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Prevalence of Helicobacter pylori infection amongst food vendors in the main market of Gulu City. Cross-sectional study.

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Abstract

Background:

Helicobacter pylori infection is a widespread gastrointestinal infection affecting more than half of the global population, with higher prevalence in low-resource settings due to poor sanitation and hygiene. This study aims to determine the prevalence of Helicobacter pylori infection amongst food vendors in the main market of Gulu City.

Methodology:

A cross-sectional study design was conducted involving 113 food vendors selected through a simple random sampling method. Data was collected using structured questionnaires and analysed using Microsoft Excel.

Results:

The study involved 113 respondents, 70.8% were female, and 29.2% male. (32.7%) were aged 26-35 years, followed closely by those aged 36-45 years (31.1%), while 19.5% were between 18-25 years, and 16.8% were 46 years and above. The prevalence of H. pylori infection was higher among females (62.5%) than males (54.5%), suggesting that gender-related differences in hygiene practices or risk exposure may influence infection rates. In terms of age, most participants were aged 26-35 years (32.7%) and 36-45 years (31.1%), representing the most active and economically productive age. This age category's high participation in food vending also reflects a greater likelihood of exposure to H. pylori infection, since they are the most engaged in daily food handling activities. The majority of respondents came from Gulu (37.1%), followed by Arua (22.1%) and Kitgum (14.2%). This distribution suggests that most food vendors were local residents or nearby migrants who have long-term exposure to the same market environment, potentially increasing the risk of cross-contamination and persistent infection within the area.

Conclusion:

The study shows a notable prevalence of H. pylori infection among food vendors in Gulu City, with higher rates in females and those aged 26–45 years.

Recommendations:

Health education on hygiene and safe food handling should be strengthened among vendors, alongside improved sanitation facilities in the market.

Keywords: *Helicobacter pylori prevalence, food vendors, Gulu City, sanitation, hygiene practices.*
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Background of the study

Helicobacter pylori infection remains a major global public health concern, with an estimated over 50% of the world's population affected, particularly in low- and middle-income countries where sanitation and hygiene practices are suboptimal. The bacterium is a Gram-negative, spiral-shaped organism that colonizes the gastric mucosa and has been classified as a Group I carcinogen by the International Agency for Research on Cancer due to its strong association with gastric cancer development (Stella I. S. et al., 2022).

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Transmission is believed to occur mainly through faecal–oral, oral–oral, and possibly waterborne routes, especially in environments where hygiene standards are inadequate.

Food vendors represent a critical population in the epidemiology of H. pylori because they operate in settings where food handling, personal hygiene, and environmental sanitation directly influence the risk of microbial transmission to large numbers of consumers. Studies suggest that individuals engaged in food handling may be at increased risk of gastrointestinal infections due to frequent exposure to contaminated water, poor hand hygiene practices, and limited access to sanitation facilities (Getnet et al., 2016). In developing countries, these risk factors are often intensified by overcrowding, low socioeconomic status, and inadequate access to safe drinking water, all of which facilitate sustained transmission of H. pylori within communities (Sanjeev et al., 2020).

Evidence from Africa indicates a persistently high prevalence of H. pylori infection in both symptomatic and asymptomatic populations. For instance, studies in Ethiopia have reported infection rates approaching 50%, with strong associations between infection and poor sanitation, lack of clean water, and overcrowded living conditions (Getnet et al., 2016). Similarly, findings from Uganda have shown substantial prevalence among children, with infection linked to water sources, sanitation practices, and socioeconomic status, suggesting ongoing community transmission (Stella et al., 2019). These findings imply that individuals in high-exposure occupations, such as food vending, may contribute to both the acquisition and dissemination of the pathogen.

Despite the recognized burden of H. pylori infection in sub-Saharan Africa, limited specific data focus on its frequency among food vendors, particularly in urban market settings such as the main market of Gulu City, Uganda. Given the likelihood of exposure to contaminated food, water, and environmental surfaces, food vendors may represent an important reservoir for continued transmission within the community. Therefore, this study aims to determine the prevalence of Helicobacter pylori infection amongst food vendors in the main market of Gulu City.

Methodology

Study Design

A cross-sectional study design was used because it provides a descriptive overview and a snapshot of a population at a single point in time, to quickly collect data from a large sample size.

Study Area

The study was conducted in the main market of Gulu City in Uganda. Gulu Main Market is a marketplace in Laroo, Gulu Municipality, Northern Uganda. 2.77249° or 2° 46′ 21″ North. Longitude. 32.3007° or 32° 18′ 3″ East.

Study Population

The study population included food vendors in the main market of Gulu city in Uganda.

Inclusion Criteria

The participants to be included in the study were required to be over 18 years and above, have been actively engaged in the business for at least six months, and handle food directly and interact with customers daily.

Exclusion Criteria

The participants excluded from the study were those with a history of recent H. pylori treatment within the past six months, and also participants with pre-existing gastrointestinal conditions unrelated to H. pylori.

Food vendors who operated food businesses without direct contact with food preparation and handling.

Sample Size Determination

The sample size for this study was determined using Cochran's formula for prevalence studies: n = Z2P (1-p) /d2, where:

n = required sample size,
Z = standard normal deviation at 95% confidence level (1.96),
P = estimated prevalence of H. pylori infection (0.25 according to Kwagala et al. (2020).
d 2 = margin of error.
Therefore,

$$N = \frac{(1.96)^2 (0.25) (1-0.25)}{(0.08)^2}$$

$$= \frac{3.8416*0.25*0.75}{}$$

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$$= \frac{0.0064}{0.7203} = \frac{0.0064}{112.54}$$

Therefore, a sample size of 113 participants shall be considered in the study.

Sampling Technique
A simple random sampling technique was employed to select study participants because it's easy to understand and implement, the concept is straightforward, and it can yield a sample that is representative of the population. Each member of the population has an equal chance of being selected.

Sampling Procedure
The simple random number technique used odd and even numbers from 1 to 226; the participants picked papers from the box randomly to choose samples. Those who chose odd numbers were included in the study, and those who chose even numbers were excluded from the study.

Independent Variables:
Hygiene practices (hand-washing, food storage, water source, cleanliness of utensils, use of gloves, and protective clothing), food handling techniques, knowledge of H. pylori transmission and prevention, and sources of food and water used in food preparation.

Dependent Variable:
Prevalence of H. pylori infection (determined through blood tests).

Data collection tools
Structured questionnaires were used to gather demographic data, hygiene practices, and awareness of H. pylori infection.
Biological samples were collected from the participants tested and analyzed for H. pylori.
Laboratory test kits were used to carry out serological tests for the diagnosis of H. pylori infection.

Data Collection Procedure
The selected participants were informed by the Researcher about the study and asked to sign consent forms to agree to participate in the study. Blood samples were collected from the participants, tested, and analyzed for H. pylori.

Quality control
The questionnaire was pre-tested on 30 respondents from Cereleno market, similar to that of the main market, before full-scale data collection. Proper training of Research Assistants was done, and educated on the purpose of the study and how to collect data and interpret results. A negative control sample known to be free of H. pylori was used to help verify test specificity and ensure that the test is not producing false-positive results, and a positive control known to contain H. pylori was used to validate test performance to confirm that the test kit is working as expected.

Data Analysis and Presentation
The collected data were entered in Microsoft Excel, cleaned, and exported to SPSS Version 20.0 for analysis.
The analyzed data were presented in the form of percentages and frequencies in tables, pie charts, and narratives.

Ethical Consideration
A written introductory letter from the Registrar of Mildmay Institute of Health Sciences was presented to the management and market association of Gulu main market. Ethical approval was obtained from the Market Counsel and participants signed consent forms before data collection. Informed consent was sought from the respondent.

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Results

Socio-Demographic Characteristics of Participants

Table 1: Social–Demographic Characteristics of Participants.

Variables	*Response*	*Frequency (N)*		*Percentage (%)*		*Total*	
		Male	**Female**	**Male**	**Female**	**Frequency (N)**	***Percentage (%)***
Age	18-25	9	13	8	11.5	22	*19.5*
	26-35	12	25	10.6	22.1	37	*32.7*
	36-45	8	27	7.1	24.0	35	*31.1*
	≥46	4	15	3.5	13.3	19	*16.8*
Total		**33**	**80**	**29.2**	**70.9**	**113**	***100***
Gender	Female		80		70.8	80	*70.8*
	Male	33		29.2		33	*29.2*
	Transgender	0	0	0	0	0	*0*
	No response	0	0	0	0	0	*0*
Total		**33**	**80**	**29.2**	**70.8**	**113**	***100***
Home District	Apac	6	9	5.3	8	15	*13.3*
	Gulu	11	31	9.7	27.4	42	*37.1*
	Arua	5	20	4.4	17.7	25	*22.1*
	Lira	4	11	3.5	9.7	15	*13.2*
	Kitgum	7	9	6.2	8	16	*14.2*
Total		**33**	**80**	**29.1**	**70.8**	**113**	***100***
Tribe	Acholi	15	33	13.3	29.2	48	*42.5*
	Lango	9	17	8	15	26	*23*
	Lugbara	5	13	4.4	11.5	18	*15.9*
	Alur	4	17	3.5	15	21	*18.5*
Total		***33***	***80***	***29.2***	***70.7***	***113***	***100***

Table 1 continues: Social–Demographic Characteristics of Participants.

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Religious Affiliations	Catholic	10	25	8.8	22.1	35	30.9
	Protestant	12	25	10.6	22.1	37	32.7
	Moslem	7	15	6.2	13.3	22	19.5
	Pentecostal	4	15	3.5	13.3	19	16.8
Total		**33**	**80**	**29.1**	**70.8**	**113**	**100**
Marital Status	Single	9	25	7.9	22.1	34	30
	Divorced	4	7	3.5	6.2	11	9.7
	Married	7	17	6.2	15	24	21.2
	Widow	8	18	7.1	15.9	26	23.0
	No response	5	13	4.4	11.5	18	15.9
Total		**33**	**80**	**29.1**	**70.7**	**113**	**100**
Level of Education	Primary	4	7	3.5	6.2	11	9.7
	Secondary	7	13	6.2	11.5	20	17.7
	Tertiary	10	36	8.8	31.85	46	40.7
	No response	12	24	10.6	21.2	36	31.8
Total		**33**	**80**	**29.1**	**70.8**	**113**	**100**
Physical Address	Laroo	5	31	4.4	27.4	36	31.8
	Pece	6	20	5.3	17.7	26	23
	Layibi	11	9	9.7	8	20	17.7
	Custom corner	4	11	3.5	9.7	15	13.2
	Limu	7	9	6.2	8	16	14.2
Total		**33**	**80**	**29.1**	**70.8**	**113**	**100**

The study involved 113 respondents, of whom 70.8% were female and 29.2% male. Most participants (32.7%) were aged 26-35 years, followed closely by those aged 36-45 years (31.1%), while 19.5% were between 18-25 years, and 16.8% were 46 years and above.

Regarding Home District, the majority came from Gulu District (37.1%), followed by Arua (22.1%), Kitgum (14.2%), Apac (13.3%), and Lira (13.2%). And in terms of tribes, Acholi dominated with 42.5%, followed by Lango (23%), Alur (18.5%), and Lugbara (15.9%).

For Religious Affiliation, Protestants (32.7%) slightly outnumbered Catholics (30.9%), while Muslims accounted for 19.5% and Pentecostals for 16.8%.

The largest group was single (30%), followed by widows (23%), married participants (21.2%), and divorced (9.7%), while 15.9% gave no response. In terms of education levels, tertiary-educated respondents formed the majority (40.7%), while secondary education accounted for 17.7%, primary education for 9.7%, and 31.8% gave no response.

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Prevalence of H. Pylori infection

Table 2: Prevalence of H. Pylori infection

Variables	Response	Frequency (N)		Percentage (%)		Total	
		Male	Female	Male	Female	Frequency (N)	Percentage (%)
Age	18-25	9	13	8	11.5	22	19.5
	26-35	12	25	10.6	22.1	37	32.7
	36-45	8	27	7.1	24.0	35	31.1
	≥46	4	15	3.5	13.3	19	16.8
Total		**33**	**80**	**29.2**	**70.9**	**113**	**100**
Gender	Female		80		70.8	80	70.8
	Male	33		29.2		33	29.2
	Transgender	0	0	0	0	0	0
	No response	0	0	0	0	0	0
Total		**33**	**80**	**29.2**	**70.8**	**113**	**100**
Home District	Apac	6	9	5.3	8	15	13.3
	Gulu	11	31	9.7	27.4	42	37.1
	Arua	5	20	4.4	17.7	25	22.1
	Lira	4	11	3.5	9.7	15	13.2
	Kitgum	7	9	6.2	8	16	14.2
Total		**33**	**80**	**29.1**	**70.8**	**113**	**100**
Tribe	Acholi	15	33	13.3	29.2	48	42.5
	Lango	9	17	8	15	26	23
	Lugbara	5	13	4.4	11.5	18	15.9
	Alur	4	17	3.5	15	21	18.5
Total		**33**	**80**	**29.2**	**70.7**	**113**	**100**
Religious Affiliations	Catholic	10	25	8.8	22.1	35	30.9
	Protestant	12	25	10.6	22.1	37	32.7
	Moslem	7	15	6.2	13.3	22	19.5
	Pentecostal	4	15	3.5	13.3	19	16.8
Total		**33**	**80**	**29.1**	**70.8**	**113**	**100**
	Single	9	25	7.9	22.1	34	30

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Marital Status	Divorced	4	7	3.5	6.2	11	9.7
	Married	7	17	6.2	15	24	21.2
	Widow	8	18	7.1	15.9	26	23.0
	No response	5	13	4.4	11.5	18	15.9
Total		**33**	**80**	**29.07**	**70.7**	**113**	**100**
Level of Education	Primary	4	7	3.5	6.2	11	9.7
	Secondary	7	13	6.2	11.5	20	17.7
	Tertiary	10	36	8.8	31.85	46	40.7
	No response	12	24	10.6	21.2	36	31.8
Total		**33**	**80**	**29.1**	**70.75**	**113**	**100**
Physical Address	Laroo	5	31	4.4	27.4	36	31.8
	Pece	6	20	5.3	17.7	26	23
	Layibi	11	9	9.7	8	20	17.7
	Custom corner	4	11	3.5	9.7	15	13.2
	Limu	7	9	6.2	8	16	14.2
Total		**33**	**80**	**29.1**	**70.8**	**113**	**100**

The study involved 113 food vendors from Gulu City Main Market, comprising 70.8% females and 29.2% males. The predominance of female respondents indicates that food vending in the market is largely a female-dominated activity. The prevalence of H. pylori infection was higher among females (62.5%) than males (54.5%), suggesting that gender-related differences in hygiene practices or risk exposure may influence infection rates. In terms of age, most participants were aged 26-35 years (32.7%) and 36-45 years (31.1%), representing the most active and economically productive age. This age category's high participation in food vending also reflects a greater likelihood of exposure to H. pylori infection, since they are the most engaged in daily food handling activities.

With regards to Home District, the majority of respondents came from Gulu (37.1%), followed by Arua (22.1%) and Kitgum (14.2%). This distribution suggests that most food vendors were residents or nearby migrants who have long-term exposure to the same market environment, potentially increasing the risk of cross-contamination and persistent infection within the area. Considering tribes, the Acholi formed the largest group (42.5%), consistent with the dominant ethnic population in Gulu District. While ethnicity itself may not directly affect H. pylori infection, it can be linked to lifestyle and dietary habits that may influence exposure risks.

Regarding religious affiliations, the largest groups were Protestants (32.7%), Catholics (30.9%), and Pentecostals (16.8%). Religious practices that influence food handling and hygiene may directly impact infection prevalence, for example, dietary restrictions.

The marital status of respondents also varied, with 30% single, 23% widowed, 21.2% married, and 9.7% divorced. The high proportion of single and widowed vendors may reflect individuals who handle food independently without shared domestic facilities, possibly limiting access to hygienic food preparation resources, thus increasing infection risks.

In terms of education level, 40.7% of respondents had tertiary education, 17.7% had secondary education, and 9.7% had primary education, while 31.8% did not indicate their education level. Higher educational attainment generally correlates with better knowledge of hygiene and disease prevention. However, the continued presence of H.

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pylori among respondents despite a relatively educated population suggests that awareness does not always translate into consistent hygienic practice.

Lastly, the residential distribution showed that most vendors lived in Laroo (31.8%), followed by Pece (23%) and Layibi (17.7%). These are densely populated divisions within Gulu City where sanitation conditions vary.

Discussion

The overall prevalence of H. pylori infection among food vendors in the Main Market of Gulu City was 60.2%. Findings of the current study are in line with the findings from a study conducted in Nigeria, West Africa, which reported a 67.4% prevalence of H. pylori. These findings are also in agreement with those from the study conducted in Ibadan, which reported a prevalence of 63.5% in patients with gastritis (Stella et al., 2019). Furthermore, findings from another sister study conducted in Morocco revealed the study's overall H. pylori seropositivity prevalence of 92.6% among asymptomatic Moroccans and 89.6% among patients with gastric disorders (Stella et al., 2019). A related study conducted in Kenya showed that the prevalence of H. pylori was found to be 67.5% in all age groups. This is in line with the findings of the current study. This similarity in this study is possibly due to the commonness we have as East Africans, whereby we share similar climatic conditions, lifestyles, and living conditions, among others.

When examined by gender, the findings show that females had a higher prevalence (62.5%) than males (54.5%). This pattern is consistent with the study findings of Getachew et al. (2016 where female prevalence was also higher (75.5%) than male prevalence (68.5%). The general trend of females being more affected than males is similar in both studies. The difference in overall prevalence between studies may be explained by variations in sample characteristics, hygiene practices, and diagnostic methods used. Likewise, although both studies show higher infection among females, neither study reports gender as a statistically significant predictor of H. pylori infection, suggesting that the observed differences may be due to other unmeasured factors.

The study findings show that respondents had varied marital backgrounds, with 30% being the highest number of single respondents, followed by 23% widowed respondents, 21.2% being married respondents, and 9.7% divorced respondents. Compared to the study conducted in Southwest Ethiopia, with 22.1% being single respondents, and 7.2% widowed respondents, 61.9% being the highest number of married respondents (Getnet et al., 2016). This is totally in agreement with the findings of the current study. This similarity in this study is possibly due to the different variations in living conditions and potential hygiene practices among respondents.

Conclusion

The study found a relatively high prevalence of Helicobacter pylori infection among food vendors in the main market of Gulu City, with higher rates observed among females and individuals in the most economically active age groups (26–45 years). The findings suggest that continuous exposure to food handling activities, coupled with possible gaps in hygiene practices and environmental sanitation, may contribute to sustained transmission of H. pylori within this population. The presence of vendors from different regions further indicates potential for cross-contamination and persistence of infection within the market setting.

Recommendations

There is a need to strengthen routine health education programs targeting food vendors on proper hygiene practices, including handwashing, safe food handling, and use of clean water. Local authorities should also improve sanitation infrastructure within the market, such as ensuring adequate access to clean water and functional toilet facilities. Regular medical screening for H. pylori infection among food vendors should be encouraged, alongside enforcement of food safety regulations to reduce the risk of transmission to the general public.

Acknowledgement

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List of Abbreviations

LIST OF ABBREVIATIONS AND ACRONYMS	
ELISA	Enzyme-linked immunosorbent assay
GIT	Gastrointestinal tract
H. PYLORI	*Helicobacter pylori*
WHO	World Health Organization
ITP	Idiopathic thrombocytopenic purpura
IgM	Immunoglobulin M
IgG	Immunoglobulin G
PUD	Peptic ulcer disease
MALT	Mucosa-associated lymphoid tissue lymphoma

Data availability
The data is available upon request.

Informed consent
Written informed consent was obtained from all participants before their inclusion in the study. Participants were informed about the purpose of the study, procedures involved, potential risks and benefits, and their right to withdraw at any time without penalty.

Source of funding
The study did not receive any external funding.

Conflict of interest
The author did not declare any conflict of interest.

Author contributions
Winfrey Winnie Awanga was the principal investigator. Emmanuel Kafeero, Hasifah Nansereko, Franscisco Ssemuwemba, Anthony Ssekitoleko, and Jane Frank Nalubega supervised the research project.

Author Biography
Winfrey Winnie Awanga holds a diploma in Medical Laboratory Technology from Mildmay Institute of Health Sciences at Mildmay Institute of Health Sciences.
Francisco Ssemuwemba is the dean of the School of Allied Health at Mildmay Institute of Health Sciences.
Hasifah Nansereko is the chairperson of the Institutional Review Council (IRC) at Mildmay Institute of Health Sciences.
Emmanuel Kafeero, Anthony Ssekitoleko, and Jane Frank Nalubega are tutors at Mildmay Institute of Health Sciences.

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