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Helicobacter Pyroli Infection in Patients With Gastro Intestinal Infections Obtaining Care at A District Hospital in Southern Province of Rwanda

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Abstract

Helicobacter pylori infection affects 50% of the world's population, with over 70% in developing countries. In Rwanda, 78% of patients with gastric cancer had H. pylori infection however studies estimating its prevalence based on stool antigen test are lacking. This study aims to determine the prevalence and factors associated with H. pylori infection among patients with clinical diagnosis of gastrointestinal infection at Kigeme District Hospital, Rwanda. This study used a cross-sectional study design with quantitative approach involving 257 participants and they were selected using simple random sampling method. Selected participants were given structured open questionnaire developed using kobo tool box then data collected were exported in excel sheet, cleaned and entered in SPSS version 21 for further analysis. The study used descriptive statistics and bivariate analysis to examine the association between dependent and independent variables, with variables with p-values below 0.05 considered significantly associated with helicobacter pylori infection. This study revealed that, the prevalence of helicobacter pylori was 19% while family history of H. pylori infection (AOR = 2.268, 95% CI: 1.6–3.43, p = 0.001), eating in restaurant (AOR = 32.83, 95% CI: 13.9–77.5, p = 0.024), consumption of raw or uncooked food (AOR = 130.4, 95% CI: 15.09–112, p = 0.001) were strongly associated with helicobacter pylori. On the other hand, consumption of spicy food(AOR = 0.149, 95% CI: 0.055–0.407, p = 0.001),A access to clean drinking water (AOR = 0.118, 95% CI: 0.045–0.308, p = 0.002), good hand hygiene practices(AOR = 0.247, p = 0.003) and washing hands after using the toilet (AOR = 0.056, p = 0.012),having a pit latrine with a slab(AOR = 0.137, p = 0.017) were protective to helicobacter pylori infection. In contrast, gender was not significantly associated with H. pylori infection (AOR = 1.423, 95% CI: 0.739–2.740, p = 0.292), indicating no substantial difference between males and females. This study concluded that family history, restaurant eating, and raw/undercooked food are associated with helicobacter pylori infection, while access to clean water, good hand hygiene, and pit latrine with slab are protective.

Keywords: *Helicobacter, Pyroli Infection, Patients, Gastro Intestinal Infections, Southern Province of Rwanda*

1.0 Introduction

Helicobacter pylori infection affects approximately 50% of world's population (Blaser & Atherton, 2004). Nearly 800 000 new cases of gastric cancer worldwide were attributed to H pylori infection in 2018(Li et al., 2023) and the linkage between helicobacter pylori and gastric cancer is documented(Tempera et al., 2022). The prevalence of helicobacter pylori infection varies across continents: Africa (70.1%), South America and Western Asia 69.4% respectively (S. Smith et al., 2019). In Africa the prevalence of helicobacter pylori varies across regions, with rates of 70-90% in West Africa (Ofori et al., 2019), 77.6% in South Africa (Leja et al., 2019) ,36.8–94% in middle East (Alsulaimany et al., 2020) and 50.98% in East Africa (Mnichil et al., 2024). Among East African countries, including Rwanda, the prevalence varies from country to country: it is 39.1% in Tanzania, 54.8% in Kenya, 87% in Uganda (Namyalo et al., 2021), 70.8% in Burundi. The H. Pylori prevalence is 75% in Rwanda (Smith et al., 2022). This infection is known as an important risk factor for gastric cancer, which is the third leading cause of mortality (Padda et al., 2021) and the fourth leading cause of mortality in Rwanda, accounting for 11.9% of deaths in the country (Niyongombwa et al., 2022; WHO, 2022). For instance, a study done in Rwanda among patients with gastric cancer at the University Teaching Hospital of Butare found that 78% of these patients had Helicobacter pylori infection (Shikama et al., 2022). According to the Rwanda National Cancer and Control Plan 2020-2024, one of its aims was to prevent infectious disease-leading cancers, including Helicobacter pylori, through screening and early detection (MOH, 2020). Therefore, the aim of this study was to determine the prevalence and factors associated with Helicobacter pylori infection among patients with gastrointestinal infection attending Kigeme DH in Nyamagabe District, Southern Province of Rwanda.

2.0 Materials and Methods

This study employed a cross-sectional design with a quantitative approach to investigate Helicobacter pylori infections among patients attending Kigeme Hospital with clinical diagnoses of gastrointestinal infection. The researcher included patients whose medical records contained H. pylori antigen test results, while excluding those without gastroenteritis, incomplete medical files, or who declined participation. Based on previous research conducted at CHUB Rwanda indicating a 78.8% prevalence of H. pylori among gastric cancer patients, the sample size was calculated using Fisher's formula, resulting in 257 participants. Data collection was accomplished through a three-section questionnaire addressing demographic characteristics, lifestyle/behavioral information, and H. pylori antigen testing results, with instruments adapted from similar published studies. The collected data was entered into IBM SPSS version 22.0 for comprehensive analysis, with proportions expressed as frequencies and continuous data such as age presented as median with standard deviation. The analysis began with a univariate approach using H. pylori infection as the dependent variable against socio-demographic, economic, and behavioral characteristics as independent variables. Subsequently, all variables underwent multivariable logistic regression with backward elimination to adjust for covariates, calculating adjusted odds ratios and 95% confidence intervals with statistical significance set at $p < 0.05$. Ethical considerations were thoroughly addressed, with clearance obtained from Mount Kenya University's Institutional Review Board (Ref No MKU/ETHICS/23/01/2024(1)) and permission granted by Kigeme District Hospital, while participants received detailed consent forms explaining the study purpose and were assured of confidentiality with all data securely stored on password-protected computers accessible only to the researchers.

4.0 Results and Discussion

Table 1 provides demographic information for a sample population of 257 individuals. The majority (72.8%) is aged 31 years and above, while 18.3% are between 20-30 years, and 8.9% are in the 3-19-year age group. More women (68.8%) than men (31.12%) are represented. Most participants are married (87.9%), with smaller percentages of divorced (3.5%), widowed (6.2%), and single individuals (2.3%). The dominant religion is Christianity (81.3%), while Muslims and those practicing traditional beliefs each make up 9.3%. The majority of participants are farmers (77.8%), with public (10.9%) and private (8.9%) employees and students (2.3%) representing smaller occupational groups. Regarding education, 59.9% have completed primary school, 21.4% have informal education, 14.4% secondary education, and only 4.3% have a university degree. Household size also varies, with 40.5% having more than three members, 29.2% having three members, 17.5% having two, and 12.8% having just one member.

Table 1: Socio-demographic Characteristics of Study Participants

Variable	Frequency (n=257)	Percentage
Age group		
3-19	23	8.9
20-30	47	18.3
31 and above	187	72.8
Gender		
Male	80	31.12
Female	177	68.8
Marital status		
Married	226	87.9
Divorced	9	3.5
Widow	16	6.2
Single	6	2.3
Religion		
Christian	209	81.3
Muslim	24	9.3
Tradition	24	9.3
Occupation		
Student	6	2.3
Farmer	200	7.8
Public employee	28	10.9
Private employee	23	8.9
Level of education		
Informal education	55	21.4
Primary	154	59.9
Secondary	37	14.4
University	11	4.3
Number of members in the household		
One	33	12.8
Two	45	17.5
Three	75	29.2
More than three	104	40.5

Prevalence of helicobacter pylori infection among patients with clinical diagnosis of gastrointestinal infection obtaining care at Kigeme District Hospital. Figure 1: Depicts the prevalence of Helicobacter pylori in the study population. 48(19%) out of 257 participants with clinical diagnosis of helicobacter pylori infection were positive to stool helicobacter pylori antigen test

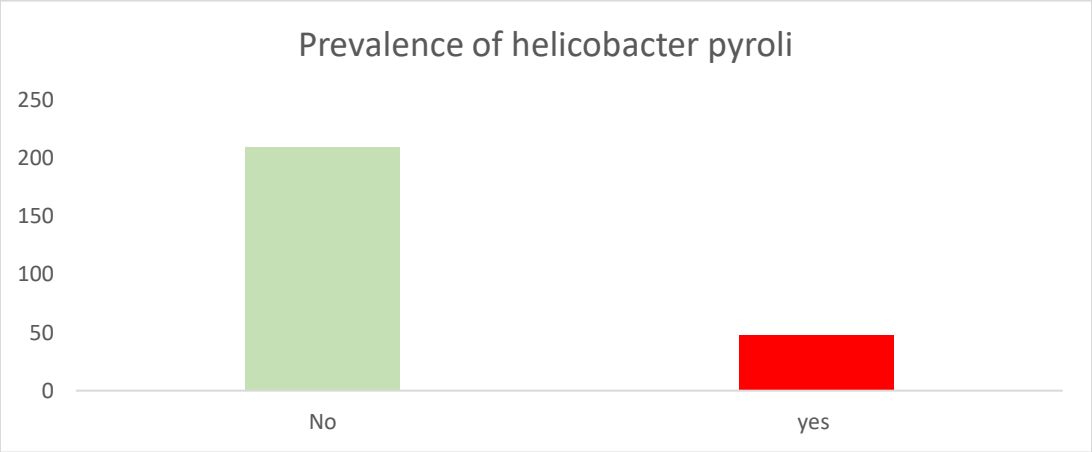

Figure 1. Prevalence of Helicobacter pylori among patients with clinical diagnosis of gastro intestinal infections attending Kigeme District Hospital

4.1 Bivariate Analysis of Socio Demographic Characteristics

Table 2. shows bivariate analysis of demographic factors associated with helicobacter pylori infection among patients with clinical diagnosis of gastro intestinal infections attending Kigeme District Hospital. Household size was significantly associated with H. pylori infection. Households with three members had the highest prevalence, while those with more than three members had a lower prevalence (P-value=0.045). Similarly, gender was significantly associated with helicobacter pylori infection (P-value=0.031) whereby the prevalence of this infection was 21.4% in female compared to male who were having the prevalence of 11.6%. On the other hand, occupation, education level, religion, age group showed no significant association with H. pylori infection.

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Table 2: Bivariate Analysis of Socio Demographic Characteristics

Variable	Prevalence of Helicobacter pylori		Fisher's exact test p-value
	No n (%)	Yes n (%)	
Age group			0.759
3-19	20(87)	3(13)	
20-30	40(80)	10(20)	
31 and above	149(81)	35(19)	
Gender			**0.031**
Male	61(88.4)	8(11.6)	
Female	147(78.6)	40(21.4)	
Occupation			0.982
Student	5(83.5%)	1(16.7%)	
Farmer	163(81.5%)	37(18.5)	
Public employee	23(83.1)	5(17.9)	
Private employee	18(78.3)	5(21.7)	
Level of education			0.475
Informal education	46(83.6)	9(16.4)	
Primary	125(81.2)	29(18.8)	
Secondary	30(81.1)	7(18.9)	
University	8(72.7)	3(27.3)	
Religion			
Christian	20(83.3)	4(16.7)	
Muslin	168(80.4)	41(19.6)	
Traditional	21(87.5)	3(12.5)	
Number of members in the household			**0.045**
One	29(87.9)	4(12.1)	
Two	38(84.4)	7(15.6)	
Three	57(95)	3(5)	
More than three	85(71.4)	34(28.6)	

4.2 Bivariate Analysis of Life Style/Behavioral Characteristics

A bivariate analysis has shown that 8 out of 9 life style variables were statistically significant factors associated with helicobacter pylori infection among patients with clinical diagnosis of gastro intestinal infections. Family history of helicobacter pylori, alcohol consumption, eating spicy food, inadequate access to clean water, poor hand washing practice before eating and after toilet and eating raw/uncooked meal was associated with helicobacter pylori infection among patients with gastrointestinal symptoms at Kigeme District hospital with P-value<0.05 as shown in table 4.3. In contrast, smoking status was not statistically associated with helicobacter pylori infection with p-value=0.089 as illustrated in Table 3 below.

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Table 3: Bivariate Analysis of Life Style/Behavioral Characteristics

Variable	Prevalence of helicobacter pylori		Fisher's exact test P-value
	Yes n (%)	No n (%)	
Family history of Helicobacter pylori infection			**0.0001**
Yes	38(69.1)	17(30.9)	
No	192(95)	10(5)	
Smoking status			0.089
Yes	1(4.3)	22(95.7)	
No	47(20.7)	187(79.3)	
Alcohol consumption			**0.036**
Yes	2(5.6)	34(94.4)	
No	46(20.8)	175(79.2)	
Consumption of spicy food			**0.0001**
Yes	30(37.5)	50(62.5)	
No	18(10.2)	159(89.8)	
Use of restaurant			**0.0001**
Yes	38(62.3)	23(37.7)	
No	10(5.1)	186(94.9)	
Access to clean drinking water			
Yes	19(9.8)	175(90.2)	
No	29(46)	34(54)	
Washing hand before meal			**0.0001**
Yes	13(6.9)	176(93.1)	
No	35(51.3)	33(48.5)	
Washing hand after toilet			**0.001**
Yes	16(9.3)	156(90.7)	
No	32(37.6)	53(62.4)	
Consumption of raw/uncooked food			**0.001**
Yes	31(93.9)	2(6.1)	
No	17(7.6)	207(92.4)	
Presence of pit latrine with slabs			**0.001**
Yes	34(15.3)	188(84.7)	
No	14(40)	21(60)	

4.3 Multivariate Analysis of Factors Associated with Helicobacter Pylori Infection

Table 4 illustrate multivariate analysis of factors associated with helicobacter pylori infection among patients with clinical diagnosis of gastro intestinal infections attending Kigeme District Hospital. Family history of H. pylori infection (AOR = 2.268, 95% CI: 1.6–3.43, p = 0.001), eating in restaurant (AOR = 32.83, 95% CI: 13.9–77.5, p = 0.024), consumption of raw or uncooked food (AOR = 130.4, 95% CI: 15.09–112, p = 0.001) were strongly associated with helicobacter pylori among patients with clinical diagnosis of gastro intestinal infections attending Kigeme District Hospital. On the other hand, consumption of spicy food(AOR = 0.149, 95% CI: 0.055–0.407, p = 0.001),A access to clean drinking water (AOR = 0.118, 95% CI: 0.045–0.308, p = 0.002), good hand hygiene practices(AOR = 0.247, p = 0.003) and washing hands after using the toilet (AOR =

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0.056, p = 0.012),having a pit latrine with a slab(AOR = 0.137, p = 0.017) were protective to helicobacter pylori infection. In contrast, gender was not significantly associated with H. pylori infection (AOR = 1.423, 95% CI: 0.739–2.740, p = 0.292), indicating no substantial difference between males and females. Similarly, household size showed a no statistical significance association with helicobacter infection even though, those with more than three members had a higher likelihood of infection (AOR = 3.481), but this was not statistically significant (p > 0.05). Smoking (AOR = 1.151, p = 0.893) and alcohol consumption (AOR = 2.360, p = 0.596) were also not significant factors for H. pylori infection.

Table 4: Multivariate Analysis of Factors Associated with Helicobacter Pylori Infection

Variable	Prevalence of Helicobacter pylori		P-value
	AOR	95% CI	
Gender			
Male	Ref		
Female	1.423	0.739-2.740	0.292
Number of members in the household			
One	Ref		
Two	0.32		0.56
Three	2.076		0.681
More than three	3.481		0.481
Family history of Helicobacter pylori infection			
No	Ref		
Yes	2.268	1.6-3.43	**0.001**
Smoking status			
No	Ref		
Yes	1.151	0.032-71	0.893
Alcohol consumption			
No	Ref		
Yes	2.360	0.099-56.1	0.596
Consumption of spicy food			
No	Ref		
Yes	0.149	0.55-0.407	**0.001**
Use of restaurant			
No	Ref		
Yes	32.83	13.9-77.5	**0.024**
Access to clean drinking water			
No	Ref		
Yes	0.118	0.045-0.308	**0.002**
Washing hand before meal			
No	Ref		
Yes	0.247	0.097-0.624	**0.003**
Washing hand after toilet			
No	Ref		
Yes	0.056	0.013-0.244	**0.012**
Consumption of raw/uncooked food			
No	Ref		
Yes	130.4	15.09-112	**0.001**
Presence of pit latrine with slabs			
No	Ref		
Yes	0.137	0.027-0.703	**0.017**

4.5 Discussion

This study has found that the prevalence of helicobacter pylori was 19%, this finding is lower compared to a systematic study which involved 73 countries in six continents which revealed that the prevalence stands at 44.3% worldwide and 34.7% in developed countries (Zamani et al., 2018). The prevalence from this study is also lower compared to the prevalence found in different countries united Arab Emirate (41%), Korea (41.5%), 27.5% in East China (27.5%) and 87.2% in Spain (87.2%) (Leja et al., 2019). This prevalence is extremely low compared to the finding in study which comprised data form 62 countries whereby Africa was ranked among the highest with pooled prevalence of 70.1% whereas Oceania had the lowest prevalence 24.4%. By comparing our study finding among different countries in Africa this was lower compared with the prevalence of helicobacter pylori which was 87.7% in Nigeria (Hooi et al., 2017), Burundi(70.8%), Togo and Congo Brazzaville was respectively 70.41%, Morocco(63.8%),88% in Ghana (88%), Egypt (66.12%) in 2019, Benin (71.5%), Cameroon (73.2%) and Algeria (71.43%) (Smith et al., 2022).

The prevalence (19%) from this study is also low compared with the study done in Rwanda at CHUB using urea breath test which found 75% positivity for *H. pylori* among patient who underwent endoscopic examination(Nizeyimana et al., 2021) and it is also lower compared to the study done by Shikama et al., 2024 whereby it was 78.8% among patients with with upper gastrointestinal cancer in Rwanda (Shikama et al., 2022). In contrast, the prevalence of 19% from this study is nearly the same finding in the study which was conducted in Switzerland which found the prevalence of 18.9% (Hooi et al., 2017). Concerning the factors associated with helicobacter pylori infection among patients with clinical diagnosis of gastro intestinal infections attending Kigeme District Hospital, this study has found that family history of H. pylori infection, eating in restaurant, consumption of raw or uncooked food were strongly associated with helicobacter pylori among patients with gastrointestinal symptoms. These finding are similar to other studies which found that overcrowding, inadequate sanitation (Razuka-Ebela et al., 2020) ;(Smith et al., 2018) and also a study conducted in Democratic Republic of Congo found that history of *H. pylori* in the family was associated with helicobacter pylori infection(adjusted odds ratio: 7, 95 CI: 2.742–17.867; $P<0.0001$)(Birato et al., 2023).

On the other hand, consumption of spicy food, access to clean drinking water, good hand hygiene practices and washing hands after using the toilet, having a pit latrine with a slab were protective to helicobacter pylori infection. This is in line with the study conducted which has shown that consumption spicy food was protective to helicobacter pylori infection were protective against *H. pylori* infection(Mhaskar et al., 2013). The findings also are in line with the study which was conducted in Hainan Province, China which has shown that washing hand before meal and after toilet were protective to helicobacter pylori infection(Chen et al., 2023). In contrast, gender was not significantly associated with H. pylori infection, indicating no substantial difference between males and females. Similarly, household size showed a no statistical significance association with helicobacter infection even though, those with more than three members had a higher likelihood of infection (AOR = 3.481), but this was not statistically significant ($p > 0.05$). Smoking (AOR = 1.151, $p = 0.893$) and alcohol consumption (AOR = 2.360, $p = 0.596$) were also not significant factors for H. pylori infection. However, these findings were not in line with other previous studies whereby gender and high number of household occupants were significantly associated with H. pylori infection ($p<0.05$) (Odigie et al., 2020). Similarly, these finding were not in line with other study which density of occupation of sleeping accommodation (more than three persons sharing a room) (Aguemon et al., 2005).

5.0 Conclusion

This study concludes that family history of helicobacter pylori, eating in restaurant, eating raw undercooked food were strongly associated with helicobacter pylori infection among patients with clinical diagnosis of gastro intestinal infections attending Kigeme District Hospital. In contrast, consumption of spicy food, access to clean drinking water, good hand hygiene practices, washing hands after using the toilet, having a pit latrine with a slab were protective to helicobacter pylori infection.

6.0 Recommendations

The study recommends health officials to promote goof hygiene practice, dietary advice, and regular inspection of restaurants, availability of clean water as well as hygiene and sanitation facilities to all population in partnerships with local government and ministry of health.

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