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HELICOBACTER PYLORI FECAL ANTIGENEMIA IN CLINICALLY SUSPECTED PEPTIC ULCER DISEASE ADULTS IN DAR ES SALAAM, 2025.

By

Dr Neema Hamis Lweno (HK/PG/IM/22/0024).

A Dissertation Submitted in (partial) Fulfillment of the Requirements for the Degree of Master of Medicine (Internal Medicine) at Kairuki University

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Certification

It is certified that the undersigned has read and recommends acceptance by Kairuki University of a dissertation titled: "***HELICOBACTER PYLORI FECAL ANTIGENEMIA IN CLINICALLY SUSPECTED PEPTIC ULCER DISEASE ADULTS IN DAR ES SALAM,2025***" in partial fulfillment of the degree of Master of Medicine in Internal Medicine at Kairuki University.

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I, Dr. *Neema Hamis Lweno*, hereby state that this dissertation proposal is my work and original effort. I assure you it has not been submitted, nor will it be, to any other university for a similar degree or any other academic qualification. As a Student Researcher at Kairuki University, I am aware that plagiarism is a serious issue. That is why I can confidently say that the content of this research is entirely my own.

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Dedication.

This work is dedicated to my family (husband, son, and daughter) and my late parents for their unwavering love and support, which have been my foundation throughout this journey.

Abstract

Background: Globally, Helicobacter pylori infection affects over 50% of the world's population, with prevalence rates varying significantly by region.[1] Common in developing countries like Tanzania due to poor sanitation and overcrowding. Its ability to survive in acidic conditions and evade the immune system makes it a major contributor to PUD, alongside factors like NSAID use, smoking, and alcohol use. Understanding the prevalence of H. pylori and its socio-demographic, environmental, and behavioral risk factors is crucial. Early detection and targeted interventions can effectively prevent PUD and its complications in the community.

Objective: To determine the *H. Pylori* fecal prevalence, risk factors, and correlation between *H .pylori* and PUD in adults clinically suspected of PUD in Dar es Salaam Communities,2025.

Methodology: This was a descriptive, cross-sectional, community-based study conducted among adults clinically suspected of Peptic Ulcer Disease in Dar es Salaam. Participants were selected using multistage sampling. The dependent variable was Helicobacter pylori infection (positive/negative), while independent variables included socio-demographic, environmental, behavioral factors, and clinical suspicion of PUD. Data were analyzed with SPSS v25; continuous variables were summarized as means ± SD, and categorical variables as counts and percentages. Comparisons were tested using chi-square, with variables at $p < 0.2$ included in multivariable logistic regression (significance $p < 0.05$, 95% CI). Spearman's rank correlation assessed the relationship between clinical suspicion of PUD and H. pylori infection.

Results: Among the 390 participants recruited, 252(64.6%) were females, 138(35.4%) were males, and the mean age was 36.9 ± 15.7 standard deviation years. Overall, 161(41.3%) were H.pylori positive. H.pylori infection was highest among those aged 40 to 49 years,35(46.7%), singles,41(44.6%), marital groups, tap water users, at 106 (46.9%),

residents in poor areas,16 (43.2%), those who consumed alcohol and smoked cigarettes, 63(50.4%) and 126(44.5%),

a family history of Helicobacter Pylori infection, 141(43.0%), those who rarely use painkillers, 27(50.9%), those with dietary habit of eating fast foods and source of daily diet from street vendors 140(43.3%) and 152(41.8%) respectively. Those with excellent access to toilets showed notably low infection rates, 1 (12.5%).In univariate analysis, factors such as Gender, source of drinking water, smoking habit, alcohol use, family history of H. pylori, and Dietary habits achieved a significance level of 0.2; however, multivariable regression revealed that only the source of water was significantly associated with Helicobacter pylori infection. A positive linear statistical correlation was observed between H. pylori infection and clinically suspected PUD, with a strength ranging from 63.4% to 93.3%.

Conclusion: Helicobacter pylori infection was more prevalent among adults who were clinically suspected of having peptic ulcer disease in the Dar es Salaam communities. The use of tap water for drinking was the most significant risk factor.

Recommendations: Ensure tap water safety by regular testing, infrastructure improvements, community education on safe drinking water handling, and Future studies should employ longitudinal designs to establish causal relationships between H. pylori infection, behavioral risk factors, and clinical outcomes.

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List of Abbreviations

Aor	Adjusted odds Ratio.
BMI	Body Mass Index
CI	Confidence interval
CagA	Cytotoxin-associated gene A
ELISA	Enzyme-linked immunosorbent assay
EGD	Esophagogastroduodenoscopy
H. Pylori	Helicobacter pylori infection
IBD	Inflammatory Bowel Disease
NSAIDs	non-steroidal anti-inflammatory drugs
OR	Odds Ratio
PUD	Peptic ulcer disease
PCR	Polymerase chain reaction
PI	Principal investigator
PPI	Proton pump inhibitor
Vaca	Vacuolating cytotoxic A

Definition of terms

Helicobacter pylori infection is a bacterial infection caused by a gram-negative spiral-shaped bacterium that colonizes the gastric mucosa and causes dyspepsia, Peptic ulcer disease, and Gastric cancer. [2].

Peptic ulcer disease is a break in the mucosal lining of the duodenum and gastric mucosa that extends past the muscularis mucosa, caused by an imbalance between defensive elements like mucosal barriers and aggressive elements like stomach acid and pepsin.[3].

Adult: Someone aged 18 years and above who has gained legal rights and obligations, including voting, contract signing, or adult court trials[4].

Helicobacter pylori fecal antigenemia: the presence of *H. Pylori* antigens found in the stool of a study participant, pointing to an active infection.

Clinically suspected Peptic ulcer disease refers to the likelihood of peptic ulcer disease based on a patient's reported symptoms and clinical presentation before definitive diagnostic confirmation. Using questions adapted from Cornell Medical Index and Dunn's questionnaire[5]. The assessment focuses on characteristic signs such as recurrent stomach pain related to meals, relief of pain with food or milk, nocturnal pain awakening the patient, or a prior diagnosis confirmed by endoscopy. This symptom-based evaluation helps identify patients likely to have PUD and guides further diagnostic testing, such as Helicobacter pylori testing, to confirm the diagnosis.

Regular NSAIDs user: Use NSAIDs daily or more than 3 times per week for 4 weeks or longer in individuals having chronic conditions.

Occasionally NSAID users: Use NSAIDs on some days or use them 1 to 2 times per week, for less than 4 weeks in individuals with acute conditions.

Rarely NSAID users: use NSAIDs once in several weeks or months when symptoms of a certain condition arise.

Fast food: foods that are quickly prepared, ready-to-eat meals sold by local vendors or small eateries in the community. They are affordable and convenient, including items like fried snacks, grilled meats, chips, and sweetened drinks. They are often high in oil, salt, and sugar, and low in nutritional value.

Poor dietary habits refer to unhealthy and unbalanced eating patterns that do not provide adequate nutrition for the body and can lead to negative health effects. These diets are commonly consumed and often high in oil, fat, salt, and refined carbohydrates while being low in fiber, protein, and essential vitamins. They frequently include items such as fried foods, sugary snacks, and soft drinks, which contribute to poor overall health**.**

Excellent toilet facility: A toilet that is clean, well-maintained, safe, and hygienic, with a regular water supply, handwashing facilities (soap and water), proper lighting, and effective waste disposal.

Good toilet facility: A toilet that is functional and fairly clean, with basic privacy and access to water, although it may lack consistent cleaning, handwashing materials, or advanced sanitation features.

Poor toilet facilities: A functional toilet, but it lacks cleanliness, privacy, and a consistent water supply. It may also have odors or waste spillage, with missing or non-functional handwashing stations.

Very Poor Toilet facility: Unsatisfactory, unsafe, and often with no water supply, no privacy, no waste management, and poses health risks, which may have open defecation areas.

CHAPTER ONE

1.0 Introduction

Helicobacter pylori infection is a common worldwide infection caused by a gram-negative bacterium colonizing the gastric mucosa. It is associated with various gastrointestinal disorders such as dyspepsia, peptic ulcer disease, and gastric cancer. It affects over half of the world's population and is concerning due to its association with gastric cancer.[6]Peptic ulcer disease is an ulcer occurring in the mucosa of the digestive tract extending to the submucosa, primarily caused by acid injury, with an estimated global prevalence between 5% and 10%[7]. This study aimed to determine the Helicobacter Pylori fecal prevalence, risk factors, and Correlation between Helicobacter pylori infection and PUD in clinically suspected Peptic ulcer disease adults in Dar es Salaam.

1.1 Background

1.1.1 Peptic ulcer disease

Peptic ulcer disease is a disturbance of mucosal integrity that results in the deep destruction of the mucosa, duodenum, and stomach lining. This damage extends past the muscularis mucosa, specifically to the muscle layer, because of environmental gastric acid generation. There are two primary forms of peptic ulcers: duodenal and gastric.[3].

1.1.2 Epidemiology of Peptic Ulcer Disease

Peptic ulcer disease (PUD) affects four million people worldwide annually and has an estimated lifetime prevalence of 5–10% in the general population. Prevalence rates in Africa range from 6.6% to 30%, with Kenya at 18.3%, Uganda at 11.4%, and Tanzania at 24.1%. Biological, lifestyle, and environmental factors—such as Helicobacter pylori infection, non-steroidal anti-inflammatory drug use (NSAIDs), age, gender, smoking,

alcohol consumption, psychological stress, and other medical conditions like Zollinger-Ellison syndrome—are risk factors for peptic ulcer disease (PUD).

1.1.3 Pathophysiology of Peptic Ulcer Disease

The pathophysiology of peptic ulcer disease (PUD) involves an imbalance between protective factors of the gastric mucosa and harmful factors that increase gastric acid secretion or damage the mucosal barrier. The mucus, bicarbonate production, and sufficient blood flow typically shield the stomach and duodenum from the damaging effects of gastric acid and digestive enzymes. The mucosa is susceptible to harm when this equilibrium is disrupted, and aggressive substances like stomach acid, pepsin, and bile salts can weaken the mucosal barrier, particularly if the production of protective mucus or bicarbonate is impaired, which can result in the development of an ulcer. [8]

1.1.4 Clinical Features of Peptic Ulcer Disease

The location and intensity of the ulcer might affect the clinical symptoms of peptic ulcer disease (PUD); however, they often include epigastric abdominal pain, fullness and bloating, vomiting and nausea, Acid reflux, heartburn, hematemesis, Melena, Fatigue, and weight loss. [9,10]

1.1.5 Diagnosis and Treatment of Peptic Ulcer Disease

Peptic ulcer disease is typically diagnosed based on clinical symptoms and relevant investigations. Common symptoms include episodic gnawing or burning pain in the epigastric region, pain occurring two to five hours after meals or on an empty stomach, and nocturnal pain alleviated by food, antacids, or antisecretory medications. A history of episodic or persistent epigastric pain, relief of discomfort after eating, and waking up at night due to pain that subsides with food intake provides strong evidence for peptic ulcer disease and aids in confirming the diagnosis.[11]

Patients should be assessed for alarm symptoms, which may indicate more serious conditions. Signs such as anemia, hematemesis, melena, or heme-positive stool suggest gastrointestinal bleeding; vomiting may indicate obstruction; anorexia or weight loss raises suspicion for cancer; persistent upper abdominal pain radiating to the back suggests penetration; and severe, spreading upper abdominal pain points to perforation. Patients older than 55 and those with alarm symptoms should be referred for prompt upper endoscopy [11]. Esophagogastroduodenoscopy (EGD) is more sensitive and specific for peptic ulcer disease than upper gastrointestinal barium studies and enables gastric lesion biopsy. Patients under the age of 55 who have no alarm signs should be tested for H. pylori infection and encouraged to stop taking NSAIDs, smoking, drinking alcohol, and using illicit drugs. The presence of H. pylori can be confirmed by a blood enzyme-linked immunosorbent assay (ELISA), urea breath test, stool antigen test, or endoscopic biopsy [11].

Treatment of peptic ulcer disease should involve the elimination of H. pylori in patients with this infection. In most duodenal ulcers, an H2 blocker or proton pump inhibitor induces healing for four weeks. Proton pump inhibitors provide superior acid suppression, healing rates, and symptom relief, and are recommended as the initial therapy for most patients.[11]

Eradicating H. pylori is adequate for patients with peptic ulcers. A repeat EGD with biopsy is recommended to confirm stomach ulcer healing and rule out cancer. Maintenance therapy with H2 blockers or proton pump inhibitors prevents recurrence in high-risk patients (e.g., those with a history of complications, frequent recurrences, ulcers testing negative for H. pylori, refractory giant ulcers, or severely fibrotic ulcers). Still, it is not generally recommended for patients who have been eradicated of H. pylori and are not taking NSAIDs long-term. [11]

Patients who are intolerant of medications or do not adhere to medication regimens, as well as those who are at high risk of complications, who develop a relapse during maintenance treatment, or have had many sessions of medication, should undergo surgery. [11]

1.1.6 Helicobacter Pylori infection

Helicobacter pylori infection is caused by a spiral-shaped bacterium that colonizes the stomach lining, often leading to chronic inflammation and conditions such as gastritis, peptic ulcer disease, and gastric cancer. H. pylori is one of the most frequent bacterial infections worldwide and a substantial contributor to gastrointestinal disorders [12].

1.1.7 Epidemiology of Helicobacter Pylori infection among PUD

The most common bacterial infection in humans affects almost half of the world's adult population, and prevalence is higher in developing countries than in wealthy countries. The following were shown to be potential risk factors: age, inadequate hygiene, living in overcrowded settings, alcohol usage, smoking, NSAID use, blood group O, and a significant family history of stomach cancer.[13]

1.1.8 Pathophysiology of Helicobacter Pylori Infection in PUD

Ulcers are caused primarily by stomach or duodenal mucosal lining damage, which ordinarily functions as a protective barrier against gastric acid. *H. pylori* infection causes persistent inflammation in the stomach lining, compromising its protective barrier. The bacteria produce urease, which neutralizes stomach acid and releases toxins that cause inflammation. The acidic environment might worsen the resultant damage, causing ulcers[14].

1.1.9 Clinical features of Helicobacter Pylori infection among PUDs

Clinical features include persistent abdominal pain, typically in the upper abdomen, frequently described as burning or gnawing. It may be worse when the stomach is empty, particularly at night or in between meals, with bloating, early satiety, nausea, and in more severe cases, hematemesis (vomiting blood) or melena (black, tarry stools), which indicate gastrointestinal bleeding.[15]

1.1.10 Diagnosis and Treatment of Helicobacter Pylori in PUD

A diagnosis can be made using both invasive and non-invasive procedures. Clinicians routinely employ non-invasive procedures to identify *H. pylori*, such as serology, stool antigen testing, and urea breath testing. The most effective non-invasive procedures for detecting current infection are the urea breath test and stool antigen test, whereas invasive diagnostic techniques for endoscopy include biopsy, histology, immunohistochemistry, urease detection, culture assay, and polymerase chain reaction (PCR)[16].

Helicobacter pylori infection can be treated with triple clarithromycin, bismuth quadruple therapy, or non-bismuth quadruple therapy. When choosing an *H. pylori* treatment program, it is critical to consider prior antibiotic exposure. Clinicians should only prescribe triple clarithromycin-based treatment to patients who have never taken macrolides and live in areas with low clarithromycin resistance. Currently, the ideal regimen is bismuth quadruple therapy or concurrent non-bismuth quadruple therapy (PPI, amoxicillin, clarithromycin, and nitroimidazole)[16]. This strategy is most effective in reducing antibiotic resistance, especially in cases where antibiotics have already been used. If the patient has had clarithromycin as a first-line treatment, bismuth salt regimens or levofloxacin are the preferred treatments.[16]

1.2 Problem Statement

Helicobacter Pylori (H. pylori) infection is a significant public health issue globally, especially in developing nations such as Tanzania. It is closely linked to various gastrointestinal conditions, including dyspepsia, peptic ulcers, and gastric cancer.[6] While many people are infected, only a subset develops PUD, emphasizing the need for accurate diagnosis and understanding of risk factors.[19,20]

Globally, nearly half of the population is infected with H. pylori.[2] with a prevalence exceeding 70%, in sub-Saharan Africa.[17] In Tanzania, gastrointestinal diseases rank among the leading causes of hospital attendance, with H. pylori implicated as a major contributor.[18] Most studies on H.pylori and PUD have been hospital-based and primarily focused on patients visiting health facilities, with little or no research conducted at the community level. This leaves an incomplete understanding of the true magnitude, distribution, and causes of the problem. As a result, there is insufficient evidence to guide community-level interventions and policy decisions, emphasizing the need for studies that produce representative data at the community level.

PUD is commonly diagnosed based on clinical symptoms linked to H. pylori infection, such as dyspepsia, abdominal pain, and gastrointestinal bleeding.[19] However, not all H. pylori-infected individuals develop ulcers, making proper diagnostic testing essential to differentiate H. pylori-associated PUD from other gastrointestinal disorders.[20]

Untreated or mismanaged H. pylori infections can lead to chronic gastritis, ulcer perforation, and gastric cancer[14]. Key risk factors include poor sanitation, low socioeconomic status, overcrowding, contaminated food and water, lifestyle behaviors, and host susceptibility.[1]

Inadequate diagnosis and inappropriate treatment increase antibiotic misuse, drug resistance, and healthcare costs, highlighting the need for data-driven interventions and targeted community health strategies.[13,18]

1.3 Rationale

Peptic Ulcer Disease (PUD) is a major public health concern, with Helicobacter pylori (H. pylori) as a key contributor to chronic gastritis and ulcer formation[14]. Stool antigen testing provides a non-invasive, sensitive method for detecting H. pylori in resource-limited settings and has proven reliable in endemic areas like Uganda[21].

Not all H. pylori infections lead to PUD, as factors such as NSAID use, smoking, and host immune responses also influence disease development[7,22]. Misconceptions that infection always results in ulcers may cause unnecessary treatment and antibiotic misuse[11].

In Tanzania, high H. pylori prevalence is linked to poor hygiene and unsafe water[18]. A community-based study in Dar es Salaam can identify prevalence among adults clinically suspected of PUD, highlight high-risk groups, and inform targeted interventions such as improved sanitation, health education, and appropriate treatment strategies.

This community-based study aims to determine the true burden of H. pylori infection in Dar es Salaam, identify local risk factors, and evaluate the accuracy of clinical suspicion in predicting infections. The findings will guide effective prevention, early detection, and treatment strategies, helping reduce complications such as peptic ulcers and gastric cancer.

1.4 Research Questions

I. What is the H. pylori fecal prevalence in adults clinically suspected of having PUD in Dar es Salaam Communities?

II. What sociodemographic risk factors are associated with Helicobacter pylori infection in adults clinically suspected of PUD in Dar es Salaam Communities?

III. What environmental risk factors are associated with Helicobacter pylori infection in adults clinically suspected of PUD in Dar es Salaam Communities?

IV. What behavioral risk factors are associated with Helicobacter pylori infection in adults clinically suspected of PUD in Dar es Salaam Communities?

V. What is the Correlation between H. Pylori infection and clinical suspicion of PUD among adults in Dar es Salaam Communities, 2025

1.5 Objectives

1.5.1 Broad Objective

To determine the H. Pylori fecal prevalence, risk factors, and Correlation between H. Pylori infection and PUD in adults clinically suspected of having peptic ulcer disease in Dar es Salaam, Communities 2025.

1.5.2 Specific Objectives

I. To determine the *H. Pylori* fecal prevalence in clinically suspected peptic ulcer disease (PUD) adults in Dar es Salaam communities, 2025.

II. To determine the distribution of Socio-demographic risk factors (age, gender, marital status, Education level, and Employment status) of *H. pylori* infection in adults clinically suspected of PUD in Dar es Salaam communities, 2025.

III. To determine the distribution of Environmental risk factors (Source of drinking water, Availability of Toilets, Hand washing habits, and living environment) of *H. pylori* infection in adults clinically suspected of PUD in Dar es Salaam communities, 2025.

IV. To determine the distribution of Behavioral risk factors (smoking cigarettes, alcohol use, use of NSAIDs, family history of *H. pylori* infection, Dietary habits, and Source of daily diet) for *H. pylori* infection in adults suspected of PUD in Dar es Salaam communities, 2025.

V. To determine the correlation between *H. Pylori* infection and clinical suspicion of PUD among adults in Dar es Salaam communities, 2025.

CHAPTER TWO

2.0 Literature Review

Helicobacter pylori infection is a major contributor to peptic ulcer disease (PUD), causing chronic gastritis and increasing the risk of gastric and duodenal ulcers, though not all infected individuals develop ulcers, with other factors such as genetics, lifestyle, and environment influencing disease progression[11,13,14].

Globally, Helicobacter pylori (H. pylori) infection affects over 50% of the world's population, with prevalence rates varying significantly by region.[1]. The fecal antigen test is recognized as a reliable, non-invasive diagnostic method to detect active infections.[21]The World Gastrointestinal Organizational Global guideline reported that high-income countries have lower prevalence rates (20-40%) due to better hygiene practices and advanced healthcare infrastructure. In contrast, low—and middle-income countries report higher prevalence rates, often exceeding 70%, due to suboptimal sanitation, overcrowding, and contaminated food and water supplies.[22]

The New England Journal of Medicine of 2002 showed that although not all individuals infected with H. pylori develop PUD, the bacterium is strongly implicated in up to 70% of gastric ulcers and 90% of duodenal ulcers. Genetic predisposition, environmental conditions, and bacterial virulence factors such as CagA and VacA play roles in disease progression.[23]

A systematic review and meta-analysis conducted in January 2016 revealed a global prevalence of 44.3%, with higher rates in developing countries with poor sanitation and limited healthcare access. The prevalence of H. pylori infection is closely linked to factors such

as sanitation, access to clean drinking water, and crowded living conditions, all of which are more prevalent in low-income regions.[24]

Africa has the largest prevalence, constituting approximately 70.1% (nearly 2.1 billion) of the worldwide burden of Helicobacter Pylori Infection, reflecting the widespread risk factors such as poor sanitation, high population density, and limited access to healthcare[25]. Limited data exist on fecal antigen prevalence; however, A hospital-based cross-sectional study conducted in Ethiopia from August 1 to November 30, 2020, reported that more than one-third (34%) of dyspepsia patients were positive for the H. pylori stool antigen test, and overcrowding and poor hygienic conditions are the main risk factors for H.pylori infection[26] Poor hygiene and sanitation are significant contributors to infection through contaminated food and water. Overcrowding and High population densities facilitate person-to-person transmission. Limited access to preventive healthcare and clean resources were risk factors in Africa. Despite the high prevalence, the progression to PUD varies, suggesting that host factors, bacterial strain differences, and lifestyle behaviors modulate disease risk.[27]

A cross-sectional study conducted between December 2004 and May 2006 in Nigeria showed that Helicobacter pylori infection is very prevalent among patients with peptic ulcer disease in Kano, Nigeria with the Prevalence of Helicobacter pylori infection in all the study participants at 81% and, Helicobacter pylori were found present in 93.3% of patients with peptic ulcer disease with duodenal ulcer 95.8% and gastric ulcer 90.9%. However, 80% of those with normal endoscopic findings also had Helicobacter pylori infection.[19]

A hospital-based prospective study conducted in Abuja, Nigeria, from June 2016 to June 2017 a H.pylori infection rate of 42.2%.In patients with confirmed PUD, the infection showed a strength of association of 81.1% which was statistically significant ($p<0:001$)[28].

In Sub-Saharan Africa, H. pylori prevalence rates are among the highest globally. Highlight the role of environmental and behavioral factors, including poor sanitation and dietary habits. In Kenya, fecal antigen prevalence was reported at 54.8%, while in Uganda, the prevalence reached 44.3% among adults with gastrointestinal symptoms. Risk factors such as the use of non-steroidal anti-inflammatory drugs (NSAIDs) and alcohol consumption exacerbate infection severity and disease progression.[29] Interestingly, despite high infection rates, severe complications such as PUD and gastric cancer are less frequent in this region compared to other parts of the world. This "African enigma" has been attributed to differences in bacterial virulence factors and host immune responses [30].

A systematic review and meta-analysis of existing studies published between 1985, and February 2021 aimed to estimate the pooled prevalence and identify factors associated with *H. pylori* infection in East Africa showed that more than half of the populations of East African countries were positive for *H. pylori infection*, and Rural residence, source of water, and alcohol consumption were significantly associated with *H. pylori* infection. Therefore, healthcare workers could provide health education on the risk factors, and the government and other stakeholders could improve the source of drinking water in East Africa.[31].

In Tanzania, *H. pylori* is a significant cause of gastritis and PUD. Fecal antigen testing has shown a prevalence of 43.4% among symptomatic adults. A hospital-based, cross-sectional study conducted from October 2022 to April 2023 among adults attending the gastroenterology clinic at Kilimanjaro Christian Medical Centre showed that the fecal prevalence of H. pylori is high in this setting, and H. pylori stool antigen can be used as the initial workup for symptomatic patients before the initiation of proton pump inhibitors.

It is recommended that H. pylori stool antigen testing be part of the initial evaluation and that EGD be considered in the absence of other alarm symptoms if symptoms persist despite an appropriate trial of medical therapy [32].

A hospital-based analytical cross-sectional study conducted in Dodoma between February and April 2020 showed that the prevalence of Helicobacter pylori infection was found to be relatively high at 49.66%, and Helicobacter pylori infection was significantly associated with advanced age, low level of education, unsafe water, Relatives with H.pylori, and the use of NSAIDs[33].

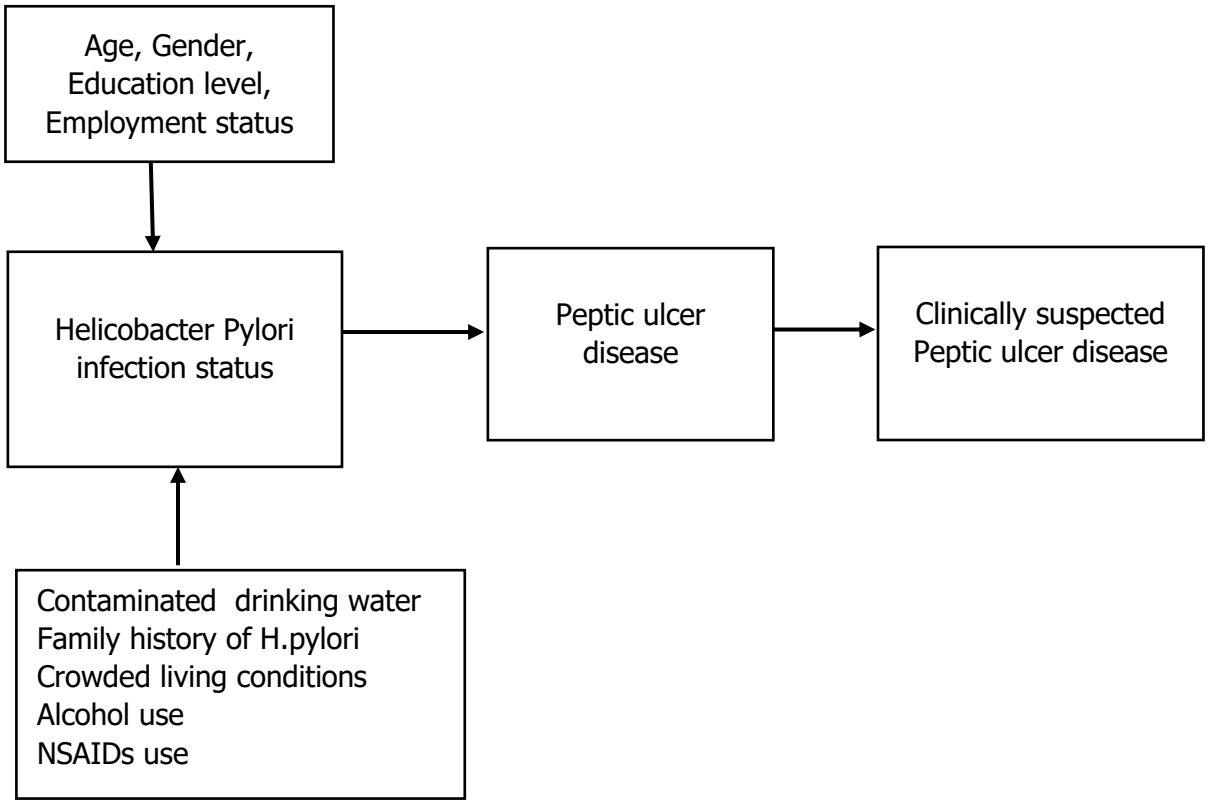
Dar es Salaam, Tanzania's largest urban center, experiences a dual burden of infectious and chronic diseases. A cross-sectional study done from 2012 to December 2016 showed that Helicobacter pylori infection was associated with the presence of peptic ulcer disease, chronic gastritis, and the absence of gastric cancer. The rate of detection of Helicobacter pylori infection was higher in tissue blocks of elderly patients (40-59 years old,45.9%) than in those of young patients (< 20 years old,23.1%). Also, gastric cancer was more prevalent in older female patients.[34]

Despite studies describing the prevalence of Helicobacter pylori infection globally and across Africa, most available data originate from hospital-based populations, primarily involving patients presenting with dyspeptic symptoms or undergoing endoscopy. Consequently, these findings may not accurately represent the true community burden of infection. Furthermore, limited data exist on the prevalence of H. pylori using noninvasive stool antigen testing among community-dwelling adults in Tanzania. The association between H. pylori infection and clinically suspected peptic ulcer disease has also been inadequately explored outside clinical

settings. In addition, few studies have comprehensively examined the influence of behavioral, environmental, and sociodemographic risk factors on infection at the community level.

To address these gaps, a community-based study investigates the prevalence of H. pylori infection using fecal stool antigen testing among adults in Dar es Salaam, explores its correlation with clinically suspected peptic ulcer disease, and selected risk factors. By providing updated and population-based data, this study contributes valuable evidence to inform early detection strategies, community health education, and policy interventions aimed at reducing the burden of H. pylori infection and its complications in Tanzania.

Conceptual Framework



CHAPTER THREE

3.0 Methodology

3.1 Study Design

A cross-sectional descriptive study among clinically suspected adults with peptic ulcer disease in Dar es Salaam communities.

3.2 Study Area

The study was conducted in the Dar es Salaam region within the community. Dar es Salaam is located between latitudes 6°45″S and 7°25″S, and longitudes 39°E and 39°55″E on the Eastern coast of Tanzania.[35]. It comprises five municipalities: Kinondoni, Dar es Salaam City, Temeke, Ubungo, and Kigamboni [36]. The current population of Dar es Salaam, according to the 2022 census, is 5,383,728[36] . Dar es Salaam is an important city for Industrial, business, government activities, and education.

3.3.Study duration

This study was conducted for 10 months from November 2024 to August 2025, whereby proposal development, data collection, entry, analysis, and report writing were performed.

3.4. General Population

All adults living in Dar es Salaam communities.

3.5. Target Population

Adults clinically suspected of having PUD in Dar es Salaam Communities.

3.6. Study Population

Adults clinically suspected of having PUD, from the selected households in sub-streets within Dar es Salaam communities.

3.7 Eligibility Criteria

3.7.1 Inclusion Criteria

I. Adults aged 18 years and older who consent to participate and are residents of Dar es Salaam communities.

II. Adults with clinical suspicion of PUD based on Cornell Medical Index criteria[5].

III. Adults who can communicate effectively in Swahili or English.

3.7.2 Exclusion Criteria

I. Adults who are on long-term anti-acids or Proton pump inhibitors.

II. Adults who have used antibiotics in the last 4 weeks.

Justification for Exclusion Criteria

I. Long-term use of antacids or PPIs alters the acidity of the stomach, which can affect H. pylori colonization can Reducing stomach acid may lead to false-negative results for H. pylori infection or impact the development of peptic ulcers (PUD), making it difficult to assess the true prevalence and role of H. pylori in causing PUD.

II. Antibiotics can suppress or eradicate H. pylori bacteria, leading to false-negative results in diagnostic tests like stool antigen tests or breath tests. This would impact the accuracy of the study's findings regarding the prevalence of H. pylori infection among PUD patients.

3.8 Sample Size Estimation

$$n = \frac{Z^2 . P(1-P)}{\varepsilon^2}$$

Were

Z—1.96 at 95% Confidence level.

P—The prevalence of *H. pylori* infection, as reported from a previous study conducted, is 42%[37].

ε —The margin of error at 95% Confidence Interval, which is 5% (0.05).

n — the required sample size.

$$n = \frac{1.96^2 . 0.42(1-0.42)}{0.05^2}$$

The overall sample size for this study was **374.**

Justification of the formula

The Kish-Leslie formula for single proportion estimation of the sample was used to calculate the internal valid sample size for estimating the prevalence of Helicobacter Pylori infection. The proportion used for calculating sample size was obtained from a corresponding study done by Yang Jae Lee et al. in the Namtumba District in Eastern Uganda.[37] The study aimed to determine the prevalence of Helicobacter pylori within the general adult population in a region of Eastern Uganda and evaluate the efficacy of standard triple therapy for eradicating Helicobacter pylori. Thus, using similar proportions ensured the validity of the results and minimized bias.

3.9 Sampling Procedure

In this study, a multistage sampling technique was used to recruit study participants in Dar es Salaam. In the first stage, one district was randomly chosen from the five districts in Dar es Salaam (Kigamboni, Kinondoni, Ilala, Temeke, and Ubungo). In the second stage, a list of administrative divisions within the chosen district was compiled, and one division was selected randomly. In the third stage, two administrative wards were randomly selected from the designated division, resulting in the selection of two streets. In the fourth stage, sub-streets within the selected streets were randomly selected; the 1st, 2nd, and 5th sub-streets were chosen from one street, while the 4th, 5th, and 7th sub-streets were selected from another street. In the fifth stage, households within the selected sub-streets were chosen using systematic random sampling, with every 2nd household on the list included. In each selected household, adults who met the inclusion criteria and provided consent were interviewed, and confidential stool collection was conducted. Those who did not meet the inclusion criteria were excluded, ensuring the required sample size of 374 participants was achieved.

3.10 Study Variables

3.10.1 Dependent Variables:

The dependent variable of this study was the Helicobacter pylori infection status. A combination of Helicobacter Pylori positive and negative results from fecal antigen testing was used to assess the Helicobacter Pylori status, based on the presence or absence of H. pylori antigens in stool samples.

3.10.2 Independent variables:

The independent variables of this study were categorized into social demographics, Environmental and living conditions, Behavioral factors, and Clinical suspicion of PUD

Social Demographic Characteristics included: Age: Categorized into age groups 18-29, 30-39, 40-49, 50 and above, Gender: Male or Female, Level of Education: No formal education, Primary, Secondary, Higher, Employment status: Employed and Unemployed, and Marital Status: Single, Married, Divorced, Widow/Widowed, Cohabiting.

Environmental and Living Conditions included: Drinking water Sources: tap water, well water, and purchased bottled water, Availability of toilet facilities: Rated as Excellent, Good, Poor, Very Poor, Handwashing Practices: Yes, or No, and Living Conditions: Adequate, Overcrowded, Poor.

Behavioural Factors: included Smoking: Yes, or No, Alcohol Consumption: Yes, or No, Use of NSAIDs (painkillers): Regularly, Occasionally, Rarely, Never, Family History of *H. Pylori* Infection: Yes, or No, Dietary Habits: Rated as Poor dietary habits, Balanced diet, Consumes mostly fast foods, and Source of daily diet: Eating at Street Vendors or Restaurants, Others (home-cooked food, hotel, institutionalized)

Clinical suspicion of PUD was assessed using 11 symptom-related questions adapted from the Cornell Medical Index (CMI) and 6 diagnostic questions based on Dunn's criteria for ulcer-type pain[5] . The CMI questions evaluated gastrointestinal symptoms such as poor appetite, frequent stomach pain, and indigestion, with yes/no responses coded as 1 for "yes" and 0 for "no."

The six diagnostic questions further characterized ulcer-related pain patterns and medical history. Participants responded "yes" or "no" to the following:

- (I) Have you ever been troubled by episodes of stomach pain or stomachache?

- (I-A) If yes, how soon do these episodes usually come on after eating?
- (I-B) If yes, are they relieved by taking milk or food?
- (I-C) If yes, have they ever awakened you at night?
- (II) Have you ever been told by your doctor that you had a peptic ulcer?
- (II-A) If yes, was this finding confirmed by esophagogastroduodenoscopy (OGD)?

Based on the responses, clinical suspicion of PUD was determined using the following criteria:

- Criterion 1 Participants who answered "yes" to Question I, I-A (stomach pain, pain occurs ≥2 hours after eating), and I-B (pain relieved by milk or food) were classified as having clinical suspicion of PUD. A score of 3 indicated suspicion, whereas scores of 1–2 indicated no suspicion under this criterion.
- Criterion 2 Participants who answered "yes" to Question I (stomach pain) and I-C (pain awakens at night) were classified as clinically suspected PUD with a score of 2. Those who scored 1 were not suspected under this criterion.
- Criterion 3 Participants who answered "yes" to Question II (doctor-diagnosed ulcer) and II-A (confirmed by OGD) were classified as clinically suspected PUD with a score of 2. A score of 1 indicated no suspicion under this criterion.

3.11 Data Collection

Data Collection comprised of Socio-demographic, Clinical, and laboratory variables. The principal investigator and a trained research assistant collected data from study participants in selected households.

3.11.1 Questionnaire

A structured questionnaire, which consisted of six distinct sections, was used to collect social demographics and Clinical variables by the principal investigator and research assistant.

General Information section: This section gathered basic details such as the date of survey completion, the area of research within the selected Municipality, and the participant's place of residence.

Social Demographic Characteristics section: This section captured demographic information, including the participant's age, gender, level of education, Employment status, and marital status.

Environmental and Living Conditions section: This section examined the participants' environmental and living conditions, focused on sources of drinking water, availability of toilet facilities, handwashing practices, and overall living conditions.

Behavioral Factors section: This section collected data on the participant's behavior, including smoking habits, alcohol use, use of NSAIDs, family history of *H. pylori* infection, dietary habits, and Source of daily diet.

Clinical Suspicion of PUD section: This section evaluated the clinical signs and symptoms associated with PUD, utilizing questions adapted from the Cornell Medical Index and Dunn's questionnaire[5] which assessed the participant's history and current condition.

H. Pylori Test Result section: This section recorded the result of the H. pylori fecal antigen test, indicating whether the test result was positive or negative.

3.11.2 LABORATORY VARIABLE DPL H. Pylori Stool Kit

This device was used to collect and test samples. The DPL H. Pylori Stool Kit, Nantong EGENS Biotechnology Co., Ltd., Nantong, China, 2024 version has the following components for collecting and testing stool samples:

Clean, Labelled, Disposable Containers: These were provided to participants for hygienic collection of stool samples at home.

Collection Stick: Used by the research assistant to transfer a portion of the stool sample into the collection tube.

Sample Collection Tube: Contained phosphate-buffered saline (PBS) solution to mix with the stool sample.

Phosphate-buffered Saline (PBS) Solution: Used to homogenize the stool sample, ensuring accurate testing.

Antigen Detection Cassette: The main testing device where 3 drops of the stool-buffer mixture were added to detect the presence of H. pylori antigen.

3.11.3 Reliability and validity of the data tool

The questionnaire for this study was developed by the Principal Investigator (PI) by compiling questions from previous studies after a rigorous literature review. The section on clinical evaluation of PUD was adopted from a previous study conducted in Israel, which validated the questionnaire in a diverse, ethnically heterogeneous population comprising individuals from Europe, Africa, and Asia.[5].

The PI translated this questionnaire into Swahili and then back-translated it into English to ensure accuracy and minimize any loss of meaning.

The questionnaire was reviewed by the supervisor, co-supervisors, and the Institutional Review Board (IRB) reviewers, all experts in internal medicine. Their comments, suggestions, and any modifications were incorporated to enhance the tool's validity.

3.11.4 Data Collection Procedures

Data collection for this study commenced in April 2025, following the securing of ethical clearance from the Institutional Review Board of KU.

The data collection team consisted of the Principal Investigator (PI) and a Research Assistant (RA). A research assistant, who was a laboratory technician with a diploma in Medical Laboratory Sciences, registered under the Health Laboratory Practitioners Council(HLPC). The RA had prior experience in specimen collection, community-based health surveys, and field data recording. Before the commencement of data collection, the Research Assistant (RA) received comprehensive training from the Principal Investigator (PI). The training covered the study objectives, ethical considerations, informed consent procedures, and confidentiality protocols. Additional instruction was provided on the use of data collection tools and interview techniques, stool sample collection and handling, storage and transport of stool samples, community engagement and communication, and daily monitoring and reporting procedures. The PI provided continuous supervision throughout the data collection period to ensure adherence to data quality standards, ethical research practices, and the proper handling of stool samples.

The data collection utilized systematic random sampling to select households within the community. In each selected household, each adult who met the inclusion criteria and consented to participate was asked to sign an informed consent form. After obtaining consent, the research assistant and the PI administered the questionnaire by reading the questions and recording the participants' responses.

Participants collected stool samples at home using clean, labeled, disposable containers provided by the PI or research assistant. The testing was conducted at Kambangwa Dispensary so as to observe IPC(Infection prevention and control) and sanitary measures, as well as safe disposal of the collected stool samples.

The research assistant performed the Helicobacter pylori antigen test on these samples using the DPL H. Pylori Stool Kit, Nantong EGENS Biotechnology Co., Ltd., Nantong, China, 2024 version. Stool samples were transferred into a sample collection tube containing phosphate-buffered saline (PBS) solution, mixed well, and 3 drops of the mixture were added to the antigen detection cassette. Results were read within 15 minutes, indicated positive if two lines appeared, and negative if one line appeared.

Invalid results required a new test. The research assistant documented the results in the participant's questionnaire form and properly disposed of used components in a biohazard waste bin.

Participants with positive stool test results for Helicobacter pylori were referred for appropriate medical treatment and eradication of the infection. Participants with negative results were advised to maintain their health and avoid risk factors for H. pylori infection.

After data collection, the collected data were systematically managed and analyzed using Microsoft Excel. The research team entered all responses and test results into a well-structured Excel spreadsheet, ensuring that each variable is appropriately labeled and coded. The data were meticulously reviewed for accuracy and completeness, with any inconsistencies or errors promptly addressed.

3.12 Data Analysis

The data analysis used SPSS version 25.0 (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp). Data collected from the field were initially entered into Microsoft Excel and then transferred into SPSS for analysis. The dataset was cleaned to address forgotten, missing, or duplicate entries. Continuous variables, such as age, were summarized using mean and standard deviation.

Age was categorized into 18–29, 30–39, 40–49, and 50 years and above. Categorical variables such as gender, level of education, Employment status, marital status, Source of drinking water, Availability of toilets, handwashing practices, living conditions, smoking, alcohol use, use of NSAIDs, dietary habits, Source of daily diet, and family history of H. pylori infection were summarized using absolute counts and percentages. Data were presented using text, tables, and figures.

Proportional comparisons of the independent variables with Helicobacter pylori infection status were conducted using the chi-squared test. Spearman's rank correlation coefficient analysis was performed to assess the correlation between Helicobacter pylori infection and clinical suspicion of peptic ulcer disease (PUD). Variables such as Gender, Source of drinking water, cigarette smoking status, alcohol use status, Family history of *H. Pylori,* and Dietary habits that achieved a significant level of ≤0.2 in the chi-squared test were included in a multivariable logistic regression model to identify factors associated with Helicobacter Pylori infection. The results were reported as adjusted odds ratios (aOR) with corresponding 95% confidence intervals (CI). A p-value less than 0.05 was considered statistically significant with Helicobacter Pylori infection.

3.13 Dissemination of Results

The research results will be disseminated to the Kairuki University Library, the Ministry of Health, Kinondoni municipality in Dar es Salaam, Tanzania, the Gastroenterology and Endoscopy Society, and the Association of Physicians of Tanzania through research reports, scientific conferences, and publications.

CHAPTER FOUR

4.0 Ethical Considerations

Ethical clearance for this study was sought from the Kairuki University Institutional Research and Ethics Committee. Permission to conduct the study was granted by the Dar es Salaam Regional Administrative Secretary. Before data collection, the study's purpose, objectives, and procedures were clearly explained to study participants and relevant community leaders to promote transparency and cultural sensitivity. Community leaders at the regional, district, ward, street, and sub-street levels were informed about the study to ensure cooperation and trust.

Voluntary informed consent forms were provided to all participants to read and sign. For participants who were unable to read or write, the consent forms were read to them, and a thumbprint was obtained as an alternative to a signature. The study was conducted in a manner that ensured no serious harm to participants. Confidentiality and anonymity were strictly maintained by assigning professional identification codes in place of personal names, with a number for adults who consented to participate in a study. All collected data were securely stored, with access restricted to authorized research personnel using password-protected systems and unique login credentials.

Participation in the study was entirely voluntary, and participants were informed of their right to withdraw at any time without coercion or impact on any services they received. The principal investigator was responsible for addressing all questions and concerns raised by participants. Individuals who tested positive for Helicobacter pylori infection were referred for further medical management, while those who tested negative were counseled on preventive health practices and reducing risk factors for infection.

CHAPTER FIVE

5.0 Results

This study was conducted for 10 months from November 2024 to August 2025, and 400 clinically suspected PUD adults in Dar es Salaam communities were recruited.10 participants had incomplete data (did not produce a stool sample), resulting in a total of 390 participants with complete data who were included in the analysis, as depicted in the CONSORT flow chart below.

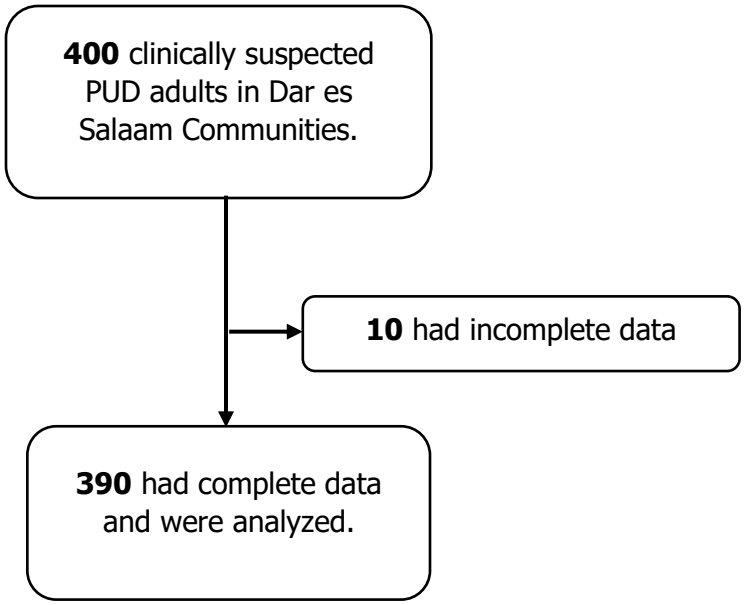


Figure 1: Consort flow chart of study participants

5.1 The baseline characteristics (social demographics &history) of adults with clinically suspected Peptic ulcer disease in the Dar es Salaam Community.

Table 1 illustrates the distribution of baseline characteristics of study participants (social demographics and their history). The mean age was 36.9 ± 15.7 standard deviation years, with a minimum age of 18 and a maximum of 97 years. Notably, the study participants were predominantly female, comprising 252 out of 390 (64.6%) of the total. Furthermore, the majority of participants, 169/390 (43.3%), were aged between 18 and 29 years.

Of these,181/390(46.4%) were married. The distribution of education level among participants revealed that 27/390 (6.9%) had no formal education, while the majority,187/390(47.9%) had attained primary education,126/390(32.3%) had completed secondary education, and 50/390(12.8%) had a higher education. Furthermore, a significant proportion of the participants, 319/390(81.8%), were employed.

The majority of study participants, 226/390(57.9%), used tap water, while 130 (33.3%) used well water, and a minority used bottled water, with a proportion of 34/390(8.7%). Nearly half of the participants,194/390(49.7%), had poor availability of toilets, with only 8/390(2.1%) having excellent availability of toilets, and 175/390(44.9%) rated their toilet as good. More than half,220/390(56.4%), of the participants reported practicing the hand-washing habit, while 170/390(43.6%) did not practice.

About two-thirds,266/390(68.2%), lived in overcrowded conditions, with one-fifth,87/390(22.3%), residing in an adequate living environment. 124/390(31.8%) of participants reported being smokers, while the majority,266/390(68.2%), did not smoke.

Nearly three-quarters,283/390 (72.6%) of participants were drinking alcohol compared to 107/390(27.4%) who abstained. Nearly half of the study participants,188/390(48.2%), used painkillers regularly, in contrast to 3/390(0.8%) who never used painkillers. The majority of participants,330/390(84.6%), had a family history of Helicobacter Pylori infection, while 60/390(15.4%) had no family history of Helicobacter Pylori infection. Moreover, concerning dietary habits,323/390(82.8%) of participants consumed fast food, while 39/390(10%) maintained a balanced diet, and 28/390(7.2%) reported having poor dietary habits. Furthermore, nearly all participants,364/390(93.3%), reported their source of daily diet to be from street vendors.

Table 1: The baseline characteristics (social demographics and history) of the clinically suspected Peptic ulcer disease adults in the Dar es Salaam Community. (N=390)

Variables	Frequency(%)
Gender	
Male	138(35.4)
Female	252(64.6)
Age	
18-29	169(43.3)
30-39	75 (19.2)
40-49	75 (19.2)
50 and >	71 (18.2)
Education level	
Not formal	27(6.9)
Primary	187(47.9)
Secondary	126(32.3)
Higher education	50(12.8)
Employment status	
Employed	319(81.8.)
Unemployed	71(18.2)
Marital Status	
Single	92(23.6)
Married	181(46.4)
Divorced	11(2.8)
Widow/Widower	32(8.2)
Cohabiting	74(19.0)
Source of drinking water	
Tap water	226(57.9)
Well water	130(33.3)
Bottled water	34(8.7)
Availability of Toilet	
Excellent	8(2.1)

Good	175(44.9)
Poor	194(49.7)
Very Poor	13(3.3)
Hand-washing habit	
Yes	220(56.4)
No	170(43.6)
Living Environment	
Adequate	87(22.3)
Overcrowded	266(68.2)
Poor	37(9.5)
Cigarette Smoking status	
Yes	124(31.8)
No	266(68.2)
Alcohol Use Status	
Yes	283(72.6)
No	107(27.4)
NSAIDs use	
Regular	188(48.2)
Occasional	146(37.4)
Rarely	53(13.6)
Never	3(0.8)
Family h/o of *H. pylori*	
Yes	330(84.6)
No	60(15.4)
Dietary habit	
Poor	28(7.2)
Balanced Diet	39(10.0)
Fast Food	323(82.8)
Source of daily diet	
Street vendors	364(93.3)
Others(home cooked,hotel,institution)	26(6.7)

*NSAIDs, Non-steroidal Anti-inflammatory Drugs, h/o, History of.

5.2 The Prevalence of *H. pylori* Infection in Clinically Suspected Peptic Ulcer Disease Adults in Dar es Salaam Community.

Figure 2 shows the prevalence of Helicobacter Pylori infection in clinically suspected PUD Adults. Among 390 clinically suspected adults with Peptic ulcer disease,161(41.3%) tested positive, while 229(58.7%) tested negative. The rate of H.pylori negative was significantly higher than H.pylori positive (p-value 0.000), underscoring that not every patient with H.pylori infection will exhibit Peptic ulcer disease.

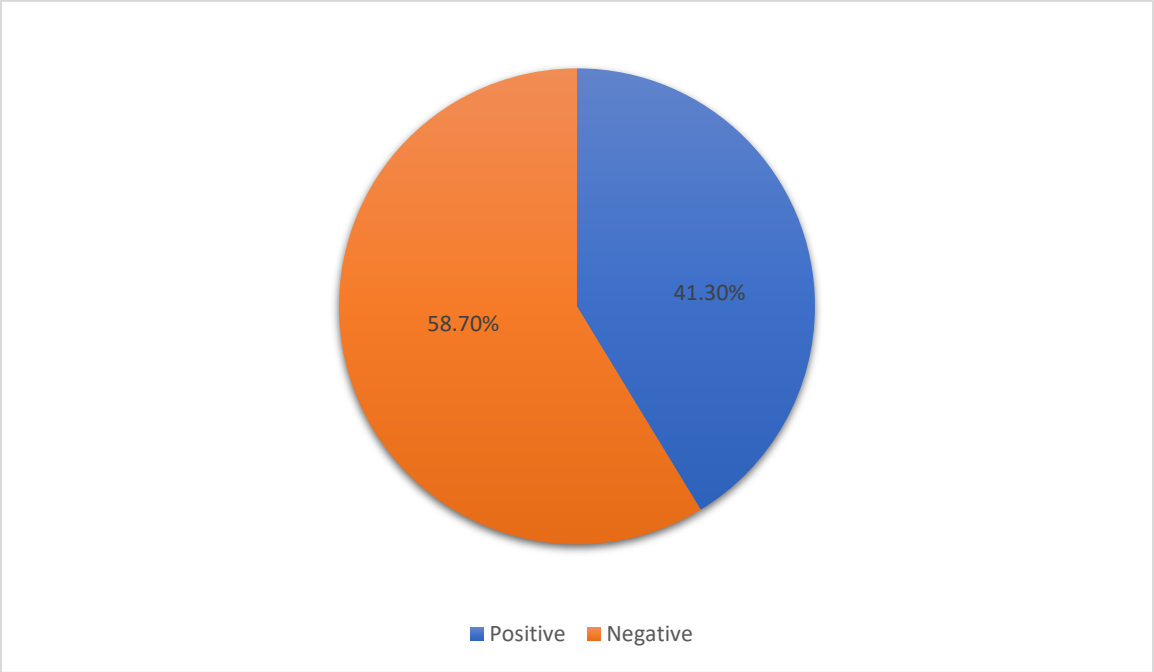


Figure 2: The Prevalence of H. pylori infection among clinically suspected Peptic ulcer disease adults in the Dar es Salaam Community. (N=390)

5.3 The distribution of social demographic characteristics (Gender, Age, Education level, Employment status, and marital status) of H. pylori infection in adults clinically suspected of Peptic ulcer disease in the Dar es Salaam Community.

Table 2 shows the distribution of social demographic characteristics according to Helicobacter pylori infection status**.** Helicobacter Pylori infection was more common among males, at 49.3% (68/138), than among females, at 36.9% (93/252), and the association was statistically significant (p-value<0.05). Moreover, the majority of participants were employed, 42.6% (136/319), compared to the Unemployed, 35.2% (25/71), and the association was statistically insignificant (p-values >0.05). Furthermore, Helicobacter Pylori infection increased with age, with a slight decrease in the oldest group, where most diagnoses were observed among participants in the age group 40-49 years, with a proportion of 46.7%(35/75), although it was not statistically significant (p> 0.05). Moreover, although the association was not statistically significant (p-values > 0.05), the proportion of Helicobacter Pylori infection was highest among those with a secondary education level, 46.0% (58/126), and singles, 44.6% (41/92), in the marital group.

Table 2: Socio-demographic risk factors of H. pylori infection in adults clinically suspected of Peptic ulcer disease, Dar es Salaam Community. (N=390)

Variables	Positive N(%)	Negative N(%)	χ^2	p-value
Gender				
Male	68(49.3)	70(50.7)		
Female	93(36.9)	159(63.1)	5.629	0.018**
Age				
18-29	69(40.8)	100(59.2)		
30-39	32(42.7)	43(57.3)		
40-49	35(46.7)	40(53.3)		
50 and above	25(35.2)	46(64.8)	2.252	0.522
Education level				
Not formal	9(33.3)	18(66.7)		
Primary	72(38.5)	115(61.5)		
Secondary	58(46.0)	68(54.0)		
Higher Education	22(44.0)	28(56.0)	2.634	0.452
Employment status				
Employed	136(42.6)	183(57.4)		
Unemployed	25(35.2)	46(64.8)	1.338	0.247
Marital Status				
Single	41(44.6)	51(55.4)		
Married	78(43.1)	103(56.9)		
Divorced	4(36.4)	7(63.6)		
Widow/Widower	12(37.5)	20(62.5)		
Cohabiting	26(35.1)	48(64.9)	2.126	0.713

** statistically significant at p-value < 0.05

5.4 The Distribution of Environmental Risk Factors (Source of water, Availability of Toilet, Hand washing habit, and living environment) of H. pylori infection in clinically suspected Peptic ulcer disease adults in Dar es Salaam Community.

Table 3 presents the distribution of Helicobacter Pylori infection according to Participants' Environmental risk factors. Helicobacter Pylori infection was more prevalent among tap water users, 106/226(46.9%), with the highest infection rate, than well water users,42/130(32.3%), who had the lowest infection rate, and the association was statistically significant(p value < 0.05). Furthermore, those with excellent availability of toilet facilities,1/8(12.5%), showed a notably lower infection rate; however, the association was not statistically significant(p-value> 0.05). Surprisingly, although the association was not statistically significant (p-value >0.05), the proportion of Helicobacter Pylori infection was higher among those reporting hand-washing habits, 94/219 (42.9%). Helicobacter Pylori infection increased with deteriorating living conditions, with Poor living conditions,16/39(43.2%), having the highest infection rate, although the association was not statistically significant (p value > 0.05).

Table 3: Environmental Risk Factors of H. pylori infection in clinically suspected Peptic ulcer disease adults in Dar es Salaam Community. (N=390)

Variables	Positive N(%)	Negative N(%)	χ^2	p-value
Source of water				
Tap water	106(46.9)	120(53.1)		
Well water	42(32.3)	88(67.7)		
Bottled water	13(38.2)	21(61.8)	7.486	0.024**
Availability of Toilet				
Excellent	1(12.5)	7(87.5)		
Good	77(44.0)	98(56.0)		
Poor	79(40.7)	115(59.3)		
Very Poor	4(30.8)	9(69.2)	4.364	0.225
Hand-washing habit				
Yes	94(42.9)	125(57.1)		
No	67(39.2)	104(60.8)	0.554	0.457
Living environment				
Adequate	33(37.9)	54(62.1)		
Overcrowded	112(42.1)	154(57.9)		
Poor	16(43.2)	21(56.8)	0.536	0.765

** statistically significant at $p < 0.05$

5.5 The Distribution of Behavioral Risk Factors(Cigarette smoking, Alcohol use, NSAIDs use, Family history of *H. pylori*, Dietary habit, and Source of daily diet) of H. pylori Infection in Clinically Suspected PUD Adults in Dar es Salaam Community.

Table 4 shows the distribution of Behavioral risk factors according to Helicobacter Pylori infection status. The distribution of Helicobacter Pylori infection was notably higher among study participants who smoked,50.4%(63/125), compared to those who did not smoke,37%(98/265), and the association was statistically significant ($p < 0.05$). Furthermore, participants who drank alcohol,44.5%(126/283), exhibited a higher H. pylori infection rate

than those who abstained,22.7%(35/107), and the association was statistically significant (p< 0.05). Helicobacter Pylori infection was more prevalent among study participants with a family history of H. pylori,43.0%(142/330), relative to those without a family history,31.7%(19/60), and the association was statistically insignificant (p >0.05). Moreover, Helicobacter pylori infection was higher among participants with a dietary habit of eating fast food, 43.3%(140/323), compared to those eating a balanced diet,30.8%(12/39), and this association was statistically insignificant(p>0.05). Surprisingly, participants who rarely use NSAIDs,50.9%(27/53), and whose source of daily diet was from street vendors,41.8%(152/364), had higher H. pylori infection, although the association was statistically significant (p>0.05).

Table 4: Behavioral Risk Factors of H. pylori infection in clinically suspected Peptic ulcer disease adults in Dar es Salaam Community. (N=390)

Variables	Positive N(%)	Negative N(%)	χ^2	p-value
Cigarette Smoking Status				
Yes	63(50.4)	62(49.6)		
No	98(37.0)	167(63.0)	6.309	0.009**
Alcohol use status				
Yes	126(44.5)	157(55.5)		
No	35(32.7)	72(67.3)	4.470	0.035**
NSAIDs use				
Regular	77(41.0)	111(59.0)		
Occasional	56(38.4)	90(61.6)		
Rarely	27(50.9)	26(49.1)		
Never	1(33.3)	2(66.7)	2.643	0.455
Family h/o *H. pylori.*				
Yes	142(43.0)	188(57.0)		
No	19(31.7)	41(68.3)	2.774	0.096
Dietary habit				
Poor	9(32.1)	19(67.9)		
Balanced diet	12(30.8)	27(69.2)		
Fast foods	140(43.3)	183(56.7)	3.309	0.102
Source of daily diet				
Street vendors	152(41.8)	212(58.2)		
Others	9(34.6)	17(65.4)	0.520	0.471

*NSAIDs, non-steroidal anti-inflammatory drugs, h/o, History of, ** statistically significant at P-value <0.05.

5.6 Factors associated with Helicobacter Pylori infection in clinically suspected PUD adults, in the Dar es Salaam Community.

Participants' Gender, source of water, cigarette smoking, alcohol use, family history of H. pylori, and dietary habits were found to have a p-value < 0.2 in univariate logistic regression. In Table 5, the multivariate logistic regression was conducted with Gender, Source of drinking water, Cigarette smoking, Alcohol use, Family history of H. pylori, and Dietary habits as factors for the prevalence of Helicobacter pylori infection. The water source variable was significantly associated with H. pylori infection (p-value < 0.05), which showed that participants using well water were 42.6% less likely to have an H. Pylori infection (AOR of 0.574) compared to those using tap water. Conversely, being female, smoking cigarettes, consuming alcohol, having no family history of H. pylori infection, and eating fast food were associated with a higher risk of Helicobacter pylori infection, while maintaining a balanced diet appeared to be protective. However, this association was not statistically significant (p > 0.05)

Table 5: The multivariate logistic regression of (Gender, Source of water, Cigarette smoking, Alcohol use, Family h/o H. pylori, and Dietary habit) with H.pylori infection in clinically suspected Peptic ulcer disease adults in Dar es Salaam Community. (N=390)

Variables	UOR for 95% C.I (lower-upper)	P-value	AOR FOR 95% C.I (lower-Upper)	P-value
Gender				
Male(ref)				
Female	1.661(1.091-2.529)	0.018	1.182(0.549-2.544)	0.670
Source of water				
Tap water(ref)				
Well water	0.566(0.364-0.879)	0.011	0.574(0.362-0.911)	0.018**
Bottled water	0.870(0.420-1.793)	0.706	0.780(0.363-1.672)	0.522
Cigarette Smoking Status				
Yes	1.770(1.150-2.725)	0.009	1.279(0.563-2.904)	0.556
No(ref)				
Alcohol use status				
Yes	1.651(1.035-2.634)	0.035	1.318(0.778-2.232)	0.304
No(ref)				
Dietary Habits				
Poor(ref)				
Balanced diet	0.603(0.296-1.228)	0.163	0.944(0.323-2.759)	0.916
Fast foods	1.676(0.956-2.937)	0.071	1.376(0.590-3.210)	0.460
Family h/o H.pylori				
Yes(ref)				
No	1.630(0.907-2.928)	0.096	1.417(0.767-2.619)	0.266

h/o, history of

5.7 The Correlation between *H. Pylori* infection and clinical suspicion of PUD among adults in the Dar es Salaam Community.

Table 6 shows the correlation between Helicobacter pylori infection and clinical suspicion of peptic ulcer disease among adults in the Dar es Salaam community who are suspected of having PUD, based on three ulcer classification criteria. Most participants with Helicobacter pylori infection fell into criterion 1, accounting for 144/341(42.2%), compared to 16/42 (38.1%) in criterion 2, and 1/7 (14.3%) in criterion 3. Furthermore, there appears to be a statistically significant ($p<0.05$) and positive linear association (Spearman's ρ = 0.634, 0.933, and 0.884) between clinical suspicion of PUD across criteria 1, 2, and 3 and Helicobacter pylori infection. The strength of this association is approximately 63.4% in criterion 1, 93.3% in criterion 2, and 88.4% in criterion 3.

Table 6: The Correlation between H. Pylori infection and clinical suspicion of Peptic ulcer disease(Criteria 1-3) among adults in the Dar es Salaam Community. N= 390

Criteria	Positive, N(%)	Negative,N(%)	Spearman's rank (ρ)	**P-value**
Criterion 1	144(42.2)	197(57.8)	0.634	0.001***
Criterion 2	16(38.1)	26(61.9)	0.933	0.000***
Criterion 3	1(14.3)	6(85.7)	0.884	0.000***

*** statistically significant at p-value < 0.05.

CHAPTER SIX

6.0 Discussion

This study determined the Helicobacter pylori fecal prevalence, risk factors, and correlation between Helicobacter Pylori infection among clinically suspected PUD adults in the Dar es Salaam community. More than two-fifths (41.3%) of all study participants were found to be infected with Helicobacter pylori. This result is almost similar to a study conducted at the Kilimanjaro Christian Medical Centre (KCMC) in Northern Tanzania, which reported a fecal prevalence of 43.4% among symptomatic adults visiting the gastroenterology clinic.[32]. The resemblance in findings may be due to the use of similar sampling techniques; both studies utilized systematic random sampling to reduce selection bias. In this study, households were selected by choosing every second house, while KCMC employed a 2:1 selection ratio to ensure adequate representation of the target demographic. Additionally, both investigations targeted a comparable group of adults exhibiting dyspeptic symptoms, whether in a community or clinical environment. This alignment in study methodology and participant characteristics likely accounts for the almost similar prevalence rates of Helicobacter pylori infection[32].

Helicobacter pylori infection was most common among individuals aged 40 to 49 years and least common in those aged 50 and older. Additionally, it was more frequently observed in participants with secondary education. This finding contrasts with a study conducted in Dodoma, which revealed a significant association of H. pylori infection with older adults aged 60 and above (38.26%) and individuals with lower educational attainment.[33]. The observed differences may be due to variations in the study populations. This study was community-based, encompassing all adults clinically suspected of peptic ulcer disease (PUD),

Whereas the Dodoma study was hospital-based, focusing on patients diagnosed with peptic ulcer disease via esophagogastroduodenoscopy (OGD). Consequently, the hospital environment likely included participants with more severe gastrointestinal symptoms and a higher proportion of older adults, which may account for the stronger correlation with advanced age. Moreover, the elevated infection rates among those with secondary education in the present study could be associated with lifestyle or behavioral risk factors, including occupational exposure, dietary habits, and stress, which may heighten susceptibility to H. pylori infection. Conversely, the Dodoma study identified a stronger link with lower education levels, likely attributable to factors such as inadequate sanitation, limited health literacy, and restricted access to healthcare services, particularly in rural or underserved areas[33].

The rate of Helicobacter pylori infection was higher among Males (49.3%) than among females(36.9%). Although after being subjected to multivariate regression, these findings were found to be not statistically significant, this was similar to the epidemiological studies done by Linda Brown, which showed that there was inconsistency in gender differences associated with *H. pylori* infection.[27] . This could be because the Male gender was confounded with other risk factors, such as environmental and behavioral factors associated with Helicobacter Pylori infection.

Furthermore, the infection was more common among employed individuals than in those who were unemployed and among singles and married individuals compared to widowed, divorced, and cohabiting individuals. Nevertheless, these variations were not statistically significant.

Helicobacter pylori infection was found to be significantly associated with the source of water, with a relatively high rate among tap water users, which was statistically significant with a p-value. Furthermore, multivariable regression analysis strengthens that the source of water was statistically significant. This was similar to a systematic review and meta-analysis done in East Africa, which showed that the source of water was significantly associated with Helicobacter Pylori infection[31]. This similarity is due to Helicobacter Pylori being transmitted primarily via the fecal-oral route, with contaminated water as a major means of transmitting the infection, particularly in places with inadequate water treatment services and sanitation. The similarity might also be caused by the use of multivariable regression analysis, which showed a strong association between the source of water and Helicobacter Pylori infection[31].

The proportion of Helicobacter Pylori infection was relatively higher among those with reported hand washing habits than those who did not wash their hands. Similarly, the infection rate was higher among those with good availability of toilets, and poor toilet availability than with excellent availability of toilets, who showed a lower infection rate and Helicobacter Pylori infection increased with deteriorating living conditions, with Poor living conditions and overcrowding having the highest infection rate, respectively, than those with adequate living conditions. However, the association were not statistically significant.

Helicobacter Pylori infection distribution was typical among those who smoked cigarettes and consumed alcohol, and the association was significant. However, multivariate regression analysis showed that smoking cigarettes and alcohol consumption were not associated with Helicobacter Pylori infection. This was contrary to the systematic review and meta-analysis done in East Africa, which showed that alcohol consumption and smoking cigarettes were significantly associated with Helicobacter pylori. [31], which could be explained due to Data from multiple populations, possibly with varying age groups, socioeconomic backgrounds, and cultural customs, that were combined in the systematic study. Also, differences in how alcohol consumption was defined, measured, or categorized (e.g., frequency, quantity, type of alcohol) could lead to different findings[31].

The Helicobacter pylori infection rate was relatively higher among those with a family history of Helicobacter pylori infection, as well as among those who ate fast food. However, after running the multivariable regression was found to be statistically insignificant. Unlike an epidemiological study, which showed the Helicobacter Pylori route of transmission was highly associated with a family history of *H. pylori* infection and was less associated with balanced diet intake than fast foods.[27]. This could be explained by close living conditions, shared hygiene practices, shared materials/utensils, and large family size, which increase the likelihood of transmission of infection amongst family members. Also, the intake of balanced diet foods is associated with a lower risk of Helicobacter pylori infection largely because it supports gastric mucosal health, reduces inflammation, and may inhibit bacterial growth through specific nutrients and bioactive compounds, unlike fast food intake which is associated with high infection rate due to association with poor handling of water and food during food preparation in setting with poor sanitation[27].

A higher proportion was prevalent among those who rarely use Painkillers and eat at street vendors. However, despite the higher proportions, the association was statistically insignificant.

This study demonstrated a positive linear correlation between Helicobacter pylori infection and clinical suspicion of PUD, assessed using three classification criteria, which was statistically significant. This correlation highlights a clear pattern where increasing clinical suspicion correlates with a higher likelihood of H. pylori infection. This finding is similar to a study conducted in Abuja, Nigeria, which also showed a strong positive relationship between H. pylori and clinical suspicion of PUD, with PUD confirmed through OGD. The similarity may be due to both studies including patients with suspected PUD rather than testing a random or asymptomatic population. Additionally, in both communities, limited access to early diagnostic tools could allow H. pylori infection to progress clinically to evident PUD, thereby strengthening the observed correlation between symptoms and infection[38].

CHAPTER SEVEN

7.0 Study strengths, limitations, and mitigations.

Strengths include that the study followed the appropriate standards of study design. From the calculation of sample size, sampling procedure, recruitment of study participants, data collection, and analysis of data. Not only that, but the use of a standardized, validated tool to assess clinical suspicion of PUD enhances the reliability of findings, which reflects clinical reality, and stratification of risk factors enables a direct and accurate measurement of associated risks.

There were some limitations to be addressed in this study. Firstly, A potential limitation of this community-based study was the reliance on self-reported data and participant compliance. Despite efforts to ensure accurate data collection and adherence to protocols, participants may have misreported symptoms, dietary habits, or medication use, either intentionally or unintentionally. To mitigate this limitation, thorough training was provided, and clear instructions were given to both participants and research assistants. Furthermore, the multivariate logistic regressions used to calculate the adjusted odds ratio for the respective variables were conducted, which increased the reliability of the association and controlled for confounders.

CHAPTER EIGHT

8.0 Conclusion

The findings from this study provide evidence that Helicobacter pylori infection was more prevalent among adults who were clinically suspected of having peptic ulcer disease in the Dar es Salaam communities. It was found that Environmental and behavioral risk factors played a dominant role in the transmission of infection, with the use of tap water for drinking emerging as the most significant risk factor.

8.1 Recommendations

It is strongly recommended that preventive measures against Helicobacter pylori should be prioritized at the community level by promoting community-based screening programs, especially those targeting individuals with clinical suspicion of PUD. Ensure tap water safety through regular testing and infrastructure improvements, while educating communities on safe water handling, conducting regular water quality monitoring, and community education campaigns on hygienic water collection, handling, and storage. Community-based health interventions should further emphasize lifestyle modifications that address the behavioral risk factors, including reducing alcohol consumption, discouraging cigarette smoking, and improving dietary habits by limiting reliance on fast foods and street-vended meals. Promoting healthier eating patterns, sanitation improvements, and routine health screenings will contribute to lowering infection rates and preventing long-term complications. Future studies should employ longitudinal designs to establish causal relationships between H. pylori infection, behavioral risk factors, and clinical outcomes.

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APPENDICES

Appendix I: Informed Consent Form (English version)

TITLE: HELICOBACTER PYLORI FECAL ANTIGENEMIA AMONG CLINICALLY SUSPECTED ADULTS WITH PEPTIC ULCER DISEASE IN DAR ES SALAAM.

1. Introduction

I, Dr. Neema Hamis Lweno, a resident in the Department of Internal Medicine, am conducting this study as part of my postgraduate research. Your participation will help gather important health information that will be used in this study. This form aims to provide you with all the necessary details to help you decide whether or not you would like to take part.

2. Purpose of the Study

This study aims to determine the prevalence of Helicobacter pylori infection, its associated risk factors, and its correlation with peptic ulcer disease (PUD) among adults who are clinically suspected of having PUD in Dar es Salaam. The findings of this study may help in the early screening of Helicobacter pylori infection and allow for early intervention to prevent complications associated with PUD.

3. What Participation Involves

If you agree to participate, you will be asked to provide information about your age, gender, education, occupation, lifestyle habits (such as smoking, alcohol use, and dietary habits), and living conditions through a questionnaire. Additionally, a stool sample will be collected from you to test for the presence of Helicobacter pylori antigen. You will be asked to provide this sample in a clean container provided by the research team. The collected data will be kept confidential and will only be used for this study.

4. Confidentiality

All the information you provide, including your stool sample, will be kept strictly confidential. The results of the study will not be shared with anyone who is not directly involved in the research, and no information will be released in a way that could identify you personally.

5. Voluntary Participation

Participation in this study is completely voluntary. You are free to refuse participation or to withdraw from the study at any time without any penalty or loss of benefits to which you are otherwise entitled. Your decision whether or not to participate will not affect your current or future relationship with the research team or any healthcare providers.

6. Risks and Benefits

There are no known significant risks associated with participating in this study, although there may be minor discomfort when providing the stool sample. The potential benefits include contributing valuable information that may help improve the diagnosis and treatment of Helicobacter pylori infection and peptic ulcer disease in Dar es Salaam.

7. Contact Information

If you have any questions or concerns about this study, please do not hesitate to contact any of the following:

- **Chairperson of the Department of Internal Medicine**: Prof. Y. Mgonda, Contact: 0754 277554
- **Secretary of KU-IREC**: Prof. Columba Mbekenga, Contact: 0784 645777

- **Principal Investigator**: Dr. Neema Hamis Lweno, Postgraduate student, Department of Internal Medicine. Contact: 0789031057

8. Consent

By signing below, you are indicating that you have read and understood the information provided above and that you agree to participate in this study voluntarily. You understand what will be involved in your participation, including completing a questionnaire and providing a stool sample, and you acknowledge that you can withdraw at any time without consequence.

Signature of Participant: _____ Date: _____

Signature of Principal Investigator: _____ Date : _____

Appendix II: Fomu ya idhini (Swahili version).

MAAMBUKIZI YA HELICOBACTER PYLORI MIONGONI MWA WATU WAZIMA WANAOSHUKIWA KUWA NA UGONJWA WA VIDONDA VYA TUMBO DAR ES SALAAM.

1. Utangulizi

Mimi, Dr. Neema Hamis Lweno, Mwanafunzi wa shahada ya uzamili katika Idara ya Tiba na magonjwa ya Ndani, ninafanya utafiti huu kama sehemu ya tafiti yangu za shahada ya uzamili. Kushiriki kwako kutasaidia kukusanya taarifa muhimu za kiafya zitakazotumika katika utafiti huu. Fomu hii inalenga kukupa maelezo yote muhimu yatakayokusaidia kuamua kama ungependa kushiriki au la.

2. Malengo ya Utafiti

Lengo kuu la utafiti huu ni kubaini kiwango cha maambukizi ya Helicobacter pylori, sababu zinazohusiana na maambukizi hayo, na uhusiano wake na ugonjwa wa vidonda vya tumbo kwa watu wazima wanaoshukiwa kuwa na vidonda vya tumbo katika Jiji la Dar es Salaam. Matokeo ya utafiti huu yanaweza kusaidia katika uchunguzi wa mapema wa maambukizi ya Helicobacter pylori na kuruhusu hatua za mapema za matibabu ili kuzuia matatizo yanayohusiana na vidonda vya tumbo.

3. Ushiriki

Ukikubali kushiriki, utaombwa kujibu maswali kwenye dodoso ambalo litakusanya taarifa kuhusu umri wako, jinsia, kiwango cha elimu, ajira, tabia zako za maisha (kama vile uvutaji sigara, matumizi ya pombe, na tabia zako za kula), na hali ya maisha yako. Zaidi ya hayo, sampuli ya kinyesi itakusanywa kutoka kwako ili kupima uwepo wa Antijeni ya Helicobacter

pylori. Utaombwa kutoa sampuli hii kwenye chombo safi kitakachotolewa na timu ya utafiti. Taarifa zitakazokusanywa zitahifadhiwa kwa siri na zitatumika tu kwa ajili ya utafiti huu.

4. Usiri ya Taarifa

Taarifa zote utakazotoa, ikiwa ni pamoja na sampuli yako ya kinyesi, zitahifadhiwa kwa siri kabisa. Matokeo ya utafiti hayatashirikiwa na mtu yeyote ambaye hajahusishwa moja kwa moja na utafiti, na hakuna taarifa itakayochapishwa kwa namna yoyote inayoweza kukufichua wewe binafsi**.**

5. Ushiriki wa Hiari

Kushiriki katika utafiti huu ni hiari kabisa. Una uhuru wa kukataa kushiriki au kujiondoa katika utafiti wakati wowote bila kuathiriwa kwa njia yoyote au kupoteza faida yoyote ambayo ungekuwa nayo. Uamuzi wako wa kushiriki au kutoshiriki hautaathiri uhusiano wako wa sasa au wa baadaye na timu ya utafiti au wahudumu wa afya.

6. Hatari na Faida

Hakuna hatari kubwa inayojulikana inayohusiana na kushiriki katika utafiti huu, ingawa kunaweza kuwa na usumbufu mdogo wakati wa kutoa sampuli ya kinyesi. Faida zinazowezekana ni pamoja na kutoa taarifa muhimu ambazo zinaweza kusaidia kuboresha uchunguzi na matibabu ya maambukizi ya Helicobacter pylori na ugonjwa wa vidonda vya tumbo katika Jiji la Dar es Salaam.

7. Maswali

Ikiwa una maswali yoyote au wasiwasi kuhusu utafiti huu, tafadhali wasiliana na mmoja wa watu hawa:

• Mwenyekiti wa Idara ya Tiba ya Ndani: Prof. Y. Mgonda, Mawasiliano: 0754 277554

• Katibu wa KU-IREC: Prof. Columba Mbekenga, Mawasiliano: 0784 645777

• Mtafiti Mkuu: Dr. Neema Hamis Lweno, Mwanafunzi wa Shahada ya Uzamili, Idara ya Tiba ya Ndani. Mawasiliano: 0789031057

8. Ridhaa

Kwa kusaini hapa chini, unaonyesha kuwa umesoma na kuelewa maelezo yaliyotolewa hapo juu na kwamba unakubali kushiriki katika utafiti huu kwa hiari yako. Umeelewa kile kitakachohusisha kushiriki kwako, ikiwa ni pamoja na kujibu maswali na kutoa sampuli ya kinyesi, na unakubaliana kwamba unaweza kujiondoa wakati wowote bila athari yoyote**.**

Sahihi ya Mshiriki: _____ Tarehe: _____

Sahihi ya Mtafiti Mkuu: _____ Tarehe: _____

Appendix III: Questionnaire (English version)

HELICOBACTER PYLORI FECAL ANTIGENEMIA IN CLINICALLY SUSPECTED

PEPTIC ULCER DISEASE IN ADULTS IN DAR ES SALAAM.

1. DATE_____ 2. AREA OF RESEARCH _____ 3. RESIDENCE_____

A. SOCIAL DEMOGRAPHIC CHARACTERISTICS

4. Age (Years) ☐ 1. 18- 29 ☐ 2. 30-39 ☐ 3. 40-49 ☐ 4.50 and above

5. Gender ☐1. Male ☐2. Female

6. Level of education ☐1. No formal ☐ 2. Primary ☐ 3.Secondary

☐4.Diploma/certificate/Higher

7. Employment status ☐ 1.employed ☐ 2.unemployed

8. Marital Status ☐ 1.Single ☐ 2.Married ☐ 3.Divorced

☐ 4.Widow/Widower ☐ 5. Cohabiting

B: ENVIRONMENTAL AND LIVING CONDITIONS

9. How would you describe your source of drinking water?

☐1. Tap water ☐ 2. Well water, ☐ 3.Bought bottled water.

10. How would you describe your access to clean toilet facilities?

☐1. Excellent ☐ 2.Good ☐3. Poor ☐ 4. Very Poor

11. Do you wash your hands before eating and after defecation/urination? ☐1. Yes ☐ 2.No

12. How would you describe your living environment?

☐1. Adequate ☐ 2. Overcrowded ☐ 3. Poor

C: BEHAVIORAL FACTORS

13. Do you smoke now? ☐ 1. Yes ☐ 2. No

14. Do you drink alcohol? ☐ 1. Yes ☐ 2. No

15. How frequently do you take NSAIDs (painkillers)?

☐ 1. Regularly ☐ 2. Occasionally ☐ 3. Rarely ☐ 4. Never

16. Have you ever had a family history of Helicobacter pylori infection? ☐1. Yes ☐ 2. No

17. How would you assess your dietary habits (eating habits or food intake)?

☐ 1. Poor ☐ 2. Balanced diet ☐ 3. Consumes mostly fast food.

18. What is the main source of your daily diet?

☐ 1. Street vendors

☐ 2. Others (home cooked, Hotel, Instutionalized)

D: Clinical Suspicion of Peptic Ulcer Disease (PUD)

(This section evaluates clinical signs of PUD contributing to the suspicion.)

19. Have you experienced any of the following symptoms? *(Check all that apply.)*

The 11 questions from the Cornell Medical Index that were included were as follows:			
	Question item	1=Yes	2=No
1	Is your appetite always poor?		
2	Do you usually eat sweets or other food between meals?		
3	Do you always gulp your food in a hurry?		
4	Do you often suffer from an upset stomach?		
5	Do you usually feel bloated after eating?		
6	Do you usually belch a lot after eating?		
7	Are you often sick to your stomach?		
8	Do you suffer from indigestion?		
9	Do severe pains in the stomach often double you up?		
10	Do you suffer from constant stomach trouble?		
11	Has a doctor ever said you had Peptic ulcer disease?		
The diagnostic questions			
(I)	Have you ever been troubled by episodes of stomach pain or stomachache?		
(I-A)	If yes, how soon do these episodes usually come on after eating?		

(a)	Right after eating		
(b)	$\frac{1}{2}$ —1 hour after eating		
(c)	2 hr. or longer after eating		
(d)	Not related to eating		
(I-B)	If yes, are they relieved by taking milk or food?		
(I-C)	If yes, have they ever awakened you at night?		
(II)	Have you ever been told by your doctor that you had a PUD?		
(II-A)	If yes, was this finding confirmed by Esophagogastroduodenoscopy?		

Ulcer Classification:

- **Criterion 1:** Positive answer to:
  - Question I: Have you ever been troubled by stomach pain or aches?
  - And Question I-A-c: How soon do these episodes usually come on after eating? (2 hours or longer)
  - And Question I-B: Are they relieved by taking milk or food?
- **Criterion 2:** Positive answer to:
  - Question I: Have you ever been troubled by stomach pain or aches?
  - And Question I-C: Have they ever awakened you at night?
- **Criterion 3:** Positive answer to:
  - Question II: Have you ever been told by your doctor that you had a PUD?
  - And Question II-A: Was this finding confirmed by Esophagogastroduodenoscopy?

E. **SUMMARY: CIRCLE ONE**

20*. H. pylori* Test Result: ☐ 1. Positive ☐ 2.Negative.

F: END OF QUESTIONNAIRE: Thank you for your participation in this study. Your responses will remain confidential and will only be used for research purposes**.**

Appendix IV: Dodoso (Kiswahili).

MAAMBUKIZI YA HELICOBACTER PYLORI MIONGONI MWA WATU WAZIMA WANAOSHUKIWA KUWA NA UGONJWA WA VIDONDA VYA TUMBO DAR ES SALAAM.

1.Tarehe _____ 2. Mahali pa Utafiti _____ 3. Eneo la Makazi _____

A. MAELEZO YA KIJAMII NA DEMOGRAFIA

4.Umri (Miaka): ☐ 1.18-29 ☐ 2.30-39 ☐ 3.40-49 ☐ 4.50 na Zaidi

5. Jinsia: ☐ 1.Mwanaume ☐ 2.Mwanamke

6. Elimu**:** ☐ 1.Hana elimu rasmi ☐ 2.Msingi ☐ 3.Sekondari ☐ 4.Cheti/Diploma/Ya juu.

7.Kazi :☐ 1.nimeajiriwa ☐ 2.sijaajiriwa

8.Hali ya Ndoa: ☐ 1.Hajaoa/Hajaolewa ☐ 2.Ameoa/Ameolewa ☐ 3.Ameachika

☐ 4.Mjane/Mgane ☐ 5.Anaishi pamoja bila ndoa

B. MAZINGIRA NA HALI YA MAISHA

9.Unaelezeaje chanzo chako cha maji ya kunywa? Maji ya

☐ 1.bomba ☐ 2.kisima/visima virefu ☐ 3.chupa yaliyonunuliwa.

10.Unaelezeaje upatikanaji wako wa huduma za upatikanaji choo?

☐ 1.Bora sana ☐ 2.Nzuri ☐ 3.Duni ☐ 4.Duni sana

11.Je, huwa unaosha mikono kabla ya kula na baada ya kutumia choo? ☐ 1.Ndio ☐ 2.Hapana

12.Unaelezeaje mazingira unayoishi?

☐ 1.Mazuri ☐ 2.Ya msongamano ☐ 3.Mazingira yasiyo na usafi

C. TABIA ZA KIMAISHA

13. Je unavuta sigara kwa sasa? ☐ 1.Ndio ☐ 2.Hapana

14. Je unakunywa pombe? ☐ 1.Ndio ☐ 2.Hapana

15. Mara ngapi Unatumia dawa za kutuliza maumivu kama vile Ibuprofen and Aspirin?

☐ 1.Mara kwa mara ☐ 2.Mara chache ☐ 3.Nadra ☐ 4.Kamwe/situmii kabisa

16. Je, umewahi kuwa na historia ya familia yenye maambukizi ya Helicobacter pylori

☐ 1.Ndio ☐ 2.Hapana

17. Unaelezeaje tabia zako za ulaji?

☐ 1.duni za ulaji ☐ 2.Lishe bora ☐ 3..Hutegemea vyakula vya haraka

18. Je, chanzo kikuu cha mlo wako wa kila siku ni Kipi?

☐ 1.Wauzaji wa vyakula mtaani

☐ 2.Vingine(cha kupika nyumbani,hotelini,kwenye taasisi)

D. UCHUNGUZI WA DALILI ZA VIDONDA VYA TUMBO (PUD)

19. Je, umewahi kupata dalili zifuatazo? (Tiki zote zinazohusika)

Maswali 11 kutoka kwa Cornell Medical Index yaliyojumuishwa ni kama ifuatavyo:			
	Swali la kipengele:	1=Ndiyo	2=hapana
1	Je, hamu yako ya kula huwa mbaya kila wakati?		
2	Je, kwa kawaida wewe hula peremende au vyakula vingine kati ya milo?		
3	Je, sikuzote wewe hula chakula chako haraka-haraka?		
4	Je, mara nyingi wewe huwa na matatizo ya tumbo kujaa gesi?		
5	Je, kwa kawaida wewe huhisi tumbo kujaa baada ya kula?		
6	Je kwa kawaida wewe hutoa gesi nyingi baada ya kula?		
7	Je, mara nyingi unahisi kichefuchefu?		
8	Je, unasumbuliwa na kiungulia?		
9	Je, maumivu makali ya tumbo mara nyingi yanakufanya kujikunja?		
10	Je, unasumbuliwa na matatizo ya tumbo kila wakati?		
11	Je, daktari amewahi kukuambia kuwa una vidonda cha tumbo?		
Maswali ya utambuzi:			
(I)	Je, umewahi kusumbuliwa na vipindi vya maumivu au maumivu ya tumbo?		
(I-A)	Ikiwa ndiyo, vipindi hivi huanza lini baada ya kula?		

(a)	Mara baada ya kula		
(b)	Ndani ya nusu saa hadi saa moja baada ya kula		
(c)	Masaa mawili au zaidi baada ya kula		
(d)	Hayahusiani na chakula		

(I-C)	Ikiwa ndiyo, je, yamewahi kukuamsha usiku?		
(II)	Je, umewahi kuambiwa na daktari kuwa una Vidonda cha tumbo?		
(II-A)	Ikiwa ndiyo, je, matokeo haya yalithibitishwa kwa uchunguzi wa Uchunguzi wa umio, tumbo, na sehemu ya mwanzo ya utumbo mdogo kwa kutumia kifaa maalum cha kuona (OGD)		

Uainishaji wa Vidonda vya Tumbo:

- **Kigezo cha 1**: Majibu Chanya kwa:
  - o Swali I: Je, umewahi kusumbuliwa na maumivu au maumivu ya tumbo?
  - o Na Swali I-A-c: Vipindi hivi huanza lini baada ya kula? (Masaa 2 au zaidi)
  - o Na Swali I-B: Je, yanapungua unapokunywa maziwa au kula chakula?
- **Kigezo cha 2**: Majibu chanya kwa:
  - o Swali I: Je, umewahi kusumbuliwa na maumivu au maumivu ya tumbo?
  - o NA Swali I-C: Je, yamewahi kukuamsha usiku?
- **Kigezo cha 3:** Majibu chanya kwa:
  - o Swali II: Je, umewahi kuambiwa na daktari kuwa una kidonda cha tumbo?
  - o Na Swali II-A: Je, matokeo haya yalithibitishwa kwa uchunguzi wa Uchunguzi wa umio, tumbo, na sehemu ya mwanzo ya utumbo mdogo kwa kutumia kifaa maalum cha kuona (OGD)

E. MUHTASARI:

20. Matokeo ya Kipimo cha *H. pylori*: ☐ 1.Chanya (Positive) ☐ 2.Hasi (Negative)

F: MWISHO WA MASWALI: Asante kwa kushiriki katika utafiti huu. Majibu yako yatabaki kuwa siri na yatatumika kwa malengo ya utafiti pekee.

Appendix V: Kairuki University Institution Review Ethical Committee Report.

KAIRUKI UNIVERSITY (KU)

70 Chwaku Street,
Mikocheni,
P.O BOX 65300,
Dar es Salaam,
Tanzania.

Tel: +255-22-2700021/4
Fax: +255-22-2775591
Email: irec@ku.ac.tz
Website: www.ku.ac.tz

Ref. No. KU/IREC/27.10/553 **8 April, 2025**

Dr. Neema Hamis Lweno,
Kairuki University,
70 Chwaku Street,
Mikocheni,
P. O. Box 65300.
Dar es Salaam, Tanzania.

RE: ETHICAL CLEARANCE CERTIFICATE FOR CONDUCTING HEALTH RESEARCH

I am pleased to inform you that the research titled: **Helicobacter Pylori Fecal Antigenemia in Clinically Suspected Peptic Ulcer Disease Adults in Dar es Salaam (Lweno, N, H., 2025)** has been granted ethical approval.

This approval is in effect for one year from the above date.

- Any changes in the procedures should be reported to the Institutional Research Ethics Committee.
- Significant changes will require the submission of a revised request for ethical approval.
- You will be required to submit **a study progress report** every six months.

Permission to publish your findings should be sought from the National Institute for Medical Research (NIMR) before submission to a publisher and not concurrently.

CHAIR PERSON

Name: Prof. Frederick Kaijage

Signature: _____

SECRETARY

Name: Prof. Columba Mbekenga

Signature: _____

DIRECTOR POSTGRADUATE STUDIES AND RESEARCH INSTITUTE
KAIRUKI UNIVERSITY
P. O. Box 65300, DSM

Appendix VI: Permission Letters for data collection

KAIRUKI UNIVERSITY (KU)

70 Chwaku Street
Regent Estate – Mikocheni
P.O. Box 65300,
Dar es Salaam
Tanzania

Tel: +255-22-2700021/4
Email: secvc@ku.ac.tz
Website: www.ku.ac.tz

Ref. No. KU/PT/30.5/561

10th April 2025

Regional Administrative Secretary

P.O. BOX 5429

Dar es salaam

Imepokelewa
10/04/25
AM.

Re: LETTER OF INTRODUCTION FOR DR. NEEMA HAMIS LWENO (MMed Part II – INTERNAL MEDICINE).

The above named is a MMed postgraduate student specialising in Internal Medicine. As part of fulfilling her MMed programme, she plans to undertake a study titled, **"Helicobacter Pylori Fecal Antigenemia in Clinically Suspected Peptic Ulcer Disease Adults in Dar es Salaam ".** This study was reviewed and has been granted with an ethics approval No. **KU/IREC/27.10/553** by the KU Institutional Research Ethics Committee that will be valid for one year with effect from 8th April 2025.

This letter serves to introduce **Dr. Neema Hamis Lweno** who will be conducting her study in Dar es Salaam, please accord her with the needed support.

Thank you for your support and cooperation in developing human resources for health in our country.

Regards,

DIRECTOR POSTGRADUATE STUDIES
KAIRUKI UNIVERSITY
P. O. Box 65300, DSM
AND RESEARCH INSTITUTE

Professor Columba Mbekenga, PhD
Director Postgraduate Studies & Research Institute

c. c. Prof. Yassin Mgonda, Head, Department of Internal Medicine, KU.

c.c: Kinondoni kwa kopa and Kambangwa streets.

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Email: info@ku.ac.tz
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Admissions:
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+255 659 371 234

JAMHURI YA MUUNGANO WA TANZANIA
OFISI YA RAIS
TAWALA ZA MIKOA NA SERIKALI ZA MITAA

MKOA WA DAR ES SALAAM
Anwani ya Simu:
Simu: 2203156/58
Fa: +25522203213
Tovuti: www.dsm.go.tz
Barua Pepe: ras@dsm.go.tz
Unapojibu Tafadhali taja:

OFISI YA MKUU WA MKOA,
3, Barabara ya Rashid Kawawa,
S.L.P 5429,
12880, DAR ES SALAAM.

Kumb. Na. EA.260/307/01B/220

11 Aprili, 2025

Mkurugenzi wa Manispaa,
Manispaa ya Kinondoni,
DAR ES SALAAM.

YAH: UTAMBULISHO WA UTAFITI

Tafadhali husika na kichwa cha habari hapo juu.

2. Ofisi ya Mkuu wa Mkoa wa Dar es Salaam inautambulisha utafiti ujulikanao ***"Helicobacter Pylori Fecal Antigenemia in Clinically suspected Peptic Ulcer Disease Adults in Dar es Salaam"*** ikiwa ni sehemu ya kukamilisha mafunzo ya Shahada ya Uzamili ya Dkt. Neema Hamis Lweno ambaye ni mwanafunzi katika Chuo Kikuu cha Kairuki.

3. Utafiti huu umepangwa kufanyika katika Manispaa ya Kinondoni ndani ya Mkoa wa Dar es Salaam ambao utahusisha wanajamii watakaokua na dalili za vidonda vya Tumbo. Kibali cha kufanya utafiti huu kimetolewa na Chuo Kikuu cha Kairuki chenye Kumb. Na. KU/IREC/27.10/553 ambacho kinaanzia tarehe 10 Aprili, 2025 hadi 13 Aprili, 2026.

4. Kwa barua hii, namtambulisha kwako **Dkt. Neema Hamis Lweno** ambaye ndio msimamizi mkuu wa utafiti huo ili aweze kufanya utafiti huu muhimu.

Nashukuru kwa ushirikiano.

Dkt. Mohamedi Mang'una
Kny; KATIBU TAWALA WA MKOA
DAR ES SALAAM

Received 11/4/2025

Nakala: Katibu Tawala wa Mkoa,
DAR ES SALAAM. – Aione katika jalada

JAMHURI YA MUUNGANO WA TANZANIA

OFISI YA RAIS,
TAWALA ZA MIKOA NA SERIKALI ZA MITAA

HALMASHAURI YA MANISPAA YA KINONDONI

Unapojibu tafadhali taja:

Kumb. Na. HB.345/49 **Tarehe:** 15/04/2025

Neema Hamis Lweno,
Chuo Kikuu cha Kairuki,
DAR ES SALAAM.

YAH: KIBALI CHA KUFANYA UTAFITI

Kichwa cha habari hapo juu cha husika.

2. Ofisi ya Mkurugenzi wa Manispaa ya Kinondoni imepokea barua toka Ofisi ya Katibu Tawala Mkoa yenye Kumbukumbu namba **EA.260/307/01B/223** ya tarehe **14 April, 2025** kutoka Chuo Kikuu cha **Kairuki.**

3. Kwa barua hii, *Kibali kimetolewa kwenye* ***Divisheni ya Afya, Ustawi wa Jamii na Lishe*** *kufanya utafiti kuanzia* **10/04/2025** hadi tarehe **13/04/2026** kwa ajili ya kufanya utafiti kuhusu ***"Helicobacter Pylori Fecal Antigenemia in Clinically Suspected Peptic Ulcer Disease Adults in DAR ES SALAAM".***

4. Tafadhali mpokee na kumpa ushirikiano.

.....
S.A Setumbi
Kny: MKURUGENZI WA MANISPAA

Kny: MKURUGENZI WA MANISPAA
MANISPAA YA KINONDONI
DAR ES SALAAM

Nakala:

Mkurugenzi wa Manispaa **KINONDONI.**	-	aione kwenye jalada.
Mkuu wa Divisheni **Divisheni ya Afya**	-	kwa taarifa

Barua zote zitumwe kwa Mkurugenzi wa Manispaa Manispaa ya Kinondoni, S.L.P. 31902, 2 Barabara ya Morogoro, 14883 Dar es Salaam, Unaweza pia kuwasiliana nasi kwa Simu: +255 2170173 Nukushi: 2172606,
Barua pepe – info@kinondonimc.go.tz

JAMHURI YA MUUNGANO WA TANZANIA

OFISI YA RAIS,
TAWALA ZA MIKOA NA SERIKALI ZA MITAA

HALMASHAURI YA MANISPAA YA KINONDONI

Unapojibu tafadhali taja:

Kumb. Na. HB.345/520/01 16/04/2025

Afisa Mtendaji
Kata ya Mwananyamala (ATT. AFISA AFYA KATA)

KUH: KIBALI CHA KUFANYA UTAFITI KATIKA KATA ZA MANISPAA YA KINONDONI

Tafadhali rejea somo tajwa hapo juu.

2. Ofisi ya Mganga Mkuu wa Manispaa ya Kinondoni inapenda kumtambulisha kwako mtafiti **Neema Hamis Lweno** ambaye anasoma chuo Kikuu cha Kairuki amepewa kibali cha kufanya utafiti unaohusu **"Helicobacter Pylori Fecal Antigenemia in Clinically Suspected Peptic Uicer Disease Adults in Dar es Salaam".**

3. Utafiti huu utafanyika kuanzia tarehe **10/04/2025** hadi **13/04/2026**

4. Kwa barua hii unaombwa kutoa ushirikiano kwa watafiti hao ili kuwawezesha kukamilisha jukumu hilo kikamilifu na kwa wakati. Utafiti utajumuisha uchukuaji wa sampuli na kuzipima katika Kituo (Zahanati iliyokaribu)

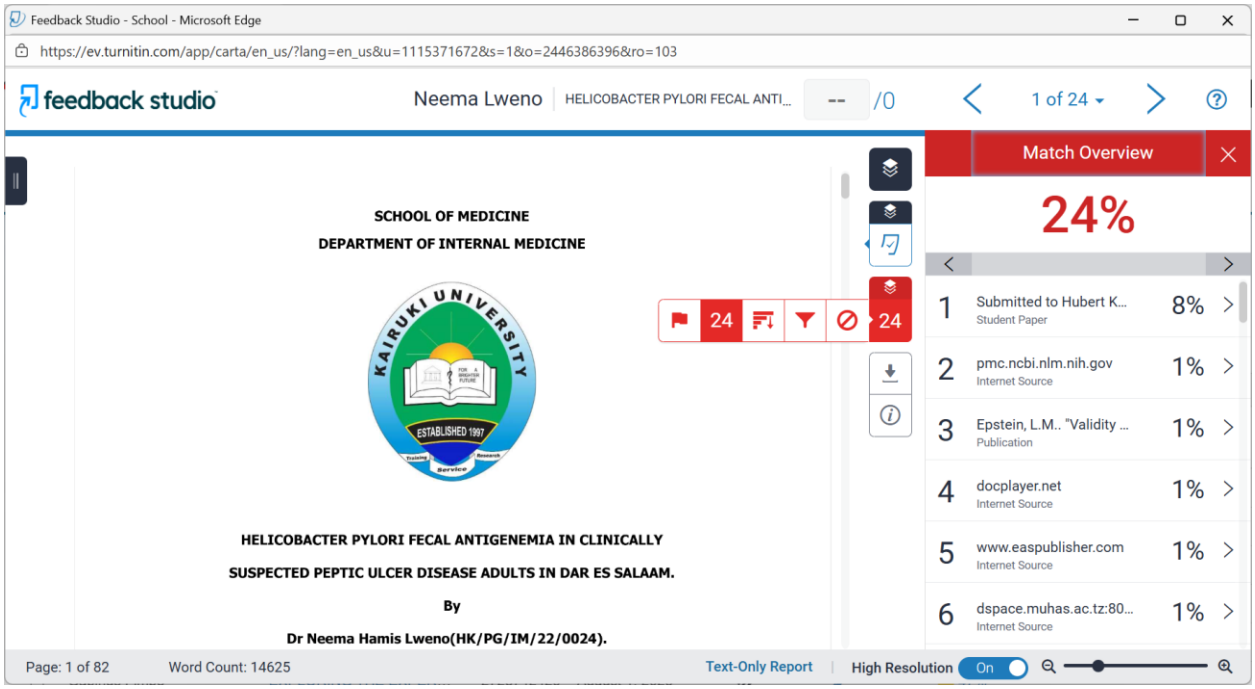
Nakutakia kazi njema.

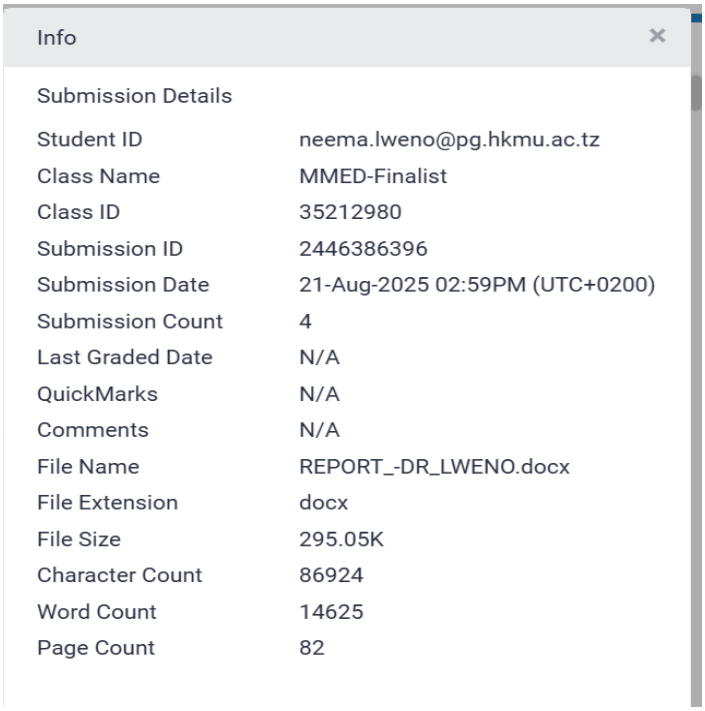
Dkt. Ezra Ngereza
Kny:MGANGA MKUU WA MANISPAA
HALMASHAURI YA MANISPAA YA KINONDONI

Kny: MGANGA MKUU WA MANISPAA

Nakala: Maganga Mfawidhi : Zahanati ya Kambangwa

Appendix VII: Turnitin Plagiarism Report.





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SCHOOL OF MEDICINE

DEPARTMENT OF INTERNAL MEDICINE

HELICOBACTER PYLORI FECAL ANTIGENEMIA IN CLINICALLY SUSPECTED PEPTIC ULCER DISEASE ADULTS IN DAR ES SALAAM.

By:

Dr Neema Hamis Lweno(MUI/PG/IM/22/00241).

A Dissertation Submitted in (partial) Fulfillment of the Requirements for the Degree of Master of Medicine (Internal Medicine) at Kairuki University

2025.