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Research Article

Prevalence and factors associated with active *H. pylori* infection among the asymptomatic population and dyspeptic patients in Mwanza North-western Tanzania

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Abstract

Helicobacter pylori (*H. pylori*) infection is the commonest gastroenterological infection in the world. Studies have documented the magnitude of *H. pylori* infections to be high in developing countries where the living conditions are poor. This study has provided the prevalence of *H. pylori* infection and its associated factors among asymptomatic and dyspeptic patients in Mwanza, North - Western, Tanzania.

Methods: This cross-sectional study was performed among dyspeptic patients who underwent esophagogastroduodenoscopy at Bugando Medical Centre, Mwanza, Tanzania, and asymptomatic individuals in the city of Mwanza, Tanzania between August 2014 and September 2019. The diagnosis of *H. pylori* infection was done using rapid stool HpSA antigen test and data analysis was done using STATA version 13.

Results: The study included 353 dyspeptic patients with a median age of 40 (IQR 30-51) years and a total 349 asymptomatic individuals with median age of 25 (IQR:21-29), p = 0.001. With excpetion of gender, significant differences were observed among other social-demographic factors among the two groups. *H. pylori* infection was significantly more in the dyspeptic patients than in asymptomatic population (60.3%, 95% CI: 55.2-65.4 vs. 46.3%, 95% CI 41-51.5, P = 0.001). More than two person in the household (OR: 1.62, 95%CI: 1.00-2.62, P < 0.048), being employed, (OR: 4.84, 95%CI: 2.08-11.24, p-value < 0.001), being a farmer (OR: 3.77,95%Cl:1.60-8.88, p-value < 0.002) and being a businessman (OR: 3.05, 95%CI: 1.44-6.46, p-value < 0.003) independently predicted *H. pylori* infections among dyspepetic individuals while only being married was independent predictor of infection (OR: 1.7, 95%CI: 1.05-2.89,P = 0.031) among asymptomatic population.

Conclusion: *H. pylori* infections is significantly more in dyspeptic individuals and is predicted by multiple social demographic factors. *H. pylori* infected individuals were more likely to develop erosion and ulceration. Due to increase in *H. pylori* antibiotic resistance, there is a need to further investigate the susceptibility patterns of these strains for the purpose of establishing the appropriate empirical treatment guidelines to prevent associated morbidity and mortality. Based on the results from this study, we suggest that public health authorities should focus on preventive measures against *H. pylor*i infection.

Keywords: *H. pylori*; Stool Antigen; Non-Ulcer Dyspepsia; *Helicobacter Pylori*

Introduction

Helicobacter pylori (H. pylori) infection is transmitted by fecal-oral route through contaminated food and water. The prevalence of *H. pylori* infection varies worldwide among different geographical regions and correlates with diverse socio-demographic factors [1]. Limited data available on the prevalence of *H. pylori* show that the positivity rate is much higher in developing countries (70-90%) than in industrialized countries 25-50% [2]. The *H. pylori* seroprevalence in East Africa has been found to range from 46% in Tanzania to 75% in Rwanda [3-7]. In 2003, it was observed that in developed world, *H. pylori* infection rate in asymptomatic individuals ranged from 5 to 15%, while the infection rate in limited resources countries was 36 to 82%. In developing countries, 30-50% of infections are acquired during early childhood and in 50-70% during adulthood [8,9]. In Egypt the prevalence of *H. pylori* among asymptomatic individuals has been found to be 87.6% which is almost the same as 86.8% in South Africa [10,11]. There is no published data from East Africa among asymptomatic adult population.

Dyspepsia is the commonest symptom that occurs in patients with *H. pylori* infection and it is one of the warning symptoms for peptic ulcer and carcinoma of the stomach [12,13]. As defined in ROME criteria, dyspepsia is postprandial fullness, early satiation, epigastric pain, and epigastric burning, for the past 3 months and symptoms onset ≥6 months but other upper gastrointestinal symptoms such as nausea, belching or abdominal bloating may coexist, therefore, are not considered as cardinal features [14]. Poor hygiene standards, simple and crowded living conditions, high number of persons in the household, infected family members and drinking unsafe water are among the factors found to be associated with *H. pylori* infections [15,16]. Other factors include low education level, regular smoking, alcohol drinking, overweight, obesity and high meat consumption [3,17-20,21-23]. The epidemiology of *H. pylori* is not well described in Tanzania; therefore, this study was done to determine the prevalence and associated factors of active *H. pylori* infection among asymptomatic and dyspeptic patients attending the Bugando Medical Centre, and asymptomatic individuals in Mwanza City, Tanzania.

Methods

This was a cross-sectional study that included dyspeptic patients undergoing upper Esophagogastroduodenoscopy (OGD) at the endoscopy unit of the Bugando Medical Centre (BMC), Mwanza, Tanzania and asymptomatic individuals recruited from the community between August 2014 and August 2019. The study population included all dyspeptic patients based on ROME criteria who were planned for upper gastrointestinal tract endoscopy as part of their workup for dyspeptic symptoms. Patients aged 18 years and above with dyspeptic symptoms that had no history of antibiotic use in past 30 days were serially enrolled in the study until the desired sample size was reached. The asymptomatic individuals were recruited from the community at Nyamagana and Ilememla districts in Mwanza, the recruitment sites were outside the BMC building and at Igombe town center. The announcements were circulated few days before the study together with the brochures about *H. pylori* infection. All individuals who volunteered to participate aged 18 years and above, who had no prior history of dyspepsia as defined by ROME criteria and neither on antibiotic for the past 30 days nor PPI for the past two weeks were enrolled. Those who agreed to be involved in the study were given written consent form to fill in and all informations were confidential. All participants who had stool for *H. pylori* positive were directed to be managed by clinicians as per local treatment guideline This study is was approved by the Ethics and Research Committee of CUHAS/Bugando with an updated clearance for publication number CREC/066b/2015.

Stool samples were collected using disposable stool containers. *H. pylori* antigen was detected using HpSA antigen test (The SD-Bioline *H. pylori* Ag Rapid test-Germany) following manufacturer's instructions. The test has sensitivity of 95%, specificity of 94% and positive predictive value of 84% [24]. It is a non-invasive test that has been recommended for pre- and post-eradication therapy monitoring [24]. The OGD was done to characterize the lesion. All patients with positive stool were treated according to the world gastroenterology organization's global guidelines for developing countries [24].

Data were entered into the computer using excel software and analyzed using STATA version 13. The main outcome in this study was positive antigen for *H. pylori* in the stool. The categorical variables such as sex, occupation, education, marital status, number of family members, type of drinking water, type of sanitary, meat consumption, alcohol use, smoking habit and body mass index (BMI) were summarized as proportions while age was summarized as median with interquartile range (IQR). Variables were subjected to univariable and multivariable logistic regression analysis to determine the independent risk factors of *H. pylori* positivity. Backward elimination (deletion) was used to select factors for multiple re-

gression analysis. All the independent variables were entered into the analysis first and each one was deleted one at a time if they do not contribute to the regression equation. The strength of association between *H. pylori* positivity and different variables were computed by odds ratio with their respective 95% confidence intervals. In all analyses, factors with p- values less than 0.05 were considered statistically significant.

Results

Social Demographic distribution among symptomatic and dyspeptic individuals

The two groups were not similar, table 1. Dyspeptic patients were significantly older than asymptomatic patiens (42 (IQR:30-51) vs. 25 (IQR:21-29), p = 0.001). Gender distribution was almost equal among the majority of the participants from symptomatic group, those who had reported using treated water were 66.8% compred to 43.75% reported in the asymptomatic group (Table 1).

Among the dyspeptic patients, the median age was 40 (IQR 30-51) years. Male and female participants had almost equal distribution whereby females were 179 (50.7%). Of 353 participants, 138 (39.1%) were married and the majority 329 (93.2%) of participants had formal education. Regarding profession, there were 138 (39.1%) business owners, 71 (20.1%) employed, 63 (17.9%) farmers, 48 (13.6%) retired and 33 (9.3%) students.

Variable	Symptomatic (Dyspeptic) Individual (N = 353)	Asymptomatic Individuals (N = 349)	Pearson chi^2	P-Value
Age**				
	42 (IQR:30-51)	25 (IQR:21-29)		0.001
Gender				
Male	174/353 (49.3%)	146/349 (41.8%)	3.8577	0.050
Female	179/353 (50.7.3%)	203/349 (58.2%)		
Occupation				
Farmers	63/353 (18%)	69/349 (19.8%)		
Students	33/353 (39%%)	203/349 (58.2%)	115.9695	0.001
Business	138/353 (63.71%)	23/349 (6.6%)		
Employed	71/353 (20.1%%)	54/349 (15.4%)		
Retired	48/353 (13.6%)	0/349 (0%)		
Marital				
Single	135/353 (38.2%)	93/349 (26.6%)	62.6922	0.001
Married	218/353 (61.8%)	256/349 (73.4%)		
Number of people in household				
≤ 2	229/353 (64.9%%)	10/349 (2.9%)	161.0978	0.001
> 2	124/353 (35.1%)	339/349 (97.1%)		
BMI**				
	26 (IQR:14.7-39)	22 (IQR:20-24)		0.001
Type of drinking water				
Treated	16/353 (43.7%)	233/349 (66.8%)	182.8858	0.001
Not treated	337/353 (61.1%)	116/349 (33.2%)		

Table 1: Demographic Factors Among Asymptomatic Individuals and Dyspeptics in Mwanza, Northwest Tanzania.

** It was calculated as Median.

Prevalence and factors associated with active infection among asymptomatic individuals

Out of 349 asymptomatic individuals tested for *H. pylori* infection, 154 were positive. It was found that being married was independent predictor of infections among asymptomatic population (OR: 1.7, 95%CI: 1.05-2.89, P = 0.031) on multivariate analysis. In this group gender, age, BMI and type of drinking water had no association with *H. pylori* positivity. Additionally, occupation and number of family members per household had no association with *H. pylori* among asymptomatic group table 2.

Variable	Positive Asymptomatic Individuals (N = 349)	Univariate analysis		Multivariate analysis	
		OR (95% CI)	p-value	OR (95%) CI	p-value
Age**	25 (IQR21-29)	0.99 (0.97-1.02)	0.826	0.99 (0.97-1.02)	0.900
Gender					
Male (146)	60/146 (41.1%)	1			
Female (203)	94/203 (46.3%	1.2 (0.80-1.89)	0.334	1.37 (0.876-2.149)	0.166
Occupation					
Farming/agriculture (69)	27/69 (39.13%)				
Students (205)	88/205 (42%)	1.16 (0.67-2.04)	0.581		
Business (23)	12/23 (52.17%)	1.69 (0.65-4.38)	0.275		
Employed (54)	27/54 (51.92%)	1.68 (0.81-3.47)	0.162	1.49 (0.809-2.78)	0.198
Marital					
Single (93)	32/93 (34.41%)	1			
Marital (256)	122/256 (47.6%)	1.73 (1.05-2.84)	0.028	1.74 (1.051-2.89)	0.031
Number of Family member					
≤ 2 (10)	3/10 (3%)	1			
> 2 (339)	339/349 (97%)	1.01 (0.94-1.07)	0.714	1.35 (0.861-2.133)	0.189
Drinking water					
Treated (233)	107/233 (45.92%)	1			
Not treated (116)	47/116 (40.52%)	0.80 (0.51-1.25)	0.338		
BMI**	22 (IQR20-24)	0.99 (0.94-1.05)	0.894		

Table 2: Factors Associated with Active Infections among 349 Asymptomatic Individuals.

**Median.

Prevalence and factors associated with active infection among dyspeptic patients

A total of 353 patients with dyspepsia were enrolled in the study. Positive *H. pylori* stool antigen was detected in 213 (60.3%, 95%CI: 55.2-65.4) of 353 non-repetitive stool samples tested. More than one person in the household (OR: 1.62, 95%CI: 1.00-2.62, p = 0.048) being employed (OR:4.84,95%CI:2.08-11.24, p-value < 0.001), being a farmer (OR: 3.77,95%Cl:1.60-8.88, p-value < 0.002) and being businessman (OR:3.05,95%CI:1.44-6.46, p-value < 0.003). were found to be independent predictors of *H. pylori* on multivariate analysis table 3.

Gastrointestinal symptoms and signs among patients presented with dyspepsia

All patients presented with dyspepsia, some of them presented with other associated symptoms shown in Table 4. Participants infected with *H. pylori* had eight and nine odds of developing erosion (OR: 8.53, 95%CI 2.82-25.84, p < 0.001) and ulceration (OR: 9.07, 95%CI 2.89-28.50, p < 0.001) compared to those with no infection. In addition, Gastrointestinal bleeding was found to be a predictor of *H. pylori* active infection (OR: 1.77, 95%CI: 1.02-3.07, p = 0.040).

Characteristic	Total number 353	*H. pylori* positivity	Univariate		Multivariate	
			OR (95% CI)	p-value	OR (95% CI)	p-value
Age						
		42 (IQR: 30-51)	1.01 (0.99-1.02)	0.197	1.01 (0.99-1.2)	0.213
Gender						
Male	174	105/174 (60.3%)	1			
Female	179	108/179 (60.3%)	0.9 (0.65-1.53)	0.99	0.99 (0.62-1.58)	0.980
Education						
No formal education	24	16/24 (66.7%)	1			
Primary	97	60/97 (61.9%)	0.81 (0.31-2.08)	0.663		
Secondary	118	61/118 (51.7%)	0.53 (0.21-1.34)	0.184		
College	114	76/114 (66.7%)	1 (0.39-2.54)	1.000	1.04 (0.82-1.30)	0.751
Occupation						
Retired	48	19/48 (39.6%)	1			
Students	33	15/33 (45.5%)	1.3 (0.52-3.12)	0.599	1.92 (0.66-5.60)	0.227
Business	138	88/138 (63.7%)	2.6 (1.37-5.27)	0.004	3.05 (1.44-6.46)	0.003
Employed	71	48/71 (67.6%)	3.1 (1.48-6.82)	0.003	4.84 (2.08-11.24)	0.000
farming/agriculture	63	43/63 (68.2%)	3.2 (1.49-7.19)	0.003	3.77 (1.60-8.88)	0.002
Marrital						
Single	135	133/135 (58.1%)	1			
Marital	218	80/218 (64.5%)	1.31 (0.83-2.06)	0.238		
Number of Family member						
< 2	229	127/229 (55.6%)	1			
> 2	124	79/124 (63.3%)	1.38 (0.89-2.13)	0.149	1.62 (1.00-2.62)	0.048
Drinking water						
Bottled	16	7/16 (43.7%)	1			
Not bottled	337	206/337 (61.1%)	2.02 (0.73-5.56)	0.173	2.34 (0.800-6.83)	0.120
Sanitary type						
Flushed	174	101/174 (58%)	1			
Non flushed	179	112/179 (62.6%)	1.20 (0.78-1.85)	0.385		
Smoking						
NO	329	201/329 (61.1%)	1			
YES	24	12/24 (50%)	0.63 (0.27-1.46)	0.287		
Meat consumption						
Often	181	113/181 (62.4%)	1			
Occasional	137	82/137 (59.9)	0.89 (0.56-1.41)	0.640		
Vegetarian (never)	35	18/35 (51.4%)	0.63 (0.31-1.31)	0.225		
BMI	353	26 (IQR 14.7-39)	1.39 (25.4-26.6)	0.110		

Table 3: Factors associated with Positive *H. pylori* Stool Antigen (HpSA antigen) among 353 Adult Dyspeptic Patients undergoing Upper Gastrointestinal Endoscopy at the Gastroenterology Unit of the Bugando Medical Centre.

Endoscopic findings among patients presented with dyspepsia at Bugando, Mwanza Tanzania

The endoscopic findings were grouped into five (5) categories; no lesions, gastritis or gastric ulcer, gastroesophageal reflux (GERD), duodenitis or duodenal ulcer, mixed sites of gastric and duodenal lesions and complications of peptic ulcer (stenosis, tumour, perforations). The majority 234/353 (66.3%) of the patients in this study had gastritis or gastric ulcers in the stomach. A total of 15/353 (4.3%) had no identified lesion in the stomach or duodenum (non-ulcer dyspepsia) and 9/353 (2.5%) had complications of peptic ulcers (Table 4), of which 7 (1.93%) has gastric tumours; 5 adenocarcinoma, 1 lymphoma and 1 gastrointestinal stroma tumour.

Location	Frequency (n)	Percentage %
Non ulcer Dyspepsia	27	7.7
Gastritis /gastric ulcer	234	66.2
Duodenitis/duodenal ulcer	33	9.3
Both Gastric and duodenal lesions	50	14.2
Pyloric stenosis and perforations)	2	0.7
Gastric tumors	7	2
Total	353	100

Table 4: The Major Endoscopic findings among 353 Adult Dyspeptic patients undergoing Upper Endoscope at the Gastroenterology unit of Bugando.

Discussion

H. pylori infection occurs worldwide, the infection can lead to erosion or ulceration with the risk of progression to malignancy. In Tanzania, there is no published data which have reported the prevalence of *H. pylori* infection among asymptomatic adults. In this study we have compared the symptomatic and asymptomatic individuals. The active *H. pylori* infection was 44.1% among asymptomatic individuals and 60.3% among dyspeptic patients**.** It was observed that, active *H. pylori* infection was higher in dyspeptic patients which was also observed in some parts of Africa [6,25]. However, the prevalence is lower than other studies done in other parts of Africa [7,25,26]. The differences in prevalence might be due to geographical variations and differences in socioeconomic status because these factors have been found to influence *H. pylori* infections [27-29]. Compared to a study in Rwanda, the higher prevalence in Rwanda could be due to the fact that the study population included patients with chronic dyspepsia, it should be noted that patients with chronic dyspepsia, have more chances of being *H. pylori* positive [7].Compared to the studies done in India, the prevalence in our study was higher compared to some areas in India, which was between 24 to 27% [30,31].In thess studies the sample sizes were small, retrospective and included children, it is known that the prevalence of *H. pylori* is lower in children.The prevalence of *H. pylori* infection among asymptomatic healthy adults in Mwanza was 44% using a stool antigen test which is significantly lower. This is comparable a study from United Arab Emirates where 41% asymptomatic subjects were positive [32], and contrary to study done in South Africa which showed 86.8% of the study population had active infection [33]. The higher prevalence is due to the fact that the study was done in the health facility setting, which could increase the chance to the contaminations. In our study, the prevalence was higher than the study which was done in Taiwan where the prevalence was19% [34]. This could be due to the differences in socialeconomic status in Taiwan is better compared to our place [35], having good socialeconimic status helps good hygen practices in the community which is one of infection prevention and control [36].

In this study, being married was a risk factors for *H. pylori* infection which is comparable to a previous report whereby intrafamilial infection was considered to be one of the main routes of transmission for *H. pylori* especially intra-spousal transmission [37,38]. This is because the transmission of infection by fecal-oral routes is higher when the individual is staying closer.

In this study, it was found that more than 2 people living in the same house was a risk factor for *H. pylori* infection, but in other studies found that living together among household with less than 4 persons had no association with *H. pylori* infection [39].Moreover, people involved in farming and agricultural activities were found to have increased risk of *H. pylori* infections compared to students, this was also observed in Ghanian study whereby being a farmer was the risk of acquiring the infection [40]. This could be due to possible zoonotic transmission because many animals are also infected with *H. pylori* and transmission to humans [41,42], has been documented. In this study it was found that, being businessman and being employed were the risks for acquiring the infection contrary to other studies, we hypothesised that, due to the fact that these two groups are involved more in movements from one place to another, therefore, they meet with different people, hence high chances of infection is high.

As documented previously, erosion/ulceration was found significantly more often in patients who had *H. pylori* infection [43]. This is because *H. pylori* bacteria, through a different mechanism, can lead to erosion and ulcer formation [44,45]. The major endoscopic findings in our study among dyspeptic patients infected with *H. pylori* were gastric lesions (erosions and ulcerations), which matches very good to the findings in previous studies [6,46]. Moreover, due to these erosions and ulcerations, GI bleeding as complications was found to predict *H. pylori* infections in our study as in previous studies [47,48]. The limitation of this study is that,there may be a recall bias to some participants and this could cause asymptomatic participatns might be symptomatic.

In conclusion, *H. pylori* infections is significantly more in dyspeptic individuals and is predicted by multiple social demographic factors. *H. pylori* infected individuals were more likely to develop erosion and ulceration. Due to increase in *H. pylori* antibiotic resistance, there is a need to further investigate the susceptibility patterns of these strains for the purpose of establishing the appropriate empirical treatment guidelines to prevent associated morbidity and mortality.

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Author Summary

H. pylori is the infection of poverty, which is widely distributed, it affects mostly undeveloped world. The infection can present with symptoms or with no symptoms (asymptomatic). The *H. pylori infection* among asymptomatic individuals has not been studied much in Africa. Little is known on the prevalence and distribution of the diseases among asymptomatic individuals. This study was done to establish the magnitude of *H. pylori* infections among dyspeptic patients and asymptomatic individuals in the city of Mwanza, Tanzania. Prevalence and associated factors of active *H. pylori* infection among dyspeptic patients and asymptomatic individuals have been documented. These findings are important in implementing the preventive and control measures of the infection. Moreover, to scientists, it shows the areas of further research.

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