

**PREVALENCE AND ASSOCIATED RISK FACTORS OF *helicobacter pylori* INFECTIONS AMONG PATIENTS ATTENDING ROTOM HOSPITAL, MUHANGA IN RUKIGA DISTRICT**

**BY**

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## DECLARATION

I Niwagaba Andrew, declare that this research project report is truly mine, my own compilation and has never been submitted to Makerere University or any other institution for a ward of a degree.

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## APPROVAL

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## **DEDICATION**

I diligently dedicate it to my parents, Mr. Rwabambari Borniface and Mrs Rwabambari Evas. Siblings Ainembabazi Agnes and Muheki Justus, cousins CPA Rollings Nyesigomwe, best friends Turyahebwa Vicent, Auk Innocent, Atuhe Ezra etc upon their guidance and care rendered to me. My fellow laboratory scientists with whom we have stood together in the academic journey from the genesis of it all.

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GOD BLESS YOU ABUNDANTLY.

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## **LIST OF ABBREVIATION AND ACRONYMS**

<b>PPE</b>	Personal Protective Equipment
<b>e.g</b>	for example
<b>i.e.</b>	That is to say
<b>WHO</b>	World Health Organization
<b>e.t.c.</b>	Among others
<b>SOPs</b>	Standard operating procedures
<b>MALT</b>	mucosa-associated lymphoid tissue
<b>ARR</b>	International Agency for Research

## KEY DEFINITIONS

**Prevalence:** proportion of a population found infected (diseases) at a given time

**Risk Factors:** Factors or behaviour that increases the chance of acquiring disease

***H. Pylori:*** Gram negative bacteria that colonize the stomach lining

**Gastric cancer:** long term *H. Pylori* infection

**Gastritis:** inflammation caused by *H. pylori* in the stomach lining

**Peptic ulcers:** sores develop on the stomach duodenal lining

## ABSTRACT

*Helicobacter Pylori* is a spiral gram-negative pathogenic bacterium causing inflammation of the stomach tissues leading to gastric ulcers. *H. pylori* are associated with cause of gastric cancer proven through a variety studies. Higher prevalence in developing countries and over 50% worldwide causes global public health problem throughout life.

The study aimed at determining the prevalence and associated risk factors of *H. pylori* infections among patients attending ROTOM Hospital, Muhanga in Rukiga district.

**Methods:** A hospital based cross-sectional study was conducted for patients attending ROTOM Hospital Muhanga in Rukiga district from December 2024 to March 2025 and data obtained was analysed stata.

**Results:** In a total of 379 participants included in the study, among them, 221 (58.3%) tested positive, and 158 (41.7%) tested negative for *H pylori* infections. Female participants (143) had many cases of *H pylori* infections indicating 59.7% almost the same with males presenting 59.1 % (78 cases) of *H pylori* infections. The highest prevalence was among (60-79) age group having 79 cases (69.3%), age group 20-39 with 41cases (56.2%), then 40-59 age group with 38 cases (46.9%) and lastly those with  $\leq 19$  years with 29 cases (43.3%).

**Conclusion:** Prevalence was 58.3% which was high meaning a certain high percentage of population is afflicted with *H. pylori* infections, a serious public health concern that can lead to a variety of gastrointestinal problems. Therefore, healthcare workers could provide health education on the aforementioned risk factors, the government and other stakeholders could improve the source of drinking water in the area. The need for further studies to a better understanding of the epidemiology of *H. pylori* infection, which is helpful in diagnosis and prevention of diseases.

**Keywords:** prevalence, *Helicobacter Pylori* and risk factors

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Back ground

*Helicobacter Pylori* is a spiral gram-negative pathogenic bacterium, *H. pylori* are a 0.5-1  $\mu\text{m}$  wide, 2-4  $\mu\text{m}$  long, short helical and its infections cause inflammation of the stomach tissues leading to gastric ulcers. If not treated properly, it can result in a lifelong infection or predispose individuals to gastric cancer. *H. pylori* is the most common cause of gastric cancer, however, its association with gastric cancer has been proven through a variety of studies. The prevalence of *H. Pylori* infections is higher in developing countries. *H. Pylori* infections are a global public health problem, affecting over 50% of the population worldwide Infections are thought to occur early in life (during childhood) (Aitila *et al.*, 2019).

*Helicobacter pylori* were first identified in the stomach of dogs as a spiral microorganism by Giulio, in 1892. As they are campylobacter-like spiral microorganisms, they were named campylobacter pyloridis by Barry Marshall and Robin Warrenin, 1983. "*Helicobacter pylori*" has a helical structure and is mostly found in the pyloric region of the stomach Godwin *et al*, 1989. The relationship between *H. pylori* and gastric cancer was investigated in 1991 and 1994, and the International Agency for Research (ARR) on Cancer, a branch of the World Health Organization, reported that *H. pylori* is carcinogenic in humans, which was reconfirmed in 2009 on the basis of epidemiological data. In the United States, the National Institute of Health reported in 1994 that *H. pylori* may be the primary cause of peptic ulcer disease and should be treated. Marshall and Warren were awarded the Nobel Prize in 2005 for their work on *H. pylori* in the field of philosophy "for discovering the role of *H. pylori* bacteria in gastritis and peptic ulcer disease." *Helicobacter pylori* is a common pathogen with about 50% of the world population infected. This infection is more prevalent in developing countries and it has been associated with poverty and social deprivation. Different risk factors include overcrowded households, institutionalization, poor sanitation, and poor water supply.

The infection has been associated with peptic ulcer disease, dyspepsia, idiopathic thrombocytopenic purpura, investigated iron deficiency anemia, and non-cardiac gastric cancer. Duodenal ulcers often appear between ages 30 and 50 years and are more common in men, but stomach ulcers often after the age of 60 years. The prevalence of ulcers over the last decades has decreased. Mongolia has the second highest incidence of gastric cancer

worldwide. According to the national health indicator data, digestive system diseases are the second most common disease among Mongolian population. Moreover, ulcerative disease complications such as bleeding and life threatening (Khasag *et al.*, 2018).

Globally, infection with *H. pylori* is associated with several upper gastrointestinal diseases including gastritis, dyspepsia, peptic ulcer, duodenal ulcers, and gastric cancers such as mucosa-associated lymphoid tissue (MALT) lymphoma and gastric adenocarcinoma. In addition, idiopathic thrombocytopenic purpura and iron deficiency anemia have also been associated with *H. pylori* infections.

In Uganda, particularly in divisions of Kampala city, few studies have been done on the prevalence of this common infection especially in corporate clinics such as Africa Air Rescue (AAR). These clinics provide medical services to mostly middle-income and high-income classes of people. Regardless of economic status, *H. pylori* infections eject are adverse or even irreversible when poorly managed. However, there is still scanty information on trends and burden of *H. pylori* in urban areas such as Kampala especially among the elite people that seek medical care at AAR clinics and hence the need of this study (Namyalo *et al.*, 2021). It's upon this background, given the significant association between *H. pylori* infections and gastrointestinal disorders, the lack of understanding regarding its prevalence, risk factors and barriers to healthcare access among people warrants an investigation to inform evidence-based intervention.

## **1.2 Problem Statement**

Despite the advancements in medical research, *H. pylori* infections continue to be a global health concern affecting diverse populations particularly in developing countries. Despite the prevalence and association with various gastrointestinal diseases of *H. pylori* infections among the patients attending ROTOM Hospital, Muhanga remain high, there's limited data on the prevalence and risk factors of *H. pylori* infections among the patients attending health facilities in Rukiga particularly ROTOM Hospital So, this study aims to investigate the prevalence and identify the risk factors of *H. pylori* infections among patients attending ROTOM Hospital in Muhanga, Rukiga district, to inform evidence based prevention and control strategies. The findings of this study will contribute to the development of effective public health policies and interventions aimed at reducing the burden of *H. pylori*-related diseases in Rukiga.

## **1.3 Research Objectives**

### **1.3.1 General objective**

To determine the prevalence and associated risk factors of *H. pylori* infections among patients attending ROTOM Hospital, Muhanga.

### **1.3.2 Specific Objectives**

To determine the prevalence of *H. pylori* infections among patients attending ROTOM Hospital, Muhanga.

To determine associated risk factors of *H. pylori* infections among patients attending ROTOM Hospital, Muhanga.

## **1.4 Research questions**

1. What is the prevalence of *H. pylori* infections among patients attending ROTOM Hospital, Muhanga?
2. What are the associated risk factors of *H. pylori* infections among patients attending ROTOM Hospital Muhanga?

## **1.5 Significance of the study**

The prevalence of *H. pylori* infections is increasing especially in developing countries attributed by poor hygiene and sanitation leading to the more cases of the *H. pylori* infections. Therefore, this study will provide necessary data to manage the *H. pylori* infections and also highlight the associated risk factors with *H. pylori* infections among the patients attending ROTOM Hospital Muhanga in Rukiga district.

## **1.6 Justification of study**

The improved management of patients and early detection of associated serious diseases like chronic gastritis and peptic ulcers hence preventing complications, reduce treatment costs and avoid misuse of antibiotics that may lead to antimicrobial resistance

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Understanding of *H. pylori*

*Helicobacter pylori* is a flagellated microaerophilic gram-negative bacillus with spiral shape that colonizes the gastric mucosa causing gastroduodenal diseases such as peptic ulcer, chronic gastritis, atrophic gastritis and gastric cancer Ami, Patel, 2017. *H. pylori* occurs when *H. pylori* bacteria infect your stomach. This usually happens during childhood. A common cause of stomach ulcers. Most people don't realize they have *H. Pylori* infection because they never get sick from it. A peptic ulcer is a sore lining of the stomach or first part of small intestine. The presence of *H. pylori* in saliva, dental plaque and feces indicate that person to person spreading is probably a major transmission mechanism of *H. pylori* (Article *et al.*, 2012).

#### 2.2 Epidemiology of *H. pylori*

A prospective epidemiological survey of *H. pylori* infections was accomplished in 2008 and 2009 involving 516 asymptomatic individuals of Barakaho, Islamabad, Pakistan. Data were obtained by questionnaire. The high prevalence of *H. pylori* infections in Pakistan's population comparable to the data from developing countries (Article *et al.*, 2012). Although the mode of transmission of *H. Pylori* is not known exactly, it is thought that it can be transmitted directly from one person to another or indirectly from the environment to people. Person-to-person transmission is thought to be the primary mode of transmission in developed countries and *H. Pylori* infections spreads more rapidly in areas with poor hygienic conditions. (Öztekin *et al.*, 2021).

Using a cross-sectional design, *H. pylori* infection was assessed by the *H. pylori* antibody test among 181 respondents attending Butemba Health center iii in Kyankwanzi. Data was collected by face-face interviews using a questionnaire. Association between *H. Pylori* and risk factors associated were analyzed using logistic regression. The overall prevalence of *H. Pylori* was 29.2%. However, the infection was highest (54.14%) in the age of 18-30 years study participants, followed by 31-40 years (45.8%). *H. Pylori* was associated with smoking of cigarettes, drinking alcohol, poor sanitation were also independently associated with *H. pylori* infection.(Iii & District, 2010).

A cross-sectional study at Holy Innocents Children's Hospital Mbarara, south western Uganda, (1-15 years) a total of 304 participants who presented with gastrointestinal complaints were recruited into the study from January to August 2017. The participants were recruited using simple randomization technique. The prevalence of *H. pylori* infection increased with increase in age from 16.2%, 27.2% and 36.7% for children aged 1-5 years, 6-10 years and 11-15 respectively. The trend is similar to what was demonstrated in other studies where infection rates increased with increase in age (Aitila *et al.*, 2019).

### **2.3 Clinical signs and symptoms of *H. Pylori***

Epigastric pain and bloating were the highest symptoms. A statistical analysis done in Indonesia using the chi-square test showed that there was no significant difference between the positivity of *H. pylori* infection with variables relating to gastrointestinal symptoms and past illness history. (Syam *et al.*, 2015).

Since the immune system is triggered by *H. pylori* infection, some inflammatory cytokines such as tumor necrosis factor  $\alpha$  (TNF- $\alpha$ ) and leptin and adipokines create an immune response to this inflammation. Relevant studies have revealed that leptin deficiency can induce an insulin resistance of high TNF- $\alpha$  and IL-6 levels. Inflammatory cytokines induce the phosphorylation of serine residues of insulin receptor substrate, causing disruption of insulin function and disrupting the substrate interaction with insulin receptors. Thus, diabetes can occur with a deterioration in blood glucose regulation. (Öztekin *et al.*, 2021).

There are several illnesses caused primarily by *H. Pylori* infections such as chronic gastritis, gastric ulcers, duodenal ulcers, and gastric adenocarcinomas. Extraintestinal manifestations are due to systemic sub-clinical inflammation caused by *H. pylori* (Elbehiry *et al.*, 2023).

### **2.4 Diagnosis of *H. Pylori* infections**

A variety of diagnostic approaches, there are several types of tests, the selection of which is based on the availability of the tests, the tools available and the medical needs of the hospital. The diagnostic testing can be performed with both invasive and noninvasive techniques. Examples of noninvasive techniques are serological, stool antigen, and breathe tests, whereas invasive techniques include endoscopy, histopathological analyses quick urea test, cultures and PCR tests. In addition to invasive and noninvasive procedures, molecular tools such as PCR, real-time PCR, fluorescence in situ hybridization and mass fingerprinting are commonly used (Elbehiry *et al.*, 2023).

#### **Invasive tests of diagnosing *H pylori***

### **2.4.1 Endoscopy**

This technique has been established to be effective in patients who do not exhibit any new worrisome symptoms or signs of any digestive disorder. Distinct characteristics are associated with gastritis, including inflammation, shrinkage, and intestinal metaplasia, which makes diagnosis difficult. Recent techniques for endoscopic imaging combine blue laser imaging with linked color imaging. All of the investigation, results indicate that blue laser magnifying endoscopy and linked color imaging greatly improves the endoscopic method. Blue Laser imaging is the most accurate technique for determining tumor formation. Endoscopes with magnifying capabilities allow for significant improvements in collecting biopsy samples, for example, with narrowband endoscopy or blue light endoscopy (Elbehiry *et al.*, 2023).

### **2.4.2 Culture techniques**

The microbiological culture method can diagnose *H. Pylori* infections with less sensitivity but more specificity than other methods this approach has also been found to provide evidence of active infection, which is advised whenever treatment fails and is a method for identifying Fluoroquinolones and clarithromycin resistant *H. pylori*. *H. pylori* infections are diagnosed according to its phenotypic characteristics, Gram staining, biochemistry and peptide mass fingerprinting technology if available in the laboratory. The performance of microbial sensitivity tests depends on several variables, the diagnostic specimen standards, duration of transportation, aerobic conditions and the quality of biopsy samples (Elbehiry *et al.*, 2023).

### **2.4.3 Histopathology**

Infection with *H. Pylori* was first identified by histopathological examinations. Several factors affect the diagnostic precision of histopathology, including specimen position and thickness, staining techniques, proton pump inhibitors, antimicrobials and the pathologist reviewing the specimens. Biopsy samples are taken from different sites. When biopsy is performed, numerous samples are taken from the distal and middle regions of stomach. Hematoxylin and Eosin staining (H &E), Giemsa staining, *H. pylori* silver staining, and immunohistochemistry are widely used staining methods in practice. Giemsa staining has higher specificity and lower false positive rate but a lower sensitivity than H &E (Elbehiry *et al.*, 2023).

### **Noninvasive tests of diagnosing *H pylori***

#### **2.4.4 Random diagnostic test (RDT)**

Rapid diagnostic tests (RDT) are commonly used to detect some kind of viruses or bacteria instead of invasive methods. *Helicobacter pylori* (*H. Pylori*) which causes gastric cancer, peptic ulcer, gastritis, mucosa-associated lymphoid tissue lymphoma diseases can be detected easily with lateral flow strip (LFS) that is one of the RDT types. The tests are evaluated whether there are control line and test line at the region of interest (ROI) by users or microbiology technicians manually. Once the test line is tentative, despite the test must be reported positive, it can be resulted as negative incorrectly. This incorrect diagnose causes incorrect treatment planning (Ozkan, 2017).

#### **2.4.5 Stool Antigen Tests (SATs)**

Using enzyme immunoassays or immunochromatography, one can determine whether saliva, blood or stool contains an antigen induced by *H. pylori* infections. An SAT is often used as it is a better alternative to invasive procedures in the diagnosis of active *H. pylori* infections. The submission of stool sample is a primary importance when using this test in epidemiological research, particularly in areas without freezing equipment and especially in areas with limited access to standard lab equipment. The stool sample should be kept at low temperatures if they are not examined within a short period of time. A temperature of -80°C is recommended for any samples that will be stored over a long period of time to keep the antigen stable (Elbehiry *et al.*, 2023).

#### **2.4.6 Faecal Occult Blood test**

Fecal occult blood test was performed using JDL occult blood test kit (Jonimedics, Enugu, Nigeria). Hemoglobin or its iron derivatives catalyze the oxidation of a non-carcinogenic chromogen (JDL chromogen) to a pink color in the presence of peroxide. The kit comprises of:

- Solution A
- Solution B
- Thick glossy paper
- Buffer

A little portion of the stool sample was emulsified in 2 drops of the buffer on the glossy paper. Positive control was prepared by adding 0.05 ml of blood to 2 liters of distilled water. The buffer was used as negative control. Two drops of each control were put on separate glossy

paper and treated the same way as the test samples. A drop of solution A was added and followed by a drop of solution B. It was examined for development of color at 2 minutes.

### **Interpretation of result**

Development of pink color indicates positive test for occult blood while absence of pink color indicates negative test for fecal occult blood (Rockey, 1999). The reaction with intact red cells probably from lower GIT bleeding occurs very slowly while the reaction with digested blood (as in ulcer conditions) is rapid. Therefore, the result should not be read beyond 2 minutes.

#### **2.4.7 Urea Breath Test (UBT)**

Urea Breath Test measures then ratio of carbon-13/14 isotopes in exhaled air before and after consumption of the radioactive urea based on *H. pylori* urease activity. By converting urea to ammonia, urease which is secreted by *H. pylori*, balances the pH of the stomach, allowing it to pass through mucus and attach to its cells. During prior to test, proton pump inhibitor and antimicrobial treatment should be discontinued.

#### **2.4.8 Serological testing**

Serological testing like ELISAs is used to measure antibody levels against *H. pylori* immunoglobulin G (IgG). IgG antibodies are produced during *H. pylori* infection and remain elevated for approximately one year before they return to normal levels. The serological screenings are sensitive between 55.6-100% and specific between 59.6-97.9%. Though they are not helpful in areas where infection rates are low.

#### **2.4.9 Molecular tests**

PCR or real-time PCR testing can detect *H. Pylori* in the stomach, digestive fluid, saliva, and dental plaque and stool samples. As a result of high specificity and sensitivity, PCR testing is an excellent method to detect *H. pylori* quickly and more safely. The PCR-based restriction fragment method length polymorphism can be applied to distinguish among *H. pylori* subtypes (Elbehiry *et al.*, 2023).

### **2.5 Treatment of *H. pylori***

It has been over a decade since *H. pylori* was first detected, and in the last few years, immense advances have been made in both diagnostic and therapeutic methods for the treatment of patients with *H. pylori*. The development of nanoparticles over the last few years has been one of the most exciting developments in the field of therapy and diagnosis. The

nanoparticles have the potential to assist in the replacement of expensive and invasive endoscopic procedures with no-cost, less invasive alternatives in the near future. In this regard, the use of a biosensor is one of these technologies as a biosensor will be able to produce audible signals by converting distinctive biological components connected to a transducer surface. This method provides accurate and precise results and allows accurate diagnosis of disorders. (Elbehiry *et al.*, 2023).

Infection treatment is carried out with a combination of antimicrobial agents and antisecretory agents and gastric pH must be increased with antisecretory agents to achieve the bactericidal effect of antimicrobial agents. Alternatively, herbal medicines and probiotics are used as a complementary therapy to help eradicate *H. pylori*, although their mechanism of action is not yet clear. The increasing prevalence of antimicrobial resistance in *H. pylori* from person to person has led to the failure of eradication therapy with decreased compliance with clinical nutrition therapies.

In the treatment of *H. pylori*, drug resistance can easily develop against antibiotics used alone, so the recommended treatment is a combination of several antibiotics. Many antimicrobial agents, antisecretory agents, and proton pump inhibitors are used in the *H. pylori* treatment protocol, including clarithromycin, amoxicillin, levofloxacin, metronidazole, tetracycline, rifabutin, and bismuth-containing compounds. According to several international guidelines, first-line therapy for the treatment of *H. pylori* infections is a triple therapy consisting of a clarithromycin antibiotic given for 7–14 days, using any antibiotic from amoxicillin or metronidazole, and a PPI or ranitidine bismuth citrate. If the treatment is not successful, second-line treatment is started. This treatment is carried out according to individual antibiotic resistance and sensitivities, or experimentally. Second-line therapy is usually designated as tetracycline, metronidazole, a bismuth salt, or PPI. After failure of the second-line treatment, antimicrobial susceptibility test should be performed on the *H. pylori* culture from which the gastric biopsy was taken, and local resistance to antibiotics should be taken into account and treatment should be continued (Öztekin *et al.*, 2021).

## **2.6 Prevention and control**

Public health and the environment are at risk because of the high prevalence of infection with *H. pylori* and the extent of its pharmaceutical treatment. Efforts should be made to find alternative methods of treating and preventing *H. pylori* infections. Strategies for preventing and treating *H. pylori* infection which can serve as a guide for the eradication of *H. pylori*. To

combat *H. pylori*, current tactics include making an accurate diagnosis and providing consistent treatments, using antimicrobial drugs and preventing *H. pylori* spread. The control of *H. pylori* infections can be achieved through preventive measures. By implementing appropriate prophylaxis, infection can be reduced effectively. Identifying and treating drug resistant infections efficiently and consistently are crucial for limiting recurrence and increasing *H. pylori* clearance rates. Whether invasive or noninvasive diagnostics are the key to quick and accurate identification.

To create logical, precise therapeutic interventions, antimicrobials should be selected according to the resistance of microorganisms to antimicrobials. Potent antibiotics play a critical role in avoiding and treating *H. pylori*. Initially, proton pump inhibitors are used in conjunction with two or three drugs for three to fourteen days to treat diagnosed *H. pylori* infections. In various important protocols, antimicrobial resistance rates are crucial factors in determining which therapy to use first. It is also advised to avoid reusing pharmaceutical drugs from first therapies in later therapies since this could lead to a buildup of antibiotic resistance (Öztekin *et al.*, 2021).

## **2.7 Associated Risk factors of *H. pylori***

*H. pylori* are the most common pathogen of the human gastric tract and the causative agent for various pathologies, including chronic gastritis and peptic ulcers, and contributes to gastric cancer development. *Helicobacter species* are subdivided into two major groups: gastric and enteric. Indeed, gastric *Helicobacter species* is considered as the most successful human pathogen, which is *H. pylori*. The infection is mostly acquired during childhood period and remains for decades and may be a lifelong infection. The severity of the clinical outcome of *H. pylori* infection is mainly influenced by the complex interaction between the host, its environment, and bacterial factors in a specific population (Arabia, 2020).

A number of studies have found poor hygiene standards, crowded households and deficient sanitation are important to both acquisition of infection in childhood and spreading of the disease. Lower socioeconomic status, non-filtered water, and smoking to be a risk factor for *H. pylori* (Article *et al.*, 2012).

### ***H. pylori* and Gastric Cancer.**

The outcome of *H. pylori* infections can be atrophic gastritis that can cause gastric carcinoma, or it can remain localized and limited to duodenal ulcer disease. The most significant factor that governs this outcome is controlled by the polymorphisms or mutations

present in the genes of the host. These mutations regulate the intensity of the inflammation in the gastric tissue that impacts the risk of specific clinical effects and Outcomes. Several studies have shown a nexus between *H. pylori* and gastric lymphoma; however, the most intriguing one is by an earlier intriguing study. According to the findings of this study among patients suffering from this type of stomach cancer, CagA protein is the deciding factor.

Histologically, stomach lymphomas can be either low-grade lymphoma of MALT type (LGLM) or diffuse large B-cell lymphoma (DLBCL). It was observed that, among the 53, patients evaluated in the study being discussed here, 45 were *H. pylori*-positive, thus reflecting an association of the bacteria with this type of cancer. Importantly, the majority of the patients having DLBCL were cagA-positive.

It has also been reported that the clinical symptoms and presentation of the infection of *H. pylori* determine the pattern and seriousness of gastritis. An example is individuals who are *H. pylori*-infected and live in areas where seasonal diets are typical dietary ingredients. In these areas, there is a long period without the availability of fresh vegetables and fruits along with food preservation by using salt and smoking, which are found to be at a higher risk of developing progressive gastric atrophy. Progressive atrophy of the stomach is associated with gastric ulcers and gastric cancer, and those individuals are more prone to develop gastric cancer due to *H. pylori* infections at some stages of their life. In contrast to these findings, the availability of fresh fruits and vegetables in some regions of the world, including South Asia, Africa, and South India, has revealed a relatively lower incidence of gastric cancer as a result of *H. pylori* infections, which mostly lead to duodenal ulcer and related complications instead. A variety of other factors define the risks of gastric cancer in *H. pylori* patients. These factors are widely studied and are discussed in the following.

### **Family History.**

There exists a strong relationship between gastric cancer and the family history of interaction with *H. pylori* infection leading to the progression of gastric cancer. A definitive interaction occurs at the genomic and physiological level between the genetic risk factors of gastric cancer and *H. pylori* pathogenesis; this is relatively higher among individuals with a positive family history of the infection as compared to those without exposure. Persons with a family history of *H. pylori* infection are at a 5-fold increased risk of developing gastric carcinoma at some stage in their lives. Along similar lines, a recent study manifests that having one of the parents who has gastric cancer enhances the chances of acquiring this type of cancer.

## **Virulence Factors.**

There are many traits and features of *H. pylori* that make it a potent carcinogen. First, it invades and infects the body like a regular pathogen and causes inflammation in its target tissues. However, there are specific mechanisms of pathogenesis that may lead to serious health consequences, including gastric cancer. Important pathogenic factors include its potent virulence factors and cell damaging molecular mechanisms. Due to its pathogenesis, gastric cancer is recognized as a model for inflammation induced cancer. Several studies have been conducted to understand the mode of action of *H. pylori* on gastric tissues and their cancer-causing effects. Virulence factors are considered as additional pathogenic factors of an invading microbe that increase the cellular damage of the host. Several reports have investigated the virulence factors of *H. pylori* and their potential role in triggering gastric cancer. According to Yamaoka and Graham, the most important virulence factors of *H. pylori* are CagA, VacA, and OipA. CagA is a potent immunogenic protein. *H. pylori* with *cagL* gene have better adhesion abilities, where *cagL* promotes the transfer of CagA protein into the target cells. Inside the host cell, the CagA protein interacts with the cytoplasmic SHP-2, which is an oncogenic protein.

The protein (SHP-2) is also known to increase the intensity of inflammation in the gastric tissues—a key risk factor for triggering gastric cancer and the VacA has also been linked to the increased pathogenesis of *H. pylori* reflected in the severity of clinical outcomes. Mainly the VacA protein induces the production of endosomal vacuoles in gastric epithelial cells, promotes apoptosis, and inhibits T-cell proliferation in vitro. These features are associated with significant gastric mucosal damage and immune dysregulation, both of which can lead to gastric carcinoma. An Italian study on the prevalence of VacA protein has shown that another variable region within the *vacA* gene, termed the region, has been associated with increased gastric cancer risk. Similarly, OipA is an adhesion protein present on the outer membrane of the *H. pylori*. It has been reported that this adhesion protein plays an essential role in the virulence of *H. pylori* and determines the inflammatory response. In addition, OpiA interacts with various cell-signaling pathways of the host. Most of these signaling pathways regulate cell-cell junction and cellular proliferation; therefore, dysregulation of these pathways by OpiA can negatively affect the homeostasis of cell division and growth, which in turn increases the risk of gastric carcinomas (Arabia, 2020).

## CHAPTER THREE

### METHODOLOGY

#### 3.1 Study design

A hospital based cross-sectional study was used to describe the data collected from all patients attending ROTOM Hospital Muhanga, irrespective of age, sex marital status, education background. All the patients attending the hospital and their information regarding *H. pylori*

#### 3.2 Study area

The study was carried out at ROTOM Hospital Muhanga, Rukiga district Uganda. The hospital is found in southwestern Uganda, located in Muhanga Town Council, Rukiga district 374.2km from Kampala, via Masaka-Mbarara road, along Kabale-Mbarara road.

#### 3.3 Study population

The study population included all the clients that present symptoms and carry out an *H. pylori* stool antigen test during the study regardless of the age status was well recorded during the study in January 2025.

#### 3.4 Sample size determination

Using a sample size formula by Kish Leslie for cross-sectional studies, the sample size was estimated (Iii & District, 2010).

$$N = Z_{\alpha/2}^2 P(1 - P) / \delta^2$$

Where N= sample size required

P= Estimated prevalence of *H. pylori* infections

1-P = the probability of not having *H. pylori* infection.

Z $\alpha$  = Standard normal deviate at 95% confidence

Interval corresponding to 1.96

$\delta$  = Absolute error between the estimated and

true population prevalence of *H. pylori* of 5%.

$$N = 1.96^2 \cdot 0.443 \cdot 0.557 / 0.05 \cdot 0.05$$

N=379 samples

The calculated minimum sample size for such a study was 379 patients.

### **3.5 sampling criteria**

#### **3.5.1 Inclusion criteria**

Only GIT patients tested for *H. pylori* infections using the stool antigen test were included regardless of age and sex.

#### **3.5.2 Exclusion criteria**

Gastrointestinal patients with completed treatment below three months of diagnosis and tested for *H. pylori* were excluded.

### **3.6 Data collection method and materials**

#### **3.6.1 Data collection**

All the patients that met the inclusion criteria were included in the study regardless of their age. A total of 379 participants with gastrointestinal complaints were randomly recruited into the study. The participants were recruited using simple randomization technique. Examination and *H. pylori* stool antigen test results were obtained from the hospital information system.

#### **3.6.2 Materials**

Questionnaire: The subjects were interviewed at the hospital by one of the authors using a pre-tested questionnaire, while data about young children was collected from an elder member of the family (one of the parents or an elder brother/sister). Questionnaires contain information on name, age, gender, monthly family income, education level, number of persons in household, number of living rooms, source of drinking water and presence of household animals etc.

### **3.7 Data management**

Data collected was entered and cleaned in the Microsoft Excel sheet, and then statistical analysis performed using Stata. Data was summarized and tabulated in Stata to generate the general annual, monthly, and clinic-based prevalence. The generated data was presented as graphs to depict trends of *H. pylori* infections among patients that attended the hospital. The data generated was coded, entered, validated, and analysed. Associations between categorical variables were then tested using the chi-squared test with reports of the corresponding p-values.

### **3.8 Sample collection**

#### **3.8.1 Procedure**

A stool sample would be collected in a sterile container, and 50 mg of stool mixed with the buffer. Three full drops of the specimen put into the sample well of the *H. pylori* antigen rapid test device (cassette). The positive result is to be read as early as 5 minutes where two line bars would be seen in the membrane of the cassette; however, negative results would be confirmed after 15 minutes seen only one visible line. Stool samples from those that test positive with antibody test were subjected to *Helicobacter pylori* antigen in human fecal specimen test strip.

### **3.9 Stool Analysis**

#### **3.9.1 Procedure of stool Analysis**

The stool analysis in this study used stool antigen test (SAT). This SAT technique was preferred for this study because it is more specific than the blood screening test and has sensitivity and specificity of 73.9% and 86.7%, respectively. A stool antigen test was chosen rather than a serology antibody because it is more specific and it detects only active infections since it's an antigen test.

#### **3.9.2 Dissemination of results**

The results of the study were submitted to: the laboratory manager, supervisor, the hospital in charge of ROTOM Hospital.

### **3.10 Data Analysis**

Demographic and clinical information were summarized by descriptive statistics. To investigate risk factors for *H. pylori* seropositivity and influential factors having a history of *H. pylori* eradication, multivariable logistic regression were used. Descriptive statistics, including frequencies and percentages, were employed to examine respondents' characteristics and responses. The chi-Square test explores the association between peptic ulcers and associated factors. A P-value  $\leq 0.05$  were considered statistically significant.

### **3.11 Quality control and quality assurance**

The test was determined following a sequential flow of pre-analytical stage, analytical stage, and post-analytical stage. The pre-analytical stage involved; collecting the right samples, using the right sample containers, and labeling with the correct patient information. The post-analytical stage involved correct results interpretations and troubleshooting in case of variation in results.

### **3.12 Ethical consideration**

Data from hospital patients' clinical forms were treated confidentially Ethical approval and clearance was obtained from COVAB, Makerere University and presented to ROTOM Hospital administration and Management for acceptance to collect data. Data from hospital patients' clinical forms were treated confidentially.

## CHAPTER FOUR

### RESULTS

#### 4.1 Prevalence of *H. pylori* infections among study participants

In a total of 379 participants who attended ROTOM Hospital were assessed for *H. pylori* infections and included in the study, among them, 221 (58.3%) tested positive, and 158 (41.7%) tested negative for *H. pylori* infections.

Among the participants, 132(34.8%) were males and 247(65.2%) were females, of which the prevalence of *H. pylori* infections for males was 59.1% higher than 57.9% for females. The research was done on all the participants regardless of the age and the majority of participants were females and between 60-79 Years. The participants were grouped and found out that 67(17.7%) were  $\leq 19$  years, 73(19.3%) were 20-39 years, 81(21.4%) were 40-59 years, 114(30%) were 60-79 years and 44(11.6%) for  $\geq 80$  years. The highest prevalence was among the  $\geq 80$  years with 77.3%, followed by 60-79 years with 69.3%, for those between 40-59 and  $\leq 19$  years had almost the same prevalence and the least prevalence was seen among  $\leq 19$  years with 43.3%. The study included participants from different areas of the region among whom were from Kamwezi T/C with the highest prevalence of 73.3%, followed by Mparo T/C with 57.4%, Muhanga T/C with 51.7% and Bukinda T/C with the least prevalence of *H. pylori* infections. All these people were of different origin which included the Bakiga Banyankore, Banyarwanda, Bafumbira, Bahima. The highest prevalence was seen among the Banyankore with 61.4% and Bakiga had 56.5%. The participants had different educational backgrounds whereby some had completed primary level, secondary college/university and others never attended any institution and the highest prevalence was among those who reached in secondary with 50%, almost equal to primary level with 49.7% and those who never went anywhere had 32.9% prevalence for *H. pylori* infections. The participants were also in different fields of work where some are still students, others are civil servants, then others do their small businesses in which the prevalence of *H. pylori* infections was highest among those in informal sector with 63.7% followed by students with 51.8% and lastly civil servants with 43.1%.

**Table 1: Prevalence of H. pylori infections among the study population**

Variable	Positives %(n=221)	Negatives% (n=158)	N=379
<b>Gender</b>			
Male	78 (59.1)	54 (40.9)	132
Female	143 (57.9)	104 (21.1)	247
<b>Age group</b>			
≤19	29 (43.3)	38 (56.7)	67
20-39	41 (56.2)	32 (43.8)	73
40-59	38 (46.9)	43 (53.1)	81
60-79	79 (69.3)	35 (30.7)	114
≥80	34 (77.3)	10 (22.7)	44
<b>Locality</b>			
Muhanga T/C	62 (51.7)	58(48.3)	120
Bukinda T/C	24 (46.2)	28 (53.8)	52
Mparo T/C	31 (57.4)	23 (42.6)	54
Kamwezi T/C	22 (73.3)	8 (26.7)	30
Others	82 (66.7)	41(33.3)	123
<b>Ethnicity</b>			
Bakiga	139 (56.5)	108 (43.5)	246
Banyankore	35 (61.4)	22 (38.5)	57
Others	47 (61.8)	29 (38.2)	76
<b>Education</b>			
Primary	67 (49.7)	68 (50.3)	135
Secondary	34 (42 .0)	47 (58.0)	81
College/University	18 (50.0)	18 (50.0)	36
None	102 (80.3)	25 (19.7)	127
<b>Occupation</b>			
Student	43 (51.8)	40 (48.2)	83
Civil servant	22 (43.1)	29 (56.9)	51
Others	156 (63.7)	89 (36.3)	245

#### 4.2 Associated risk factors of *H. pylori* infections

The individuals aged  $\geq 40$  years having a prevalence of 64.7%, are at increased risk of *H. pylori* infections. The findings suggest that  $\geq 40$  years is a significant risk factor for *H. pylori* infections with a moderate increase in risk (OR=1.23) and lies within the range of 95% CI (1.05-1.44). The association between family history and *H. pylori* infections is statistically significant with a p value of 0.02 and chi square value of 13.45. The odds ratio of 2.03 indicates that individuals with family history are 2.03 times more likely to have *H. pylori* infections compared to those without family history. The OR lies within the limits of 95% confidence interval. Individuals with a history of gastrointestinal diseases are at increased risk of *H. pylori*. The odds ratio of 1.85 lies within the range at 95% certainty (1.06-3.23) indicating that individuals with previous gastrointestinal diseases are 1.85 times more likely to have *H. pylori* infections compared to those without such history. The association between previous gastrointestinal diseases and *H. pylori* infections is statistically significant with a p-value of 0.03 and chi square of 8.51. Ethnicity is another significant risk factor of *H. pylori* infections, with an odds ratio of 1.83, p-value 0.02, chi square value 10.35, 95% CI 1.11-3.01. This suggests that ethnicity plays a role in the risk of *H. pylori* infections with certain ethnic groups being more susceptible. The statistically significant p-value and confidence interval support the association between ethnicity and *H. pylori* infections. The relationship between alcohol consumption and *H. pylori* infections are not statistically significant at 0.05 level. The odds ratio of 1.29 suggests a possible increased risk of *H. pylori* infections among alcohol consumers but the association is not so strong. Poor sanitation and hygiene are strongly associated with an increased risk of *H. pylori* infections. The odds ratio of 3.21 indicates that individuals with poor sanitation and hygiene are 3.21 times more likely to have *H. pylori* infections than those with better sanitation and hygiene and it lies within the 95% CI range (2.13-4.85) and the interval does not cross 1 indicating a significant association and the chi square value of 23.14 further supports the association between poor sanitation and hygiene and *H. pylori* infections.

**Table 2: showing bivariate analysis of factors associated with *H. pylori* infections**

Associated Risk factor	<i>H. pylori</i> positive	<i>H. pylori</i> negative	Chi Square value	P-value
Age ( $\geq 40$ yrs.)	143 (64.7%)	70 (44.3%)	12.15	<0.001
Smoking	60 (27.1%)	20 (12.7%)	8.51	0.004
Previous gastrointestinal diseases	60 (27.1%)	20 (12.7%)	8.51	0.004
Family history	80 (36.2%)	25 (15.8%)	13.45	<0.001
Alcohol consumption (>500mls/day)	45 (20.4%)	15 (9.5%)	5.63	0.018
Ethnicity	80 (36.2%)	30 (19.0%)	10.35	0.001
Socioeconomic status (low)	105 (47.5%)	40 (25.3%)	15.63	<0.001
Poor sanitation and hygiene	120 (54.3%)	40 (25.3%)	23.14	<0.001
Immunocompromised state	30 (13.6%)	5 (3.2%)	9.29	0.002
Consumption of contaminated food and water	80 (36.2%)	20 (12.7%)	16.39	<0.001
Shared food and utensils	75 (33.9%)	25 (15.8%)	11.43	0.001
Travel to endemic areas	50 (22.6%)	15 (9.5%)	7.35	0.007

The Chi Square test was used to determine the association between each risk factor and *H. pylori* infections.

The P-value indicates the significance level of the association.

A P-value  $\leq 0.05$  indicates a statistically significant association.

**Table 3: Showing multivariate Logistic Regression of factors associated with *H. pylori* infections**

Associated Risk Factor	Adjusted Odds Ratio	95% CI	P-value
Age	1.23	1.05-1.44	0.01
Smoking	1.41	1.02-1.95	0.04
Previous gastrointestinal diseases	1.85	1.06-3.23	0.03
Family history	2.03	1.13-3.65	0.02
Alcohol consumption	1.29	0.94-1.77	0.11
Ethnicity	1.83	1.11-3.01	0.02
Socioeconomic status	2.51	1.83-3.45	<0.001
Poor sanitation and hygiene	3.21	2.13-4.85	<0.001
Immunocompromised state	3.56	2.15-5.91	<0.001
Consumption of contaminated food and water	2.92	1.83-4.67	<0.001
Shared food and utensils	1.92	1.06-3.47	0.03
Travelling to endemic areas	1.67	1.02-2.73	0.04

### **Interpretation**

Risk factors with AOR > 1, indicate an increased risk of *H. pylori* infections.

Risk factors with P-value > 0.05, indicate statistical significance.

The 95% confidence interval provides a range of values within the true AOR is likely to lie.

A P-value  $\leq 0.05$  indicates a statistically significant association.

## CHAPTER FIVE

### DISCUSSION OF RESULTS

*Helicobacter pylori* infections are extremely common worldwide with evidence from a recent systematic review suggesting that almost half of the world's population is infected. It has been documented that the infection rates are higher in resource poor settings and developing countries with prevalence rates above 70% reported in Africa, the highest worldwide, whereas the prevalence in developed countries ranged between 25-40% (Eileen M *et al*, 2021). The prevalence and risk factors of *H. pylori* infections were assessed among the patients who attended ROTOM Hospital, Muhanga.

The overall prevalence obtained from this study was 58.3%, which is lower than 70% expected in Africa (Eileen M *et al*, 2021). The study reported the highest prevalence to be among  $\geq 80$  years with 77.3%, and the least being for  $\leq 19$  years with 43.3%. The prevalence of the bacteria in the current study was consistent with previous studies conducted in Kazakhstan which reported rates ranging from 61% to 62.4% (Eileen M *et al*, 2021). Unlike in this study, the prevalence is 58.3%, which contradicts with the previous studies which showed 70%. Many studies from Africa have shown high prevalence, for example, 81.7% in Nigeria, 53.0% in Egypt, 39.1% in Tanzania, 64.39% in Cameroon, 73.3% (among children) and 54.8% (adults) in Kenya (El-Kady *et al*, 2021). There are a few *H. pylori* prevalence studies that have been done in Uganda; for example, studies in Kampala have reported a prevalence of 87% among patients with stomach cancers and other cancers, 44.3% among children between 0 and 12 years, and 60.5% among pregnant women at Kawempe Health Centre (Baingana R. K *et al*, 2014). Poor management of *H. pylori* infections can contribute to the occurrence of cancers of various organs such as stomach, duodenum, pancreas, and liver cancer. However, in the study to evaluate seroprevalence of *H. pylori* infections among patients aged 35 years and older with dyspepsia symptoms in Douala metropolis found a seroprevalence of 64.39% which is lower than the prevalence of 92.2% and 79.3% reported respectively by Ndip *et al*, 2004 in the Northwest region and Andoula *et al*, 2015 in the Center region of Cameroon, both among children less than 18 years old. The age range difference in the studied population between the present and these previous studies, may explain such observation. In fact, in our sampling processes, we included only patients aged 35 years or older, who are thought to better observe principles of cleanliness compared to younger ones. Thus, the incidence rate among patients aged  $\geq 35$  years would be more or less low than that in the younger population. Moreover, the differences in this value can also be

due to the study area, the socioeconomic conditions in the study area and the type of controls used, since the prevalence of *Helicobacter pylori* is known to represent the improvements in socioeconomic conditions and sanitary standards throughout the generations. In Russian for instance, within a period of ten years (1995 to 2005), it was observed that the prevalence of *Helicobacter pylori* infections has reduced remarkably due to better standards of living (Tkachenko MA *et al*, 2007). A similar situation was observed in China due to an increase in economic growth, and improvement in environmental and hygienic conditions Johansson S *et al*, 2016. The high prevalence in developing countries has been associated with low socioeconomic status, overcrowding, poor housing, poor sanitation (both personal and environmental hygiene), unclean water supplies, accumulation of animal fecal matter, and food contamination Awuku Y.A *et al*, 2017.

The prevalence of *H. pylori* infections among the  $\leq 19$  years in this study was 43.3% which is lower than that previously reported in Ethiopia (65.7%) and higher than that reported in Nigeria (32.8%) and for  $\geq 40$  years was 64.7% which was almost equal to that of Ethiopia Schacher K *et al*, 2020). Data from a recent systematic review meta-analysis that included 198 studies with a total of 152,650 children aged  $\leq 18$  years showed that the overall global prevalence rate of *H. pylori* infections in children was 32.3%, which was higher in low- and middle-income countries than in high-income countries (43.2% and 21.7%). The low prevalence of *H. pylori* infections in our study could be explained by the fact that only asymptomatic adolescents were screened in our study. For example, a recent study by Balas *et al*, 2025. showed a low prevalence rate (14.2%) of *H. pylori* infections in children without gastrointestinal symptoms. Moreover, the difference in the sanitation and hygiene practice in the different population could explain the difference in the prevalence of *H. pylori* infections which was reported in the different studies. In the present study, the risk of contracting *H. pylori* infections was three times higher among the female than among the male adolescents. This is in agreement with previous studies. For example, in Ghana, a study by Awuku *et al*, 2017 that included 240 asymptomatic children revealed that a higher proportion of females than males had *H. pylori* infections (16.8% vs. 10.7%). Furthermore, Mehata *et al*, 2021 analysed data from the 2016 Nepal National Micronutrient Status Survey, which included 1,023 adolescents aged 10–19 years, and revealed that 16% of adolescent girls and 14% of adolescent boys had *H. pylori* infections. It is not clear why females were at higher risk to have *H. pylori* infections in this study. Perhaps, there was a difference in the hygiene and sanitation practice between males and females in the region of Sudan. The difference in the

prevalence related with age can be as a result of adults getting exposed to many risk factors like poor sanitation, contaminated food and water etc.

With respect to gender, the relationship with *H. pylori* infection prevalence among the males was slightly higher than for females in my study (59.1% and 57.9% respectively). Some studies show significantly higher *H. pylori* prevalence in males than females; in Ethiopia, males had 43.2% and females had 39.9% and others showed a higher prevalence in females though not statistically significant. In this study, there was a slight difference in gender prevalence (male: 36.0% and female: 35.3%); however, this difference was not statistically significant. The findings of this study were in agreement with other studies carried out in Nigeria, Lagos, in Mwanza, Cameroon, and in Ethiopia (M Workineh *et al*, 2016. Other studies also indicated a positive correlation between gender and *H. pylori* occurrence, in Kenya, Ethiopia Warren J, *et al*, 2020. In Iran, a longitudinal cohort study that included 54 patients diagnosed with gastric cancer reported a significant association between female sex and higher gastric cancer stage (Khedmat H *et al*, 2016). In another study, Cheng *et al* also reported a slightly higher infection rate of *H. pylori* infections among men. This is because in rural settings, men's workplaces often lack clean water sources and toilet facilities, the poor sanitation may increase the chance of men being infected with *H. pylori* infections and the variations in sample sizes, study settings such as hospitals and testing techniques used and the difference in the gender number tested for *H. pylori* infections could explain the difference in the findings.

Higher levels of education were associated with better hygienic conditions. Approximately three-quarters of illiterate patients tested positive for *H. pylori* infections compared with the literate patients. This finding aligns with the results from West Iran Al-Ouqaili MT *et al*, 2024.

However, only patients attending the hospital would be handled, some people were left out unnoticed. As a result of these findings, the hospital-based samples might not represent the general population. In addition, use of a single diagnostic method (stool antigen test), it might not detect all cases of *H. pylori* infections.

## CHAPTER SIX

### CONCLUSION AND RECOMMENDATIONS

#### 6.1 Conclusion

More than half of the world's population is afflicted with *H. pylori* infections, a serious public health concern that can lead to a variety of gastrointestinal problems and it is extremely important to assess the factors that contribute to these discrepancies. To elucidate the accurate contribution of risk factors within each geographic area, further studies should focus more on studying the differences related to the environmental factors, diagnostic methods, eradication regimens, and host-related peculiarities. This study was one of the first to look into the socio-demographic characteristics, and habits of *H. pylori* patients. The findings demonstrated a statistically significant association between *H. pylori* and ulcerative and erosive lesions in the duodenum and stomach. Smoking, source of water, and alcohol consumption were significantly associated with *H. pylori* infections. Therefore, healthcare workers could provide health education on the aforementioned risk factors, the government and other stakeholders could improve the source of drinking water in the area. Nevertheless, the study found no association between *H. pylori* infections and ethnicity, and some other few risk factors. This result highlights the need for additional investigation into the risk factors associated with *H. Pylori* and also the need for further studies to a better understanding of the epidemiology of *H. pylori* infection, which is helpful in diagnosis and prevention of diseases.

#### 6.2 Recommendations

I recommend routine screening especially with those with family history of gastric caners and those with reoccurring signs and symptoms of *H pylori* infections using non-invasive methods like stool antigen test which does not cause pain

I recommend community health awareness programs to educate people about the transmission's routes and prevention methods of the *H. pylori* infections

I recommend good hygienic practices, good sanitation practices and clean water supply to prevent contamination of *H. pylori* infections caused by dirty water

I recommend further research on investigating the precise mechanisms involved in the discrepancies of *H. pylori* prevalence worldwide.

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## APPENDICES

### Appendix 2: Questionnaire

#### PREVALENCE AND ASSOCIATED RISK FACTORS OF *HELICOBACTER PYLORI* INFECTIONS AMONG PATIENTS ATTENDING ROTOM HOSPITAL MUHANGA BRANCH, RUKIGA DISTRICT UGANDA

#### Consent Notice

I ....., hereby consent to participate in this study. I understand that my information will be kept confidential and used solely for research purposes.

Signature.....

Date.....

#### Demographic data, please tick/ fill

Age: .....

Village.....

Sex  F  M

Nationality.....

Occupation .....

Tribe.....

Marital status  Single  Married

Education level.....

#### Participants' history

**1) Have you ever experienced any of following (please tick all you have ever experienced)**

a) Diarrhea / constipation

c) Burping / Belching

b) Abdominal pain

d) Loss of appetite

c) Nausea and vomiting

e) Bloating and gas

**2) If you answered yes, to any of the options, how many times have you experienced that in the past 3 months?**

a) Once

b) 2 times

c) 3-5 times

d) >5 times

**3) Have you ever been diagnosed of *H. pylori* infections by any health care professional?**

a) Yes

b) No

**4) When were you last treated of *H. pylori* infections for the last three months?**

a) December

b) November

c) October

**5) Do you any family member who has ever experienced the same infections?**

a) Yes

b) No

**6) Do you have any other medical conditions (diabetes, hypertension etc.)?**

a) Yes

b) No

### **Knowledge and awareness**

**7) Have you heard about *H. pylori* infections?**

a) Yes

b) No

**8) Do you know the transmission modes of *H. pylori*?**

a) Yes

b) No

### **Conclusion:**

Thank you for your participation and good feedback, your responses will contribute on the better understanding and prevalence of *H. pylori* infections among the people attending the Hospital

### **Appendix 3: Ethical Approval letter**