species have been found to colonize the stomachs of humans, sheep, cattle, dogs, cats, and other animals, while enterohepatic helicobacter species are more commonly found colonizing other kinds of animals such as mice, rats, and rodents **(Almashhadany and Mayas, 2018).** H. pylori colonization of the human gastrointestinal mucosa leads to the development of gastric cancer, chronic gastritis and peptic ulcers, and gastric mucosa-associated lymphoid tissue (MALT) lymphoma **(Bin-Hameed and Barajash, 2023).**

About 50% of the world's population is estimated to be infected with H. pylori, but the prevalence varies greatly among countries and population groups within the same country. In Yemen, a previous epidemiology study of H. pylori at Thamar governorate found that the prevalence of H. pylori antibodies in females was approximately 82.71%, and the prevalence of H. pylori antigen was 19.55% **(Almashhadany and Mayas, 2018).** Additionally, a study conducted at Ibb governorates investigated the value of antibody and stool antigen tests for chronic H. pylori infections and found that the prevalence of H. pylori-Ag in female patients was 51.9%, while the prevalence of H. pylori-Ab was 43% **(Al Ofairi et al., 2024).**

The effects of sharing food or eating utensils, drinking contaminated water, and encountering an infected person's stool or vomit have all been studied, but the answer is still unknown. H. pylori have been discovered in the saliva of some infected people, indicating that infection can be transmitted by saliva contact. There is no proof that farm animals or pets cause disease. Infection has been shown to spread across family members; however, becoming infected with H. pylori as an adult is extremely unusual; most persons get infected during infancy **(Almashhadany et al., 2023).**

Gastritis, peptic ulcers, and extra-intestinal symptoms such as refractory iron deficiency anemia, failure to thrive, chronic idiopathic thrombocytopenia, and early gastric cancer are all caused by H. pylori infection. H. pylori infection can have a negative impact on both the mental and physical components of a patient's quality of life (QOL). Several studies have showed that getting rid of H. pylori improves the quality of life for patients who suffer from epigastric discomfort. However, no reports, independent of epigastric symptoms, have noted changes in QOL following H. pylori eradication, and no research has looked at QOL after H. pylori eradication **(Mnichil et al., 2023).**

There are easy and reliable tests for detecting H. pylori infection: Breath tests analyze a sample of the patient's breath to determine infection. Breath tests are precise, safe, easy, and quick to administer. They are a very useful test for determining whether or not the condition was successfully treated. Certain drugs (for example, antibiotics in the previous

month and some ulcer-healing therapies in the last one to two weeks) will affect the accuracy of this test **(Khalife et al., 2017).**

Blood tests can reveal current or recent infections. They are ineffective for determining whether or not the illness has been adequately treated since the antibody to H. pylori stays in the blood for years. Finally, endoscopy (also known as gastroscopy) can detect an infection as well as a peptic ulcer. During an endoscopy, a small sample from the stomach was obtained with a flexible tube and viewed under a microscope **(Kouitcheu et al., 2018).**

Washing hands with soap and water after using the lavatory and before eating, eating well-cleaned and well prepared food, and drinking water from a clean, safe source are all preventive practices that have resulted in a significant drop in H. pylori in the Western world. In Korea, triple treatment (proton pump inhibitor, amoxicillin, and clarithromycin) has been the first-line eradication approach for H. pylori infection for more than a decade. However, new study has showed that its efficacy is no longer acceptable due to antibiotic resistance **(Omosor et al., 2017).**

Unfortunately, no one drug is effective against helicobacter pylori. In triple treatment, at least three medications are used in therapeutic combinations. The use of medication combinations minimizes the likelihood of H. pylori developing resistance to therapy. Several medication combinations are now being explored to treat H. pylori. The most effective achieve success in 80-90% of cases. If the medications are not taken exactly as prescribed, the success rate is dramatically lowered **(Shah et al., 2021).** Quality of life is a subjective indicator of an individual's health or general sense of well-being. Patients with upper gastro-intestinal disorders and patients with myocardial infarction or congestive heart failure had a worse subjective sense of well-being than patients with other chronic ailments such as arthritis, lung difficulties, back problems, diabetes, or angina. Successful H. pylori eradication treatment may enhance patients' quality of life **(Khoder et al., 2019).** ***As a result,*** the current study sought to investigate the prevalence of H. pylori infection among females in Hodeidah city, Yemen.

Significance of the study

In Hodeidah city, one study showed that the percentage of the prevalence of H. pylori antibodies was about 69.6% in females **(Al-kadassy et al., 2013).** Many females in Hodeidah live under suboptimal housing conditions, including crowding, which may favor the transmission of H. pylori. The occurrence of H. pylori infection in Yemen has increased and up to date there are few studies have been conducted to assess the prevalence of helicobacter pylori infection among the population in Hodeidah City, therefore the objectives of this research were to investigate the prevalence of H. pylori infection by using both serology and stool antigen tests among female in Hodeidah City as well as to identify the associated risk factors that may be an association with infection.

Aim of the study

The current study aimed to determine the prevalence of helicobacter pylori Ag and Ab among females in Hodeidah City, Yemen.

This aim achieved through the following objectives:-

1. Identify helicobacter pylori antigen (Ag) and antibody (Ab)

among females in Hodeidah City, Yemen.
2. Determine the risk factors for helicobacter pylori infection among females.
3. Identify the clinical pictures for helicobacter pylori infection among females in Hodeidah City, Yemen?

Research questions

1. What is the prevalence rate of helicobacter pylori among females in Hodeidah City, Yemen?
2. What are the associated risk factors of helicobacter pylori infection among females in Hodeidah City, Yemen?
3. What are clinical pictures for helicobacter pylori infection among females in Hodeidah City, Yemen?

Materials and methods

Study design

This study was conducted based on a cross-sectional study in Hodeidah City.

Study setting

The study was carried out among the female population in Hodeidah City, which includes Al-Hali, Al-Hawak, and Al-Mina districts, from February 2024 to February 2025.

Subjects

Because this study aimed to estimate the prevalence of H. pylori infection among females in Hodiedah City, the sample size has been calculated based on an expected precision (d) in estimating a proportion (prevalence) of a binary outcome in a population with a 95% confidence level, with a prior prevalence where:

n = sample size required.

k = standard of 1.96 at 95% certainty.

p = taking proportion of prevalence of H. pylori, 68% based on study **(Chew et al., 2017)**.

q = 1 – p.

d = precision or error allowable (d = 0.05).

A study conducted at Hodiedah University reported a prevalence of H. pylori infection of 68%. Using this prior prevalence, at least 198 females were needed to estimate the prevalence with a precision of 0.05%. A total of 202 women samples were collected from all participants. The Participants' selection was according to the following **inclusion criteria:** Females who signed informed consent and delivered stool and blood specimens. Female who had used antibiotics or proton pump inhibitors (PPIs) within two weeks prior to sample collection ***were excluded***, as these medications could affect the accuracy of the fecal antigen test.

Tools of data collection

The researchers gathered the data of this study by utilizing three tools as the following:

Tool I: Structured Interviewing Questionnaire: The researchers created this tool after examining the relevant literature. It was composed of the two sections that follow:

Section 1: The demographic characteristics of females affected with H. pyloric: It was utilized to assess the demographic features of females affected with H. pyloric under the study. It included (Age, Education, Family size, District).

Section 2: Risk factors with H. pyloric infection among females: This section was used to assess source of drinking water, consumption of raw vegetables and fruits, hand washing after defecation, one of your family infected, previously infected with H. pyloric infection and mode of transmission of H. pylori.

Tool II: Clinical signs and symptoms of the studied females: It included questions concerned with symptoms and signs for H. pyloric infection as headache, heartburn, epigastric pain, nausea, weight loss, diarrhea, mouth inflammation and gastric ulcer.

Tool III: Laboratory investigations

Laboratory tests were conducted to detect H. pylori using antigen and antibody tests. Blood samples, 5 ml of venous blood was collected from females in a plain tube without anticoagulant. The tube was labeled and allowed to clot and forwarded in a sterile container to the laboratory. For stool samples, about 20 grams of stool were collected into a container to provide fresh stool samples within 2 h. The specimens were transported to the laboratory by icebox.

Blood was centrifuged, and serum was separated to be used for the detection of H. pylori antibodies by using a H. pylori antibody test card (In Tec PRODUCTION, INC, Rapid Anti-H. Pylori Test, China). The test was carried out according to the manufacturing company. Interpretation of result: Positive result/Both the control line and the test line appear; negative result, only the control line appears. The collected specimens of stool were examined by a one-step H. pylori antigen cassette test (In Tec PRODUCTS, H. pylori-Ag Rapid Test, China) for the detection of H. pylori antigen. It's a qualitative immunochromatographic assay using monoclonal antibodies. The H. pylori stool antigen test was performed according to the manufacturer's recommendation. The results were evaluated within 15 min., and tests with any change of color of the test line were interpreted as positive.

Validity and reliability of the content

The study tools were reviewed by three medical-surgical nursing and two medicine experts to find out if the tools covered the aim or not, and to assess each item individually. It was utilized to alter them, and some modifications were done based on their opinions such as rewording or rephrasing some of the questions and changing others. In order and determine the tools comprehensiveness, clarity, applicability, understanding, and relevance or not, the content validity of the study tools was measured. The internal consistency of tools was measured to evaluate tool reliability.

Field work

Field work was conducted from May 12 to August 11, 2024, in Al-Hali, Al-Hawak, and Al-Mina districts, Hodeidah City, Yemen. After obtaining ethical approval and informed consent, female participants were recruited from districts communities and households. Data were collected using a structured questionnaire on socio-demographics, lifestyle, and symptoms, in the same time collection of 5 mL venous blood and 20 g fresh stool using sterile techniques. Samples were transported within two hours in ice-cooled containers and tested for H. pylori antibodies (serum) and antigens (stool) using rapid immunochromatographic kits (In Tec Products, China) per manufacturer instructions. Quality control included proper kit storage, use of control samples, and daily data verification, with universal

precautions and safe disposal of biohazard waste.

Pilot study

It included 20 females affected with H. pyloric infection to represent (10%) of the main study samples to evaluate the clarity, and relevance of the translated instruments. Since no changes were needed in the tools, the pilot sample was included in the main study sample.

Administration and ethical consideration

Official permissions were obtained from the dean of the Medicine and Health Science Faculty of Hodeidah University, and approval to conduct the laboratory tests was obtained from the director of Althawra Hospital after explaining the nature of the study. The study was approved by the ethics committee in the faculty with an ethical code 201/2024, date:13/05/2024. Also, the verbal explanation of the nature and aim of the study was provided to female participants included in the study sample. Likewise, individual oral consent was received from each participant in the study after explaining the purpose of the study.

The sample was taken from all volunteer patients who were informed that their participation was voluntary, that informed consent was obtained from them before filling out the questionnaire and taking the samples, and that they could refuse this at any time without giving any reason.

Statistical analysis

The data collected from the questionnaire were reviewed, recorded, and entered into a computerized database before being analyzed with SPSS Statistics, version 24. Frequencies and percentages (descriptive statistics) were calculated for categorical variables. A Chi-square test was used to determine the significance of the association between dependent and independent variables, where a p-value < 0.05 is the cut-off for statistical significance. The results were presented in tables and graphs.

Result

Table (1) presents the demographic characteristics of the study participants, comprising 202 females. The majority (40.1%) of the participants were from the Al-Hawak district. The mean age of participants with SD was (25 ±9.9), with over half (54.0%) being younger than 25 years. In terms of education, nearly half (44.0%) of the participants held a diploma or higher qualification, and 30.0% had completed secondary education. Regarding family size, more than two-thirds (68.3%) of participants came from families with 5–9 members. Overall, the participants were predominantly young and relatively well-educated, with most living in moderately sized households.

In **figure (1)** Overall prevalence of H. pylori infection according to stool antigen assay and serum antibody assay among study participants: out of the total examined participants female, the number of positive females detected by the stool antigen test was (19.0%), while the individuals who were found positive by the serological test for antibody was (29.8%).

Table (2) Associated factors with H. pylori infection among the study respondents: clarify behavioral and health-related characteristics of the study participants. Regarding sources of drinking water, nearly half (48.02%) reported using treated water, while more than half (51.98%) of participants consumed untreated water, indicating a

potential exposure risk to waterborne infections. A majority (60.40%) of participants reported consuming raw vegetables and fruits. Nearly all participants (99.50%) practiced hand washing after defecation, reflecting strong hygiene habits. When asked about family health history, more than one-third (36.14%) indicated that a family member had been infected, while two-thirds (63.86%) reported no such history. Additionally, more than one-third (38.61%) of participants had a history of helicobacter pylori, whereas less than two-thirds (61.39%) had no history of infection. Lastly, less than half (44.06%) of the participants were aware of the mode of transmission of H. pylori, while more than half (55.94%) had lost this knowledge, highlighting a potential gap in public health education.

Table (3) Clinical characteristics of the participants female: show of the total study participant females, less than three quarter (70.30%) had heartburn and (71.78%) had histories of epigastric pain, nearly two-thirds (62.87%) had headaches and (62.38%) had nausea, and only (31.19%), (50%), (13.86%), and (13.86%) had weight loss, diarrhea, mouth inflammation, and gastric ulcers, respectively.

Table (4) Relationship between the H. pylori infection and demographics of the study participants: shows no statistically significant relationship between the H. pylori infection with socio-demographic P-value > 0.05.

Table (5) Association between H. pylori infection and clinical characteristics among participants females: Regarding the seroprevalence of H. pylori antibodies, there was a statically significant association between epigastric pain and the antibody positivity p-value (0.042), while there was a highly statically significant association between diarrhea, gastric ulcers, and the antibody positivity (p-value=0.001).

Discussion

H. pylori infection in humans is associated with gastritis, gastric ulcers, and gastric cancers. Studying the epidemiological data on H. pylori is essential as it provides necessary information regarding its prevalence and incidence rate and helps in establishing public health action that could halt transmission and, therefore, acquisition of the infection and aid the therapeutic program to eradicate the bacterium **(Chew et al., 2017).**

In the present study, the overall seroprevalence of H. pylori antibodies among females was less one third 29.8%. Previous studies done on the general population and seroprevalence of H. pylori Ab in females **agree** with the findings from China, 31.0% **(Nekaka et al., 2021)**. Libya, 29.5% **(Nekaka et al., 2021)**, and Uganda, 28.4% **(Nekaka et al., 2021)**. It was higher than that of studies in India, 22% **(Dhakal and Dhakal, 2018)** and Saudi Arabia, 27.5 (**Hanafi and Mohammed, 2013)**. However, it was lower than the findings from Lebanon 35.93% **(Khalife et al., 2019)**, Nigeria 51.4% **(Omosor et al., 2017)**, Ethiopia (193) 54.4% **(Mnichil et al., 2023)**, Sudan 59.2% **(Abozaid, 2020)**, in agreement with our study showed that Oman 65.5% **(Alwahaibi et al., 2013)**, Hodeidah city 69.6% (**Al-kadassy et al., 2013)**, and Thamar 82.71% **(Almashhadany and Mayas, 2018)**. These differences might be due to the differences in the titter of antibodies and their persistence in study participants, the geographical region, socio-demographic and economic factors, sample size, diagnostic kits and techniques used.

The overall feco-prevalence of H. pylori antigens among females in this study was less than one fifth. A Previous study was conducted on a gender basis and found that the results on the prevalence of H. pylori Ag infection among females were consistent with or different from our results. It is in line with findings from Thamar, 19.55% **(Almashhadany and Mayas, 2018)** and Ethiopia, 26% **(Zeme et al., 2022)**. It was lower than the findings in Pakistan, 39.4% (**Shah et al., 2021)**, Lebanon, 37% (**Khoder et al., 2021)**, and the United Arab Emirates, 53% **(Khoder et al., 2019)**. The differences in findings might be due to environmental factors, variations in the size of the study population and the methodology. The highest percentage of H. pylori infections, according to the districts, was in Al-Hawak for H. pylori Ab. Also, the highest percentage of infections based on H. pylori-Ag was in Al-Hali.

In this study, the highest infection rate of H. pylori was recorded in participants aged between 25-34 for antibody and <55 for antigen, but there were no statistically significant differences between them (P>0.05). In agreement with our study, a study in Oman **(Alwahaibi et al., 2013)** showed that a high prevalence of H. pylori infection was found in the age group 26-44 years and there was no statistically significant predictor of H. pylori infection. In contrast to findings in this study, studies in Iran **(Eslami et al., 2017)** and China **(She et al., 2023)** found age as a statistically significant predictor of H. pylori infection.

In the present finding, it was found that participants in educational primary school were highest positive for H. pylori antibodies and in secondary school for H. pylori-Ag, with no statistically significant difference. This agreed with a study in Uganda **(Nekaka et al., 2021)** that showed that level of education was not a significant factor in H. pylori infection. However, in contrast to findings in this study, other studies in Brazil **(Santo et al., 2005)** and Libya **(Almehdawi, 2016)** have found education statistically significant in the prevalence of H. pylori infection. Also, some reports mentioned that most individuals educated at the university level may lack awareness of the way pathogens are spread and transmitted **(Edrees, 2022).**

This study found no statistically significant association between family size and H. pylori infection. This was consistent with previous studies conducted in Libya and Sudan, which showed no significant association between H. pylori infection and the size of the family **(Almehdawi, 2016**; **Alyahawi et al., 2018)**. However, there is a difference with the Brazil study **(Santo et al., 2005)**, which reported that transmission between siblings is an important mode of acquiring the H. pylori infection.

There was no significant association found in this study that was found between washing hands and H. pylori infection. This result agreed with a study in Uganda **(Nekaka et al., 2021)** but contrasted with a previous study, which found no significant association between washing hands and H. pylori infection **(Santo et al., 2005)**. No statistically significant difference was found between H. pylori infection and participants who had information about the mode of transmission for both H. pylori-Ag and H. pylori-Ab (P>0.05).

The study results revealed a significant association between H. pylori-Ab and previously infected (P<0.05). Also, there was a significant association between H. pylori antibody with symptoms of epigastric pain, diarrhea,

and gastric ulcers (P < 0.05), whereas there was no significant association between H. pylori infection with symptoms of nausea, heartburn, headache, and weight loss. A similar study, which was conducted in Sana'a, showed H. pylori antibodies were higher among participants who suffer from clinical signs and symptoms, with non-significant differences **(Alyahawi et al., 2018)**.

Conclusion

There was a significant association between the prevalence of H. pylori antigen infection in females and consumption of raw vegetables and fruits, this was one of the predisposing factors. In this current study, the prevalence of H. pylori infection among females in Hodiedah City was found more in pylori-Ag and H. pylori-Ab. Also, there is a significant association between H. pylori infections in previously infected females and clinical symptoms such as epigastric pain, diarrhea, and gastric ulcer.

The highest rate of H. pylori infection in females, according to districts, was in Al-Hawak for H. pylori antibody and Al-Hali for antigen. The highest rate of H. pylori infection in females, according to educational school, was recorded in primary school for both H. pylori antibody and H. pylori antigen. The highest rate of H. pylori infection in females was found among reproductive age group. The highest rate of H. pylori antibody infection was recorded among females whose family was infected with H. pylori.

Recommendation

1. Using the ELISA test in future studies to increase the accuracy of the results, because the use of rapid chromatographic immunoassay to qualitatively detect H. pylori antibodies (IgG) and antigens in the samples is a limitation of the diagnostic power of the test.
2. Avoiding consuming unwashed raw vegetables and fruits, wash hands frequently after defecation and before meals.
3. Treatment of H. pylori infection regularly to prevent its transmission among individuals, particularly between females.
4. Implementation of community health education programs through the Ministry of Health to raise awareness about the causes of H. pylori spread.

Authors' contributions

M.S.T; and A.I.H; Conceived and designed the study, supervised field work. S.A.M; Contributed to study design, statistical analysis and corresponding and communication with Journal editor. E.E.H; A.A.H; and S.M.S; Performed data entry, statistical analysis, and assisted in manuscript preparation. A.A.H; M.A.O; and A.S.A; Contributed to data collection, and laboratory analysis. Every author contributed, edited, and approved the final work.

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Declaration of conflicting interest

The authors declared that they have no conflicts of interest.

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Table (1): Demographic characteristics of the study participant females (n=202)

Variable		Frequency	Percent
District	**Al-Hali**	58	28.71%
	Al-Hawak	81	40.10%
	Al-Mina	63	31.19%
Age **Mean age (25±9.9)**	**<25**	109	54.0%
	25-34	54	26.7%
	35-44	28	13.9%
	45-54	7	3.5%
	≥ 55	4	2.0%
Education Status	**Illiterate**	28	14%
	Reading and Writing	1	1%
	Primary school	23	11%
	Secondary school	61	30%
	Diploma and above	89	44%
Family size	**<5**	36	17.8%
	5-9	138	68.3%
	≥10	28	13.9%

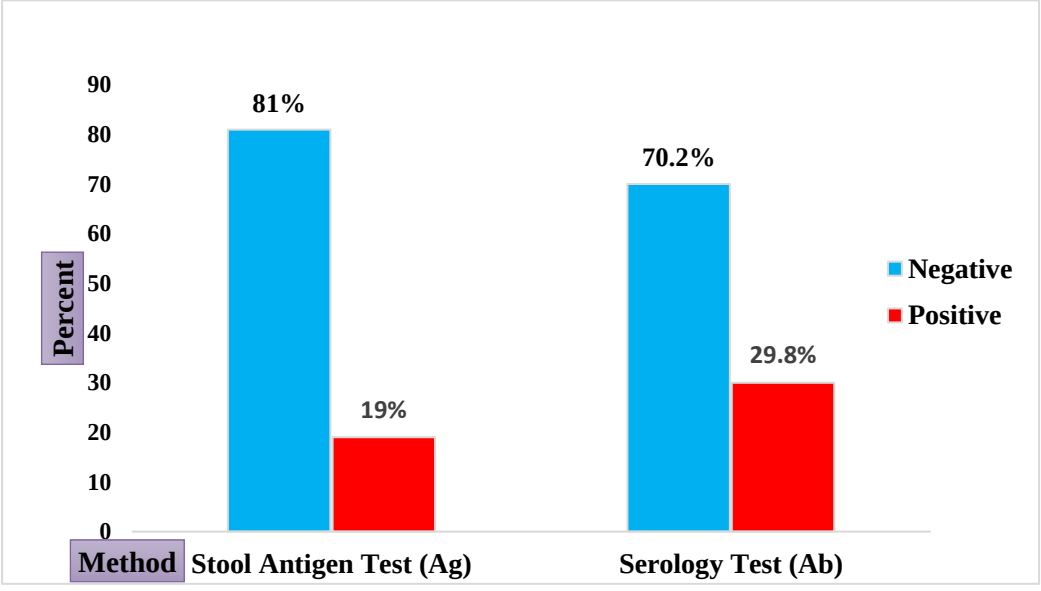

Figure (1): Overall prevalence of H. pylori infection, as determined by stool antigen assay and serum antibody assay, among study participants (n = 202)

Table (2): Associated factors with H. pylori infection among the study respondents (n=202)

Variable		Frequency	Percent
Source of drinking water	**Treated water**	97	48.02%
	Not treated	105	51.98%
Consumption of raw vegetables and fruits	**Yes**	122	60.40%
	No	80	39.60%
Hand washing after defecation	**Yes**	201	99.50%
	No	1	0.50%
One of your family infected	**Yes**	73	36.14%
	No	129	63.86%
Previously infected with H. pylori	**Yes**	78	38.61%
	No	124	61.39%
Mode of transmission of H. pylori	**Yes**	89	44.06%
	No	113	55.94%

Table (3): Clinical characteristics of the study participants female (no=202)

Variable		Frequency	Percent
Headache	**Yes**	127	62.87%
	No	75	37.13%
Heartburn	**Yes**	142	70.30%
	No	60	29.70%
Epi-gastric pain	**Yes**	145	71.78%
	No	57	28.22%
Nausea	**Yes**	126	62.38%
	No	76	37.62%
Weight loss	**Yes**	63	31.19%
	No	139	68.81%
Diarrhea.	**Yes**	101	50.00%
	No	101	50.00%
Mouth inflammation	**Yes**	28	13.86%
	No	174	86.14%
Gastric ulcer	**Yes**	28	13.86%
	No	174	86.14%

Table (4): Relationship between the H. pylori infection with socio-demographic of the study participant female (n=202)

Variable		Positive Ab n (%)	Negative Ab n (%)	P value	Positive Ag n (%)	Negative Ag n (%)	P value
District	**Al Hali**	12(20.7%)	46(79.3%)	**0.157**	13 (22.4%)	45(77.6%)	**0.750**
	Al Hawak	29(35.8%)	52(64.2%)		14(17.3%)	67(82.7%)	
	Al Mina	19(30.2%)	44(69.8%)		12(19.0%)	51(81.0%)	
Age	**<25**	33(30.3%)	76(69.6%)	**0.243**	22(20.2%)	87(79.8%)	**0.946**
	25-34	19(35.2%)	35(64.8%)		11(20.4%)	43(79.6%)	
	35-44	6(21.4%)	22(78.6%)		4(14.3%)	24(85.7%)	
	45-54	0(0.0%)	7(100.0%)		1(14.3%)	6(85.7%)	
	≥ 55	2(50.0%)	2(50.0%)		1(25.0%)	3(75.0%)	
Education Status	**Illiterate**	5(17.9%)	23(82.1%)	**0.578**	3(10.7%)	25(89.3%)	**0.606**
	Reading	0(0.0%)	1(100.0%)		0(0.0%)	1(100.0%)	
	primary school	8(34.8%)	15(65.2%)		4(17.4%)	19(82.6%)	

	Secondary school	20(32.8%)	41(67.2%)		15(24.6%)	46(75.4%)	
	Diploma and above	27(30.3%)	62(69.7%)		17(19.1%)	72(80.9%)	
Family size	**<5**	9(25.0%)	27(75.0%)		7(19.4%)	29(80.6%)	
	5-9	45(32.6%)	93(67.4%)	**0.395**	26(18.8%)	112(81.2%)	**0.951**
	≥10	6(21.4%)	22(78.6%)		6(21.4%)	22(78.6%)	

Table (5): Association between H. pylori infection and clinical characteristics among participants females (no = 202)

Variable		**Positive Ab n (%)**	**Negative Ab n (%)**	**P value**	**Positive Ag n (%)**	**Negative Ag n (%)**	**P value**
Headache	**Yes**	41(32.3%)	86(67.7%)	**0.296**	22(17.3%)	105(82.7%)	**0.353**
	No	19(25.3%)	56(74.7%)		17(22.7%)	58(77.3%)	
Heartburn	**Yes**	43(30.3%)	99(69.7%)	**0.782**	26(18.3%)	116(81.7%)	**0.581**
	No	17(28.3%)	43(71.7%)		13(21.7%)	47(78.3%)	
Epi-gastric pain	**Yes**	49(33.8%)	96(66.2%)	**0.042***	29(20.0%)	116(80.0%)	**0.691**
	No	11(19.3%)	46(80.7%)		10(17.5%)	47(82.5%)	
Nausea	**Yes**	43(34.1%)	83(65.9%)	**0.076**	27(21.4%)	99(78.6%)	**0.325**
	No	17(22.4%)	59(77.6%)		12(15.8%)	64(84.2%)	
Weight loss	**Yes**	22(34.9%)	41(65.1%)	**0.275**	13(20.6%)	50(79.4%)	**0.748**
	No	38(27.3%)	101(72.7%)		26(18.7%)	113(81.3%)	
Diarrhea	**Yes**	42(41.6%)	59(58.4%)	**0.001***	23(22.8%)	78(77.2%)	**0.212**
	No	18(17.8%)	83(82.2%)		16(15.8%)	85(84.2%)	
Mouth Inflammation	**Yes**	5(19.2%)	21(80.8%)	**0.211**	7(26.9%)	19(73.1%)	**0.292**
	No	55(31.3%)	121(68.8%)		32(18.2%)	144(81.8%)	
Gastric ulcer	**Yes**	16(57.1%)	12(42.9%)	**0.001***	7(25.0%)	21(75.0%)	**0.411**
	No	44(25.3%)	130(74.7%)		32(18.4%)	142(81.6%)	

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