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ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
MSc. RESEARCH THESIS

**SEROPREVALENCE OF *Helicobacter pylori* INFECTION
AND ITS RISK FACTORS AMONG ADULT PATIENTS WITH
DYSPEPSIA IN HAWASSA TEACHING AND REFERRAL
HOSPITAL, SOUTH ETHIOPIA**

BY
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ADDIS ABABA UNIVERSITY SCHOOL OF GRADUATE STUDIES

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Seroprevalence of *Helicobacter pylori* infection and its risk factors among adult patients with dyspepsia in Hawassa Teaching and Referral Hospital, South Ethiopia

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List of abbreviations

AA:	Addis Ababa
AAU	Addis Ababa University
AOR	Adjusted Odds Ratio
CDC	Communicable Disease Control
CI	Confidence Interval
COR	Crude Odds ratio
DMIP	Department of Microbiology Immunology and Parasitology
ELISA	Enzyme Linked Immune Sorbent Assay
ETB	Ethiopian Birr
GUTH	Gondar University Teaching Hospital
<i>H. pylori</i>	<i>Helicobacter pylori</i>
HTRH	Hawassa Teaching and Referral Hospital
HW	Hand Washing
MALT	Mucosal Associated Lymphoid Tissue Lymphoma
MVA	Multi Variate Analysis
NSAID	Non Steroidal Anti Inflammatory Drug
NUD	Non Ulcer Dyspepsia
OPD	Out Patient Department
OR	Odds Ratio
SES	Socio Economic Status
TAH	Tikur Anbessa Hospital
UBT	Urea Breathe Test
UGI	Upper Gastro Intestinal
WHO	World Health Organization

ABSTRACT

Background: *Helicobacter pylori* is a curved gram-negative bacteria which causes gastritis and peptic ulcer disease. It is also an important risk factor for the development of gastric cancer and mucosal associated lymphoid tissue lymphoma. Many studies revealed that the prevalence of *Helicobacter pylori* infection varies with geographical region, socio demographic characteristics and environmental conditions of the studied population. In addition, it is more frequent in dyspeptic patients than normal individuals and dyspeptic symptoms accounts 10% of hospital admission in Ethiopia.

Objective: The main objective was to determine the seroprevalence of *Helicobacter pylori* infection and its risk factors in adult patients with dyspepsia.

Methods: A case control study was conducted between December 2010 and February 2011 on a total of 106 patients at Hawassa Teaching and Referral Hospital, South Ethiopia. The presence of antibody against *Helicobacter pylori* was determined serologically and a face to face interview was taken to assess the contributing factors for the infection. Ethical clearance and informed consents were obtained before data collection. Logistic regression was used to estimate odds ratio (crude and adjusted with 95% confidence interval) of positive responses to the different risk factors. Comparison between groups was compared with Chi-square and a *P*-value of <0.05 was considered significant.

Results: Of the total 106 participants, 54 (51%) were male and 52(49%) female with mean age 32 years, range 18-75 years. Of these the seropositivity for *Helicobacter pylori* infection was found in 37(70%) of 53 dyspeptic patients (95% CI, 55.7% - 81.7%) and 29(54%) of 53 non dyspeptic participants (95% CI, 40.4% - 68.4%) $p > 0.05$). The seroprevalence in participants that have family size > 5 was 71.4 % (45/63) and 48.8 % (21/43) for family size ≤ 5 (AOR=2.6 (3.97-7.127) $p < 0.05$).

Conclusion: There was a considerable increase of *Helicobacter pylori* seroprevalence in dyspeptic patients than the non dyspeptics i.e. 70% versus 54%. Among all variables, over crowding was positively associated *Helicobacter pylori* infection.

Key words: *H. pylori*, Seroprevalence, Dyspepsia, Risk factors

I 1.1 INTRODUCTION

Helicobacter pylori (*H. pylori*) was the first formally recognized bacterial carcinogen and is one of the most successful human pathogen. It has been etiologically associated with gastritis and gastritis associated diseases, peptic ulcer, gastric adenocarcinoma and primary gastric lymphoma (Johannes et al., 2006; Nurgalieva et al., 2002).

H. pylori infection is now a particular concern in developing countries; It colonizes 70% to 90% of the population where as it is 50% in developed countries (Barik, 2009; Dunn et al., 1997). The prevalence of infection varies both between and within countries in relation with race, ethnicity, and geographical area of the population. The pattern of infection is an early child hood acquisition of *H. pylori* (30%-50%) that reaches over 90% during adult hood in developing countries. Unless treated colonization persist lifelong. This has been attributed to the poor socioeconomic status, hygienic practice, overcrowding condition (Amini et al., 2009; Asrat et al., 2004).

Multiple factors contributed for the pathogenecity of the bacteria, alteration of gastric acid production and tissue destruction which are characteristics' of *H. pylori* disease. Initial colonization is facilitated by bacterial acid inhibitory protein and naturalization of gastric acid by ammonia, produced by bacterial urease activity (Patrick et al., 2005; Barik, 2009).

The activity of bacterial urease is enhanced by a heat shock protein (HSPb) that is co-expressed with urease on the bacterial surface. The actively motile *H. pylori* then pass through the epithelial cells. Localized tissue damage is mediated by urease by- products and the activity of vacuolating cytotoxin that induce epithelial cell damage together with urease an bacterial polysaccharides stimulates the inflammatory response (Patrick et al., 2005; Johannes et al., 2006).

1. 2. Statement of the problem

Approximately 50% (3 billion) of the population in developed countries are known to be infected with *H. pylori*. The percentage increases to 80% in developing countries, like Ethiopia. And this has been attributed to many factors like poor socioeconomic status, hygienic practice, overcrowding, etc. The infection is more prevalent in adult population than children (Amini et al., 2009; Pounder et al., 1997).

In many reports it has been estimated that between 15% to 20% of people infected with *H. pylori* will develop ulcers. Some evidence also links *H. pylori* infection to gastric cancer, gastric mucosa-associated lymphoid tissue (MALT) lymphoma, and perhaps pancreatic cancer and cardiovascular disease (Jani et al., 2010).

As noted in a review by Barik (2009) on *H. pylori* infection in developing countries, it was obvious that the health economics of managing *H. pylori* infection to prevent the occurrence of peptic ulcer and gastric cancer is highly expensive. Therefore, it is advisable knowing the magnitude and contributing factors for the infection in a particular area to eradicate *H. pylori*, and apply prevention and control measures which are appropriate and efficient particularly in economically depressed area. This should be done based on the data that show the association between *H. pylori* infection and dyspepsia.

There are studies that show the seroprevalence of *H. pylori* in different countries. These studies found that the prevalence vary with geographic location, ethnicity, and demographic factors of the studied population (Barik, 2009).

Studies revealed that the prevalence increases in dyspeptic patients than non dyspeptic individuals and dyspeptic symptoms account 10% of hospital admission in Ethiopia. There are few studies that were conducted on the seroprevalence of *H. pylori* in adult dyspeptic patient in Ethiopia including those at Tikur Anbessa Hospital (TAH), Addis Ababa (A.A), Felege Hiwot Hospital, Bahir Dar and Gondar University Teaching Hospital (GUTH). Even though these studies are under gone they are not up-to-date and didn't consider the contributing facts for the infection.

Since the prevalence of *H. pylori* infection varies among different ethnic groups and with in different environmental factors , socioeconomic status and hygiene practice , which are common factors in most developing countries but Ethiopia contributing for the infection (As studies revealed); This study attempt to determine the seroprevalence of *H. pylori* in dyspeptic patients with respect to those contributing factors (socioeconomic demographic and hygienic practices) for the infection at Hawassa Teaching and Referral Hospital (HTRH), Hawassa, South Ethiopia, an area where similar studies were not under taken.

II. LITERATURE REVIEW

2.1 Epidemiology

Before the twentieth century, gastric ulceration constituted the bulk of peptic ulcer disease and duodenal ulcers were quite rare. The incidence of duodenal ulcers increased progressively, reaching a peak in the 1950s. The cause of this rise is unclear, because *H. pylori* are thought to have been ubiquitous in the human population for thousands of years. The prevalence of gastric and duodenal ulceration has decreased in Western Europe and the USA over recent decades, following a decrease in the prevalence of *H. pylori* (Debabarta, 2007).

H. pylori infects about 40% of adults in developed countries as shown in Table 2.1 (<http://www.meridianbioscience.com/>) and is strongly associated with greater age and with markers of overcrowding and poor hygiene in childhood. These associations arise because *H. pylori* infected progressively fewer children during the second half of the 20th century. In developing countries on the other hand, the prevalence of *H. pylori* infection is usually more than 80%, and immigrant populations from developing to developed countries (Debabrata, 2007; Patrick et al., 2005).

Table 2.1 Worldwide prevalence of *Helicobacter pylori* in the mid-1990s

Country	Prevalence (%)
United States and Canada	30-40
México and Central/South America	70-90
Western Europe	30-50
Eastern Europe	70
Africa	70-90
Asia	70-80
Australia	20

H. pylori is acquired by human contact, most likely by oro-oral (via vomitus and saliva) rather than faeco-oral transmission, an important support to this concept is the detection of *H. pylori* DNA in vomitus, saliva, dental plaque, gastric juice, and feces and seems to survive in water in non-culturable forms (Linda, 2000). Although certain epidemiological studies have suggested water borne and food borne transmission, there has been no confirmation of this. Iatrogenic transmission (during endoscopy and dental care) and zoonotic transmission occur less commonly (Mégraud, 1995; Patrick et al., 2005). There are no significant animal or environmental reservoirs (Dunn et al., 1997).

2.1 Helicobacter pylori and dyspepsia

Dyspepsia is a complex set of symptoms, rather than an indication of a specific disease. Non ulcer dyspepsia (NUD) or functional dyspepsia defined as the presence of symptom of upper gastro intestinal (UGI) distress without any identifiable structural abnormality during diagnosis particularly UGI endoscopy. Uninvestigated dyspepsia defined as the presence of dyspeptic symptoms with no further diagnostic evaluation has been performed (Shmueli et al., 2003; Debabrata et al., 2007).

Dyspeptic symptoms may have a reflux-like characters, with heart burn and regurgitation as predominant signs; may appear like, with early satiety and nausea; or may be ulcer, like, with pain and vomiting together with these symptoms are very common (Johannes et al., 2006; Selgrad et al., 2008).

The incidence of dyspepsia was 15.3 per 1000 person-years in United Kingdom (UK) (Mari-Ann et al., 2007). In most developing countries it has a higher prevalence and represents a common reason for patients to see a primary care physician. In Ethiopia it accounts 10% of hospital admission and it is also common in Sub-Saharan Africa (Asrat et al., 2002; Vaira et al., 1997).

The etiology of dyspeptic symptoms is various and complex and has opened a wide spectrum of putative mechanisms. In a subset of patients dyspeptic symptoms are likely to originate from *H. pylori* infection (Selgrad et al., 2008). Population-based studies have demonstrated that *H. pylori* is detected more frequently in dyspeptic patients compared to controls. A study in Kenya found

that *H. pylori* infection was 71% among dyspeptic patients where as in controls 51% by using rapid blood test kit (immuno chromatographic test) (Shmuely et al., 2003)

In Ethiopian dyspeptic patients, it has similar prevalence like other developing countries because most of such infections are acquired during child hood and most Ethiopian children live in households with low socio economic status and hygiene (Asrat et al., 2002). There are some published hospital based studies on the prevalence of *H. pylori* in dyspeptic patients in Ethiopia. A study by Asrat et al. (2002) at Tikur Anbessa Hospital (TAH) showed that, 71-91 % of the studied population was positive for *H. Pylori* by using EIA. A recent study result than the above study at Gonder University Teaching Hospital (GUTH), North Ethiopia demonstrated 85.6% of patient's were positive for *H. pylori* IgG using Immuno chromatographic method (Moges et al., 2006).

A case control study at Bahir Dar (Tesfahun et al., 2003) illustrates; of the total 200 studied subjects, 56% and 66(33%) were found seropositive and seronegative for *H. pylori* infection by EIA. IgG to *H. pylori* was detected in 70(70%) and 54 (54%) from dyspeptics and non-dyspeptics, respectively and there were no statistically significant difference in seroprevalence of *H. pylori* infection between dyspeptics ($P > 0.05$). Similar study by Tsega et al. (1996) in Ethiopia, reported that *H. pylori* was found 65% patients with NUD and in 56% asymptomatic controls by EIA ($P > 0.05$).

As a conclusion, the prevalence of *H. pylori* in different studies varies with methods used for the detection of *H. pylori*, the studied population and studied area and cultural definition of dyspepsia. Majority of these studies recommend that non invasive *H. pylori* test-treat strategy in dyspeptic patient's age less than 45 years reduces the risk of developing peptic ulcer diseases & other *H. pylori* related gastric pathologies (atrophic gastritis & gastric cancer) in economically depressed areas, such as Africa (Shmuely et al., 2003; Selgrad et a., 2008).

2. 3. Microbiologic characteristics

H. pylori is an S-shaped or curved gram-negative rod with 1 to 3 turn and 0.5 x 5 μ m in length. It has two to six flagella that give it the mobility to with stand rhythmic gastric contractions and penetrate the gastric mucosa and also correlated with maximum in vitro motility. It can grow in a micro aerophilic atmosphere at optimum pH 6-7 on enriched medium supplemented with blood,

hemin, or charcoal. Skirrow's medium is the selective media for *H. pylori*. It is oxides, catalase, and urease (which is the distinguishing characteristics from other species) positive and grow at 37⁰C (Jani et al., 2010; Patrick et al., 2005).

The ability to survive in the stomach provides *H. pylori* with a useful hiding place. White blood cells that would normally recognize and attack invading bacteria are unable to cross from blood vessels into the stomach lining. Instead, the ineffective white blood cells continue to respond to the site of infection, where they die and release nutrients that feed *H. pylori* (<http://www.cancer.gov/dictionary/db/>). The principal reservoir for *H. pylori* infection appears to be the human stomach, especially the antrum. However, it does not colonize areas of the stomach in which intestinal metaplasia or dysplasia is present. *H. pylori* contain a large urease enzyme protein that produces urease, which enables the organism to survive in the acidic stomach by creating an alkaline environment. It produces a number of virulence factors, including vacuolating cytotoxin (vacA) that may have different disease associations (Linda, 2000).

2.4 Clinical features

H. pylori is a causative agent of chronic gastritis and peptic ulcer disease and it is an important risk factor for the development of gastric cancer and MALT. Although, the WHO estimates indicate that high infection rates among the world population, most infected subjects develop no clinical sign and symptoms of peptic ulceration and continues their live with superficial chronic gastritis. However, still high percentage (17%) of infected subjects will develop peptic ulcer of such patients (4.25%) even experience ulcer complications and still fewer (1%) will progress to gastric cancer: who develops disease depends on bacterial, host and environmental factors (Barik, 2009; Johannes et al., 2006).

Between 80% and 90% of all ulcers are caused by or are associated with *H. pylori* (Asrat et al., 2004; <http://www.meridianbioscience.com>). The risk of ulceration is higher with more virulent strains. The best-described virulence determinants are expression of active forms of a vacuolating cytotoxin (VacA) and possession of a protein secretory apparatus called Cag (cytotoxin-associated gene products) that stimulates the host inflammatory response, thereby increasing inflammation (Jani et al., 2010). Cag+ strains interact more closely with epithelial cells and induce release of pro-inflammatory cytokines; by using a needle-like appendage to

inject CagA, a toxin produced by cytotoxin-associated gene A, into the junctions where two stomach lining cells meet. This toxin alters the structure of stomach cells and allows the bacteria to attach themselves more easily. Long-term exposure to CagA causes chronic inflammation (Jani et al., 2010).

Host genetic susceptibility and environmental factors may affect the risk; for example, smoking is strongly associated with peptic ulceration in *H. pylori*-infected individuals. Gastric ulceration occurs on a background of pan gastritis, often arising at the highly inflamed transitional zone between antrum and pylorus, particularly on the lesser curve. Identical hormonal changes occur, but acid production from the inflamed corpus is reduced or normal (Johannes et al, 2006; Debabrata et al., 2007). *H. pylori* infection is thought to cause gastric cancer by eliciting vigorous T-helper (Th1) pro-inflammatory cellular immune responses in gastric and the resulting mucosal injury is mediated by pro-inflammatory cytokines and oxygen radicals secreted by infiltrating chronic inflammatory cells (Sam et al., 2006).

Helicobacter pylori infection is usually acquired in childhood; there is typically a long period of latency with disease manifestations not appearing until adulthood (Hoda, 2002; Debabrata et al., 2007). Approximately 10-20 percent of the population will never become chronically infected with *H. pylori*. Establishment of chronic infection may be influenced by host genetic factors such as ABO blood group and Lewis blood-group antigen and by differences in susceptibility to particular strains of *H. pylori* (Linda, 2000; Bardhan, 1997).

Environmental and genetic factors appear to be important in the progression of *H. pylori*-initiated gastritis to more serious outcomes. Additionally, variation in age at acquisition of *H. pylori* has been proposed as a possible factor to explain the observation that the same organism, *H. pylori*, apparently produces different effects on the gastric mucosa that result in different clinical outcomes (Debabrata et al., 2007). Early age at acquisition of *H. pylori* infection may result in more intense inflammation and the early development of atrophic gastritis and subsequent risk of gastric ulcer, gastric cancer, or both. Later acquisition of infection would induce a different series of gastric changes that would favor the development of duodenal ulcer. High rates of gastric cancer in areas in which infection is common in early childhood support this hypothesis.

Other host and environmental factors such as hygiene practices and diet may also play a role in the acquisition of infection and the expression of clinical disease (Linda, 2000).

Chronic *H. pylori* associated gastritis per se is asymptomatic, but the initial acquisition of the infection causes acute gastritis with hypochlorhydria, which may cause abdominal pain, nausea and vomiting that resolve within a few days (Shmuely et al., 2003). Uncomplicated peptic ulcers typically cause epigastric pain and, less commonly, nausea, vomiting and weight loss, but some ulcers (particularly NSAID ulcers) are asymptomatic (Debabrata et al., 2007). The pain which is described as gnawing or burning may have a relation to meals; it is describe that duodenal ulcer pain as occurring 1–3 hours after meals and/or at night and relieved by food, whereas gastric ulcer pain is precipitated by food. However, symptoms are actually very poorly discriminatory for site of ulceration and even for whether or not an ulcer is present. Examination usually reveals epigastric tenderness, but may be normal. The differential diagnosis of peptic ulcer disease includes:

- Gastro-oesophageal reflux (which usually causes predominant heartburn but cannot reliably be discriminated from ulcer disease based on symptoms) functional dyspepsia (non-ulcer dyspepsia) which also may be indistinguishable from ulcers based on symptoms;
- gallstone disease
- gastric cancer or lymphoma
- irritable bowel syndrome
- Crohn's disease
- pancreatitis
- pancreatic cancer.

Complications

H. pylori ulcers usually heal and relapse spontaneously, but ulcers of any cause, and particularly NSAID ulcers, may cause serious complications: acutely bleeding ulcers cause haematemesis and /or melaena; chronic bleeding may cause anaemia; perforation results in peritonitis; and gastric outlet obstruction causes vomiting, and physical examination may reveal a succussion splash (Selgrad et al., 2008; Debabrata et al., 2007).

2.5 Risk factors

Possible risk factors for the infection are , social factors; age, SES, ethnicity, race, gender, crowding, marital status etc, diet; raw vegetables, diets prepared below the ideal standard etc, personal and environmental hygiene practices, water sources, occupation (being an endoscopy staff member dentists etc.), family history of gastric disease ,etc (Amini et al., 2009; Linda, 2000).

When we see literatures on factors that are contributing for the infection, majority were done on children and associated with increased age, low SES, pure hygienic practice and life style. A review by Barik (2010) on the prevalence of *H. pylori* in developing countries written that 80% of adult population is infected with *H. Pylori*. Age was the strongest risk factor in many studies. A study by Gunaid et al., (2003) showed that it had a strong association with age > 40 years in Yemen. A similar result was found in Kuwait i.e. the percentage increase with age 38.8% at 20-29 years 50.0% at age 30 – 39 years (Waleed et al., 2010).

The prevalence in adult population was independent of SES factor but in children it has inverse relation ship. A community based seroepidemiologic study of *H. pylori* infection in Mexico on children showed that 66% of the population were infected; Low educational level and low socio economic level were risk factors for the infection. But the prevalence was similar in urban and rural community (Torres et al., 1998). A meta analysis on association of gender and *H pylori* in United States of America reported that the male gender is significantly associated with *H .pylori* (de Martel et al., 2006). A research conducted by Teh et.al. (1994) in Taiwan on seroprevalence and associated risk factors of *H. pylori* infection found that among 823 subjects 54.4% of them were positive for *H. pylori* IgG using ELISA there was significant variation in geographic location with the highest seropositivity rate 63.4% with no gender difference 53.7 % male and 55.2 for females.

In Ethiopia there are studies on the risk factors which are conducted in children but where as not in adult. But some contributing factors were included in prevalence studies in adult. A study on dyspeptic patients at GUTH showed that, there was no significant association with sex, socioeconomic status and seropositivity for *H. pylori* (Moges et al., 2006). Another case control study in Bahir Dar, showed that there was no statistically significant association between *H.*

pylori infection and sex and age (Tesfahun et al., 2003) Both studies suggest to do further investigation on these variables.

Generally, in adult population *H. pylori* infection rates are higher than children and increases with age. The prevalence of infection varies in different societies and geographical locations; it also depends on the socio demographic character, socioeconomic status, hygiene and life style of the population.

2.6 Laboratory tests for *H. pylori* diagnosis

There are different diagnostic methods to detect the organism; histology, rapid urease test, culture, PCR all this require endoscopy. Urea breath test, urinary excretion [15] ammonia, antigen detection from stool and serology(which is diagnostic test of choice, either used alone or in combination with antigen test for initial evaluation of asymptomatic patient & epidemiologic studies), are non invasive tests that don't require endoscopy (Ho and Marshall , 2000).

Serology - serological tests involve detection of antibodies against *H. pylori* and the best are very accurate. However, accuracy depends critically on the precise serological test used. The main use of serology is for testing dyspeptic patients in primary care, and patients with known ulceration but unknown *H. pylori* status in secondary care. Serology may remain positive for years after successful eradication of *H. pylori* and is therefore not used for checking the success of treatment because anti body in the blood levels decreases slowly (Linda, 2000; Ho and Marshall, 2000).

Urea breath test is a simple, non invasive test based on *H. pylori* urease. Urea labeled with the non-radioactive isotope ^{13}C , or a very small dose of radioactive ^{14}C , is drunk by the patient. If *H. pylori* is present in the stomach, its powerful urease catalyses hydrolysis of urea, and labeled carbon dioxide can be detected in breath samples.

It is particularly useful for checking the success of treatment. It is also more accurate than serology, and so it is often used as a first-line diagnostic test in places where it is readily available. It must be performed at least 2 weeks after any proton pump inhibitors (PPIs) have been stopped and 4 weeks after bismuth compounds or antibiotics. If not, false-negative results are common (Debabrata et al., 2007; Linda, 2000).

Stool antigen test is a recently developed alternative to the urea breath test that needs further evaluation in the clinical setting. It appears to be a useful alternative for assessing active infection, with the same caveats about its use. However, it appears somewhat less accurate for assessing treatment success. (Patrick et al., 2005; Debabrata et al., 2007; Linda, 2000)

Biopsy urease test is the most widely used endoscopic gastric biopsy-based test. The biopsy is placed in a urea solution or gel with a pH indicator; when *H. pylori* is present, the urea is hydrolysed by its urease, resulting in a colour change. Some positive results may be available within 1 hour, although initially negative tests must be kept for 24 hours to avoid occasional false negative results. Blood in the upper GI tract may also sometimes cause a false-negative test. The same restrictions on timing with respect to PPI and antibiotic use apply as for UBTs, and this is common to all gastric biopsy-based tests (Ho and Marshall, 2000; Debabrata et al., 2007).

Histology – *H. pylori* infection can be diagnosed accurately by histology if special stains are used. The distribution of gastritis may give information on disease risk if biopsies are taken from antrum and corpus. Histology can also give information, for example, on whether gastric atrophy or intestinal metaplasia – markers of increased risk of gastric adenocarcinoma – are present (Ho and Marshall, 2000; Linda, 2000).

Culture – endoscopic mucosal biopsy specimens can be cultured for *H. pylori*. This is not useful as a single diagnostic test because it may be falsely negative but if successful. It enables antibiotic sensitivity testing. This is important for guiding treatment in specific situations, such as previous multiple treatment failure (Debabrata et al., 2007; Ho and Marshall, 2000).

Low-risk asymptomatic patients with dyspepsia, testing for *H. pylori* using serology appears to be economical and that ¹³C-labeled urea breath test (¹³C-UBT) (requires expensive laboratory equipment and exposure to moderate radiation) may also be a cost-effective alternative to serology but depending on the current cost of each test (Amini et al., 2009). In this study the available and preferred test was serology.

2.7 Treatment

The infection has a high morbidity rate, but a low mortality rate, and is curable with antibiotic therapy. First-line treatment is a one-week triple combination therapy comprising twice daily use

of a Proton pump inhibitor (PPI) and two antibiotics (clarithromycin and amoxicillin or metronidazole); it is successful in 80–90% of cases. The most common reasons for failure are antibiotic resistance to clarithromycin or metronidazole (resistance to amoxicillin is extremely rare) and poor compliance with treatment (Hoda, 2002; Patrick et al., 2005).

The issue of vaccination and the status of vaccine against *H. pylori* is currently still under development. An extensive study in the mouse model have demonstrated the feasibility of both therapeutic and prophylactic immunizations, the mechanism of vaccine-induced protection is poorly understood as several factors such as immunoglobulin and various cytokines do not contribute to protection. There is still a strong need to clarify the main protective immune mechanisms against *H. pylori* and to identify a cocktail of strong protective antigens, or recombinant bacterial strains that express antigens that could be administered by a regimen that gives rise to effective immune responses in humans (Barik, 2009).

2.8. Significance of the study

As many studies shown *H. pylori* is a cause of peptic ulcer and a risk factor for gastric cancer and mucosal associated lymphoid tissue lymphoma and with its high prevalence rate (mainly in dyspeptic patients than healthy individuals), it is becoming a major public health problem in the world, primarily in developing countries. Therefore, it was unquestionable to do assessment between *H. pylori* and dyspepsia with the contributing for the infection, because the data that would be generated could give an overview to the prevalence and risk factors of *H. pylori* in the area where published information was not found. The finding be evidence for to take some public health measure like testing susceptible people with dyspeptic symptoms and treating them, and for prevention and control of the infection around the studied area and may also for the country.

2.9. Hypotheses of the study

- Prevalence of *H. pylori* in dyspeptic patients is greater than non dyspeptic individuals.
- There is no significant association between socio demographic characters and *H. pylori* infection

III. OBJECTIVE

3.1. General objective:

The aim of this study was to determine the seroprevalence of *H. pylori* infection and its risk factors at HTRH, south Ethiopia.

3.2. Specific objectives:

1. To compare the seroprevalence of *H. pylori* infection between dyspeptic and non dyspeptic individuals
2. To assess the association of different risk factors with *H. pylori* infection (demographic, socioeconomic, personal habits & hygienic practice).

IV. MATERIALS AND METHODS

4.1 Study Area- The study was conducted at HTRH which is the only governmental specialized referral Hospital in the town, Hawassa. Hawassa is the capital town of Southern Nations Nationalities and peoples (SNNP) of Ethiopia, and is located 275 km south of Addis Ababa. HTRH is a teaching hospital for Debu University medical students and serves for 150,000 populations. It has 350 beds and sub divided into different service units Medical and surgical adult out patient department (OPD), gynecology, pathology, pediatrics ophthalmology and emergency, ART center, physiotherapy center and in patient units which is composed of different wards. Other than the central laboratory each unit has its own laboratory room.

More than 200 patients from different places of the region and neighboring regions came to adult OPD per day after referral or for primary diagnosis. Among these 60 of them referred to medical OPD and dyspeptic complaints accounts 6-10 (average 8) per day (Source; HTRH).

4.2 Study design- A case-control study design was applied.

4.3 Source population- The research participants were those patients came to adult OPD of HTRH in Hawassa, South Ethiopia.

4.4 Study population- Newly diagnosed medical OPD patients with uninvestigated symptoms of dyspepsia for at least the previous 3 months were the study population.

4.5 Sample size and Sample size determination

A total of 106 participants who came to medical OPD of HTRH from December 2010 to February 2011 and voluntary individual for the control group were involved.

The sample size was determined by using the following formula, and taking two population proportions.

Formula for comparison between two proportions (unmatched sample sizes)

$$n_1 = \frac{[Z_{\alpha/2} \sqrt{pq} (1 + 1/\lambda) + Z_{\beta} \sqrt{p_1q_1 + p_2q_2/\lambda}]^2}{\Delta^2}$$

Where $n_2 = n_1 \lambda$, $\bar{p} = (p_1 + \lambda p_2) / (1 + \lambda)$

$$q = 1 - p, \Delta = p_1 - p_2$$

n_1 is the size for dyspeptic patients and n_2 is for asymptomatic control

The study has an 80% power at a ratio 1:1 for patient and control at $\alpha = 5\%$.

$P_1 = 85\%$, which is approximated from a recent study on prevalence of *H. pylori* infection in dyspeptic patients at GUTH by serology which is similar method with the present.

$P_2 = 60\%$, which is the prevalence of *H. pylori* infection in non dyspeptic individuals (we didn't find a study in Ethiopia during proposal preparation).

$$n_1 = \frac{(1.96 \sqrt{0.725 * 0.275(1+1)} + 0.84 \sqrt{0.85 * 0.15 + 0.60 * 0.40})^2}{(0.25)^2}$$

$$= 48$$

$$n_2 = 48 * 1 = 48$$

Adding 10% none response rate i.e. 9.6

$$\text{Total} = 48 + 48 + 10 = 106$$

4.6 Study variables

Dependent: *H. pylori* serostatus and dyspepsia

Independent: Socio demographic factors; age, sex, educational status, income etc., hygiene practice like hand washing, environmental conditions (latrine, water source etc.) and personal habits (drinking alcohol, smoking cigarette etc.).

Inclusion criteria

For cases: 1) Patients with age ≥ 18 ; 2) presence of at least two of the following symptoms; upper abdominal pain or discomfort, bloating, nausea, vomiting, or early satiety; 3) persistent or recurrent symptoms occurring at least three times per week during > 3 months in the year or years preceding the study; 4) absence of nocturnal or postprandial symptoms of gastroesophageal

reflux; 5) no previous abdominal surgery except for uncomplicated appendectomy, cholecystectomy, or hernia repair.

For controls: Hospital controls were recruited from a convenience sample of asymptomatic person with age ≥ 18 . Dyspepsia in the control group was excluded by clinical interview.

All participants (patients and asymptomatic controls) were interviewed by physicians, to assess symptoms.

Exclusion criteria

Those individuals who were unable to communicate due to different illness were excluded.

4.7 Operational Definitions

- Adult – a person ≥ 18 years of age
- Dominant ethnic group- participants from Sidama racial group.
- Dyspepsia – chronic abdominal pain or discomfort bloating nausea vomiting and early satiety for ≥ 3 months
- OPD patient - patients who came to the OPD unit after referral or for primary diagnosis for the first time.
- Seroprevalence - proportion of dyspeptic patients positive for *H. pylori* antibody

4.8 Data Collection

4. 8.1 Determination of *H. pylori* status

Venus blood was obtained from all participants with a sterile disposable syringe. Serum was separated and stored at -20°C until it was performed. Anti - *H. pylori* immunoglobulin (Ig) G was determined with ACON Rapid Blood Test kit (USA). This test achieved 93.0% sensitivity and 89.2% specificity versus histologic examination and urease testing in asymptomatic and symptomatic individuals. And it has no cross reactivity with *C. jejuni*, *C. fetus*, *C. coli* and *E. coli* (ACON Laboratories, Inc. USA).

Test principle

H. pylori antigens are pre coated on to membrane as a capture reagent on the test band region. During the assay, the specimen (serum) was allowed to react with *H. pylori* antigens gold conjugate. The mixture then moves laterally in the membrane chromatographically to the test region with immobilized antigens of *H. pylori*. If *H. pylori* antibodies are present in the specimen, two colored bands will form on the test region. One colored band in the test region indicates a negative result (ACON Laboratories, Inc. USA).

Test procedure for qualitative detection antibodies against *H. pylori*

The test device will be carefully removed from the foil pouch bag. Pill of the tape from the test card and stick the test strip on the test card. 4 drops (100 μ L) of patients' serum was added into the specimen pad. The preparation is then observed at 10 minutes. A negative result was indicated when only one red band showed up, thus indicating the absence of *H. pylori* antibodies. In a positive test, showing the presence of *H. pylori* antibodies in patients specimens, two red bands are observed. Results were not interpreted after 20 minutes.

4.8.2 Assessment of risk factors associated with *H. pylori*

Participants were interviewed face to face about socio demographic characteristics, environmental conditions and personal habits, by using a pre tested and structured questionnaire. Age was coded into five categories (≤ 20 , 21–30, 31–40, 41–50, and >50 years of age); ethnicity dominant versus non dominant; marital status as currently married versus not ; monthly income ≤ 500 or >500 ETB; educational attainment $< 7^{\text{th}}$ grade(primary) or $\geq 7^{\text{th}}$ grade; number of siblings as ≤ 5 or >5 ; residence as urban or rural; hand washing with soap yes or no; flush toilet versus traditional pit latrine; water source pipe versus none pipe; alcohol use yes or no; drinking coffee yes or no; khat chewing yes or no; tobacco use as ever or never smoked cigarettes.

4.8.3 Data quality control

The serum samples were tested according to the manufacture instruction and procedure. The questionnaires were also pre tested in similar patients which are not part of the study and then the necessary adjustments were made.

4.9 Statistical analysis

Information from the laboratory analysis and questionnaires were double entered into EPI INFO, cleared and exported to SPSS, version.16. Logistical regression was used to estimate crude and adjusted odds ratio (ORs) with 95% confidence interval (CI) of positive responses to the different risk factors. Comparison between groups was compared with Chi-square and a *P*-value of < 0.05 was considered significant.

4.10 Ethical considerations

The study approved by the Ethical committee of DMIP, AAU and permission was obtained from HTRH administrator. Moreover informed consent was obtained from participants who are involved in the study.

V. RESULTS

5.1 Demographic

A total of 106(53 dyspeptic and 53 non-dyspeptic) individuals were participated, of these 54(51%) were male and 52(49%) female with mean age 32 years, range 18-75 years. Participants between age 18 and 40 years comprise 77.4% of the total. Around 86% (91/106) of participants came from Hawassa town (50%), and its suburbs. Other socio demographic characteristics of participants are shown in Table 9.1.

Table 5.1 Socio-demographic characteristics of 106 study participants at HTRH, South Ethiopia, 2011.

Variables		frequency	%
Gender	Male	54	51
	Female	52	49
Age group	≤ 20	18	17
	21-30	45	42.4
	31-40	19	18
	41-50	14	13.2
	>51	10	9.4
Ethnicity	dominant	21	19.8
	non dominant	85	79.2
Residence	urban	70	66
	rural	36	34
Marital status	Currently married	66	62.2
	Currently not married	40	37.8
No of sibling	<5	43	40.6
	≥ 5	63	59.4
Monthly income (ETB)	≤ 500	71	29
	> 500	35	33
Education status	<7 th grade	43	59.4
	≥ 7 th grade	63	40.6
Occupation	Farmer	32	30.2
	Merchant	9	8.5
	Employed	27	25.4
	Unemployed	4	3.8
	House Wife	12	11.3
	Other	4	4.7

5.2 Dyspepsia and *H. pylori*

Over all seroprevalence of *H. pylori* was 62.3% (66/106), (95% confidence interval [CI] 52.3 - 71.5) and it was high in all age group peaking 77.8% in age group ≤ 20 as shown in fig 5.1.

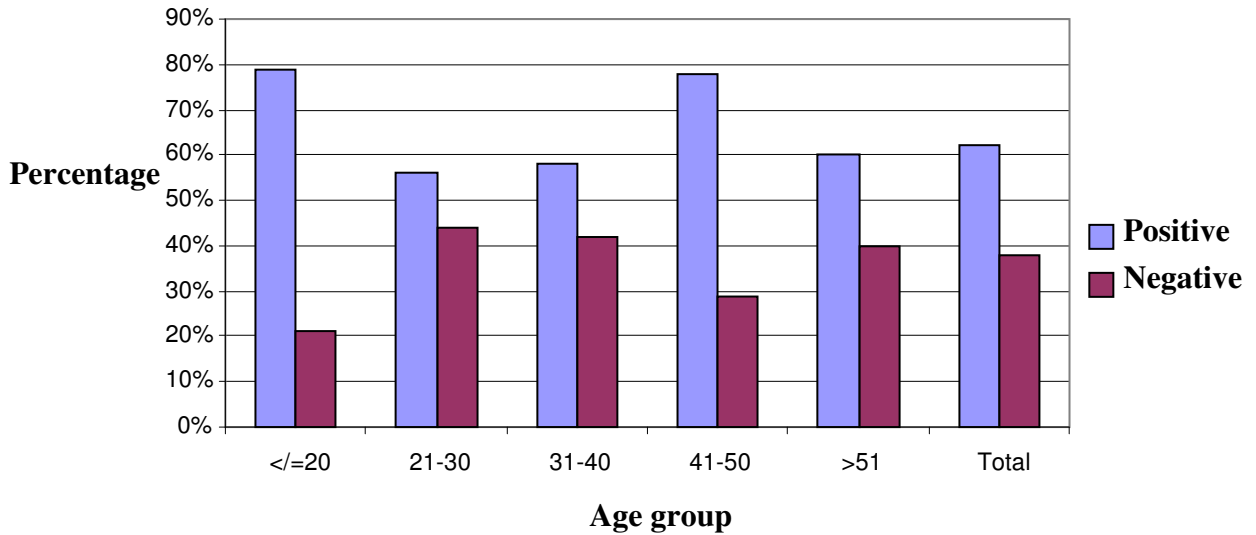


Figure 5.1 Seroprevalence rate of *Helicobacter pylori* infection with respect to age group at HTRH, South Ethiopia, 2011.

Antibody against *H. pylori* infection was found in 37 (70%) of 53 dyspeptic patients (95% CI, 55.7 to 81.7) and 29 (54%) of 53 non dyspeptic participants (95% CI, 40.4 to 68.4). *H. pylori* seropositivity have no statistically significant association with dyspeptic symptom (AOR=0.55 (0.20-1.47; $p>0.05$)).

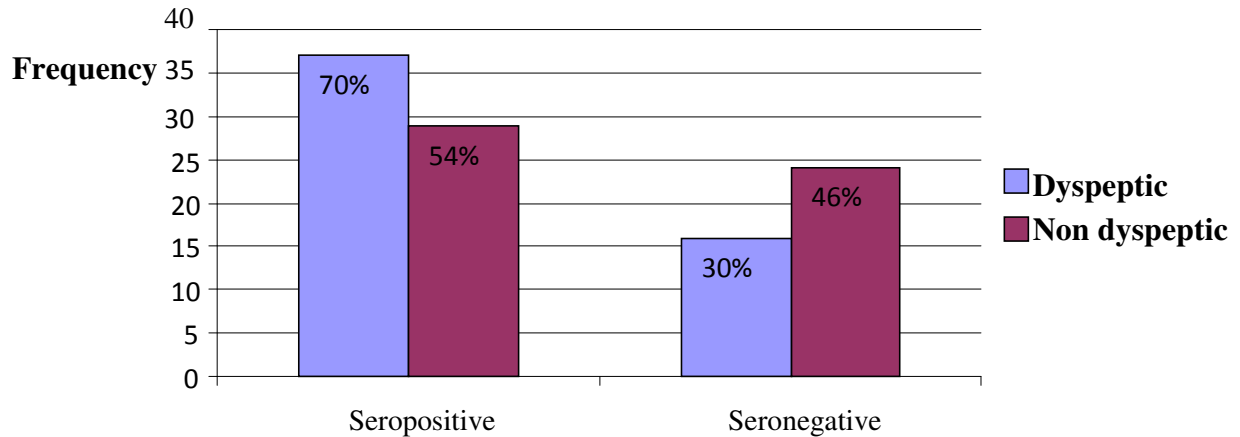


Figure 5.2. Seroprevalence of *Helicobacter pylori* in dyspeptic patients and non dyspeptic controls at HTRH, South Ethiopia, 2011.

5.3 Risk factors

As shown in Table 5.2, the seroprevalence of *H. pylori* was assessed for any association with age, gender, ethnicity, marital status, residence, literacy and, income, except number of sibling there was no a statistically significant association with all these variables and seroprevalence of *H. pylori* ($p > 0.05$). The seropositivity in participants that have family size (number of sibling) > 5 was three fold than those ≤ 5 (AOR=2.6 (1.07-7.12) $p < 0.05$).

Hand washing with soap, toilet type, water source, cigarette smoking, alcohol consumption, coffee intake and khat chewing were risk factors other than socio demographic factors included in this study, see Table 5.1. Antibody against *H. pylori* was detected in 67% (48/81) of individuals who practice hand washing with soap where as in those do not use soap it reaches to 80% (20/25) (AOR=1.67 (0.31-9.18) $p > 0.05$). The seropositivity in individuals using pipeline water source was found 62% (53/86) and 65% (13/20) for those using none pipe (AOR=0.39 (0.06-2.28) $p > 0.05$).

From Table 5.1, the seroprevalence of *H. pylori* in individuals who practiced drinking alcohol were 58.3% and 62% in never drink alcohol (COR=0.84 (0.25-2.8671) $P > 0.05$). It was 57.5% (50/87) in participants that use coffee and 83.3% (15/19) in non user (COR=.027 (0.07-1.00) P

>0.05). Of all 106 study participants we found 7 individuals who chew khat and all of them were seropositive i.e. 100%, the proportion decreases to 60% in none chewer (P>0.05) and none of them wash the khat. In this study we did not found any participant that smoke cigarette.

Table 5.2 Association between seroprevalence of *Helicobacter pylori* infection and its risk factors among study participants at HTRH, South Ethiopia, 2011

Study variable	<i>H. pylori</i> infection 66/106(62.3%)					
	Frequency	%	Bivariate analysis		Multivariate analysis	
			COR(95% CI)	p-value	AOR(95% CI)	p-value
<i>Male gender</i>	34/54	63.0	0.94(0.43-0.07)	0.88	0.73 (0.27-2.02)	0.55
<i>Dominant ethnic group</i>	14/21	66.7	0.79(0.29-2.22)	0.64	0.99 (0.25-3.9)	0.99
<i>Living in rural</i>	23/36	63.9	1.11(0.48-0.56)	0.80	1.30 (0.30-5.79)	0.71
<i>Currently married</i>	40/66	60.6	1.21(0.53-2.73)	0.65	1.16 (0.39-3.40)	0.76
<i>>5 sibling number</i>	45/63	71.4	2.62(1.17-5.89)	0.02	2.6 (3.97-7.127)	0.04
<i><7th grade</i>	23/43	53.5	0.53(0.24-1.19)	0.12	0.20 (0.06-0.27)	0.29
<i>≤500 ETH birr monthly income</i>	45/71	63.4	0.87(0.38-1.99)	0.74	1.10 (0.36-3.41)	0.85
<i>HW with out soap</i>	9/14	64.3	1.11(0.34-3.57)	0.87	1.67 (0.31-9.18)	0.55
<i>Toilet with out flush tank</i>	48/79	60.8	1.29 (0.51-3.24)	0.58	0.82(0.27-2.57)	0.74
<i>Non pipe water Source</i>	13/20	65.0	1.16(0.42-3.19)	0.78	0.39 (0.06-2.28)	0.30
<i>Alcohol use</i>	7/12	58.3	0.84(0.24-0.84)	0.79	–	1.00
<i>Coffee use</i>	50/87	57.5	0.27(0.07-1.00)	0.04	–	1.00
<i>Chewing Khat</i>	7/7	100	–	0.03	–	0.99

✚ CI: Confidence Interval COR : Crudes Odds Ratio AOR: Adjusted Odds Ratio HW: Hand Washing

✚ Dominant ethnic group: participants from Sidama ethnic group

VI. DISCUSSION

This study shows that *H. pylori* has an over all seroprevalence of 62.3% and it was found in 70% of dyspeptic patients and 54% of non dyspeptic participants. The frequency varies among all the studied variables, without gender, age, and place of residence difference. However, it had an association only with family size in multivariate analysis, and all are discussed below.

The overall prevalence, 62.3% in Hawassa was in agreement to that reported in the recent studies done in Ethiopia at Bahir Dar which was 49-70% (Tesfahun et al., 2003), Addis Ababa (Tsega et al, 1996) and in some other developing countries, Kenya (36-81%) (Shmuely et al., 2003)

The prevalence of *H. pylori* infection in dyspeptics and non-dyspeptics was 70% and 54%, which is similar with the results obtained from other case control study in Bahir Dar, Ethiopia, 70 % and 54% (Tesfahun et al., 2003) and Nakuru, Kenya, 71% and 51% (Shmuely et al., 2003). But it is different from a similar case control study in Nigeria demonstrated that the proportion of patients with control was 88% to 80 % (Oluwasola et al., 2002), but it is difficult to compare this result because, the study participants were only 50 individuals.

There was no significant association between seroprevalence of *H. pylori* infection and dyspepsia in this study ($p > 0.05$) and a similar finding was reported from other studies done in Bahir Dar (Tesfahun et al., 2003) and Addis Ababa (Tsega et al, 1996) but not in Kenya (Shmuely et al., 2003); This disparity is might be due to variation on differences in dyspepsia scoring systems or lack of clear cut definition of dyspepsia between individuals with and without dyspeptic symptoms, sampling method, sample size, and misdiagnosis of patients.

We did not found a significant association with age group, ethnicity, and marital status place of residence, income, and education ($p > 0.05$). However, many studies found a strong association between these factors and *H. pylori* infection, there are also some that did not associate.

Increased age was associated with *H. pylori* infection in Tanzania (Sam et al., 2006) and other developing countries (W.Jafri et al., 2010). Rural residence was related in Taiwan (The et al., 1994) and Kazakhstan (Nurgalieva et al., 2002). Both of these studies did not found a significant association between *H. pylori* infection and ethnicity. Low educational level and income were

related to *H. pylori* infection in Mexico (Torres et al., 1998) and Mato Grosso (Souto et al., 1998) in Brazil but not in Taiwan (Gunaid, 1994; Teh et al., 1994). All these reports are consistent with the concept that the most important factors influencing the transmission of an infection may differ with geographical location and study population. Therefore, the absence of statistically significant association with these demographic factors in this study ($p > 0.05$) might be due to similar grounds with the above concept including difference in sample size.

Although there was no a statistically significant association with the majority of socio demographic factors, there was a strong relation with large family size, which is one measure for overcrowding ($p < 0.05$), that coincides with other studies done in Mexico and Taiwan (Torres et al., 1998; Teh et al, 1994). The positive association of *H. pylori* with densely populated environments suggests that crowded living quarters may facilitate transmission of infection among siblings and other family members. This indicates that there may be person-to-person (direct contact) transmission through contamination with saliva or faeces among family members in the study area.

Person-to-person (direct contact) transmission is supported by the higher incidence of infection among institutionalized children and adults and the clustering of *H. pylori* infection within families (Linda, 2000). The confirmation to this concept is the detection of *H. pylori* DNA in vomitus, saliva, dental plaque, gastric juice and feces.

The role of individuals for person to person transmission was studied by many researchers and mother to sibling, spouse to spouse and transmission among non-family members through close contact for long periods were identified. As noted by Barik (2009), in developing countries, overcrowded conditions that create closer contacts between mothers and children and between siblings sharing the same bed might be the main reason for the high infection rates reported. And spouse-to-spouse transmission has also a major role for *H. pylori* infection and continuous contact is required for the establishment of such infection.

Despite there is visible variation in frequency of seropositivity with respect to absence of flush toilet type, hand washing with out soap and none pipe source water, there was no significant association with these variables ($p > 0.05$). This contradicts with other studies which show a positive association in Ethiopian children (Lindkvist et al., 1999) and some other developing

countries like Brazil in children (Dattoli et al, 2010) and Kazakhstan (Nurgalieva et al, 2002) Waterborne exposure, primarily with the consumption of well and river water, probably due to fecal contamination, may also be an important source of infection, especially in parts of the world in which untreated water is common.

But the absence of significant association in this study was due to participants that use water source other than pipe and practice hand washing with out soap were relatively few in number and this may be due to increased awareness about hygienic practices and environmental health conditions through health extension program through out the country. In addition, difference in the studied population and sample size could be important reasons.

This study has not found an association between tobacco use or alcohol consumption and *H. pylori* infection ($p > 0.05$) which is similar with other recent epidemiologic studies. But many noted a non statistical reduction in risk (Hishida et al., 2010; Linda, 2000). The absence of association in this study might be due to less number of alcohol users. Besides the type and amount of alcohol has also an effect on the association. However, alcohol is known to have direct antimicrobial effects that appear to be more pronounced for wine and beer than for other types of alcoholic beverages (Hermann et al., 1997; Linda, 2000). The lower seroprevalence of *H. pylori* infection in alcohol user than non users in this study, with the above fact attracted us to support the hypothesis that alcohol intake may have preventive effect for *H. pylori* infection.

In case of cigarette smoking we did not found any participant that smoke cigarette thus, we had not any association. But most of the recent studies found no significant association with current smoking or any other measure of tobacco (Hishida et al., 2010; Linda, 2000) and one study from Japan reported a significant negative association with current smoking (Machida et al., 2004). Some authors have suggested that these contradictory results may be due to uncontrolled confounding by social class or to differential antibiotic use. Since smoking appears to affect treatment success (Takeshi et al., 2006), thus we support the hypothesis that association between smoking and *H. pylori* infection may exist.

This study also assessed that khat chewing and coffee drinking had an association with *H. pylori* infection or not, and there was no statistically significant relationship with both variables in multivariate analysis ($p > 0.05$). A study by Raja'a et al. (2000) found an association between

daily khat chewing and prevalence of *H. pylori*. The absence of association in this study might be due to less number of chewers that cause difficulty to compute the association. But we believe that chewing khat may increase *H. pylori* infection because, as shown by this study there was an increased prevalence in chewers than non chewers. And this might be due to faeco-oral transmission of the bacterium because of contamination of the khat by soil with the evidence that any one of them respond that they do wash the khat and the chewers may not wash their hands before chewing.

Drinking coffee was also not associated in this study but it was positively associated in some studies (Hermann et al., 1997; Brenner, 1998) with a justification that coffee intake supports the growth of *H. pylori* by suppressing acid production, but not in this study. The absence significant association in this study might be due to difference in study area, population, and sample size. In addition the amount and duration of coffee intake may have an effect on the presence of association.

Limitation of the study

The use of a test with imperfect sensitivity and specificity and inclusion of patients receiving anti biotic for other infections or who have been treated for *H. pylori* infection in the past led us to underestimate the prevalence of *H. pylori*. In contrast, use of serology in assessing the eradication of *H. pylori* after treatment is very limited, because anti body levels decreases slowly in the serum and this may increase the prevalence. This study considered as across sectional study for the assessment of contributing factors for the infection. Therefore, it is difficult to establish temporality of the association between *H. pylori* and its risk factors.

CONCLUSION

- The overall seroprevalence of *H. pylori* in Hawassa was not different from other studies in the country i.e. 62.3%.
- There was a remarkable increase in the detection of antibody against *H. pylori* in dyspeptic patients than the non dyspeptics i.e. 70% versus 54%. However, a statistically significant association were not found between seroprevalence of *H. pylori* infection and dyspeptic symptom, which is similar to previous studies in the country.
- Large family size (over crowding) was the only risk factor that was statistically associated with *H. pylori* infection in the study area.

RECOMMENDATIONS

- This study found an increased seroprevalence of *H. pylori* infection in dyspeptic patients than non dyspeptic. Therefore, non invasive test-and-treat strategy for *H. pylori* in patients with new-onset of dyspepsia which is experienced in other countries like, United States of America may be an efficient use of health resources; that should be practiced in Ethiopia.
- In this study overcrowding (dense occupancy) were positively associated with *H. pylori* seroprevalence. Thus, minimizing overcrowded condition through an intensive family planning program in the area is mandatory.
- As confirmed by many studies, over crowded living condition facilitates direct contact (person to person) transmission of *H. pylori*. Therefore, educating people, particularly infected mothers and spouses about familial clustering of *H. pylori* infection and the risk of infecting others by direct contact and exchange of saliva is imperative. In addition, sanitary measures among family members (hand and mouth wash, brushing teeth, no sharing of food plates or drinking glasses, no sharing of spoons in feeding children, no bed sharing between siblings is crucial.
- Due to undersized number of participants in some of the studied variables, statistically significant associations were not found. As a result, further investigation on these variables is recommended.

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Annex Information sheet

Purpose: *H. pylori* infection is a major public health problem .It is associated with PUD and is a risk factor for gastric cancer and MALT. The aim of this study is to determine magnitude and associated risk factors of *H. pylori* infection in adult population.

Procedure: To determine the prevalence and associated factors of *H. pylori* infection, we invite you to take part in this study. If you are willing to participate in this project, you will be examined for your *H. pylori* status. We will collect blood samples from you. However, if you are not willing to participate in the study, you have full right to get the regular health services in the Hospital.

Risk and Discomfort: By participating in this research project, you are likely to have some discomfort such as vein puncturing during blood collection and risk of minor bleeding. As the procedure will be carried out by experienced health professionals in the health center with a standard aseptic condition and for any severe reaction you will get appropriate treatment.

Benefits: If you participate in this research, you may not get direct benefit but you will get a clinical assessment of your health condition

Incentives: You will not be provided any incentives to take part in this research.

Confidentiality: The information that we collect from this research project will be kept confidential. Information about you that will be collected from the study will be stored in a file, which will not have your name on it, but a code number assigned to it. Which number belongs to which name will be kept under lock and key, and it will not be revealed to anyone except the principal investigator and your clinician.

Whom to contact:

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DECLARATION

I, the undersigned, declare that this thesis entitled “Seroprevalence of *Helicobacter pylori* infection and its risk factors among adult patients with dyspepsia in Hawassa Teaching and Referral Hospital, South Ethiopia.” is my original work, and that all sources of materials used for the thesis have been acknowledged.

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MSc. RESEARCH THESIS

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