RESEARCH ARTICLE

Prevalence and Risk Factors of *H. pylori* from Dyspeptic Patients in Northwest Ethiopia: A Hospital Based Cross-sectional Study

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Abstract

Background: Gastric cancer is the second leading cause of cancer-related deaths worldwide and infection with *H. pylori* is considered essential for its development. *Helicobacter pylori* infects more than 50% of the world's population with higher prevalence in developing countries than developed countries. The prevalence of *H. pylori* varies in different societies and geographical locations. The objectives of this study were to estimate the seroprevalence and determine the risk factors of *H. pylori* infection in dyspeptic patents in Ethiopia. Materials and Methods: A cross-sectional study involving 209 dyspeptic patients was carried out from February 15 to April 30, 2013. Five to ten ml venous blood was collected from each dyspeptic patient and analyzed for detection of *Helicobacter pylori* immunoglobulin (IgG). The socio-demographic characteristic, hygienic practices, alcohol consumption, sources of drinking water and types of latrine were also obtained with a pre-tested questionnaire. Results: The overall seroprevalence of *Helicobacter pylori* was 72.2%. There was statistically significant difference in the prevalence of *H. pylori* among age groups (p=0.02). Seroprevalence of *H. pylori* was higher in those patients who used unprotected surface water (76.4%) than those with access to piped tap water (65.9%). There was also statistically significant differences in prevalence of *H. pylori* with the habit of hand washing before meal (p=0.01) and alcohol consumption (p=0.001). Conclusions: The prevalence of *H. pylori* was high in the study area and increased with age of dyspeptic patients. Alcohol consumption and the type of drinking water are risk factors that have associations with the prevalence of *H. pylori*. Molecular epidemiological techniques can show a true picture of *H. pylori* and improvement in the drinking water quality is recommended.

Keywords: *H. pylori* - prevalence - risk factors - Ethiopia

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Introduction

Gastric cancer is the second leading cause of cancer-related deaths worldwide (Ferlay et al., 2010) and infection with *H. pylori* is considered essential for the development of gastric cancer, such that *H. pylori* has been classified as a type I carcinogen by the International Agency for Research in Cancer (IARC, 1994). *Helicobacter pylori* is a major cause of duodenal ulcer, gastric ulcer, non-ulcer dyspepsia (Ruggiero, 2010; Sachs et al., 2011). It infects more than 50% of the worlds' population (Hunt et al, 2011). The prevalence of *H. pylori* is higher in developing countries than in developed countries (Bures et al., 2011) and varies in different societies and geographical locations. The prevalence of *H. pylori* is influenced by the socio-demographic characteristics, socioeconomic status, hygiene and life style of the population (Shmuely 2003; Salih, 2009). Poor sanitary conditions, overcrowding, and unsafe water supply sources are the risk factors associated with *H. pylori* infection (Dube et al., 2009; Zhong et al., 2012). Gender, age, occupation and alcohol consumption are among the socio-demographic factors that influence the prevalence of *H. pylori* (Moges et al., 2006; Alizadeh et al., 2009; Tanih et al., 2011; Mathewos et al., 2013).

High risk individuals should be monitored for early signs of neoplastic changes and advised for possible life style changes (Karami et al., 2013). Some studies were conducted on the seroprevalence and risk factors of *H. pylori* infection from dyspeptic patients in Ethiopia (Desta et al., 2002; Asrat et al., 2004; Tadege et al., 2005; Moges et al., 2006). However, such studies have reported inconsistent findings because the seroprevalence and risk factors of *H. pylori* vary with geographic location, ethnicity, and demographic factors of people both among and within populations (Salih, 2009). Therefore, there is a need for each community to determine its own prevalence and make attempts to delineate the epidemiologic factors which may be associated with the infection to eradicate *H. pylori* infection and apply appropriate and efficient prevention and control measures. However, no study has been done in rural hospitals of Northwest Ethiopia including Debretabor General Hospital. The aims of this study were therefore to determine the seroprevalence and determine the risk factors of *H. pylori* infection in dyspeptic patents at Debretabor General Hospital, Northwest Ethiopia.

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Materials and Methods

Study design and study population

This cross-sectional facility-based study was carried out at Debretabore General Hospital from February 15 to April 30, 2013. The study participants were dyspeptic patients from outpatients department with symptoms such as upper abdominal pain or discomfort bloating, nausea, vomiting or early satiety for at least 3 months. Inclusion criteria were persistent or recurrent symptoms occurring at least three times per week for more than 6 months in the year. Individuals who were unable to communicate due to different illnesses were excluded. A structured questionnaire was adapted from similar studies according to the objective of the study and the local situation. The questionnaire was prepared in English and then translated into Amharic, the local language. Pretesting was carried out on 20 (10%) of the sample population prior to data collection at the selected health institution. Sections that showed any discrepancies were revised. The study patients involved in the pre-testing were excluded from the main study. A laboratory technologist was involved for data collection after getting one day training. For consistency and completeness, the collected data were checked daily by the principal investigators.

Two hundred nine patents were randomly selected for this study. The average number patients with dyspeptic complaints was 10 per day, from these an average of four patients were selected per day. Interval (K^{th}) was determined by dividing the number of dyspeptic patients attending the OPD. Then systematic sampling method used for selecting the patients at each K^{th} intervals by using their card numbers a sampling frame.

Information on the socio-demographic characteristic, hygienic practices, alcohol consumption, sources of drinking water, and types of latrine was obtained using the questionnaire.

*Serological detection of **H. pylori***

None of the test methods for detecting *H. pylori* infection has been entirely ideal. Therefore, in addition to PCR amplification of *H. pylori* 16S rDNA, rapid urease test or histological examination are used to confirm the presence of *H. pylori* (Basiri et al., 2014). Five to ten ml venous blood was collected from each dyspeptic patient. The sera were obtained from the blood by centrifugation (at 3000 RPM for 10 minutes). Anti- *H. pylori* antibody (IgG), was detected by one step rapid test device (dBest *H. pylori* test strip, Ameritech USA). Appearance of color band on both test line and control line was interpreted as positive but if it is only on the control line as negative result. The tests were performed following the manufacturer's instructions.

Data analysis

Data analysis was made by using SPSS version 16 software. Chi-square test was used to test for presence of association between prevalence of *H. pylori* and socio-demographic and risk factors. Binary logistic regression test was done on socio-demographic and risk factors that showed significant association with seroprevalence of *H. pylori*. P-values <0.05 were considered to show significant difference. Those variables which showed statistical significance association with P-values <0.05 were entered to multiple logistic regression using stepwise backward logistic regression analysis.

Ethical consideration

Ethical clearance was obtained from the Bahir Dar University Research Ethics Review Board. Informed verbal consent was also obtained from dyspeptic patients prior to data collection.

Results

A total of 209 dyspeptic patients (90 males and 119 females) took part in this study. The median age of study subjects was 38 years. Majority, 123 (58.9%) of the patents do not have formal education and 69 (33%) of them completed tertiary education. One hundred twenty four (59.3%) of the patients were rural residents and 85 (40.7%) were urban dwellers. The socio-demographic characteristic of study participants is summarized in Table 1.

One hundred fifty one of the study participants were *H. pylori* seropositive, giving an overall prevalence of 72.2%. Seventy (77.8%) of male and 81 (68.1%) of female patients were positive for *H. pylori* and there was no statistically significant difference in the prevalence of *H. pylori* with respect to gender. The seroprevalence of *H. pylori* increased with age from 60% in patients less than 20 years of age to 79.1% in age groups between 31-40 years. There was statistically significant difference in the prevalence of *H. pylori* among age groups (p=0.02). However, there was no statistically significant difference in the prevalence of *H. pylori* with reference to residence

Table 1. Seroprevalence of *Helicobacter pylori* Infection of Dyspeptic Patients (n=209) with Respects to Socio Demographic Variables

Variable		Total subjects tested	*H. pylori* Positive No (%)	*H. pylori* Negative No (%)	p value
Age (Years)	<20	20	12 (60.0)	8 (40.0)	0.02
	21-30	57	40 (70.2)	17 (29.8)	
	31-40	43	34 (79.1)	9 (20.9)	
	41-50	44	34 (77.3)	10 (22.7)	
	>50	45	31 (68.9)	14 (31.1)	
Sex	Male	90	70 (77.8)	20 (22.2)	0.11
	Female	119	81 (68.1)	38 (31.9)	
Educational attainment					
	No formal education	123	95 (77.2)	28 (22.8)	0.0001
	Primary completed	11	10 (90.9)	1 (9.1)	
	Secondary completed	6	5 (83.3)	1 (16.7)	
	Tertiary completed	69	41 (59.4)	28 (40.6)	
Marital status	Unmarried	54	34 (63.0)	20 (37.0)	0.03
	Married	144	112 (77.8)	32 (22.2)	
	Divorced	11	6 (54.5)	5 (45.5)	
Occupation	Civil servant	43	27 (62.8)	16 (37.2)	0.0001
	Student	30	17 (56.7)	13 (43.3)	
	Farmer	116	90 (77.6)	26 (22.4)	
	Others	20	17 (82.4)	3 (17.6)	
Residence	Urban	85	55 (64.7)	30 (35.3)	0.06
	Rural	124	96 (77.4)	28 (22.6)	
Family size	≤4	133	91 (68.4)	42 (31.6)	0.07
	>4	76	60 (78.9)	16 (21.1)	

and number of people living in the household (Table 1). Among the socio-demographic characteristics of the patients, statistically significant difference was obtained for educational attainment (p = 0.0001), marital status (p=0.03) and occupation (p =0.0001).

The seroprevalence of *H. pylori* was higher (76.4%) in those participants who use unprotected surface water than those who use piped tap water (65.9%). Among 178 dyspeptic patients that have access to latrine, (73%) were found to be positive to *H. pylori* compared to a 67% prevalence in those who do not have access to latrine. A comparable seroprevalence was obtained among the patients who had the habit of hand washing after visiting the toilet. There was statistically significant difference in prevalence of *H. pylori* and the habit of alcohol consumption (p=0.001) and hand-washing before meal (p= 0.01) (Table 2).

Study participants who had tertiary level of education had 2.11 times higher risk of developing *H. pylori* infection (95% CI (0.91, 4.93) compared to those who have no formal education. Compared to those who do not take alcohol, alcohol consumers have 2.72 times higher chance of infection with *H. pylori* (95% CI = 1.3-5.6). Study subjects who depend on untapped drinking water sources are 1.37 more exposed to *H. pylori* than those who use piped water (Table 3).

Table 2. Seroprevalence of *Helicobacter pylori* Infection with Respects to Environmental Sanitation and Behaviours of Dyspeptic Patients (n=209)

Variable	Total subjects tested	*H. pylori* Positive No (%)	Negative No (%)	p value
Drinking water source				
Unprotected surface water	127	97 (76.4)	30 (23.6)	0.11
Piped tap water	82	54 (65.9)	28 (34.1)	
Availability of toet				
Yes	178	130 (73.0)	48 (27.0)	0.43
No	31	21 (67.7)	10 (32.3)	
Hand washing after visiting toilet				
Yes	124	87 (70.2)	37 (29.8)	0.42
No	85	64 (75.3)	21 (24.7)	
Hand washing before meal				
Yes	202	147 (72.8)	55 (27.2)	0.01
No	7	4 (57.1)	3 (42.9)	
Alcohol consumption				
Yes	172	131 (76.2)	41 (23.8)	0.001
No	37	20 (54.1)	17 (45.9)	

Table 3. Regression Analysis of the Prevalence of *H. pylori* and Risk Factors

Variable	Total subjects tested	*H. pylori* Positive No (%)	Negative No (%)	AOR (95% CI)	p value
Age (Years)					
<20	20	12 (60.0)	8 (40.0)	1*	0.5
21-30	57	40 (70.2)	17 (29.8)	1.5 (0.5,4.4)	0.49
31-40	43	34 (79.1)	9 (20.9)	0.94 (0.4,2.2)	0.88
41-50	44	34 (77.3)	10 (22.7)	0.59 (0.22,1.6)	0.28
>50	45	31 (68.9)	14 (31.1)	0.65 (0.25,1.7)	0.37
Educational attainment					
No formal education	123	95 (77.2)	28 (22.8)	1**	0.18
Primary completed	11	10 (90.9)	1 (9.1)	0.38 0.05,3.16)	0.37
Secondary completed	6	5 (83.3)	1 (16.7)	0.76 (0.08,7.4)	0.8
Tertiary completed	69	41 (59.4)	28 (40.6)	2.11 (0.91,4.93)	0.08
Alcohol consumption					
Yes	172	131 (76.2)	41 (23.8)	2.72 (1.3,5.6)	0.008
No	37	20 (54.1)	17 (45.9)	1	
Drinking water source					
Unprotected surface	127	97 (76.4)	30 (23.6)	1.37 (0.4,4.0)	0.57
Piped tap	82	54 (65.9)	28 (34.1)	1	

*CI: Confidence interval; OR: adjusted odds; **Reference

Discussion

The overall incidence of cancer in Ethiopia is 58198 and that of gastric cancer is 1478 (GLOBOCAN, 2012). Studies in Ethiopia showed that the overall prevalence of *H. pylori* infection in dyspeptic patients, as found by the different diagnostic methods, varied between 60% and 91% (Asrat et al., 2004; Tadege et al., 2005; Moges et al., 2006). These prevalence rates are generally higher than the prevalence documented in South Arica (Dube et al., 2009; Tanih et al., 2011), Kenya (Shmuely et al., 2003) but are comparable to that reported from Benin (Aguemon et al., 2005). Although the prevalence of *H. pylori* is high in many parts of Africa, gastric cancer is unexpectedly low. The infection rate of *H. pylori* in various populations does correspond with the morbidity caused by the infection. This has been termed by a number of authors the 'African enigma' based on an apparently low incidence of gastric carcinoma and other *H. pylori* -associated morbidities in Africa (Campbell et al., 2001). Conversely several investigators have questioned the realism of this enigma (Agha and Graham, 2005). Both proponents and opponents of the 'Africa enigma', however, agree that there are insufficient data from Africa to allow a more critical analysis of the issue.

The prevalence of *H. pylori* obtained in this study corresponds with the figures of Shmuely et al. (2003), Aguemon et al. (2005) Alizadeh et al. (2009) and Demirel et al. (2013). The prevalence of *H. pylori* found in this study is higher than the reports of other studies conducted in different countries (Mathewos et al., 2013; Sheikian et al., 2011). However, the prevalence was lower than that reported from other studies (Moges et al., 2006; Dorji et al., 20013). The difference in prevalence could be due to difference in testing methods and variations in the socio-economic status of the study subjects (Ndip et al., 2004).

There are conflicting reports on the relationship between age of patients and prevalence of *H. pylori*. Studies conducted in Bhutan (Dorji et al., 20013) and China (Zhang et al., 2013) documented identical prevalence with no statistically significance different among age groupd. However, Alizadeh et al. (2009) found out that the prevalence of *H. pylori* increased with age. In this study there was an increase in the prevalence of *H. pylori* with age and statistically significant association was found between age and prevalence of *H. pylori*. A similar finding was reported from studies done in developing countries (Moges et al., 2006; Tanih et al., 2010; Ameri et al., 2013). This increase in prevalence with age is attributed to annual increase in the rate of infection (Goodman et al., 1996) and birth cohort effect (Banatvala et al.,1993).

Several studies have shown similar prevalence of *H. pylori* in males and females (Moges et al., 2006; Tanih

et al., 2011; Alvarado-Esquivel, 2013; Dirji et al., 2013). On the other hand, Alizadeh et al. (2009) reported that the prevalence of *H. pylori* was higher in females than males, while Valliani et al. (2013) found out that the prevalence was higher in males than females. In this study the prevalence of *H. pylori* was slightly higher in females than males. This is similar to a study done in South Africa (Tanih et al., 2010). Presumably, the variation in prevalence between males and females could be due to the difference in the lifestyles and habits such as smoking and alcohol consumption (Sasidharan et al., 2010).

Regarding educational attainment of the dyspeptic patients, the highest seroprevalence of *H. pylori* was observed in those who had completed primary school. On the other hand, a study done in Mexican parents showed high *H. pylori* seroprevalence with low level of education (Torres et al., 1998) . This finding is consistent with the finding of studies conducted in developing countries which indicated that the most important factors influencing the transmission of *H. pylori* infection may differ with geographical location and study populations (Shmuely et al., 2003; Salih, 2009).

In this study the prevalence of *H. pylori* was slightly higher in dyspeptic patients from rural areas than urban dwellers, with no statistically significant association. Ahmed et al. (2007) have also reported similar results. Ndip et al. (2004) also showed that the prevalence of *H. pylori* can vary among urban and rural populations within the same country. Although large family size is accepted as a risk factor for acquisition of *H. pylori* infection (Herbarth et al., 2010), the number of family members in the household did not play a significant role in the seroprevalence of *H. pylori* in this study. This finding is in agreement with the study from Iran (Mansouri-Ghanaei et al., 2009) but is not in line with the findings of Dorji et al. (2013) and Ahmed et al. (2007).

It is believed that the prevalence of *H. pylori* varies with respect to the sources of drinking water. In the current study, the seroprevalence of *H. pylori* was higher in individuals who used unprotected surface water than in those who used piped tap water. This is similar to a study done in China which showed that drinking river water had higher risk of *H. pylori* infection compared with drinking tap water (Brown et al., 2002). In India, as well, the prevalence of *H. pylori* was higher in populations who used well-water than those who used piped tap water (Ahmed et al., 2007). Conversely, a study done in Ethiopia indicated that the prevalence of *H. pylori* was higher among those who used piped water compared to those using well water (Lindkvist et al., 1998).

Disposal of human excreta is the first step in preventing faeco-oral and other routes of disease transmission as improved sanitation standards reduce contamination of the environment. In this study majority of the study subject who have latrine and wash hands before meal were found to be have higher seroprevalence of *H. pylori*. This gives room for speculation of other possible reasons for higher seroprevalence of *H. pylori* notwithstanding the hygienic practices such as having latrines and washing the hands. Although poor sanitation, such as the lack of sanitary services at home, is believed to be an important risk factor for *H. pylori* infection (Dube et al., 2009). Anomalies were found by other investigators also, showing that hygienic practice has no significant effect on the seroprevalence of *H. pylori* (Alizadeh et al., 2009). Poor association between seroprevalenec and socio-economic status in the present study is consistent with many other studies (Dube et al., 2009; Dorji et al., 2013). This could be due to similarities in socioeconomic status across the study populations. This indicates that socioeconomic conditions are less important in developing countries than in developed ones.

There are conflicting reports on the association between alcohol consumption and prevalence of *H. pylori*. In this study there was statistically significant association between alcohol consumption and seroprevalence of *H. pylori* (p=0.001). This is in agreement with a study done in Ethiopia (Moges et al., 2006) and in Finland (Paulinio et al., 1994). However, different results have been reported in other countries such as in Germany (Brenner et al., 1999), in Japan (Ogihara et al., 2000) and South Africa (Tanih et al., 2010) where alcohol, particularly wine consumption were inversely associated with seroprevalence of *Helicobacter pylori*. Possible explanation for this could be similar alcohol preparation and consumption besides cultural similarity of study population.

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