Approval sheet

Haramaya University

POST GRADUATE PROGRAM DIRECTORATE

On behalf of Haramaya University College of Health and Medical sciences, School of Medical Laboratory Sciences, We the advisors of this research with the title of "Prevalence of *Helicobacter Pylori* Infection and Associated Factors among Children Visiting Pediatric Clinic of Hargeisa group Hospital, Hargeisa, Somaliland" read and confirm as MSc thesis for the student and recommended that it can be submitted as fulfilling the thesis requirement.

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As member of board examiners of the MSc thesis of open defense examination, I certify that I have read and evaluated the thesis prepared by Yuusuf Haashi Hassan. I recommended that this thesis to be accepted as fulfilling the thesis requirements for the degree of master of medical microbiology.

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STATEMENT OF THE AUTHOR

I declare that this thesis with title of "Prevalence of *Helicobacter Pylori* Infection and Associated Factors among Children Visiting Pediatric Clinic of Hargeisa group Hospital, Hargeisa, Somaliland" as my original work and has not presented in any higher institutions for fulfillment of any degree program and I assure it with my signature.

I also assure that any materials and source taken from others were correctly cited and referenced in the paper and all ethical confederations were considered starting data.

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Abbreviations and Acronyms

AOR	Adjusted Odds Ratio
CI	Confidence Interval
ELISA	Enzyme-Linked Immuno-Sorbent Assay
FISH	Fluorescent in Situ Hybridization
GIT	Gastrointestinal Tract
HGH	Hargeisa Group Hospital
HP	Helicobacter Pylori
MALT	Mucosa-Associated Lymphoid Tissue
MFAT	Monoclonal Fecal Antigen Testing
OMV	Outer Membrane Vesicles
OR	Odds Ratio
PUD	Peptic Ulcer Disease
PPI	Proton Pump Inhibitor
PP	Per Protocol
PCR	Polymerase Chain Reaction
SPSS	Statistical Package for Social Sciences
SAT	Stool Antigen Test
SES	Socio-Economic Status
UBT	Urea Breath Test
US	United States
WHO	World Health Organization

Abstract

Background:*Helicobacter pylori* infection is usually acquired during childhood and is associated with different socio-demographic factors. It is a major public health problem in many developing countries and the local burden of disease among children is largely unknown due to limited studies.

Objective: The aim of this study was to determine the prevalence of *H. pylori* infection and its associated factors among children 1-17 years of age at Hargeisa Group Hospital, from September 5 to December 25, 2022.

Method: A cross-sectional study was conducted among 317 clinically suspected children for *H. pylori* infection. Children were selected consecutively in pediatric outpatient department. A pre-tested questionnaire was used to collect data on the socio-demographic and associated factors such as family size, sources of water and family income. A stool sample was collected and processed for the detection of *H. pylori* antigen using rapid test kit.The data was entered using Epi data 3.1, and analyzed using SPSS version 20. The association of different variables was statistically tested using bivariate and multivariable regression analysis. The magnitude of association was measured by adjusted odds ratio at 95% CI and P-value less than 0.05 was considered as statistically significant.

Results: Among 317 participants, 166(52.4%) were female and 41% of them were in the age range of 1 to 5 years. The prevalence of *H. pylori* was 33.1% (95% CI: 28.1-38.2). Children from family monthly income of 115-345 (AOR=2.3:95%Cl: 1.06-4.96; p= 0.034), using flush toilet (AOR= 0.496; 95%Cl: 0.3-0.9; p= 0.013), unpracticed of hand washing after toilet visit (AOR=3.3; 95%Cl: 2.9-6.4; p= 0.003), neverpracticed hand washing with soap after toilet visit (AOR=2.6; 95%Cl: 1.3–7.3; p= 0.026) were found significantly associated with *H. pylori*

infection. **Conclusion:** One-third of children had *H. pylori* infection. The infection is significantly associated with family monthly income, hand washing habit, type of toilets and hand washing with soap. Thereforeraise awareness about sanitation and hygiene is important. The infection is primarily acquired between the ages of 1 and 5, therefore, the study is recommended early diagnosis.

Key words: *Helicobacter pylori*, Prevalence, Associated factor, Hargeisa

Introduction

1.1. Background

Helicobacter pylori affects 44.3% of the world's population and in developing countries the rate is 50.8%(Zhou *et al.*, 2022). It is one of the most common chronic bacterial infections world-wide and it is estimated that most children are also affected by the bacterium (Etukud et al, 2012).It is a small, highly motile, gram-negative, microaerophilic, fastidious bacterium and it is one of the commonest bacterial pathogens in human (Das, 2007). It is a curved spiral-shaped bacterium, with a natural ecological niche at the antral portion of the human stomach and it has been associated with gastroduodenal diseases worldwide (Etukud et al, 2012). In the process of colonization, it induces a chronic inflammation of the mucosa without invading it. This bacterium has been recognized as the major etiological factor resulting in peptic ulcer disease in adults and children (Elitsur, 1985).

It is ubiquitous but the prevalence, timing of acquisition and perhaps symptoms and the sequelae differ in developed compared to developing countries (Etukud et al, 2012). The infection causes chronic gastritis which significantly increases the risk of developing gastric or duodenal ulcer, gastric adenocarcinoma, and mucosa associated lymphoid tissue (MALT) lymphoma (Red, 2011).

The international agency for cancer classified *H. pylori* as the number one carcinogen or cancer causing agent and now it is the most common cause of gastric cancer which is the third cause of mortality amongst the cancers worldwide (Msekandiana, *et al.*, 2019).

It is widely accepted that *H. pylori* infection is the main etiological factor for gastritis and peptic ulcer (Etukud et al, 2012). Moreover, it has been detected in individuals of all ages throughout the world and its prevalence ranges between 20%-80% (Patel, 2014).

Infection is usually acquired during childhood and is associated with socio-demographic factors such as low socio-economic status, poor hygiene and crowding (Cedillo-rivera, 2008). This infection is mostly acquired during childhood through the fecal-oral and oral-oral route and initial infection with this organism is usually silent but symptoms and pathologic changes occur later in life(Awuku, 2017).

Childhood is the key period of acquisition (Cherian *et al*, 2008). Acquisition of infection in childhood reflects the social, environmental and economic status of the community (Mashhour *et*

al., 2009a). Lower prevalence rates have been reported in communities which have a higher socioeconomic status and generally better environmental conditions (Etukud et al., 2012).

Within developed nations, prevalence rates of *H. pylori* infection among children have been shown to range from as low as 1.8% to as high as 65%. While in developing countries the prevalence is generally higher reaching up to 90% in some countries. Its main risk factors include overcrowded households, poor sanitation and poor water supply(Paulo,et al 2010).

In Africa, the acquisition of infection is an early childhood that ranges from (30%-50%) and reaches over 90% during adulthood(Zaterka, 2006). In Somaliland, *H. pylori* mostly affects adults, however, there is limited evidence regarding *H. pylori* infection among children.

1.2. Statement of the Problem

H. pylori infection is a global public health problem, affecting most of the population worldwide and it remains an important cause of peptic ulcer disease (PUD). Over 50% of people in the world have *H. pylori* infection(Zebasil, 2022). It was reported a global childhood *H. pylori* infection prevalence of 33%, but without assessing the differences between geographic areas, countries, or sub-regions(Balas, et al, 2022). Infection with *H. pylori* is asymptomatic most of the time; however, it can induce gastric ulcers, duodenal ulcers and, gastritis when it affects human(Zebasil, 2022).

Infections are thought to occur early in life (during childhood) and the infection implicates several medical conditions (Hooi *et al.*, 2017). Infected individuals present with gastric reflux, abdominal pain, intestinal bleeding, occasional fevers and loss of weight which if not treated can result in gastric ulceration and perforation(Aitila, *et al.*, 2019).

The incidence and prevalence rates of childhood infection with *H. pylori* vary greatly within developing and developed nations (Aitila, *et al.*, 2019).

The mode of transmission of *H. pylori* is not certainly known however, epidemiological studies strongly support person to person transmission however, school going children in developing countries are at higher risk of *H. pylori* infection and most of the infected subjects remain asymptomatic (Abadi, 2017).

The public health impact of *H. pylori* infection is gradually becoming obvious and the bacterium now being implicated as an etiologic agent of gastric diseases. There is increasing evidence that *H. pylori* is acquired in early childhood and infects more children in developing countries than developed countries. In Africa *H. pylori* in children reaches some countries its prevalence 80%(Smith , 2019). However, which factors mostly affects the acquisition of *H. pylori* infection in children is not yet identified in Somaliland.

This is the first study looking at *H. pylori* infection in children done in Somaliland and to our knowledge there are no publications seen on studies done in country on similar topics. In addition to this gap, the prevalence of *H. pylori* infection in children is not well understood in the study area. In order to design preventive strategies, the explanation of the mode of spread of the pathogen is essential and will design its prevalence in children if it was remained poorly understood.

1.3. Significance of the Study

The result of this study will give an insight towards the prevalence of *H. pylori* infection among children. The result of this study will be benefited by the Hargeisa group hospital and the health policy makers such as Ministry of Health Somaliland.

The findings of this study will also add to the existing literature and give more information about problems of *H. pylori* in the community especially in children and also other researchers they can use it as secondary data in their research. As no previous research of this kind has been done in the study area.

1.4. Objectives

1.4.1. General Objective

The aim of this study was to determine the prevalence of *H. pylori* infectionand associated factorsamong Children at Hargeisa Group Hospital, Hargeisa, Somaliland from September 5 to December 25, 2022.

1.4.2. Specific Objectives

To determine the prevalence of *H. pylori* infection among children in Hargeisa Group Hospital.

To identify factors associated with *H. pylori* infection among children in Hargeisa Group Hospital.

2. Literature Review

2.1. Prevalence of H. pylori infection

*H. pylor*i infects about 40% of adults in developed countries 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(Alem, 2011).

World Health Organization (WHO) has published lists of 16 bacteria that pose the greatest risk for human health. *H. pylori* was thus categorized as a high priority pathogen for research and development of new and effective treatments(Melese *et al.*, 2019). In northern Iran prevalence of *H. pylori* in children ranges from less than 10% to greater than 80% in otherwise healthy individuals and is dependent upon age, socioeconomic class and country of origin(Mashhour *et al.*, 2009b).

In northern Brazil overall prevalence of *H. pylori* infection was 40%(Braga *et al.*, 2007). In Turkey, the prevalence of infection due to *H. pylori* in children has been reported as high as 53.9%(Ceylan , 2007).

A cross-sectional study of *H. pylori* prevalence was conducted among elementary and middle school children who lived in the same region but in different settings rural and urban in Italy then the overall prevalence of *H. pylori* was 22%(Dore , 2002).

Prevalence of *H .pylori* infection in Nigeria of 30.9% obtained in prospective observational study is high and suggests that *H. pylori* infection is significant in the pediatric age group of the study locality(Access, 2012). The overall prevalence of *H. pylori* infection in Egyptian schoolchildren was 72.38% and this study explained there was no significant difference in the prevalence of infection between boys and girls (73.80% and 70.34% respectively(Mohammad *et al.*, 2007).

Another cross-sectional study was conducted at Kassala state, east of Sudan the study children was comprised of schoolchildren, those who were selected from various primary schools in Kassala city and *H. pylori* prevalence was found to be 21.8%(Abbas *et al.*, 2018). Another cross-sectional study was conducted at Holy Innocents Children's Hospital and prevalence of the *H. pylori* infection was 24.3% among children aged 1 to 15 years attending Holy Innocents Hospital, Mbarara district in Uganda(Aitila, *et al.*, 2019).

In Kenya prevalence of *H. pylori* was found to be 67.5% in all age groups (73.3% in children and 54.8% in adults), similar to the findings of Shmuel who documented 60 - 73% in all age groups in dyspeptic patients(Sjomina *et al.*, 2018). Clinic-based cross-sectional study was conducted at Jigjiga University Clinic to determine the prevalence of *H. pylori* and associated risk factors among gastritis people who visited the hospital. The prevalence of *H. pylori* infection among the study children was 71.0%(Alebie, 2016). All reports on the prevalence of infection indicate that subjects are infected with *H. pylori* early in childhood(Salih, 2016). The prevalence of *H. pylori* varies from country to country and by age-groups(Ceylan , 2007).

In Ethiopia thirty seven studies carried out with a total of 18,890 children those were eligible and included in the analysis. The overall pooled prevalence of *H. pylori* infection was 52.2% (95% CI: 45.8–58.6) (Melese *et al.*, 2019). In the subgroup analysis by region, the highest prevalence was found in Somalia region (71%; 95% CI: 32.5–92.6) and the lowest prevalence was reported in Oromia (39.9%; 95% CI: 17.3–67.7). Absence of hand washing after toilet (OR = 1.8, 95% CI; 1.19–2.72), and gastrointestinal symptoms (OR = 2.23, 95% CI; 1.59–3.14) were associated with *H. pylori* infection. The trend of *H. pylori* infection showed a decreasing pattern overtime from 1990 to 2017 in the meta-regression analysis(Melese *et al.*, 2019).

2.2. Factors associated with *H. pylori* infection

Factors associated with *H. pylori* infections were grouped into sociodemographic, environmental, behavioral and clinical factors(Melese *et al.*, 2019). Several factors were studied about *H. pylori* seropositivity and the factors were gender, school attendance, sources of drinking water at schools, homes, and the presence of hand washing sanitary facility at schools and homes, number of persons living in a home, family history of peptic ulcer disease and family history of stomach cancer(Aitila, *et al.*, 2019).

2.2.1. Socio-demographic factors

In both developing and developed countries, high prevalence of *H. pylori* is apparently related to family income level, education, occupation(Shi *et al.*, 2008) residence in a developing country, an ethnic and genetic predisposition(Das, 2007). Each of these variables may measure a different component of the socioeconomic complex therefore, it is not surprising that the associations have differed according to the measure used(Jaime , 2018).

In Ethiopia a study carried out a total of two hundred twenty one pediatric patients in association with *H. pylori* infection among the study subjects 114(51.6%) were females and 107 (48.4%) were males aged from 9month to 15years with the mean age of 6.29 (95% CI 5.9-6.7). According to the economic factor the association of socio economic status and *H. pylori* stool antigen positivity showed, 27.6 %(OR =0.622; 95% CI: p =0.234) (Ahmed., 2014).

Another study indicated sociodemographic data (by age, sex, residency and level of education) were extracted and analyzed to determine their possible association with *H. pylori* infection but none of these variables had significant association. Even though not significant male children (OR = 1.07; 95% CI: 0.93–1.23; p = 0.33) and urban residents (OR = 1.04; 95% CI: 0.74–1.74; p = 0.83) were more likely to be infected with *H. pylori* than their counter parts(Melese *et al.*, 2019).

Although it has been shown that *H. pylori* infection is associated with age, and the condition of the social economy, the main risk factors for infection and transmission vary by countries(Aitila, *et al.*, 2019).Within a country age-specific prevalence is higher in lower socioeconomic groups(Heli-, 1996). *H. pylori* is found in all parts of the world, although the prevalence is higher in developing countries. Almost all infections occur before the age of 10 years(Duynhoven , 2001). And the childhood is now known to be the major risk period for *H. pylori* acquisition(Jaime, 2018).

Another cross-sectional study hospital based study done at the Kilimanjaro Christian medical college pediatric department, Tanzania which indicated factors such as age, fathers' occupation, have been identified strong association with *H. pylori* infection(OR =0.01; 95% CI: 0.09-20.18, p =0.025) (Msekandiana, *et al.*, 2019).

2.2.2. Environmental factors

Sources of drinking water, Sanitation and overcrowding living conditions were the environmental factors assessed for their possible association with *H. pylori* infection. Children

who were not washing their hands after toilet were more likely to be infected with *H. pylori* (OR = 1.8; 95% CI: 1.19–2.72, p = 0.005). Other variables had no significant association(Melese *et al.*, 2019).

A cross-sectional study hospital based study done at the Kilimanjaro Christian medical college pediatric department, Tanzania which indicated hygiene and environmental factors, lack of indoor tap water have been identified strong association with *H. pylori* infection and it means that improved hygiene and sanitation can help eradication of *H. pylori* in our population(OR = 4.41; 95% CI: 0.69-27.9, p = 0.114) (Msekandiana *et al.*, 2019).

2.2.3. Behavioral factors

A cross-sectional study was conducted on 300 healthy Lebanese children volunteers, interestingly, a significant correlation was found between hand washing habits, history of displacement and *H. pylori* infection. These findings highlight the need for the development of preventive approaches and strategic indications for the appropriate management of *H. pylori* infections in Tripoli, North Lebanon(Khoder, 2021).Another cross-sectional study done in jigjiga, Somali regional state of Ethiopia life style habits such as khat chewing, alcohol drinking and tobacco smoking have been recognized as important risk factors for acquisitions of *H. pylori* infection in children(p =0.011) (Alebie , 2016).

2.2.4. Clinical factors

Gastrointestinal (GI) symptoms, allergic reactions, HIV and TB infections were some of the clinical factors reported with *H .pylori* infection(Melese *et al.*, 2019). 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(Alem, 2011). In a cross-sectional study carried out pediatric patients who is clinically diagnosed for factors gastroenteritis, dyspepsia and peptic ulcer in Beham specialized children's higher clinic, Addis Ababa, Ethiopia. A total of two hundred twenty one pediatric patients having upper gastrointestinal symptoms because of a suspicion of *H. pylori* infection participated in the study(Ahmed., 2014).

In a cross-sectional study carried out in Ethiopia the association between GIT symptoms and *H. pylori* infection. Hence, children who had GI symptoms including dyspepsia, gastritis, peptic

ulcer and related were more likely to be infected with *H. pylori* (OR = 2.23; 95% CI: 1.59–3.14, p < 0.00001)(Melese *et al.*, 2019).

2.3. Conceptual framework

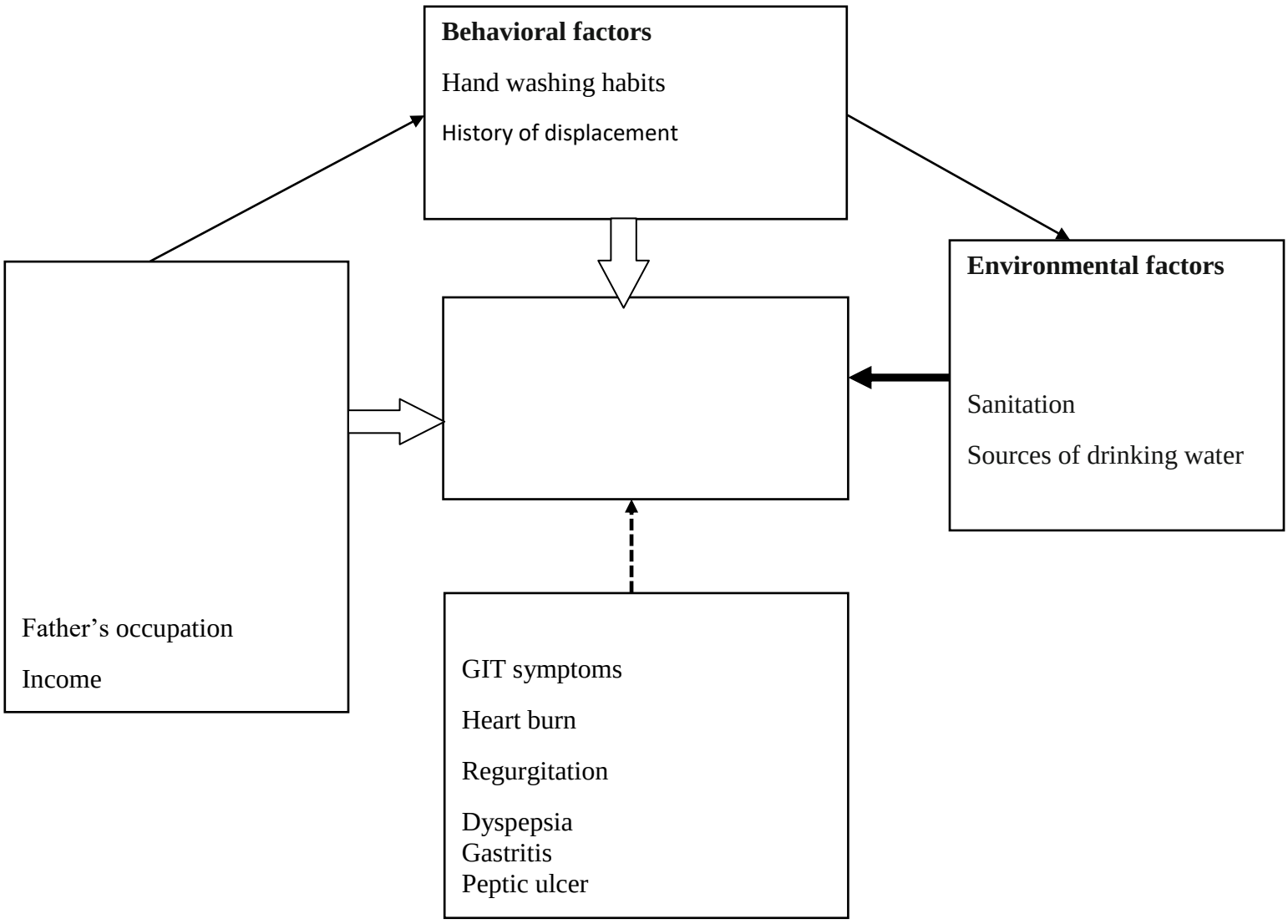

Figure 1: Conceptual framework for prevalence of *H. pylori* infection and associated factors among children.

Source: Constructed by the investigator from reading of different literatures*(Melese et al., 2019). (Alebie, 2016), (Msekandiana et al., 2019).*

3. Methods and Materials

3.1. Study Area and period

The study was conducted in Hargeisa Group Hospital (HGH). Hargeisa group Hospital is the national Hospital in the republic of Somaliland and also the teaching Hospital for medical universities in Hargeisa city. It is founded in 1953 and is the largest referral Hospital in Hargeisa where many patients visit to seek medical services. It is located Hargeisa capital city of Somaliland. The Hospital has 400 bed, and consists of many departments such as maternity, dental and emergency department. The Hospital's capacity to deliver better medical services was significantly is low due to the limited number of qualified senior physicians(Horst, 2016). The study was conducted from September 5 to December 25, 2022.

3.2. Study design

Cross-sectional study design was used.

3.3. Population

3.3.1. Source population

All children visiting pediatric outpatient department (OPD) of Hargeisa Group Hospital were considered as the source of population during the study period.

3.3.2. Study population

All children suspected of gastritis visiting in the Hargeisa Group Hospital during the study period.

3.4. Inclusion and Exclusion criteria

3.4.1. Inclusion criteria

Children under the age of 18 years visiting Pediatric (OPD) of Hargeisa Group Hospital whose parents/guardians give assent and clinically suspected.

3.4.2. Exclusion Criteria

Severely ill children and children with no gastroenteritis complaints were excluded. Patients with documented *H. pylori* infection, history of taking antibiotic or proton-pump inhibitor beyond four weeks were excluded from the study.

3.5. Sample size determination

A). For objective one

The sample size was calculated using a single population proportion formula based on the assumption of 5% expected margins of error, considering 95% confidence interval, 10% non-response rate and by taking considering 25% previous prevalence (Ahmed,(2014).

By using the following formula:

$$n = \frac{(z/)^2 \times p\,(1-p)}{d^2}$$

$$n = \frac{(1.96)\ ^2 \times (0.25\ (1-0.25))}{(0.05)\ ^2}$$

n = 288

10% non-respondent rate= 29. Therefore, the final total study subjects of this study was (n = **317**).

Where:

n = sample size

z = statistic for level of confidence

p = previous prevalence

d= margin of error

B). For objective two

For second objective sample size was determined by considering different factors associated with *Helicobacter pylori* by using EPI info 7 statistical software for double population proportion formula for assumption of two sided confidence level of 95%, the margin of error 5%, 10% non-respondent rate and power of 80%.

Table 1**:** Second objective sample size calculation

Objectives	Variables	Assumptions	Sample	references
2nd Objective	Overcrowding	Exposed and non-exposed 32%, AOR=3.795, Power=80 Cl=95%, MOE=5%, NRR= 10%	168	(Ahmed ,2014)
	Sanitation	Exposed and non-exposed= 42%,AOR=1.735, power=80% Cl= 95%, MOE= 5%, NRR=10%	178	(Ahmed , 2014)
	Abdominal pain	Exposed and non-exposed =33%,AOR=0.084, power=80% Cl=95%, MOE=5%, NRR= 10%	50	(Ahmed , 2014)

AOR= adjusted odds ratio, NRR= non-respondent, MOE= margin of error

The final sample size was 317.

3.6. Sampling Technique

Eligible children were enrolled consecutively by convenient sampling technique until the calculated sample size fulfilled.

3.7. Data collection methods

3.7.1. Data collection instruments

Data on children characteristics (socio-demographic and socio-economic) and potential associated factors were collected by interviewing the parents or the guardians using pre-structured questionnaire translated into the local language (Somali). Clinical factors were obtained from the patient's clinical records.

3.7.2. Data collectors and supervisors

Two data collectors and two supervisors were included in the data collection. Training was provided for data collectors how to collect data from the study participants before the actual study period.

3.7.3. Procedure of data collection

Stool specimen was collected from the outpatient department (fresh stool sample about 2-5grams) (for liquid or watery stool specimen 1ml) using stool cup and firstly labeled stool cup was given for the child parent then the parent/guardian was instructed to bring stool sample.

3.7.4. Laboratory analysis

The test was based on the principle of immunochromatography invitro for qualitative determination of *H. pylori* antigens in stool (Vaxpert). The test used *H. pylori* specific monoclonal antibodies coated on the membrane of the test device. The cap of the sample extraction tube was opened by unscrewing the cap. Using the sample collection stick attached to the cap, a fresh stool sample (about 50mg), approximately the size of a peanut was collected from at least four different sites of the specimen. For liquid or watery stool specimen, 100µl (approximately two drops) of the sample was taken using a plastic disposable pipette. The sample collection stick was then inserted in to the sample extraction tube containing phosphate buffer and the tube was tightly closed to secure it. The tube was then swirled and shaken well to dissolve the stool sample. It was mixed homogenously with the phosphate buffer in the sample extraction tube. The testing device (cassette) was then taken out of the foil pouch and paced on a clean and flat surface, preferably on a bench. Then the dispenser cap of the sample tube was twisted off and by holding the tube vertically, five (5) drops of the mixture of the stool sample

and buffer were dispensed into the sample well of the cassette test device. The results were read after 15 minutes.

3.8. Study Variables

3.8.1. Dependent Variables

Prevalence of *H. Pylori* infection

3.8.2. Independent Variables

Socio-demographic characteristics (sex, age, residence, bed sharing, parental/gurdian educational level, family income).

Clinical factors (Family history, GIT symptoms and abdominal pain).

Behavioral factors (handwashing status, improper food handling).

Environmental factors (Overcrowding living conditions, availability of latrine).

3. 9. Operational definitions

Children: Those <18 years of age visiting the pediatric clinic of Hargeisa Group Hospital (Ahmed ,2014).

Overcrowding: Residing or presence of more than one child and their parents in one room(http://www.ihatepsm.com/blog/assessment-overcrowding household)

Gastritis: Inflammation of the children's stomach(Ahmed ,2014)..

Social class: Those children whose families have the similar wealth, income, education, and occupation(https://www.cliffsnotes).

Lower class: Those children whose families have the lowest social rank or standing due to low income, occupation and education

Middle class: Those children whose families have middle social rank according to the family income, occupation and education

Upper class: Those children whose families have high social rank according to the family income, occupation and education

3.10. Data quality control

The stool samples were tested according to the manufactures instruction and all quality issues were maintained by using standard operating procedure in detection of *H. pylori* Ag in stool sample during pre-analytical, analytical and post analytical stages. The questionnaires were also pre tested 40 participants in similar patients which are not part of the study and then the necessary adjustments was made. In order to ensure quality of the data one day proper training was given to data collectors about the questionnaire and data collection techniques. The test result was examined independently with two experienced laboratory technologist and finally checked by the principal investigator. The data collectors were submitted questionnaires accompanied with stool specimen on daily bases and principal investigator perform supervision on data collection and transportation. Each of the questionnaires were checked for their completeness, correctly filled whether the necessary information was properly filled.

3.11. Methods of data processing and analysis

The questionnaires were checked for their completeness, unrecorded value, and improbable responses and was then be cleaned up manually. The data were entered using Epi data 3.1, and it was exported and analyzed using Statistical Package for Social Sciences (SPSS) version 20. The basic characteristics of the children was summarized using descriptive statistics. Logistic regression was done to determine the effect of independent variables by calculating the strength of association between disease and potential risk factors using odds ratio (OR) and taking 95% confidence interval (CI).

Odds Ratio was calculated using binary logistic regression. For those variables, which P-value <0.25 in the bivariate, the analysis was further entered into the multivariable logistic regression model. Adjusted OR (AOR) with 95% CI was used to assess the strength of association and P-value < 0.05 were applied to assess statistical significance.

3.12. Ethical Consideration

The study was evaluated and approved by the Haramaya University College of Health and Medical sciences Institutional Health Research Ethics Review Committee (IHRERC). Participation was a voluntary, and all the accompanying adults/guardians responsible for the children signed assent form. Support letter was also gained from Haramaya University. Permission was gained from Hargeisa Group Hospital administration, where the study was carried out.

The parents/guardians of the study subjects were informed on the procedures and significance of the study. An informed voluntary written and signed assent was obtained from parents/guardians of the participating children and Head of the Hospital. Any information about the data was kept confidential and result was only be communicated to the responsible physician or health care. Every study participant had the right to refuse taking part the study and for those with no willing was not be forced to be included into the study.

3.13. Dissemination of results

The result of this study will be disseminated or communicated to Haramaya university school of medical laboratory science, Hargeisa group Hospital, local institutions and other concerned bodies through reports and publication on an appropriate journal.

4. Results

4.1 Socio demographic characteristics of the study subjects

A total of 317 children were participated in this study. Among the study subjects 166(52.4%) were females and 41% of the children were between the ages of 1 and 5years. Majority 287(90.5%) of children came from urban area. The parents or care takers of 45.7% were able to read and write (table 2).

Table 2**:** Socio-demographic characteristics of 317 study children at Hargeisa group hospital, Hargeisa, Somaliland, 2022.

Variables		Frequency	Percent
Gender	Male	151	47.6
	Female	166	52.4
Age	1-5	130	41
	6-10	120	37.9
	11-15	50	15.8
	16-17	17	5.4
Residence	Urban	287	90.5
	Rural	30	9.5

Educational level of parents/guardians	Unable to read and write	112	35.3
	Read and write	145	45.7
	Primary to secondary	40	12.6
	College to university	20	6.3
Occupation of parents/guardians	Employed	280	88.3
	Unemployed	37	11.7
Monthly income of parents/guardians	115-345	210	66.2
	460-690	59	18.6
	805$-1035	36	11.4
	1150$ and above	12	3.8
Family size	1-4	70	22.1
	5-8	190	59.9
	>8	57	18

4.2. Behavioral and environmental factors

The majority 215(67.8%) of children's families were middle class. According to the sources of water, most 205 (64.7%) children get water from the water tanker (table 3).

Table 3**:**Distribution of children by household population characteristics at Hargeisa group hospital, Hargeisa, Somaliland, 2022.

Variables		Frequency	Percent
Number of bedrooms	1-2	188	59.3
	3-4	110	34.7
	>4	19	6
Social class	Lower	90	28.4
	Middle	215	67.8
	Upper	12	3.8
Sources of water	Tap water	102	32.2
	Water tanker	205	64.7
	Bottled water	10	3.2
Type of toilet	Pit latrine	225	71

	Flush toilet	92	29
Hand washing habit after toilet visit	Always	72	22.7
	Seldom	86	27.1
	Often	92	29
	Never	67	21.1
Camp visit(Internal displacement People areas)	Yes	60	18.9
	No	257	81.1
Hand washing habit with soap after toilet visit	Always	65	20.5
	Often	70	22.1
	Seldom	107	33.8
	Never	75	23.7

4.3. Prevalence of *H. pylori* infection

H. pylori antigens were detected in 105 of the 317 children giving an overall prevalence of (33.1%) (95% CI: 28.1-38.2). Of the total children enrolled in the study,*H. pylori* antigen was detected in the stools of 59 (35.5%) females compared to 46 (30.5%) males.

4.4. Factors associated with *H. pylori* infection among children

In bivariate analysis family income, number of bedroom, type of toilet and hand washing habit after toilet visit were significantly associated with *H. pylori* infection(P<0.05). However, in multivariable analysis family income, type of toilet, hand washing habit after toilet visit and hands washing with soap after toilet visit were statistically significant association with these variables of prevalence of *H. pylori* infection *(p<0.05).* Children from family monthly income of 115-345 were 2 times more likely to have *Helicobacter pylori* infection compared to those who earn 460-690(AOR= 2.3:95%Cl: 1.06-4.96). Those children who use flush toilet were

50% less likely to acquire *H. pylori* infection than those use pit latrine (AOR=0.496; 95%Cl: 0.285-0.865; p<0.05).

Of those children neverpracticed hand washing after toilet visit 3.3 times more likely to have *H. pylori* infection compared to those always practiced hand washing after toilet visit (AOR=3.3; 95%Cl: 2.9-6.4). Of those children neverpracticed hand washing with soap after toilet visit 2.6 times more likely to catch *H. pylori* infection than those always practiced hand washing with soap after toilet visit(AOR=2.63; 95%Cl: 1.3–7.3)(table 4).

Table 4:Bivariate and multivariable logistic regression analysis for prevalence of *H. pylori* infection and associated factors among children visiting pediatric clinic of Hargeisa Group Hospital, Hargeisa, Somaliland, 2022(n=317).

		H. Pylori					
Study variable	Category	Positive	Negative	Bivariate analysis		Multivariable analysis	
				COR(95%CI)	p-value	AOR(95%CI)	p-value
Residence	Urban	99(34.5)	188(65.5)	1		1	
	Rural	6(20)	24(80)	2.1(0.83-5.3)	0.115	2.18(0.83-5.3)	0.12
Income	115-345	79(37.6)	131(62.4)	1		1	
	460-690	11(18.6)	48(81.4)	2.6(1.29-5.36)	0.008	2.29(1.06-4.96)	**0.034***
	805-1035	11(30.6)	25(69.4)	1.37(0.64-2.93)	0.418	1.27(0.55-2.94)	0.56
	1150$ and	4(33.3)	8(66.7)	1.20(0.35-4.1)	0.766	1.38(0.379-5.04)	0.623

	above						
Bedrooms	1-2	52(27.7)	136(72.3)	1		1	
	3-4	45(40.9)	65(59.1)	0.55(0.34-0.91)	0.019	0.757(0.438-1.3)	0.318
	>4	8(42.1)	11(57.9)	0.53(0.20-1.38)	0.19	0.52(0.179-1.52)	0.23
Type of toilet	Pit latrine	62(27.6)	163(72.4)	1		1	
	Flush toilet	43(46.7)	49(53.3)	0.43(0.26-0.71)	0.001	0.496(0.285-0.86)	**0.013***
Hand washing habit after toilet visit	Always	12(16.7)	60(83.3)	1		1	
	Seldom	31(36)	55(64)	3.36 (1.15–9.78)	0.008	2.8 (1.25–5.73)	**0.017***
	Often	32(34.8)	60(65.2)	3.5(2-4.5)	0.01	2.9(2.25-4.3)	**0.008***
	Never	30(44.8)	37(55.2)	4.4(1.6-5.1)	0.001	3.3(2.9-6.4)	**0.003***
Camp visit	No	26(43.3)	34(56.7)	1		1	
	Yes	79(30.7)	178(69.3)	1.72(0.97-3.06)	0.064	1.46(0.77-2.76)	0.24
Hand washing habit with Soap after Toilet visit	Always	17(26.2)	48(73.8)	1		1	
	Often	28(40)	42(60)	1.1(0.9-1.13)	0.09	1.09(0.8-1.12)	0.097
	Seldom	29(27.1)	78(72.9)	1.16(0.9-1.15)	0.89	1.15(0.8-1.46)	0.33
	Never	31(41.3)	44(58.7)	3.48 (1.39–8.73)	0.06	2.63 (1.3–7.3)	**0.026***
History of GIT	Yes	75(31)	167(69)	1		1	
	No	30(40)	45(60)	0.67(0.39-1.15)	0.15	0.836(0.45-1.54)	0.56

P-value<0.05, COR<0.25, AOR<0.05, CI=95%

5. Discussion

H .pylori infection is a growing public health problem in the study area. According to this study, one-third of the children were *H. pylori* positive (33.1%(95% CI: 28.1-38.2.). Lower monthly income, type of toilet, hand washing habit and hand washing with soap were found important factors associated with *H. pylori* infection.

We did not find a significant association with age group, gender, residence, educational level, Occupation, number of bedrooms, social class, and sources of water, camp visit, family members of *H. pylori* treated and history of GIT symptoms ($p > 0.05$). However, many studies found a strong association between these factors and *H. pylori* infection, there are also some that did not associate.

The prevalence of *H. pylori* infection of this study was 33.1 %(95% CI: 28.1-38.2) which is comparable with other studies conducted in Nigeria 30.9% (Access, 2012), Ethiopia, Oromia region (39.9%) (Melese *et al.*, 2019), Brazil 35.6%(Paulo *et al.*, 2010). However, this finding is

higher than the national reports and previous studies reported from different countries, Addis Ababa, Ethiopia 25.8%(Ahmed, 2014), in Uganda 24.3%(Aitila *et al.*,2019), in Kassala city Sudan *H. pylori* prevalence was found to be 21.8%(Abbas *et al.*, 2018) and Italy22%(Dore,2002).

The possible reasons for the variations could be due to differences in the methods of detection *H. pylori* infection, geography and socio-economic status. But this finding is lower than similar cross sectional studies conducted in Kenya 73.3% (Salih, 2016), in Egyptian schoolchildren 72.38%(Mohammad *et al.*, 2007), in Turkey 53.9%(Ceylan , 2007), in Iran prevalence of *H. pylori* in children ranges from 10% to greater than 80%(Mashhour *et al.*, 2009b) and Brazil children had prevalence of 73% in all age groups (Sjomina *et al.*, 2018).

The variation of prevalence *H. pylori* infection could be due to differences geographic location, level of exposure to *H. pylori* infection, national health care strategies in *H. pylori* control among countries, population access to health-care facilities and negligence from people who did not know the seriousness of the disease.

Although there was no a statistically significant association with the majority of socio demographic factors, but there was a strong relation with family income ($p < 0.05$), that coincides with other studies indicated that *H. pylori* is apparently related with family income in a studies conducted in Western Australia(Shi *et al.*, 2008), North eastern Brazil(Zaterka, 2006) while contrary study were carried out in Lebanon (Khoder *et al.*, 2021). Although *H. pylori* infection was a statistically significant association with the type of toilet in this study while other studies contradicted with in findings of this study such as studies conducted Addis ababa, Ethiopia(Ahmed, 2014), Somali Regional state Ethiopia(Alebie, 2017) and rural setting in sub-saharan Africa(Awuku ., 2017). The variation could be due to differences of geographic location and life style.

Of those unpracticed hand washing after toilet visit had 3.3 times more likely to have *H. pylori* infection than those practiced hand washing after toilet visit. This result is in lined with a study done in Ethiopia (Melese *et al.*, 2019). And another study conducted Addis ababa, Ethiopia(Ahmed, 2014).There is visible variation in frequency of *H. pylori* infection with respect to absence of flush toilet type and hand washing without soap.

Those children whose families did not have history of GIT symptoms 17% less chance to acquire *H. pylori* infection than whose families had history of GIT symptoms and this study is in lined with study carried out in Ethiopia (Melese *et al.*, 2019). While other study done in Kassala city in Sudan was contradicted with in finding of this study (Abbas *et al.*, 2018). The reason for this difference within the population in different country is largely unknown, but could be due to the difference in socio-economic factors and life style.

The role of individuals for person to person transmission was studied by many researchers and mother to sibling, and transmission among non-family members through close contact for long periods were identified. This study has not found an association between number of bedrooms, family members and *H.pylori* infection ($p>0.05$) which is similar with other recent epidemiologic studies.

Although in developing countries, the most significant associated factor was overcrowded conditions like the study conducted in south western Uganda(Aitila, , *et al.*, 2019) 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 while this study the most significant associated factors reported were not related overcrowded conditions. The higher prevalence rates in developing countries are thought to be a consequence of the socioeconomic conditions (Ahmed, 2014). And this study indicates also socioeconomic factor is an important factor.

And among family members transmission has also a major role for *H. pylori* infection and continuous contact is required for the establishment of such infection. This study is strongly support that the prevalence of *H. pylori* infection in developing countries is higher than the prevalence in developed countries.

5.1. Strengths and limitations

Among the strengths of this study is that it provides an overall picture of the prevalence of *H. pylori* infections in children using the endorsed method stool antigen test in Hargeisa group hospital. Due to the availability of ELISA stool Ag test, the study was supported to rule out *H. pylori* infection in pediatric population because stool Ag test is the appropriate test in pediatrics.

The limitation of this study was lack of quantitative confirmatory test. The test was confirmed by enzyme-linked immunosorbent assay (ELISA) stool Antigen test. Because the Linear *H. Pylori* Ag cassette is limited to the qualitative detection of *H. Pylori* antigen

in human fecal specimen. This study was done in one public pediatric clinic and the data was collected from those clients who came to this clinic during the data collection period. It does not include other pediatric hospitals and clinics in the city of Hargeisa that may underestimate findings. The limitation of the study also was related to study design and sampling technique. The cross-sectional study design could not clearly define the cause-and effect relationship. The convenient sampling technique limits the generalizations of the research findings beyond the population under the study. Therefore, the findings of this study should be interpreted within these limitations.

5.2 Conclusion and Recommendation

5.2.1 Conclusion

H. pylori infection was high among children in the study area. In variables, family income, type of toilets, hand washing habit and hand washing with soap were the associated factors that statistically significant with *H. pylori* infection in the study area.

5.2.2 Recommendation

In this study family income is a significant factor of *Helicobacter pylori* infection among children therefore, enhancement of family income is important by the government and donors. Hand washing habit after toilet visit were positively associated with *H. pylori* prevalence in this study. So, the study is recommended washing hands after toilet visit is mandatory. In variables, type of toilet, hand washing habit and hand washing with soap after toilet visit were the risk factors that statistically associated with *H .pylori* infection in the study area. Thereforeraise awareness about sanitation and hygiene is important. The infection is primarily acquired between the ages of 1 and 5, which is a fairly young age among children in the research area. Therefore, the study is recommended early diagnosis of *H. pylori* infection in the age group is important.

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7. Annexes

7.1: Information sheet and informed voluntary Consent form for the Head of Hargeisa group Hospital

1. Introduction: My name is Yuusuf Haashi Hassan. I am the principal investigator of the study to be conducted in this Hargeisa group Hospital. I am studying for my Master's degree at Haramaya University, the College of Health and Medical Sciences. I kindly request you to lend me your attention to explain you about the study and your institution being selected as the study setting.

2. The study title: Prevalence of *H. pylori* infectionand associated factorsamong children visiting pediatric clinic of Hargeisa group Hospital, Hargeisa, Somaliland.

3. Purpose of the study: The findings of this study can be of a paramount importance for the Hospital to plan intervention programs to prevent childhood acquisition of Helicobacter pylori infection in the community, thereby improve child health and survival in general, Moreover, the aim of this study is to write a thesis as a partial requirement for the fulfillment of a Master's program in the principal investigator.

4. Procedure and duration: I will be interviewing the parents/guardians of the <18 years children using a questionnaire to provide me with pertinent data that is helpful for the study. There are 17 questions to answer where I will fill the questionnaire by interviewing the parents/guardians. The interview on each parent/guardian will take about 20 minutes.

5. Risks and benefits: The risk of participating in this study is very minimal, but only taking few minutes from parent's/guardian's time. There would not be any direct payment for participating in this study. But the findings from this research may reveal important information for the local health planners.

6. Confidentiality: The information that we will be provided will be kept confidential. There will be no information that will identify the participants in particular. The findings of the study will be general for the study community and will not reflect anything particular of individual persons. The questionnaire will be coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the research.

7. Rights: Participation for this study is fully voluntary. The participants have the right to declare to participate or not in this study. If they decide to participate, they have the right to withdraw from from the study at any time and this will not label them for any loss of benefits which they otherwise are entitled. They do not have to answer any question that they do not want to answer. The hospital has also the right to stop this study from being conducted if any misdeeds and unethical procedures are observed during the data collection process in the hospital's premises.

8: Contact address: If there are any questions or enquires any time about the study or the procedures, please contact: **PI:** Yuusuf Haashi Hassan,contact address: Tel:0934004983/+252634254743**,** E-mail:**yuusufxashi368@gmail.com.** As well as contact

address of the responsible Institutional Health Research Ethics Review Committee (IHRERC) at office phone: 0252662011 or P.O.Box 235, Harar, Ethiopia.

9. Declaration of informed voluntary consent: I have read the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating and the contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that participants have have the right to withdraw from the study at any time or not to answer any questions that they do not want. I am also informed that the Hospital has the right to stop this study from being conducted if any misdeeds and unethical procedures are observed during the data collection process in the Hospital's premises. Therefore, I declare my voluntary consent on behalf of Hargeisa goup Hospital management to allow this study to be conducted in the Hospital with my initials (signature).

Name and Signature of Head of the Hospital: _____ Date: _____

Name and Signature of the PI: _____Date:_____

N.B

This is signed face to face in the presence of the PI.

Please provide a copy of this signed consent to the responsible head.

7.2: Participant information sheet and voluntary consent form minor (age<18 years) and must be signed by parents/guardians

1. Introduction: My name_____. I am working as a data collector for the study being conducted in this community by Yuusuf Haashi Hassan who is studying for his Master's degree at Haramaya University, the college of Health and Medical sciences. Your child is randomly selected to be participant in this study. I kindly request you to lend me your attention to explain you about the study and the child's participation.

2. The study title: Prevalence of *H. pylori* infectionand associated factorsamong children visiting pediatric clinic of Hargeisa group Hospital, Hargeisa, Somaliland.

3. Purpose of the study: The findings of this study can be paramount importance for the ministry of Health office to plan intervention programs to prevent childhood acquisition of Helicobacter pylori infection thereby improve child Health and survival in general. Moreover, the of this study is to write a thesis as a partial requirement for the fulfillment of a Master's program in the principal investigator.

4. Procedure and duration: You will take small stool sample of your child by using sterile cup and bring back the stool sample without any contamination as well I will ask you 17 questions about your child that will help us to know the Helicobacter pylori status of the child. This procedure will take you about 20 minutes. Therefore, I kindly request you to spare me this time and allow me to perform this procedure on your child.

5. Risks and benefits: The risk of being participating for your child in this study is very minimal, but only taking few minutes from your time. There would not be any direct payment for participating in this study. But the findings from this research may reveal important information for the local health planners.

6. Confidentiality: The information that we will collect from this study will be confidential. There will be no information that will identify your child or yourself in particular. The findings of the study will be general for the study community and will not reflect anything particular of individual persons or housing. The data that we gather from the measurements will exclude showing names. No reference will be made in oral or written reports that could link participants to the research.

7. Rights: Participation for this study is fully voluntary. You have the right to declare to allow your child to be involved in this study or not. If you would allow your child for this study, you have the right to withdraw him/her from the study at any time and this will not label you/your child for any loss of benefits which you/your child otherwise are entitled. You do not have to answer any question that you do not want as well.

8. Contact address: If there are any questions or enquires any time about the study or the procedures, please contact: **PI: Yuusuf Haashi Hassan**,contact address: Tel:0934004983/+252634254743, E-mail:**yuusufxashi368@gmail.com.** As well as contact

address of the responsible Institutional Health Research Ethics Review Committee (IHRERC) at office phone: 0252662011 or P.O.Box 235, Harar, Ethiopia.

9. Declaration of informed voluntary consent: I have read/ was read to me the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating and the contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that I have the right to withdraw my child from the study at any time or not to answer any question that I do not want. Therefore, I declare my voluntary consent to allow my child to participate (be involved) in this study with my initials (signature).

Name of the participant :_____(Assent affirmed if a minor age of 12-17 years)

Name and signature of parent/legal guardian: _____Date:_____

Name signature of data collector: _____Date:_____

N.B

This is signed face to face in the presence of the data collector.

Please provide a copy of this signed consent to the participant's legal representative.

If the representative (parent/guardian) is lay person and cannot sign initials, can put his/her thumb print in front of a competent witness and the withness have to sign alongside (with his/her name and address).

If the participant is in the age range of 12-17 years, an assent (oral or written) may also be required from the minor on top of the parental/guardian consent.

7.2: Warqada macluumaadka ka qaybqaataha iyo foomka ogolaanshaha ikhtiyaariga ah ee da'da ka yar 18 jirka waana inay saxeexaan waalidiinta/ cida ka masuulka ah

1. Hordhac: Magacaygu_____. Waxa aan xog ururiye ka ahay daraasadda uu bulshadan ka wado Yuusuf Xaashi Xasan oo shahaadada Masterka ka baranayo Jaamacadda Haramaya, kulliyadda caafimaadka iyo caafimaadka. Ilmahaaga si aan kala sooc

lahayn ayaa loo doortay inuu ka qaybqaato daraasaddan. Waxaan si naxariis leh kaaga codsanayaa inaad i amaahiso dareenkaaga si aan kuugu sharaxo daraasadda iyo ka qaybgalka ilmaha.

2. Cinwaanka daraasadda: Baahitaanka caabuqa H. pylori iyo arrimaha la xidhiidha carruurta booqanaya rugta caafimaadka carruurta ee Hargeysa group Hospital, Hargeysa, Somaliland.

3.Ujeedada daraasadda: Natiijooyinka daraasaddan waxay noqon kartaa muhiimadda ugu weyn ee xafiiska wasaaradda caafimaadka si loo qorsheeyo barnaamijyada wax-ka-qabashada si looga hortago helitaanka carruurnimada ee caabuqa Helicobacter pylori si loo hagaajiyo Caafimaadka carruurta iyo guud ahaan badbaadada. Intaa waxaa dheer, daraasaddan waa in la qoro qoraal ahaan shuruudo qayb ahaan looga baahan yahay dhammaystirka barnaamijka Master's ee baaraha maamulaha.

4. Habka iyo muddada: Waxaad ilmahaaga ka qaadi doontaa muunad yar oo saxaro ah adiga oo isticmaalaya koob nadiif ah oo soo celi saxarada iyada oo aan wax wasakh ah lahayn sidoo kale waxaan ku weydiin doonaa 17 su'aalood oo ku saabsan ilmahaaga kuwaas oo naga caawin doona inaan ogaano heerka Helicobacter pylori ee ilmaha. Habkani wuxuu ku qaadan doonaa ilaa 20 daqiiqo. Sidaa darteed, waxaan si naxariis leh kaaga codsanayaa inaad ii tudho wakhtigan oo aad ii ogolaato inaan nidaamkan ku sameeyo ilmahaaga.

5. Khatarta iyo faa'iidooyinka: Halista ka-qaybgalka ubadkaaga daraasaddan aad ayay u yar tahay, laakiin waxay qaadanaysaa daqiiqado yar oo keliya wakhtigaaga. Ma jiri doonto lacag toos ah ka qaybqaadashada daraasaddan. Laakiin natiijooyinka ka soo baxay cilmi-baaristan ayaa laga yaabaa inay daaha ka qaadaan macluumaadka muhiimka u ah qorshayaasha caafimaadka maxalliga ah.

6. Qarsoodi: Macluumaadka aan ka ururin doono daraasaddan waxay noqon doontaa qarsoodi. Ma jiri doono macluumaad si gaar ah u aqoonsan doona ilmahaaga ama naftaada. Natiijooyinka daraasadda ayaa noqon doona mid guud oo loogu talagalay bulshada daraasadda mana ka tarjumayso wax gaar ah oo qof ama guri. Xogta aan ka soo ururinay cabbirada waxay ka reebaysaa muujinta magacyada. Wax tixraac ah laguma samayn doono warbixino hadal ama qoraal ah oo xidhiidhin kara ka qaybgalayaasha cilmi-baadhista.

7.Xuquuqda: Ka-qaybgalka daraasaddan waa ikhtiyaari. Waxaad xaq u leedahay inaad caddayso inaad u ogolaato ilmahaaga inuu ka qaybqaato daraasaddan iyo in kale. Haddii aad u ogolaan lahayd ilmahaaga daraasaddan, waxaad xaq u leedahay inaad isaga/iyada ka joojiso

daraasadda wakhti kasta, tani kuma calaamadayn doonto adiga/ilmahaaga wax khasaare ah oo dheefo ah oo adiga/ilmahaagu haddii kale aad xaq u leedahay. Uma baahnid inaad ka jawaabto su'aal kasta oo aadan rabin sidoo kale.

8. Cinwaanka lagala soo xidhiidho: Haddii aad wax su'aalo ah qabtid ama aad waydiiso wakhti kasta oo ku saabsan daraasadda ama nidaamka, fadlan la xiriir: PI: Yuusuf Xaashi Xasan, ciwaanka: Tel: 0934004983/+252634254743, E-mail: yuusufxashi368@gmail.com. Sidoo kale ciwaanka lagala soo xidhiidho Gudida Dib u Eegista Anshaxa Cilmi Baadhista Caafimaadka ee masuulka ka ah (IHRERC) ee lagala xidhiidho telefoonka xafiiska: 0252662011 ama P.O.Box 235, Harar, Ethiopia.

9. Ku dhawaaqida ogolaanshaha ikhtiyaariga ah ee la wargaliyay: Waan akhriyay/ la ii akhriyay xaashida macluumaadka ka qaybqaataha. Waxaan si cad u fahmay ujeedada cilmi-baarista, hababka, khatarta iyo faa'iidooyinka, arrimaha sirta, xuquuqda ka qaybgalka iyo ciwaanka xiriirka wixii su'aalo ah. Waxaa la i siiyay fursad aan ku weydiiyo su'aalo laga yaabo in aan caddayn. Waxaa la igu wargeliyay inaan xaq u leeyahay inaan ilmahayga ka saaro waxbarashada wakhti kasta ama inaan ka jawaabin su'aal kasta oo aanan rabin. Sidaa darteed, waxaan caddaynayaa oggolaanshahayga ikhtiyaarka ah si aan ugu oggolaado ilmahayga inuu ka qaybqaato (ka qaybqaadashada) daraasaddan oo leh xarfaha hore (saxiixa).

Magaca ka qaybqaataha:_____Ogolaanshaha la xaqiijiyay haddii da'da yar ee 12-17 sano)

Magaca iyo saxiixa waalidka/masuulka sharciga ah: _____Taariikhda:_____

Ogoy:

Middan fool ka fool ayaa loo saxiixayaa iyada oo uu joogo xog-ururiyuhu.

Fadlan sii koobiga ogolaanshahan saxeexan wakiilka sharciga ee ka qaybqaataha.

Haddii wakiilka (waalidka/masuulka) uu yahay qof caadi ah oo uusan saxiixi karin xarfaha bilowga ah, wuxuu ku dhejin karaa suulka hortiisa markhaati karti leh oo waa inuu la saxiixaa (magaceeda iyo cinwaankeeda).

Haddii ka qaybqaataha uu da'diisu u dhaxayso 12-17 sano, ogolaansho (af ama qoraal) ayaa sidoo kale looga baahan karaa ilmaha aan qaan-gaarin ee kor ku xusan ogolaanshaha waalidka/masuulka.

7.3: Questionnaire (data collection form English version)

Haramaya University, College of Health and Medical Sciences, Department of Medical Microbiology.

Questionnaire for the study on "Prevalence of *Helicobacter pylori* infection and associated factors among children visiting pediatric outpatient department of Hargeisa group Hospital, Hargeisa, Somaliland.

I request kindly to give me appropriate response for each question. Your response will be kept confidential

Master of Medical Microbiology Program

Questionnaire ID. NO_____

Address district_____

Name of the hospital_____

Date of interview_____

Part I. Socio-demographic characteristics		
S/N	Questions	Response
1	Sex of the children	1. Male……. 2. Female…….
2.	Age of the children in years	Age……
3.	Residence	1. Urban……. 2. Rural…….
4.	Educational status of parent/ guardian	1. Unable to read and write……. 2. Read and Write…… 3. Primary to secondary…….. 4. College to University……
5.	Occupation of the parent/ guardian	1. Employed……. 2. Unemployed…….
6.	How much is your monthly income in S/land Shilling?	1.1000000-3000000……. 2. 4000000-6000000…… 3. 7000000-9000000…… 4. D. 10000000

		and above…….
Part II. Behavioral and environmental characteristics		
7.	How many family members live within the house?	1. 1–4…….. 2. 5-8…… 3. **>8**……
8.	How many bedrooms do you have in the house?	1. 1-2….. 2. 3-4…….. 3. >4……
9.	Social Class of Parents	1. Lower …….. 2. Middle…….. 3. Upper……
10.	What is your water Source for drinking?	1. Tap water……. 2. Water tanker…….. 2. Bottled water….....
11.	What type of toilet uses in your house?	1. Pit latrine…….. 2. Flush toilet…….
12.	What is your hand washing habit?	1. Always…… 2. Seldom…… 3. Often …… 4. Never……
13.	Have you gone to a camp in the last six months?	1. Yes…….. 2. No…….
14.	Do you wash your hands with soap after visiting the toilet?	1. Always……. 2. Often……... 3. Seldom……. 4. Never…….

14.	Do you wash your hands with soap after visiting the toilet?	1. Always……. 2. Often……... 3. Seldom……. 4. Never…….
Part III. Clinical and laboratory related questions		
15.	Have any one of your family members been treated for H. pylori infection?	1. Yes…….. 2. No……...
16.	Do you have any family history of GIT symptoms and *H. pylori* infection?	1. Yes…….. 2. No……
17.	*H. pylori* diagnosis test result (stool antigen)	1. Positive……. 2. Negative……..

7.3: Xog waraysi (Foomka xog ururinta qaybta af soomaaliga ah)

Jaamacadda Haramaya, Kuliyadda Caafimaadka iyo Sayniska Caafimaadka, Waaxda Caafimaadka barashada xanuun sababayaasha ilma qabatayda ah.

Su'aalo ku saab san "Baah sanaanta caabuqa Gaastariga (*Helicobacter pylori)* iyo arrimaha la xidhiidha ee carruurta yimaada qaybt caruurta ee bukaan socod ka Cusbitaalka wayn ee Hargeysa, Hargeysa, Somaliland.

Lambarka aqoonsiga sualaynta:_____

Magaca Cusbitaalka:_____

Taariikhda lawaraysanayo:_____

Qaybta 1. Dhaqanka iyo dabeecadaha		
S/N	Suaalo	Jawaabo
1.	Jinsiga caruurta	1. Lab…… 2. Dhedig…….
2.	Dada caruurta	1. Da'da……..
3.	Meesha uu deganyahay	1. Magaalo…….. 2. Miyi…….
4.	Heerka waxbarasho ee waalidka/ilaaliyaha sharciga ah	1. akhrin karin waxna qori karin…… 2. Akhriya waxna qori kara …… 3. Dugsiga hoose ilaa dugsi sare…… 4. Heer jamacadeed…….
5.	Shaqada waalidiinta/ ilaaliyaha sharciga ah	1. Shaqeeya …… 2. Aan shaqayn……
6.	Waa imisa dakhligaagu bishii S/land Shilling?	1.1000000-3000000……..

		2.4000000-6000000…….. 3. 7000000-9000000……. 4. D. 10000000 and above……..
Qaybta II. Astaamaha dhaqanka iyo deegaanka		
7.	Immisa xubnood ayaa ku nool guriga?	1. 1–4…….. 2. 5-8…….. 3. >8…….
8.	Immisa sariirood ayuu gurigu leeyahay?	1. 1-2…….. 2. 3-4…… 3. >4……
9.	Heerka Bulshada ee Waalidiinta/ilaaliyaha sharciga ah	1. Hoose…… 2. Dhexe……. 3. Sare……
10.	Waa maxay Isha biyaha aad ka hesho?	1. Biyaha qasabada…… 2. Biyaha booyada …….. 3. Biyaha caagada…….
11.	Waa maxay nooca musqul ee lagu isticmaalo gurigaaga?	1.musqul god ah ……. 2. musqul fijaan leh ……
12.	Waa maxay caadadaada gacmo-dhaqashada?	1. Had iyo jeer…….. 2. Dhif ah…….. 3.Badanaa…… 4. Marna …….
13.	Ma tagtay xero lixdii bilood ee ugu dambeysay?	1. Haa……. 2. Maya……

14.	Ma ku dhaqdaa gacmaha saabuun kadib markaad musqusha booqato?	1. Had iyo jeer……. 2. Badanaa……. 3. Naadir…….. 4. Marna……..
Qaybta III. Su'aalaha la xidhiidha caafimadka iyo shaybaadhka		
15.	Mid ka mid ah qoyskaaga ma laga daaweeyay caabuqa H.pylori?	1. Haa…… 2. Maya…….
16.	Miyaad leedahay taariikh qoys oo calaamadaha tuunbada caloosha ah iyo caabuqa *H. pylori*?	1. Haa……. 2. Maya……..
17.	Natiijada baaritaanka ogaanshaha *H.pylori*	1. Laga helay…….. 2. Laga waayay……

7.4: Test procedure for *Helicobacter pylori* stool Antigen

1. Bring all reagents and sample and do not open punches until ready to perform the assay.
2. Remove the applicator stick from the diluent tubes/sample collectors. Insert and turn the stick into feces at different sites.
3. Re-insert the applicator stick into the diluent tubes/sample collectors, screw the cap and shake the tube vigorously to mix the sample well.
4. Remove the test card from the foil pouch and place on a clean dry surface.
5. Rotating clockwise to loosen the lid of diluent tubes/sample collectors cap.
6. Dispense 2 drops (100µl) of sample or control into the circular sample well on the card.
7. Interpret the test results at 15-20 minutes and do not interpret the results after 20 minutes.

7.5: Curriculum vitae

Personal details

Mr. Yuusuf Haashi Hassan

Address: Hargeisa, Somaliland

Nationality: Somalilander

Language(s): Somali, English and Arabic

Telephone: (+252) 63-4254743/(+251)0934004983

E-mail: yuusufxashi368@gmail.com

Profile

- I have progressive years of experience of teaching and training experienced, driven medical analyst with a notable background of managing huge of different complex projects for different organizations to provide analysis, advice & support within the organizational departments which are involved medical.
- 4 years' experience with international non-governmental and governmental organizations
- In-depth knowledge in the areas of infectious diseases, laboratory, operations, safety, security and quality control Systems.

Educational background

Qualification	Institutions	Subject	Year
Bachelor degree of biomedical and medical laboratory science	University of Hargeisa, Somaliland	Medical laboratory	2014-2018
GCSE Somaliland	Abuhuriara secondary school,Hargiesa	Science stream	2010-2014
Somaliland certificate in primary school	Omer binu abdiaziz	Intermediate	2002-2010
Certificate	Universal institute	English	2010

Diploma	Tisqaad computer science	Computer	2014
Certificate	Muslim college	Fundamental nursing	September 2017
Certificate	University of Hargeisa	Statistical package social science(SPSS)	2018
Certificate	Frantz Fanon university	Water, Sanitation and Hygiene	2019

Tasks and responsibilities

- ✓ Conduct chemical analyses of body fluids, such as blood or urine, using microscope or automatic analyzer to detect abnormalities or diseases and enter findings into computer.
- ✓ Analyze the results of tests or experiments to ensure conformity to specifications, using special mechanical or electrical devices.
- ✓ Set up, maintain, calibrate, clean, and test sterility of medical laboratory equipment.
- ✓ Prepare standard volumetric solutions or reagents to be combined with samples, following standardized formulas or experimental procedures.
- ✓ Collect blood or tissue samples from patients, observing principles of asepsis to obtain blood sample.
- ✓ Keep abreast of developments in the field by reading current literature, talking with colleagues and participating in professional conferences.
- ✓ Supervise laboratory sessions

Work experiences

- ✓ Lecturer at Rift valley university
- ✓ Lecturer at Alpha university
- ✓ 3 years worked Gargaar laboratory and pharmacy.
- ✓ 3 months pharmacy internship of Maamuus pharmacy, Hargeisa
- ✓ 1 year laboratory internship of Hargeisa general hospital.
- ✓ 4 year mainly Biology, home teaching classes and backup studies at home.

Skills

- ✓ Excellent communication skills and sociable Interaction.

- ✓ Keen to work in any pressure and circumstances that enables me to achieve my goals and attitudes.
- ✓ Honesty, sincerity and commitment.

Volunteer experience or community involvement

National election commission (NEC)	Somaliland card distribution Somaliland presidential election Somaliland election awareness Somaliland election preparation of national cards

Languages

English	Advance
Somali	Advance
Arabic	Intermediate

7.6: Approval sheet

HARAMAYA UNIVERSITY

SCHOOL OF GRADUTE STUDIES

Submitted By:

Yuusuf Haashi Hassan Signature _____ Date_____

Name of the student

Approved by:

Dr. Kedir Urgesa Signature_____ Date_____

1. Name of major advisor

   Dr. Desalegn Admassu Signature _____ Date_____

2. Name of co-advisor

3. Research thematic area Signature_____ Date_____

4. Chairman, DGC/SGS Signature_____ Date_____

5. PGPD Signature_____ Date_____

6. Name of Internal examiner

Dr. Getachew Signature_____ Date_____

7. Name of external examiner

Dr. Agumas Signature_____ Date_____