ORIGINAL RESEARCH

Seroprevalence of *Helicobacter pylori* Infection and Associated Factors Among Adult Dyspeptic Patients in Public Health Facilities, Mizan Aman Town, Southwest, Ethiopia: Institutional-Based Cross-Sectional Study

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Background: Helicobacter pylori infection is a public health problem associated with chronic gastritis, peptic ulcer, and gastric cancer. It is endemic in developing countries like Ethiopia. This study was aimed to assess seroprevalence of *H. pylori* infection and associated factors among adults' dyspeptic patients in public health facilities of Mizan Aman Town, Southwest Ethiopia.

Methods: Cross-sectional study was conducted in public health facilities of Mizan Aman Town, from April 1, 2018, to June 30, 2018. A total of 208 adult dyspeptic patients were included in the study. A structured questionnaire was used to collect data. Serum was tested for anti-*H. pylori* antibody using a commercial test strip. Data were entered using Epi info 6.04 and exported to SPSS 21 for analysis. Bivariate and multivariate logistic regression was employed and OR with 95% CI was retrieved. P-value of less than 0.05 was considered as statistically significant.

Results: A total of 208 participants were interviewed. The mean age of respondents was 31.70 (SD ±9.123) years. Seroprevalence of *H. pylori* infection was 89 (42.8%). Presence of domestic animals (AOR = 13.33, 95% CI = (2.203–80.692)), sources of drinking water (AOR = 0.011, 95% CI = (0.001–0.110)), toilet type (AOR = 11.236, 95% CI = (1.921–65.73)), shared beds with siblings (AOR = 7.775, 95% CI = (1.676–36.082)), family size (AOR = 0.015, 95% CI = (0.003, 0.089)), storing and reusing water (AOR = 0.014, 95% CI = (0.002–0.103)) and occupational status (AOR = 23.33, 95% CI = (2.034–67.661)) were variables significantly associated with seroprevalence of *H. pylori*.

Conclusion: Seroprevalence of *H. pylori* infection is relatively high in Ethiopia. Family size, shared bed, presences of domestic animals, storage and reuse of water, toilet type, sources of drinking water, and occupation were significant factors associated with *H. pylori* infection. The possible identified modifiable risk factors should be addressed through effective health education.

Keywords: *H. pylori*, seroprevalence, dyspepsia, Ethiopia

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Introduction

Helicobacter pylori infection is a global public health problem and associated with chronic gastritis, and strongly linked to peptic ulcer diseases and gastric cancer. The

bacterium is endemic in Africa and Asia.[1] Its prevalence is highly variable in relation to geographical area, age, and socioeconomic factors; which is high in developing countries. Globally, different strains of *H. pylori* appear to be associated with differences in virulence, and the resulting interplay with host and environmental factors leads to subsequent differences in the epidemiology of infection.[2,3]

It has been well established that *H. pylori* is the cause of almost all duodenal ulcers and chronic benign gastric ulcers.[4] The infection is found to be associated with gastritis, non-ulcer dyspepsia, duodenal ulcer, gastric ulcer, gastric cancer, and gastric lymphoma of mucosa-associated lymphoid tissue.[5] Gastric cancer is a major global health threat and is the third leading cause of cancer deaths worldwide causing an estimated >720,000 deaths per year globally.[6,7] Chronic *H. pylori* infection can also contribute to gastric mucosal instability by reducing gastric acid secretion.[8]

An epidemiological survey reveals that *H. pylori* infection is significantly higher in developing countries where the prevalence rate ranges between 70% and 90%, as compared to 20–50% in developed countries. The association between *H. pylori* infection and dyspeptic symptoms has long been established with *H. pylori* infection having high population attributable risk for dyspepsia.[9] In Nigeria, various studies on *H. pylori* show prevalence rates between 73.0% and 94.5% among patients with dyspepsia[10–12].

In developing countries, 70–90% of the population harbor *H. pylori*, which is mostly acquired during childhood.[13] Transmission of *H. pylori* is largely through oral–oral or fecal-oral routes. A lack of proper sanitation, safe drinking water, basic hygiene, as well as poor diets and overcrowding, play a role in determining the overall prevalence of infection. Transmission of the bacterium is pronounced through poor environmental sanitation and crowding conditions including fecal contamination of water sources.[2,14] In addition, the continuing emergence of resistance to the conventional anti-bacterial drugs used to treat *H. pylori* infections is challenging the eradication of *H. pylori* in developing countries.[15,16]

In Ethiopia, studies documented a high prevalence of *H. pylori* infection among adults in various localities.[17,18] Planning and prevention measures that reduce the public health impact of *H. pylori* infection are critically needed. In this regard, investigating the epidemiology of the infection among the different segments of population is required to design effective intervention measures. Hence, the current study was aimed at the assessment of seroprevalence of *H. pylori* infection and associated factors among patients with dyspepsia in selected public health facilities in southwest Ethiopia.

Methods
Study Design and Setting
An institutional-based cross-sectional study was conducted in Mizan Tepi University Teaching Hospital (MTUTH) and Mizan health center, Bench Maji Zone, Southwest Ethiopia. The health facilities are located in Southwestern part of Ethiopia, Mizan Aman town, 561 km far from the capital city Addis Ababa. The town has a latitude and longitude of 7° 0′N 35°35′E/7.000°N35.583°E, respectively, with an elevation of 1451 meters above sea level. The health facilities are expected to provide medical services for about 1 million people in Southwest Ethiopia and surroundings. The study was conducted from April 1, 2018 to June 30, 2018.

Source and Study Population
Adult dyspeptic patients aged ≥18 years based on ROME III criteria were included in the study. Patients with history of gastrectomy and who were critically ill and unable to give responses were excluded.

Sample Size Determination and Procedure
The minimum sample size (n) was determined by using single population proportion formula [$n = (Z \alpha/2)^2 P (1-P)/d^2$], where $Z_{\alpha/2}$ = the value under standard normal table at 95% level of confidence which is 1.96, expected prevalence P, set at 85.6%, a previous study conducted in Gondar hospital, Ethiopia,[19] d= precision which was set at 5%. Including 10% non-response rate, the final sample size was 208 dyspeptic patients.

The sample size was proportionally allocated to the two health facilities based on previous flow of dyspeptic patients through six months record review. Proportionally, a total of 139 dyspeptic patients from MTUTH and 69 dyspeptic patients from Mizan health center were selected consecutively.

Data Collection Tool and Procedure
Structured questionnaire which was adopted and modified from different reviewed literatures was used.[19–21] Socio-demographic data included sex, age, ethnicity, and socio-economic factors and data on risk factors of *H. pylori* included smoking, diet, and alcohol consumption. The

questionnaire was pretested among 5% of the sample size in other health institution before the actual data collection period. The coherence and skipping pattern of the questionnaire were corrected after the pretest.

Specimen Collection and Laboratory Procedure

Upon completion of the questionnaire, 3–5 mL of the venous blood sample was aseptically collected by trained laboratory professionals and serum sample was tested for anti-*H. pylori* antibody using a commercially available *H. pylori* serology test strip (HEXAGON *H. PYLORI*, Germany), following manufacturer's instructions and interpreted accordingly. The kit has 97% sensitivity and 95% specificity compared with ELISA (HEXAGON H. *PYLORI*, Germany). Those participants tested positive results for the *H. pylori* serology test were asked to produce the stool when coming for the *H. pylori* serology test and the results were confirmed by the stool antigen test. The questionnaire was pre-tested and adequate supervision during data collection was made. The quality of the laboratory results was guaranteed by applying quality control measures during specimen collection and testing.

Operational Definitions

H. pylori Positive: Those participants whose serum result was reactive for the anti-H. pylori antibody test.

H. pylori Negative: Those participants whose serum result was non-reactive for an anti-H. pylori antibody test.

Adult: a human being whose age is 18 years and above who is expected to become sexually mature (According to Ethiopian National law).

Dyspepsia: Pain or discomfort centered in the central portion of the upper abdomen associated with a variety of symptoms such as fullness in the upper abdomen, early satiety, bloating or nausea or vomiting (ROME III criteria).

Educational status: refers to the highest level of education attended by the respondent during the time of the survey.

Income: for rural study participants calculated in kind the crop and cattle changed into monetary forms.

Data Processing and Analysis

Data were entered by using Epi info version 6.04 and exported into SPSS version 21 for cleaning, categorization, and analysis. The results were summarized using descriptive statistics including frequencies and proportions. Bivariate

analysis was conducted to identify the association between each independent variable with the outcome variables. Multivariate analysis was employed to identify independent predictors associated with the outcome variables. In the multivariate analysis, adjusted odds ratio (AOR) and corresponding 95% confidence intervals were retrieved. Those variables with a p-value of less than 0.05 were considered as statistically significant.

Results

Socio-Demographic Characteristics of the Respondents

A total of 208 eligible participants were included in the study from selected public health institutions. The mean age of the respondents was 31.70 (SD ±9.123) years. Most of the participants, 87 (41.8%) were in the age range of 25–34 years. Of the total respondents, 123 (59.1%) were rural residents. Eighty-three (39.9%) of participants were not able to read and write (Table 1).

Seroprevalence of *Helicobacter pylori* Infection

The overall seroprevalence of *H. pylori* infection was 89 (42.8%) through antibody detection. Of the positives, 24/89 (26.96%) and 19/89 (21.34%) were occupational housewives and farmers, respectively. A high proportion of *H. pylori* seropositive cases, 49/89 (55.05%), 59/89 (66.29%), and 82/89 (92.13%) were reported among participants with a household family size of ≥6, who have domestic animals, and who does not treat water before use, respectively (Table 2).

Risk Factors of *H. pylori* Infection

A number of variables like; occupational status, household family size, shared bed with siblings, presence of domestic animals, boiling water before drinking, storing and reusing water, frequency of bathing and showering, toilet type, hand washing with soap after toileting, sources of drinking water, water treatment and garbage collecting system in the compound were the factors found to be significantly associated with the participants' current serostatus of anti-*H. pylori* antibody by bivariate analysis. However, after adjusting for possible confounders with multivariate analysis, only variables like; occupational status, household family size, shared a bed with siblings, presence of domestic animals, storing and reusing water, toilet type, and sources of drinking water were found to be significantly associated.

Table 1 Socio-Demographic Characteristics of the Respondents (n=208), Southwest Ethiopia, 2018

Variables	N (%)
Place of residence	
Urban	85 (40.9)
Rural	123 (59.1)
Age of respondents	
18–24	48 (23.1)
25–34	87 (41.8)
35–44	49 (23.6)
≥45	24 (11.5)
Mean ± SD	31.70 ±9.123
Sex	
Male	95 (45.7)
Female	113 (54.3)
Marital status	
Married	148 (71.2)
Single	30 (14.4)
Divorced	16 (7.7)
Separated	9 (4.3)
Widowed	5 (2.4)
Religion	
Protestant	92 (44.2)
Orthodox	75 (36.1)
Muslim	41 (19.7)
Ethnicity	
Bench	68 (32.7)
Kefa	64 (30.8)
Sheka	24 (11.5)
Amhara	20 (9.6)
Oromo	20 (9.6)
Others*	12 (5.8)
Respondent's educational status	
Unable to write and read	83 (39.9)
Able to read and write	36 (17.3)
Primary	32 (15.4)
Secondary	27 (13.0)
Certificate	15 (7.2)
Diploma and above	15 (7.2)
Respondent's occupational status	
Farmer	54 (26.0)
Housewife	48 (23.1)
Merchant	37 (17.8)
Student	22 (10.6)
Daily worker	23 (11.1)
Government employee	24 (11.5)
Monthly household income in Ethiopian Birr (ETB)	
≤750	60 (28.8)

(*Continued*)

Table 1 (Continued).

Variables	N (%)
751–1000	59 (28.4)
1001–2000	39 (18.8)
≥2001	50 (24.0)
Mean ±SD	1400.1±1012.27
Household family size	
≤3	30 (14.4)
4–5	89 (42.8)
≥6	89 (42.8)
Total	208 (100%)

Note: Others* represents Tigre, Me'anit, Surma.

Those participants whose family size was 4 to 5 per household were less likely to be positive for anti-*H. pylori* antibody than those whose family size was ≥6 members per household (AOR = 0.015, 95% CI = (0.003, 0.089)). Respondents who shared a bed with siblings were 7 times more likely to be positive for anti-*H. pylori* antibody than their counterparts (AOR = 7.775, 95% CI = (1.676–36.082)) and participants who respond for the presence of domestic animals were 13 times more likely to be positive for anti-*H. pylori* antibody than their counterparts (AOR = 13.33, 95% CI = (2.203–80.692)). Participants whose sources of drinking water were bore-hole/well were less likely to be positive for the current status of anti-*H. pylori* antibody than those who used river water (AOR = 0.011, 95% CI = (0.001–0.110)).

Those whose educational status were students were more likely to be positive for the current status of anti-*H. pylori* antibody than government worker (AOR =23.33, 95% CI= (2.034–67.661)). Those who sometimes store, and reuse water were less likely to be positive for the current status of anti-*H. pylori* antibody that those who always store and reuse the water (AOR =0.014, 95% CI= (0.002–0.103)).

Participants who use the open field for toilet were 11 times more likely to be positive for the current status of anti-*H. pylori* antibody than those who use water pit toilet (AOR =11.236, 95% CI= (1.921–65.73)). Respondents who use well water were less likely to be positive for the current status of anti-*H. pylori* antibody than those who use river water (AOR =0.011, 95% CI= (0.001–0.110)) (Table 3).

Discussion

In the current study, the seroprevalence of *H. pylori* infection was 42.8% (95% CI (36%; 50%)) through the detection of anti-*H. pylori* antibody in the serum samples. More

Table 2 Distribution of Seroprevalence of *H. pylori* Infection (n=208), Southwest Ethiopia, 2018

Variables	Anti-*H. pylori* Antibody Serostatus	
	Negative, N (%)	Positive, N (%)
Occupational status		
Farmer	35 (64.8)	19 (35.2)
Housewife	24 (50.0)	24 (50.0)
Merchant	19 (51.4)	18 (48.6)
Student	13 (59.1)	9 (40.9)
Daily worker	10 (43.5)	13 (56.5)
Government employee	18 (75.0)	6 (25.0)
Household family size		
≤3	10 (33.3)	20 (66.7)
4–5	69 (77.5)	20 (22.5)
≥6	40 (44.9)	49 (55.1)
Shared bed with siblings		
Yes	57 (50.9)	55 (49.1)
No	62 (64.6)	34 (35.4)
Domestic animals		
Yes	49 (45.4)	59 (54.6)
No	70 (70.0)	30 (30.0)
Boiling water before drinking		
Consistently boiling water before drinking	28 (80.0)	7 (20.0)
Sometimes boiling water before drinking	9 (31.0)	20 (69.0)
Never boiling water before drinking	82 (56.9)	62 (43.1)
Storing and reusing water		
Never storing or reusing water	11 (52.4)	10 (47.6)
Sometimes storing and reusing water	49 (71.0)	20 (29.0)
Always storing and reusing water	59 (50.0)	59 (50.0)
Frequency of bathing and showering		
At least 2–3 times/week	17 (70.8)	7 (29.2)
Less than 2–3 but more than once/week	40 (66.7)	20 (33.3)
Once/week or less	62 (50.0)	62 (50.0)
Toilet type		
Water-closet	17 (77.3)	5 (22.7)
Pit-latrine	43 (65.2)	23 (34.8)
Open-field	59 (49.2)	61 (50.8)
Hand washing with soap after toileting		
Yes	49 (75.4)	16 (24.6)
No	70 (49.0)	73 (51.0)
Sources of drinking water		
Tap Water	20 (44.4)	25 (55.6)
Bore-hole/well	69 (69.7)	30 (30.3)
River Water	30 (46.9)	34 (53.1)
Water treatment		
Yes	21 (75.0)	7 (25.0)
No	98 (54.4)	82 (45.6)

(*Continued*)

Table 2 (Continued).

Variables	Anti-*H. pylori* Antibody Serostatus	
	Negative, N (%)	Positive, N (%)
Garbage collecting system in the compound		
Yes	33 (71.7)	13 (28.3)
No	86 (53.1)	76 (46.9)

than half of the world's populations in developing countries are infected with *H. pylori* infection.

In this study, the seroprevalence of *H. pylori* infection was much higher than a study conducted in North Jakarta 22.5%[20] and comparable with a study conducted in Tanzania, 39% (95% CI: 32.3 −45.7).[22] Whereas the result is lower compared to the studies done in Kano Nigeria, 81.7%,[23] Bahrain, 54%,[24] Nigeria, 73.6%,[21] South Africa, 66.1%,[25] and in Northwest Ethiopia, 85.6%[19] and Addis Ababa St. Paul hospital, 64.2%.[26] In comparison with the other studies conducted in different areas of the world, it was also found to be lower as compared with the systematic review and meta-analysis conducted in Ethiopia from 1990–2017, where the overall pooled prevalence of *H. pylori* infection was 52.2%.[27] The difference could be attributed due to the socioeconomic difference, study period difference, and laboratory methods used by the individual studies, in which some of the above studies used histological technique, and urea breath test to determine the prevalence of *H. pylori* infection. Another reason could be due to the difference in sample size as that of this study is relatively lower.

Different predictor variables were found to be significant with serostatus of *H. pylori* infection.

In the current study, having high family size per household is significantly associated with *H. pylori* infection. The condition related to crowdedness which favors the transmission of the bacterium between individuals. Similar studies from Iraq,[28] North Jakarta,[29] Isreal[30] and in Nigeria,[21,31] documented high crowding index was a significant predictor *H. pylori* infection. Furthermore, this result is supported by the studies conducted in China[32] and Sweden,[33] documented that family size is a predictor variable for *H. pylori* infection in which high family members per household will play a significant role for interfamilial transmission of the bacterium during childhood which results in high seroprevalence of *H. pylori* in the general

Table 3 Determinant Factors for Participant's Current Status of Anti-*H. pylori* Antibody (n=208), Southwest Ethiopia, 2018

Variables	Anti-*H. pylori* Antibody Serostatus		COR (95% CI)	AOR (95% CI)
	Negative, N (%)	Positive, N (%)		
Occupational status				
Farmer	35 (64.8)	19 (35.2)	1.629 (0.553–4.794)	4.127 (0.376–45.351)
Housewife	24 (50.0)	24 (50.0)	3.000 (1.015–8.864)*	7.868 (0.746–83.008)
Merchant	19 (51.4)	18 (48.6)	2.842 (0.921–8.768)	4.023 (0.368–43.939)
Student	13 (59.1)	9 (40.9)	2.077 (0.592–7.288)	23.334 (2.034–67.661)*
Daily worker	10 (43.5)	13 (56.5)	3.900 (1.131–13.45)*	3.995 (0.348–45.832)
Government employee	18 (75.0)	6 (25.0)	1.00[+]	1.00[+]
Household family size				
≤3	10 (33.3)	20 (66.7)	1.633 (0.686–3.883)	0.329 (0.019–5.815)
4–5	69 (77.5)	20 (22.5)	0.237 (0.124–0.453)*	0.015 (0.003–0.089)*
≥6	40 (44.9)	49 (55.1)	1.00[+]	1.00[+]
Shared bed with siblings				
Yes	57 (50.9)	55 (49.1)	1.760 (1.006–3.076)*	7.775 (1.676–36.082)*
No	62 (64.6)	34 (35.4)	1.00[+]	1.00[+]
Domestic animals				
Yes	49 (45.4)	59 (54.6)	2.810 (1.587–4.975)*	13.334 (2.203–80.692)*
No	70 (70.0)	30 (30.0)	1.00[+]	1.00[+]
Boiling water before drinking				
Consistently boiling water before drinking	28 (80.0)	7 (20.0)	1.00[+]	1.00[+]
Sometimes boiling water before drinking	9 (31.0)	20 (69.0)	8.889 (2.836–27.86)*	9.292 (0.890–97.006)
Never boiling water before drinking	82 (56.9)	62 (43.1)	3.024 (1.240–7.376)*	3.875 (0.736–20.408)
Storing and reusing water				
Never storing or reusing water	11 (52.4)	10 (47.6)	0.909 (0.359–2.302)	5.212 (0.828–32.799)
Sometimes storing and reusing water	49 (71.0)	20 (29.0)	0.408 (0.217–0.769)*	0.014 (0.002–0.103)*
Always storing and reusing water	59 (50.0)	59 (50.0)	1.00[+]	1.00[+]
Frequency of bathing and showering				
At least 2–3 times/week	17 (70.8)	7 (29.2)	0.412 (0.160–1.063)	0.222 (0.024–2.082)
Less than 2–3 but more than once/week	40 (66.7)	20 (33.3)	0.500 (0.263–0.950)*	0.525 (0.086–3.203)
Once/week or less	62 (50.0)	62 (50.0)	1.00[+]	1.00[+]
Toilet type				
Water-closet	17 (77.3)	5 (22.7)	1.00[+]	1.00[+]
Pit-latrine	43 (65.2)	23 (34.8)	1.819 (0.594–5.564)	1.423 (0.289–7.004)
Open-field	59 (49.2)	61 (50.8)	3.515 (1.219–10.14)*	11.236 (1.921–65.73)*
Hand washing with soap after toileting				
Yes	49 (75.4)	16 (24.6)	0.313 (0.163–0.601)*	1.459 (0.358–5.950)
No	70 (49.0)	73 (51.0)	1.00[+]	1.00[+]
Sources of drinking water				
Tap Water	20 (44.4)	25 (55.6)	1.103 (0.513–2.373)	6.151 (0.104–34.283)
Bore-hole/well	69 (69.7)	30 (30.3)	0.384 (0.200–0.736)*	0.011 (0.001–0.110)*
River Water	30 (46.9)	34 (53.1)	1.00[+]	1.00[+]
Water treatment				
Yes	21 (75.0)	7 (25.0)	0.398 (0.161–0.984)*	0.394 (0.059–2.620)
No	98 (54.4)	82 (45.6)	1.00[+]	1.00[+]

(*Continued*)

Table 3 (Continued).

Variables	Anti-*H. pylori* Antibody Serostatus		COR (95% CI)	AOR (95% CI)
	Negative, N (%)	Positive, N (%)		
Garbage collecting system in the compound				
Yes	33 (71.7)	13 (28.3)	0.446 (0.219–0.909)*	0.378 (0.101–1.416)
No	86 (53.1)	76 (46.9)	1.00[+]	1.00[+]

Notes: *Adjusted for all significant variables p <0.05. [+]Reference Category.
Abbreviation: CI, confidence interval.

population too. In addition, a shared bed with siblings is a predictor variable associated with high prevalence of *H. pylori* infection in the current study. A similar study reported that the prevalence of *H. pylori* infection increased with the increment of sibling number (20% in those with none sibling versus 63% with eight or more siblings) in a household.[34]

The presence of domestic animals was found to be significantly associated with serostatus of *H. pylori* infection. A similar finding was documented from a study in Butajira, Ethiopia.[35] The probability of acquiring the bacterium could be increased due to the presence of domestic animals like cats, dogs, and cattle's which could contribute to the contamination of food and drinking utensils and could also directly or indirectly contaminate food items and water as well.[36]

In the current study, sources of drinking water from the river and storing and reusing water frequently were significantly associated with seroprevalence of *H. pylori* infection compared to those who use tap water. In addition, the toilet type of participants was a factor associated with seroprevalence of *H. pylori* infection. A similar related finding was reported from a study done in Sana'a,[37] and North Jakarta[20] which reported poor hand hygiene, hand washing habit, low clean water, and low sanitation index as factors significantly associated with seroprevalence of *H. pylori* infection. This indicated that poor personal hygiene and environmental sanitation are the source of transmission for infectious diseases causative agents including *H. pylori*. Whereas, a contradicted finding was reported from a study conducted in Rural Beninase,[38] which indicated seroprevalence of *H. pylori* infection does not have an association with the source of drinking water. This difference with the current study could be attributed to the difference in sources of water used because nearly one-third of the participants of this study were used river water whereas the study subjects in Benine used tap water and well water only. River water is easily contaminated by

animal and human waste products, and drinking such water was a high-risk factor for *H. pylori* infection.[39]

The result of the current study needs to be interpreted cautiously in which the study has some limitations. The first limitation is, we only studied people aged 18 years or above and did not assess the prevalence in children. Secondly, the inclusion of patients receiving antibiotics for other infections or who have been treated for *H. pylori* infection in the past may affect the diagnostic accuracy of the test result. Thirdly, it was conducted in a health institution setting and may not be a true representative of the prevalence of *H. pylori* among dyspeptics in the general population of South-West Ethiopia. A community-based study including all age group therefore needs to be considered by future researchers.

Conclusions

In conclusion, the observed seroprevalence of *H. pylori* infection among adult dyspeptic patients is relatively high in the study area. Family size shared a bed with siblings, presence of domestic animals, frequent storage and reuse of water, toilet type, and sources of drinking water were significant factors associated with the overall seroprevalence of *H. pylori* infection. The result can further suggest that the bacterium is still a public health problem that requires further study and effective interventions. Hence, the possible modifiable risk factors should be addressed through effective health education on personal hygiene and sanitation, water handling, toilet usage, handling of domestic animals. Dyspeptic patients should be tested for *H. pylori* serologically and future broad studies with advanced laboratory procedures should be conducted to identify further associated factors and socioeconomic impact of *H. pylori* infection.

Data Sharing Statement

All relevant data are included within the manuscript, but any additional data required are available from the

corresponding author upon request. Email: Alex.sayiha-lem2012@gmail.com.

Ethical Considerations

This study was conducted in accordance with the Declaration of Helsinki and after ethical clearance was obtained from the Institute of Research, Community Development and Support (IRCDS) office of the Mizan Tepi University (Ref No: MTU/CHS/91/421/21/10). After explaining the objectives of the study, written consent was obtained from each study participant. For the participants who were unable to read and write, trained interviewers have carefully explained the purpose, benefits, and potential risks before consent was obtained. In this case, fingerprint was used as a signature. The interview with study participants was conducted with strict privacy and confidentiality. The test was also performed following the manufacturer's instructions and interpreted accordingly. Then, for those study participants who resulted positive, all necessary information was informed and finally linked to the health facilities for further investigation (histology, rapid urease test (RUT), microbiological culture, and polymerase chain reaction (PCR), endoscopy) and treatment.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

We declare that we do not have any conflict of interests.

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